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"Marginal analysis of a distribution model designed to increase the social welfare function of Medicare-funded diagnostic services."

A thesis submitted in fulfilment of the requirements for the award of the degree

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By

Keith McDonald, M.HSM, B.App.Sc, Dip.Teach.

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Certification

I, Keith A. McDonald, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Graduate School of Business, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Keith A. McDonald

18 December 2008

Table of Contents

List of Tables

List of Figures

List of abbreviations

AAPP	Australian Association of Pathology Practices
ABS	Australian Bureau of Statistics
ACR	American College of Radiologists
AIHW	Australian Institute of Health and Welfare
AMA	Australian Medical Association
AusDiab	Australian Diabetes, Obesity & Lifestyle Study
Aust.	Australia
BEACH	Bettering the Evaluation and Care of Health
BMA	British Medical Association
BMI	Body Mass Index
CIN	Cervical Intraepithelial Neoplasia
COPD	Chronic Obstructive Pulmonary Disease
CPI	Consumer Price Index
CT	Computer Tomography
CVA	Cerebrovascular Accident (or stroke)
CVD	Cardiovascular Disease
DALY	Disability-Adjusted Life Year
DCIS	Ductal Carcinoma in-situ
DEXA	Dual-energy x-ray absorptiometry
DoHA	Department of Health and Ageing
EDQUM	Enhanced Divisions Quality Use of Medicine
EPC	Enhanced Primary Care
EUC	Electrolytes, urea & creatinine
FBC	Full blood count
GDM	Gestational Diabetes Mellitus
GDP	Gross Domestic Product
GP	General Practitioner
HbA1c	Glycosylated haemoglobin
HIC	Health Insurance Commission (Medicare Australia)
HIV	Human Immuno-inefficiency Virus
HMO	Health Maintenance Organisation
HMR	Home Medication Reviews
HPV	Human Papilloma Virus
IFG	Impaired Fasting Glucose
IGT	Impaired Glucose Tolerance

IHD	Ischaemic Heart Disease
IPA	Independent Practice (or Practitioner) Association
LFT	Liver function test
MAHS	More Allied Health Services
MC&S	Microscopy, culture & sensitivity
MRI	Magnetic Resonance Imaging
NH&MRC	National Health and Medical Research Council
NHS	National Health Service (UK)
NIDDM	Non-Insulin Dependent Diabetes Mellitus
NSW	New South Wales
OECD	Organisation of Economic Cooperation and Development
OMP	Other Medical Practitioner
PCP	Primary Care Physician
PHCRIS	Primary Health Care Research and Information Service
PIP	Practice Incentive Payment
POS	Point-of-service plan
PPO	Preferred Provider Organisation
PPP	Purchasing Price Parity
PSA	Prostate-specific antigen
QALY	Quality-Adjusted Life Year
QOF	Quality and Outcomes Framework
RACGP	Royal Australian College of General Practice
RANZCR	Royal Australian and New Zealand College of Radiology
RAWP	Resource Allocation Working Party
RDF	Resource Distribution Formula
RCPA	Royal College of Pathologists of Australasia
SIP	Service Incentive Payment
SIQ	Semi-Inter-Quartile range (25-75%)
STARDS	Standards for Reporting of Diagnostic Accuracy
SWPE	Standardised Whole Patient Equivalent
TIA	Transient Ischaemic Attack
TRUS	Trans-rectal ultrasound-guided needle biopsy
UK	United Kingdom
US	United States (of America)
VR	Vocational Registration
WHO	World Health Organisation

Abstract

The pursuit of a more beneficial service mix in primary medical care is a worthwhile public goal. Public expenditure on diagnostic testing referred from general practice is a matter of public interest because of its potential benefit to the social welfare function.

To realise this potential, interventions must first reflect the evidence-base for enhancing clinical quality and promote discretionary increases in certain interventions (Eddy 1994[b] p.817; Rodwin 2004 p. 1328; Starfield 1998 p.406; Van Weel & Del Mar 2004 p.99). The effectiveness of primary care however is stratified by social class (Macinko, Starfield & Shi 2007 p.121; Starfield 1998 p.411). Therefore, services must also take into consideration any access barriers for vulnerable social groups and demonstrate a positive commitment to addressing the imbalance (Starfield 1998 p.406).

In practice, good clinical or scientific evidence alone is insufficient to achieve the optimum distribution of health services. The evidence must be matched by economic viability and sensitivity to the prevailing socio-political imperatives (Haas 2001 p.228; Van Der Weyden & Armstrong 2004 pp.607-608). Planning should explicitly consider marginal opportunities for changes in the balance of costs and benefits (Haas et.al. 1997 p.81).

The purpose of this study is to derive a model that levers redistribution of general practitioner-referred diagnostic services in favour of vulnerable social groups within Australia. The study operates within the boundaries of the dominant disease-state paradigm, because it focuses on systematically addressing nationally-prioritised epidemiological indicators for targeted populations.

The derived model relies on intermediaries representing groupings of general practices to drive the redistribution. It establishes an environment of nominal risk for the Divisions of General Practice network, acting as intermediaries. In turn, the actual risk to the Australian Government as the purchaser is limited to public funding through the Medicare Benefits Schedule of general practitioner-referred medical imaging (Category 5 [excluding Group I5]) and pathology tests (Category 6).

This is achieved by introducing a credit reserve ledger as a novel mechanism to track and reward Division performance. The ledger is a tool for the Australian Government to map the balance of benefits claimed on diagnostic services referred by general

practitioners enrolled with each Division. Ledger balances depend on a separation of medical imaging and pathology items into three streams. The systematic streaming of items is according to whether they are over-, appropriately- or under-referred, according to the available evidence.

The key for Divisions to draw on their credit reserve ledger is the proportionate uptake of the evidence-based target items by identified vulnerable social groups within their catchment. This is compared with a target level of activity set for these groups to establish a specific performance ratio for each financial period.

The research design of this study tests the model's effectiveness in the current health care environment, rather than its theoretical efficacy. The model acknowledges Australia's current legislative and policy framework and its communities' over-arching socio-political imperatives. No presumptions are made about changing the Medicare Benefits Schedule or its predominant fee-for-service mode of delivery.

The redistribution model is tested using a series of scenarios, and analysed in three parts. In the first part a macro-level analysis examines the net implications of the redistribution for the Australian Government, Divisions of General Practice and diagnostic providers as a whole across four different scenarios. In the second part, a meso-level analysis uses the existing Divisions' network in a further three scenarios. Normative projections are developed across categories of geographic dispersion for each of the given scenarios. Thirdly, a micro-level analysis examines the absolute values of projected credit reserves within the same scenarios as the meso-level analysis for each of the Divisions.

The model results in a 0.02% increase in total tests with a 2.2% reduction in the total of benefits claimed. Within this ideal redistribution, there is an 18.4% reduction in uptake of over-referred items, a modelled 0.8% growth in uptake of appropriately referred items, and a substantial growth in uptake of the targeted, under-referred items (activity by 84.9% and benefits claimed by 94.2%).

The meso-level analysis demonstrates that the model has a defining normative bias in favour of increasing rurality and remoteness. This is consistent with the model's aim of delivering supply-side incentives to service vulnerable social groups.

The meso-level results also indicate that a staged implementation of the model is required. This is because the overwhelming majority of Australia's population live within the more metropolitan and regional Divisions that require the greatest effort to glean benefit from the model. Initially, they may be the most difficult to engage.

At the micro-level, the model is tested on estimated parameters matched to one-hundred and nineteen Divisions of General Practice. The result is that all the Divisions of General Practice within the existing network have sufficient critical mass to accumulate a material benefit from participation.

The study acknowledges that limitations in the model design may risk perverse incentives and unintended aberrations. For this reason, the model requires the protection of a regulatory framework to ensure its proper application in the field. Based on implementation experience, refinements may be required over time to reduce any unintended consequences.

There are limitations to the study design which give cause for further investigation and testing in the field. The analyses rely on secondary data, which risks artefacts within the results. Further, this is a study of marginal costs and benefits, rather than a true cost-effectiveness analysis because the utilisation targets used are interim measures of process, and not definitive measures of change in health status. Finally, this study is also limited by its inability to test the model against the actual parameters from identified Divisions of General Practice.

The study concludes that the model undergo further investigation and field testing in order to derive empirical results. It is also recommended that future studies test the generalisability of the model, with research into the redistribution modelling of general practice prescriptions and referrals to specialists for elective procedures. The consistent aim is to achieve marginal redistribution in the pursuit of an enhanced social welfare function.

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CHAPTER ONE - Overview

1.1 Introduction

Health care distribution within an industrialised society is both inefficient and inequitable if left solely to the open market. Typically the state uses regulations and policy directives to manipulate the distribution of prioritised services (Haas, Mooney, Viney & Cooper 1997 p.81; Haas 2001 p.228; Hay 2006 p.5). Despite its narrow focus on addressing epidemiological indicators prioritised according to the relative burdens of both mortality and morbidity, the disease-state paradigm continues to dominate health care policy and planning across the Organisation for Economic Cooperation and Development (OECD) member states (Starfield 1998 p.61). This study operates within the boundaries of this prevailing paradigm.

There are a variety of models for health care distribution across the member states of the OECD (see Appendix 1 page 322 for a description of the OECD). Most seek to contain cost, pursue quality, and/or reward the attainment of policy targets. All betray a tension between addressing objectives of equity and efficiency (Duckett 2000 p.228; Eagar, Garrett & Lin 2001 pp.188-189; Feldstein 1999 p.175; Hay 2006 p.2; Le Grand 1996 p.151; Mooney & Newberry 1999 p.42; Starfield 1998 p.398). The result depends on the prevailing social order and the value judgments of those who control the means of production and distribution (Evans 1996 pp.35; Le Grand 1996 p.161; Podger 2006 p.139). One feasibility test for a planned service is its ability to fit within the relevant regulatory and policy environment (Duckett 2000 p.228; Eagar, Garrett & Lin 2001 pp.188-189; Le Grand 1996 p.151; Mooney & Newberry 1999 p.42). In practice, good clinical or scientific evidence alone is insufficient. It must be matched by economic viability and sensitivity to the prevailing socio-political imperatives (Van Der Weyden & Armstrong 2004 pp.607-608).

From the neo-classical welfarist perspective, maldistribution must be addressed if negative externalities detract from society's aggregate utility and subsequently decreases economic efficiency (Hurley 2000 p.87). Alternatively, from the extra-welfarist perspective, the net impact of targeted utilisation on the social welfare function is the key outcome measure (Hurley 2000 p.107). Regardless of the theoretical perspective, the pursuit of a more beneficial service mix in primary medical care is a worthwhile public goal. Planning should explicitly consider marginal opportunities for changes in the balance of costs and benefits (Haas et.al. 1997 p.81). It is also essential that an account be taken of relevant socioeconomic and demographic variables (Haas 2001 p.228) (see Appendix 1 page 333 for a description of the social welfare function).

Rarely does realising equity equate with identical distribution of the same goods to all social groupings. Empirical evidence repeatedly demonstrates a positive association between improved primary care distribution and the relative health status of vulnerable social groups within communities (Blumenthal, Mort & Edwards 1995 p.259; Deeble 1999 p.7; Holland, Mossialos & Permanand 1999 p.2; Starfield 1998 pp.12-14). A commitment to solidarity requires that distribution is according to comparative need, provided a service is deemed to be a merit good (Starfield 1998 p.14) (see Appendix 1 page 320 for descriptions of merit goods and need respectively).

Australian health policy accepts the importance of equitable access to primary medical care for vulnerable social groups as a matter of justice, without necessarily considering any underlying utility interdependencies. However the reality of resource scarcity challenges this policy commitment with the normative economic imperative for efficiency that drives many operational directives. This is a common theme in contemporary health care policy development across the OECD member states (OECD 2001 p.30).

The purpose of this study is to derive a model that levers marginal redistribution of general practitioner-referred diagnostic services in favour of vulnerable social groups within Australia. It is in the public interest to study mechanisms that contain the expenditure growth in diagnostic testing referred from general practice, whilst sustaining clinical quality and rewarding discretionary increases for certain population screening tests. Some over-referred test items produce a dead-weight loss in public expenditure that has the potential for redistribution. Simultaneously, general practice-referred diagnostic testing plays a pivotal role in the screening and monitoring of two of the major disease burdens in Australia - cancer and cardiovascular disease. To truly enhance the social welfare function, referral patterns for these tests should reflect attempts to counter the barriers to access for vulnerable social groups.

1.2 The structure of the study

The study comprised a comprehensive literature review and an original research project using theoretical scenario modelling.

1.2.1 The scope of the literature review

The purpose of this literature review is to explore the relevance of population-based diagnostic screening as a primary care strategy capable of enhancing health gain for vulnerable social groupings in Australia. Health services are considered within three contextual levels. The first is the macro-environment of legislation, government policy, goals and resource allocation. The second is the meso-environment of delivery systems, planning, budgeting and contracting. The third is the micro-environment of discrete service provision to the patient (Marriott & Mable 1998 pp.553-554).

The review explores a range of economic paradigms that describe health care provision. At one level it is considered a production function with utilisation the dependent variable. At another level utilisation proves only to be an interim measure, with health care considered as one of numerous inputs to broader (and less tangible) measures of the social welfare function. Typically, in the context of health policy and planning, measures of health status are taken as proxy indicators of social welfare. Accepting the limitations of this approach, the scope of the review deliberately lies within the confines of planning and measurement related to the delivery of health care. It does not attempt to address full scale social planning and evaluation of the holistic health of a community.

A common theme underpinning the literature review is the economic reality of resource scarcity in health care delivery. The conundrum of balancing strategies that pursue efficiency with principles of social justice and equity is prevalent. The apparent failure of health care to truly operate within an open competitive market is discussed. The justifications for planning processes that use extensive control systems are considered. Particular attention is drawn to the concept of targeted utilisation (Duckett 1995 p.122-124).

The literature review is set out in five chapters (Chapters Two to Six). Chapters' Two to Six progressively telescope from broad outlines to the particular service components in question. Specifically, Chapter Two is a broad overview of contemporary health care systems across member states of the OECD. Chapter Three examines the provision and resourcing of general practice in Australia, and its impact on health measures. Chapter Four examines the distribution of general practice-referred diagnostics in Australia. The evidence of where there are possibly excessive rates of referral is examined. Chapter Five then discusses diagnostic screening and the possible justifications for increasing rates of referral in certain cases if national health priority targets are to be met. Chapter Six highlights the range of factors other than clinical evidence which influence general practice referral behaviour. The implications for devising realistic levers that will drive a marginal redistribution of general-practice referred diagnostics are then considered.

1.2.2 The scope of the research project

The research project is set out in the next three chapters (Chapters Seven to Nine). Chapter Seven examines Medicare Benefit Schedule data for the financial year 2002/03 to establish a baseline on the distribution of general practice-referred diagnostic services and the public cost that this generates. The streaming of medical imaging and pathology services is a key building block in this study’s analyses and modelling.

In Chapter Eight, an original model is presented which aims to achieve a marginal change in general practice referrals for diagnostic imaging and pathology tests. This redistribution aims to achieve two concurrent outcomes. The first outcome is increased utilisation by vulnerable social groups of particular population screening procedures. The second is a reduction in the referral of diagnostic items that are over-utilised compared with clinical need.

Chapter Nine outlines the results of scenario modelling designed to test the model. Scenarios are examined at macro-, meso- and micro-levels. Both normative and absolute findings are presented (see Appendix 1 page 316 for a description of marginal analysis).

Chapter Ten, the final chapter, then discusses the results of the scenario testing. Limitations to the research design and results are highlighted. The implications for a redistribution of general practice-referred diagnostic services are considered. Conclusions are drawn on the major findings of this study. Particular consideration is given to the feasibility of applying the model within the field.

1.2.3 Search strategy

The literature review and research project has relied on a range of sources for citations. Most important amongst these include the following:

- The University of Wollongong library
- The Charles Sturt University library
- The Cochrane Collaboration library
- Primary Health Care Research and Information Service (PHCRIS) fortnightly bulletins
- Australian College of Health Service Executives (ACHSE) monthly library bulletins
- Australian Health Review quarterly subscription
- An Australian Divisions of General Practice 2004 study tour of New Zealand Independent Practice Associations (IPA)

In addition, weekly automated searches were established with the following two on-line bibliographical services:

- Ovid databases citation auto-alert
- PubMed service of the Unites States National Library of Medicine
- Scopus search alert

Keywords and phrases used in citation searches included the following:

- “Diagnostic services and primary care”
- “Diagnostic screening”
- “Population screening”
- “Primary care”

Several constraints were placed on citation searches. These included limits to human subjects and English language text. Automated searches were also limited to citations published from 1990 and thereafter. On occasion, further searches also accessed citations that pre-dated 1990.

Press releases and position statements by politicians, lobbyists or stakeholder interest groups were excluded from the review. Similarly any citation that constituted an advertisement or product endorsement was excluded.

In total, 568 citations were reviewed. 252 of the citations have been referenced. A broad range of material has been utilised. These include the following:

- Peer-reviewed journal articles encompassing research studies, meta-analyses, literature reviews editorials and expert commentaries.
- Published texts.
- Published conference proceedings
- Published reports, discussion papers and guidelines.

1.2.4 Summary of results

The literature provided empirical evidence to draw upon in the design of a model for marginal redistribution of general practice diagnostic referrals. The model is designed to enhance the social welfare function through increased uptake of cervical and hypercholesterolaemia screenings by socially vulnerable groups and concurrently reducing referral rates for items that are over-utilised compared with clinical need.

A key building block in the analysis is the streaming of medical imaging and pathology services according to the levels of general practice referral relative to the available evidence. Different financial levers are applied to each stream in order drive the marginal redistribution.

The model is tested against scenarios in three parts. The first part is a macro-level analysis which considers the net implications of the redistribution for the Australian Government, intermediaries and diagnostic providers. The second part is a meso-level analysis which examines the normative impact of scenarios on the nationwide Divisions of General Practice network grouped by measures of geographic dispersion (Australian Divisions of General Practice 2005; Primary Health Care Research and Information Service 2006). Finally, a micro-level analysis tests the absolute implications of the same scenarios against a range of Division sizes with a variety of demographic profiles.

1.3 Conclusion

The model results in a 1.2% redistribution of Medicare-funded diagnostic services to achieve a net benefit in the social welfare function. After an initial, staged implementation, the model aims to maintain a cost-neutral state. These calculations assume that there is no imminent change in Australia's current legislative and policy framework. Nor are presumptions made about changing either the Medicare Benefits Schedule or medical practitioners' predominant fee-for-service mode of delivery.

The absolute scale of credit reserves that Divisions can accrue correlates closely with catchment size, though the importance of this relationship declines as rurality and remoteness increases. This is because the model demonstrates a normative bias towards rurality and remoteness. The implication is that all the Divisions of General Practice within the existing network have sufficient critical mass to accumulate a material benefit from participation.

There are numerous limitations in the model design which will require the protection of a regulatory framework to ensure its proper application in the field. There are also limitations to the study design which give cause for further investigation and testing in the field. Nevertheless, the study's methodology demonstrates sufficient rigour. The datasets are reliable and the testing protocols are appropriate. The results in this study have adequate face validity.

The model requires further investigation and field testing in order to derive empirical results that will give an indication of predictive validity. Analysis of data from a pilot study using a case-control design over three financial years could achieve this. A quota sample of Divisions of General Practice will use the funding model over this time. The data collected from these cases will be compared with concurrent data from a matched quota sample of controls with a similar range of demographic profiles.

It is also recommended that future studies test the generalisability of the model, with research into the redistribution modelling of general practice prescriptions and referrals to specialists for elective procedures. The consistent aim is to achieve marginal redistribution in the pursuit of an enhanced social welfare function.

CHAPTER TWO - A systems analysis of health care distribution in the OECD

2.1 Introduction

The rationale for resourcing a state's health system depends on its prevailing social order, and the value judgements of those who control the means of production and distribution (Evans 1996 pp.35; Le Grand 1996 p.161; Podger 2006 p.139). Health systems across the OECD member states are clearly disparate. However one theme common to most OECD states is a paternalistic policy framework that attempts to either direct, manipulate and/or constrain utilisation by their particular communities (Rice 1998 p.66; Ross et.al. 1999 p.3; Starfield 1998 p.60).

All public decisions regarding health care distribution betray an omnipresent tension between the principles of efficiency and equity (Duckett 2000 p.228; Eagar, Garrett & Lin 2001 pp.188-189; Feldstein 1999 p.175; Hay 2006 p.2; Le Grand 1996 p.151; Mooney & Newberry 1999 p.42; Starfield 1998 p.398). It is also evident that for virtually every contingency, these two fundamental elements are cross-referenced with one or more complementary elements in order to derive a policy decision. These complementary elements are resource rationing and financial risk.

2.2 Fundamental elements in health care policy

2.2.1 Efficiency

Normative analyses of efficiency rely heavily on interpretations of demand measures and assume that the resultant supply is a true representation of the opportunity cost in resource consumption (Hurley 2000 p.85; Rice 1998 p.42). In other words, optimal output should be achieved when the price of care reflects both the minimal cost of producing the care and the maximal marginal benefit derived from it (Feldstein 1999 p.149) (see Appendix 1 pages 285, 297, 304 and 335 for descriptions of benefit, cost, efficiency and supply respectively).

A competitive market in equilibrium is assumed to represent the distribution of resources that best maximises society's utility, and with it, its social welfare (Rice 1998 p.143). However, there are several critical challenges to the treatment of health care within such a construct which risk market failure (Hurley 2000 pp.73-74; Segal 1998 p.271) (see Appendix 1 pages 296, 316, and 337 for further descriptions of competition, market failure and utility respectively).

An efficient market requires information symmetry between vendor and purchaser on the products at hand. Patients seek two types of information, related to diagnosis and treatment respectively. The technical complexity of most health care services invariably creates information asymmetry, with the consumer dependent largely on providers to advise both on their causes of ill health, and what services they require (Hurley 2000 p.73; Reinhardt 1996 p.88). Short of experience, most patients do not have the capacity to know what alternatives are available for any given condition. Nor are they capable of considering the counterfactual if they did not seek treatment. With this uncertainty the individual is in a poor position to judge the quality of the care that they are provided, let alone always make a welfare maximising decision (Garber 2000 p.186; Hurley 2000 p.74; Rice 1998 p.73). The lack of any practical sovereignty challenges the validity of interpreting consumer welfare from measures of health care demand (Hurley 2000 p.79; Segal 1998 p.272) (see Appendix 1 pages 298 and 324 for descriptions of demand and preference respectively).

A true market should be free of externalities. This means that the costs and benefits of a transaction should be discrete to those partaking in the activity (Rice 1998 p.23). Again, this is clearly not the case with certain health matters, where the actions or status of one party may impact indiscriminately on the health of many others (e.g. spread of infectious diseases). Also some health care interventions are judged public goods, because the market conditions of exclusiveness and rivalry are absent (Duckett 2000 pp.23-24; Garber 2000 p.186). An example is the management of infectious diseases using vaccination programs to create levels of herd immunity (Ross et.al. 1999 p.4) (see Appendix 1 page 328 for a description of public goods).

Finally, in a competitive market the level of production and supply should be in direct response to current and predicted levels of demand. The inherent uncertainty of actual demand for health care presents considerable risk to providers. In a business sense, it may not be viable to make available additional services for future consumption that is possible, yet unpredictable (Hurley 2000 p.72).

Therein lays the argument for public subsidy to ensure an optimally efficient level of production, and government regulation to control or prohibit negative consumption externalities (Hurley 2000 p.72; Rice 1998 p.24) (see Appendix 1 page 303 for a description of the dominant paradigms in economic analysis across OECD states).

The welfarist paradigm favours cash transfers because it does not threaten the consumers' sovereignty to purchase their preferences and maximise their individual utility (Rice 1998 p.156). However this creates a policy tension between individual primacy and the expectations of donors (e.g. the taxpaying electorate). Donors may judge the quality and direction of the transfer according to the utility they derive from caring externalities (Rice 1998 pp.156-157; Tsuchiya & Williams 2001 p.24).

The recognition of interdependencies associated with the utility that others may derive from certain groups' utilisation of particular services undermines any value that measures of demand offer policy considerations (Rice 1998 p.77). This is another justification for public intervention in the resourcing, organisation and administration of health care. It is not sufficient to only consider optimal production. Publicly-funded health care should also address distributional concerns (Hay 2006 p.1; Rice 1998 p.77).

Depending on the identification of need, calls for altruistic responses range from demand-side price subsidies at a minimum, up to and including supply-side regulation and even direct control of delivery (Hurley 2000 p.73). The rationale for redistribution premised on caring externalities is not necessarily the same as that which underlines equity concerns (Hurley 2000 p.85; Rice 1998 p.145). Caring externalities draws on preferences that appreciate the frequent interdependency of utility functions, and the subsequent impact this will have on allocative efficiency. For example, social policy that mitigates inequality through improved employment rates will increase economic productivity, increase tax revenues, reduce industrial conflict and foster political stability (Hay 2006 pp.1-2). In the welfarist tradition, if interdependencies cannot be demonstrated, then caring externalities cease and there is less concern for social justice and rights (Rice 1998 p.145; Starfield 1998 p.402) (see Appendix 1 pages 284, 313 and 331 for descriptions of altruism, justice and rights respectively).

Instead, extra-welfarism argues that the avoidance of market failure is sufficient justification for paternalistic service interventions and normative analyses to establish an appropriate policy framework for distribution (Bezzola & Martinsson 1998 p.9; Hurley 2000 p.57; Podger 2006 p.134). It is argued that the very characteristics predisposing health care to fail as a good or service within a market jeopardises the ability of classic economic methods to analyse its behaviour and appropriately inform policy responses. For example, a strict application of the Pareto criterion creates policy paralysis (McPake et.al. 2002 p.71). In reality, any public allocation of scarce resources allocation will invariably leave some groups worse off than they otherwise might be with an alternative scheme of distribution (Garber et.al. 1996 p.33; Reinhardt 1996 p.71; Rice 1998 p.70; Tsuchiya & Williams 2001 p.23) (see Appendix 1 page 322 for a description of the Pareto criterion).

The Kaldor Hicks criterion in pursuit of a potential Pareto improvement offers little guidance (Garber 2000 p.187). The Scitovsky paradox states that unless the compensation is actually delivered to those made worse off, competing and equally legitimate claims still apply to the resources in question (McPake et.al. 2002 pp.72-73). The search costs and policing required ensuring that actual compensation was efficiently delivered makes the concept infeasible (Tsuchiya & Williams 2001 p.23) (see Appendix 1 page 313 for a description of the Kaldor-Hicks criterion).

The extra-welfarist paradigm rejects the primacy of utility maximisation in favour of marginal health gain as the objective in evaluating the impact of resource allocation on the social welfare function (Hurley 2000 p.63; McPake et.al. 2002 p.76) (see Appendix 1 page 309 for a description of health gain measures). However, extra-welfarism is not without flaws. It is criticised by Garber (2000 p.185) for its reticence on three points. One argument is that it lacks resolution in validating one health outcome measure over another. Also, the approach does not readily evaluate trade-offs between health care and other social goods (e.g. education, nutrition etc.). Finally, it offers no direct mechanism for constituting and measuring costs.

2.2.2 Equity

Health care delivery left to an open market is problematic from an economic perspective (Hay 2006 p.5). Evans (1996 p.35) also argues for either heavily regulating health care or else treating it within a non-market context because of equity and social justice issues. From this perspective, health inequalities are a direct consequence of deprivation, which in turn is symptomatic of inherent injustices within society. The argument follows that, for reasons of fairness, enhanced social welfare can be interpreted through redistribution despite an inefficient use of resources (Le Grand 1996 p.152; Rice 1998 p.21) (see Appendix 1 page 306 for a description of equity).

Arguably the most referenced notions of equity and social justice applied to health care draw in the first instance on the writings of John Rawls (1971), whom Smith (1992 p.57) credits with the following two guiding principles:

"Each person should have an equal right to the most extensive basic liberty compatible with a similar liberty of others; and
Social and economic inequalities are to be arranged so that they are both:

(a) Reasonably expected to be to everyone's advantage, and
(b) Attached to positions and offices open to all… (The indifference principle)".

These Rawlsian principles are premised on theories of what choices rational, self-oriented people would make in a situation where everyone was ignorant of their relative place in society in terms of class, social status, assets, intelligence, and physical attributes. This is referred to as the original position. It is important to note that Rawls (1971) only extends principles of fairness to the allocation of primary goods, defined as *"…rights and liberties, powers and opportunities, income and wealth"* (Rice 1998 pp.146-147). The theory follows that persons in the original position operate under a veil of ignorance and accept that primary goods should be distributed equally. The exception is where an unequal distribution is to the benefit of all. It follows then that inequality equates with injustice when the benefit of all is not served.

From the Rawlsian perspective, inequalities in the distribution of primary goods are acceptable when it is to the benefit of the most disadvantaged (the so-called *maxim rule*). This is achieved either through direct consumption or as a flow on effect of consumption by others who assist the most disadvantaged (Garber et.al. 1996 p.35; Mackenbach & Bakker 2003 p.1411). However this creates a policy difficulty in terms of measurable effects on the social welfare function. This is because it suggests that a valid improvement is only achieved when there is a gain for those people in the worst starting position (McPake et.al. 2002 p.76).

Empirical evidence suggests that community members nominating the choices they would make if in the original position would not give primacy to the maximisation of benefits for the most disadvantaged. Rather the stated preference is to maximise the average benefits for all, provided the most disadvantaged are maintained above a satisfactory minimum (Rice 1998 p.149). This is consistent with the Rawlsian approach to non-primary goods (including health care), which are left to market competition to determine appropriate distribution (Rice 1998 p.36). Rawlsian principles then typically apply in policy as an acknowledgement of the need to establish basic standards of care for all, regardless of any implications for utility (Smith 1992 p.57).

However the inherent risk is the historic tendency for publicly-funded systems to take a lowest common denominator approach. Equitable access then only equates with a libertarian provision of a minimum service threshold (or safety net) for all (Starfield 1998 p.399). Subsequently, standardised notions of provision are often confused as a valid indicator of access in the pursuit of equality, without reference to either consumer preference or measured need (Marriott & Mable 1998 p.632) (see Appendix 1 page 314 for a description of libertarianism).

Should all participants commence from the same point of initial health status and have equal capacity to benefit from a given mix of services, it is theoretically possible that an optimally efficient health production function will equate with equal distribution of either access or outcomes, and achieve equity at the margin (see Appendix 1 page 326 for a description of a production function). However, in reality, society is heterogeneous. Empirical evidence demonstrates that partitioning society by many well-recognised social variables will demonstrate a significant health gradient between the groups (Evans 1996 pp.37-38). Horizontal equity only occurs in a very restricted set of circumstances (Mullen 1998 pp.17-18).

Both the welfarist and extra-welfarist schools of normative economic analysis share a strong consequentalist focus (Hurley 2000 p.66). Together they are also criticised for their limited capacity to address equity issues. Both schools share a Rawlsian commitment to individualism, which fails to accommodate a person's social context (Mooney 2000 pp.81-82).

The utilitarian social welfare function is seen as an aggregate of individuals' ranked preferences and utility in turn is a normative construct derived according one's position relative to the social norm. Ordinal utilitarianism treats the ranking of each individual's preferences as equal. Primacy is given to consumer sovereignty in a competitive market (see Appendix 1 page 336 for a description of utilitarianism). If some parties fail to satisfy their preferences for whatever reason from the ensuing competition, their utility is depressed relative to others. It follows that the social welfare function is not optimised. No mechanism is necessarily offered to compensate individuals for their relative deprivation (Rice 1998 pp.32-33). It is argued therefore that the paradigm gives no consideration to distributive justice and fails to properly address the full scope of equity concerns (Rice 1998 p.32; Tsuchiya & Williams 2001 p.22).

Realising equity at the macro-level will not be achieved by having services distributed identically to all social groups (Mullen 1998 p.11). In the first instance, the egalitarian tradition draws on Aristotle's writings with regards notions of justice and equality. The argument follows that, in order to achieve equity, justifiable inequality will pervade distributive decisions and address differentials in need. This concept Mullen (1998 pp.11-12) refers to as proportionate equality. If those most in need are synonymous with those most likely to benefit in terms of health gain, then in theory, both the vertical equity and allocative efficiency objectives are compatible (Hurley 2000 pp.90-91; Rice 1998 p.139) (see Appendix 1 page 305 for a description of egalitarianism).

Concern for vertical equity in weighting resource distribution according to either demographic or epidemiological indices is reconcilable with the extra-welfarist framework (Hurley 2000 p.93). The goal is to optimise the aggregate of weighted health gains in a given community. Nonetheless, the challenge remains to develop a set of weightings that validly reflects the defined needs of the community in question, such that the egalitarian commitment to one social domain does not compromise egalitarian principles in another. For example, distributional concerns may not necessarily have primacy over concerns for procedural fairness, autonomy or duty of care (Hurley 2000 p.93; Le Grand 1996 p.153) (see Appendix 1 pages 285 and 303 for descriptions of autonomy and duty of care respectively).

Producing coercive care by strictly applying affirmative strategies for the most disadvantaged is a potential risk. Paternalism disregards both consumer sovereignty and the heterogeneity of preferences. This is a clear shift from Rawlsian principles, which reduces treatment of equity to libertarian considerations of opportunity or potential accessibility. In part this is overcome pragmatically by only applying egalitarian criterion to resource allocation at the aggregate level (e.g. regional distribution), with utilisation of the services provided remaining at the individual's discretion (Hurley 2000 p.92).

To avoid the vertical inequities likely to manifest should competing demands be left to the open market, Mooney (2000 pp.79-80) supports the incorporation of communitarian claims in weighting public resource allocation decisions. Rather than being dependent on normative measures of health gain, communitarian claims recognise community preference for certain defined benefits. Hurley (2000 p.66) contends that this interpretation of benefit still betrays a clear affinity with welfarist notions of utility. However Mooney (2000 p.79) does acknowledge that preferences are complicated because they will vary across the social spectrum. This concurs with Rice's (1998 pp.39-40) criticism of the traditional economic insistence on stable preferences over time and the irrational assumption of immaterial variation between classes, societies and cultures (see Appendix 1 page 295 for a description of communitarianism).

Communitarian claims provide the community at large with the responsibility for weighting the social attributes of either individuals or groups and applying these to the allocation of public resources so that preferenced marginal benefits are achieved. Short of introducing other externalities or perverse incentives, Mooney (2000 p.82) argues that individuals' recognition of their mutuality and interdependence within society will outweigh the risk of parochialism. Nevertheless, Hurley (2000 p.94) argues that an inherent difficulty remains in building a valid social welfare function upon the broad heterogeneity of preferences in a community. This becomes most problematic where some dominant values may otherwise be judged as ethically repugnant.

It is clear that policy must be context-specific and carefully articulate the focal variable upon which its definition of equity is built. Not all focal variables can be mutually satisfied (Hurley 2000 pp.94-95). This approach equates well with pragmatic sensibilities, which reject any commitment to an absolute position (Smith 1992 p.60) (see Appendix 1 page 324 for a description of pragmatism). Whether by design or default, governments frequently demonstrate pragmatism when trading off efficiency gains for equity objectives (Mullen 1998 p.18). Deference to political expediency is a more cynical interpretation.

2.3 Complementary elements in health care policy

2.3.1 Resource rationing

Implicit within any process of priority setting are assumptions of resource scarcity and recognition of rationing (Daniels 1993 p.224; Eagar, Garrett & Lin 2001 pp.188; Le Grand 1996 p.150; Woolfe 1990 p.9). The argument follows that rationing mechanisms should temper measures of market demand for publicly-funded health care with some accepted indicators of need and justice, assuming that it is broadly accepted as a merit good (see Appendix 1 pages 330 and 333 for descriptions of rationing and scarcity respectively).

The ensuing tension between identified gaps (real or perceived) and the availability of supply invariably determines how priorities are set (Decter 2000 p.223; Lenaghan 1996 pp.4-5; Vissers 1998 pp.87-88). The inherent threat to equity in rationing supply indiscriminately is the risk of denying access to necessary care for those in genuine need (Decter 2000 p.223).

This is the argument for prioritising distribution according to relative need. However an objective determination of need remains difficult (McPake et.al. 2002 p.203). Arguably some measure of service use (where a genuine need is identified) is the most practical means of observing equitable access and driving future rounds of distribution (Mullen 1998 p.13). The difficulty is that this perpetuates the distributional bias inherent in using the relative burden of disease as a dominant measure of need, without consideration for either capacity to benefit or the relative cost of interventions. The needs-based approach risks distorting the identification of priorities according to the absolute size of the problem measured, rather than net cost effectiveness (Le Grand 1996 p.153; Mooney 2000 p.78; Mooney & Newberry 1999 p.42; Viney et.al. 2000 p.12) (see Appendix 1 page 285 for a description of the burden of disease).

Some critics reject distribution according to need altogether. This is because allocation of resources is only equivalent in circumstances where each of the recognised measures of need is equal (Mullen 1998 p.16). This means there must be equivalency in measures of initial health, the capacity to benefit, the amount of health care required to attain equality of health and the expenditure required to exhaust ones capacity to benefit (Culyer & Wagstaff 1993).

Others argue instead for an outcomes-based approach to health care planning. The pivotal point for priority setting lies in the economic assessment of net marginal benefit for the distribution of any additional resources (Cohen 1994 p.781; Eddy 1994[b] p.823; Mooney 2000 p.78). This approach is driven by an imperative for allocative efficiency.

Nevertheless, several practical difficulties may arise with funding according to explicit outcomes criteria. One difficulty is that, despite the primacy afforded it by the extra welfarist paradigm, there is no consensus in the literature that recognises quantifiable health gain as the key indicator of benefit. Another is that direct and readily applied measurement of outcomes linked to care is difficult for third party funding entities, with an inherent risk of significant transaction costs. Finally, outcome-dependent contracts lack incentives for practitioners to deliver certain emergency and critical care services to patients with a poor prognosis. This creates significant ethical and medico-legal dilemmas (Le Grand 1996 pp.154-155; McPake et.al. 2002 p.176).

2.3.2 Financial risk

The financial risk of many health care interventions is beyond the capacity of most individuals to bear. Evidence suggests that the real cost of health care has increased over time (Feldstein 1999 p.136). With the inherent uncertainty of ones future health status, it is a rational response for individuals to seek opportunities to pool their financial risks within a larger group.

Statistically any one adverse health event is unpredictable at the individual level, though the probability of events can be calculated for a group, given a reasonable sample size. For this reason probability-based risk bearing schemes (i.e. insurance) are common to most health systems in response to a common desire to minimise loss (Feldstein 1999 p.123; Hurley 2000 p.80; Persson & Guzelgun 1998 p.263).

In theory, if a levy for given cover is actuarially fair, then a risk-adverse consumer will each time accept the cost and reduced utility whilst in good health as a trade off for avoiding even greater loss in the event of having to self-fund the impost of a major illness (Hurley 2000 pp.80). An actuarially fair premium is a function of the expected loss and the probability of it occurring to a large number of the population (Feldstein 1999 p.123).

In practice, insurers must add a loading to levies for their business costs, such as administration, marketing, risk reserves, and a profit margin (Feldstein 1999 p.186). By definition, the levy is unfair in actuarial terms. However, provided the risk-adverse consumer perceives that their expected loss of utility in the event of self-insuring an illness is still greater than that with the load-adjusted premium in good health, there is a reasonable chance they will maintain coverage, if they have the means to do so (Hurley 2000 pp.80-81; McPake et.al. 2002 pp.208-209).

The aggregate demand for health insurance is price inelastic, because risk-adverse consumers have few if any substitutable options. However where there is a competitive market, the consumer is able to substitute between insurers, and the demand curve becomes more price elastic. This then constrains the price of premiums (Feldstein 1999 pp.178-179) (see Appendix 1 page 334 for a description of substitution).

Communal risk pooling is counter-intuitive to the welfare construct of individual utility maximisation. Where a premium is set according to society's average risk (community rating), rather than each applicant's particular risk profile (risk rating), the insurance policy is most attractive to individuals with high risk (Bezzola & Martinsson 1998 p.19; Feldstein 1999 pp.137-138; Hurley 2000 p.82). This is inefficient because it does not permit low-risk groups to purchase insurance at its cost of production, and they are more likely to opt-out (Feldstein 1999 p.192). On the supply side, if insurers do not have the capacity to adjust premiums for risk, they have a perverse incentive to cream skim enrolees to off-set their risk (Feldstein 1999 p.185). The grading of insurance premiums to personal risk however is problematic because its redistribution effects are minimal, and its contribution to broader social objectives is questionable (McPake et.al. 2002 p.211; Persson & Guzelgun 1998 p.263).

In the absence of insurance, the demand for health care is income elastic. Risk pooling is premised more on a communal expectation of enhanced social utility from equalising individual's access to care deemed a merit good, regardless of income distribution (Bezzola & Martinsson 1998 p.21). Communal risk pooling implies an acceptance that the sharing of resources to maximise aggregate benefits should take priority over personal gain (Eddy 1994[b] p.823). The classic economic opposition to universal public insurance because of welfare loss is outweighed by the potential welfare implications generated from the interplay of information asymmetry, agency relationships, externalities, technological diffusion and social redistribution (Decter 2000 p.19; Hurley 2000 pp.86-87; Rice 1998 p.160).

Consequently, the empirical evidence of how the risk in health care is managed across most OECD member states does not reflect the actuarial insurance model typically found in other market sectors (Decter 2000 p.19; Hurley 2000 pp.86-87; Rice 1998 p.160). One significant exception is the work-placed insurance system in the United States. This system grew from life and accident insurance companies with a clear actuarial focus offering policies for loss of income (Marriott & Mable 1998 p.594; McPake et.al. 2002 p.215). This market gathered considerable momentum during the great depression and World War Two, where the federal government used health cover as a tax shelter to diffuse industrial unrest and trade off against restrictions on wage increases. This system became well-entrenched over time as workers' unions bargained for further health benefits to offset the impost of income-creep with inflation into higher tax brackets (Feldstein 1999 p.206).

By contrast, the European tradition of health care as a social welfare provision traces back to the 18th century. This was a time of great social change, with the concurrent rise of republicanism and civil liberty plus expanding systems of trade and commerce (Szreter 2003 p.421). By the early 20th century many European states had established extensively subsidised national sickness or health insurance systems (DeVoe 2001 p.1; EOHCS 2000 p.6; Vallgarda, Krasnik & Vrangbaek 2001 p.10). For example, Belgium established sickness funds (mutualities) in 1894, and the United Kingdom first initiated a national sickness insurance plan in 1911 (Closon et.al. 1999 p.70; DeVoe 2001 p.2; EOHCS 2000 p.6). Most began mainly from voluntary workplace-based schemes, though many became compulsory post World War Two. Most progressed further over time to provide universal coverage for their respective populations (Closon et.al. 1999 p.75; EOHCS 2000 pp.7-8; Szreter 2003 p.421). An exception until 1996 was Switzerland. It did not introduce compulsory enrolment in health insurance until the enactment of amendments to federal health insurance legislation following a referendum, after some thirty years of parliamentary debate (Bezzola & Martinsson 1998 p.16; Burstrom & Gisin 1998 p.105; Persson & Guzelgun 1998 p.261).

With the notable exceptions of Mexico, South Korea and the United States, all other OECD economies currently finance their health care sector using predominantly public investment (Martin 2003 p.11). This is achieved either through explicit funding and grants, or indirectly via tax relief (Brouselle 1998 p.45; Centre for International Statistics 1998 p.157; Duckett 2000 p.42; Hurley 2000 p.57).

Deriving a positive co-efficient variable greater than unity, Brittle & Perera (2000 pp.185-186) conclude that the depressive effect of public sector financing on the relative price of health at the point of service is the major driver in aggregate expenditure growth. However this conclusion needs to be considered within the context of a single-nation analysis (Australia), where the proportion of public contribution to third party subsidisation has changed marginally since 1984.

Other critics insist there is no positive correlation between increased total health expenditure and the proportion of public financing (Duckett 2000 p.41). Some cross-national studies conclude that possibly the reverse is true. Greater application of co-payments and private health insurance drives higher both the per capita expenditure and the share of gross domestic product consumed by the health care sector (Duckett 1997 p.11) (see Appendix 1 page 309 for a description of gross domestic product).

Studies of longitudinal data from 13 OECD states demonstrate a significant inverse relationship between the proportion of public investment and aggregate health care costs (Brouselle 1998 p.45). Nevertheless, if outlying data from the United States are excluded, the relationship is no longer significant. This suggests that there is possibly a threshold point (as yet untested) for private expenditure on health care, beyond which it has a significantly negative impact on cost control.

The libertarian perspective argues that there is a greater willingness to pay for health care compared with other public services (McPake et.al 2002 p.237). It follows that communities will accept higher co-payments in preference to tax increases. Lower taxes combined with higher user charges should then enhance individual work effort whilst dampening risk-taking behaviour. However this position has negative implications for the socioeconomically disadvantaged. The relative income hypothesis documented by Duesenberry (1952) predicts that people with low income will save smaller than expected portions of their earnings because their consumption patterns tend to mimic the social class immediately above them. If this theorem holds true, then people with a low socio-economic status will have reduced capacity to pay for health care and tend to under-utilise services relative to need compared with other social classes (Rice 1998 p.27). This argument presumes however that increased consumption of health goods and services has not already contributed to the lower saving levels of the poorer social classes.

Nonetheless, consumer cost sharing is well established across many OECD member states (Duckett 2000 p.58; Jarvelin 2002 p.37; Martin 2003 p.5; Starfield 1998 p.55). Broad-based strategies employed by insurers to counter any moral hazard associated with demand-side subsidisation include incentives such as no-claim bonuses on premiums and deterrents, including high deductibles and co-payments (Bezzola & Martinsson 1998 p.23; Feldstein 1999 p.120; Reinhardt 1996 p.79) (see Appendix 1 pages 297 and 298 for descriptions of co-payments and deductibles respectively).

Price rationing through increased consumer cost sharing is most effective where there is a high price elasticity of demand (Rice 1998 p.98). This in turn assumes that the demand curve is a true reflection of consumers' marginal utility (Rice 1998 p.101). Though justified as a means of discouraging unnecessary utilisation, in practice efficiency gains using indiscriminate cost sharing are questionable (Ross et.al. 1999 p.11). This is because co-payments reinforce private valuations of services, and create regressive barriers to equity for the socioeconomically disadvantaged where a genuine need exists (Duckett 2000 p.28; Feldstein 1999 p.120; McPake et.al. 2002 p.212; Murphy 1998 p.233; Rice 1998 p.162; Starfield 1998 p.125).

A typical problem is that some effective preventive services are not necessarily valued highly by the general public. Subsequently they have relatively high elasticities of demand. Should these services attract a high co-payment then utilisation is depressed and a welfare loss results (Rice 1998 p.100) (see Appendix 1 pages 325 and 338 for descriptions of prevention and value respectively).

The most discussed analysis in the literature which assessed the impact of co-payments on service utilisation adjusted for socio-economic status comes from the RAND health insurance experiment (HIE). Conducted over 15 years from 1971, the RAND research centre assessed the impact of different health insurance plans on services provided to households. The experiment used a randomised control study in an empirical setting with a time series design. It focused on the impact of out-of-pocket service price to the consumer, with the key variable for manipulation being the level of co-payment (Duckett 1997 p.83). This also allowed economic consideration of the welfare loss/gain from health insurance coverage and patient cost sharing (Hurley 2000 p.79).

Using co-payments ranging from 0% (free plan), through 25%, 50% to 95%, the RAND health insurance experiment series assessed the relative impact on the dependent variables of medical services, outpatient expenditures, fee-for-service visits and total health care expenditures. In each case, the design demonstrated that increasing the application of a co-payment reduced utilisation of health services (Duckett 1997 pp.83-84; Rice 1998 pp.129-130).

Analysis of co-variates within the RAND health insurance experiment produced some significant trends. For example, on grouping subjects according to household income, the effect of co-payments on utilisation was most profound in the lowest tertile grouping (Duckett 1997 p.85).

Accepting empirical evidence that co-payments reduce utilisation, the argument follows that services which provide the least utility should be foregone (Hurley 2000 p.85;

McPake et.al. 2002 p.217; Persson & Guzelgun 1998 p.264; Rice 1998 pp.86-87). However the RAND health insurance experiment results indicate that co-payments reduce utilisation irrespective of either the judged effectiveness or the clinical urgency of the care provided. This implies that the level of reduction in utilisation with a rising co-payment increasingly distorts as the subject's level of income declines, hence demonstrating a profound social inequity (Duckett 1997 p.88; Rice 1998 p.96; Starfield 1998 p.125).

The RAND health insurance experiment results illustrate that individual utility does not always equate with social welfare given the imperfect market conditions. Without paternalistic intervention there remains a risk of net welfare loss in the presence of co-payments (Rice 1998 p.92). However, the experiments drew the conclusion that the reduced utilisation associated with increased user charges produced no measurable impact on subjects' health status. This conclusion has subsequently been challenged, because the time frame used to measure adverse health effects was considered too short (Maynard 1993 p.9).

Despite strong controls for internal validity, caution is required with the RAND health insurance experiment results because the demand elasticities may be misleading. This is because only a small portion of any one provider's patients faced increased cost sharing (Hurley 2000 p.79; Rice 1998 pp.130-131). The impact on each provider's income was marginal and most likely inconsequential. If cost sharing policies are implemented on a broad scale, the revealed demand elasticity would be dampened by the counter-effect of providers' responses to inducements. Supply-side dynamics were not explicitly addressed in the RAND health insurance experiment study. Inferences from results are limited only to the effect that cost sharing has on demand, and not the impact that a large-scale cost-sharing initiative may have on net utilisation.

Consumers show a preference for deductibles at the point of indifference in expected utility between self insurance and accepting the price of cover (Hurley 2000 p.81). This is because deductibles contain the loading factor and make self-insuring for small losses acceptable, whilst maintaining coverage for potentially large losses. Even where demand for medical care is absolutely price inelastic, individuals are least likely to opt for insurance coverage against low-risk illnesses at either end of the probability spectrum (Feldstein 1999 p.129). These include illnesses with a very small probability of occurring plus those low cost interventions that occur very frequently (or routine care). In either case, the marginal benefit is outweighed by the likely price of the respective insurance premiums.

However the use of deductibles also has limitations. On one hand, deductibles are regressive, and impose a barrier to access for the socioeconomically disadvantaged (Starfield 1998 p.54). On the other hand, once a high user of services exceeds the out-of-pocket threshold, there is no restraint on further consumption in an absence of either co-payments or a managed care-style framework (Feldstein 1999 pp.144-145; Reinhardt 1996 p.80; Rice 1998 p.95). For example in Sweden there is an annual consumer co-payment ceiling on ambulatory care and prescriptions (see Appendix 1 page 284 for description of ambulatory care). In this system, once the nominated expense limit is reached, the consumer is granted a free card to fully subsidised social insurance for the remainder of the year. As expected, a marked acceleration in cumulative health care consumption is mapped for those patients who are approaching or exceeding this ceiling (Persson & Guzelgun 1998 pp.257-258).

'Safety-net' provisions for means-tested groups, plus exemptions for select public health services, are strategies employed to temper the regressive impact of cost sharing (Podger 2006 p.136). In Belgium identified vulnerable groups are exempt from both mutuality contributions and the standard 25% gap payments for ambulatory care (EOHCS 2000 p.22; van Mossveld & van Son 1999 p.124; Starfield 1998 pp.337-338). In New Zealand charges are waived for cervical screening, vaccinations on the national immunisation schedule, and sexual health consultations (Marriott & Mable 1998 p.585). Since the establishment of Primary Health Groups (PHO) in 2002, New Zealand has gradually introduced a public subsidy for general practice consultations (McDonald et.al. 2007 p.48). This began initially with disadvantaged groups (including children plus means-tested community service card and high-use card holders), with the intention of moving to universal access to primary care subsidies by July 2007 (Frogner & Anderson 2006 p.100; Marriott & Mable 1998 p. 586).

There are at least three types of health insurance systems (McPake et.al. 2002 p.226). They include voluntary private insurance, social insurance and a tax-based system. The systems may operate in parallel to varying degrees within any one economy. Where systems operate in parallel, insurance cover stratifies according to social status. Willingness to voluntarily opt for private insurance of extra services declines as income declines (McPake et.al. 2002 pp.226-227). The greater the stratification, the less is the solidarity and risk sharing. With this, there is less commitment in treating certain aspects of health care as public goods. The more predominant private voluntary schemes are, the more muted are subsidies of public health and preventive initiatives. McPake et.al (2002 p.231) argues that the more a system diverges from universal coverage the greater is the welfare loss.

The United States continues to have the largest private voluntary insurance market amongst the OECD member states (Brouselle 1998 p.45; Centre for International Statistics 1998 p.157; Clancy 2000 [b] p.2; Duckett 2000 p.42). Approximately two-thirds of the United States population has private health insurance coverage, with 85% of that market provided in the workplace as a condition of employment (Feldstein 1999 p.212). Wealthy subscribers in the upper social tiers also continue to access open-ended health care using personal medical savings accounts (MSA). Medical savings accounts are tax-sheltering indemnity plans designed to cover the impost of high cost items in return for a substantial deductible (Duckett 2000 p.236; Marriott & Mable 1998 p.596; Reinhardt 1996 p.89; Rice 1998 p.95) (see Appendix 1 page 311 for a description of indemnity plans).

The treatment of health care in this manner is problematic for both equity and efficiency. The offset of insurance costs against income tax is a regressive public subsidy that primarily benefits the affluent (Feldstein 1999 p.131; Reinhardt 1996 pp.91-92). Also, tax deductibility lowers the true price of health insurance to a point where it risks falling below the actuarial value of some medical expenses (Feldstein 1999 p.148; Marriott & Mable 1998 pp.594-595; Reinhardt 1996 p.88).

Though structurally diverse, social insurance schemes have two characteristics that distinguish them from tax-based systems (McPake et.al. 2002 pp.215-216). The first is the use of a hypothecated levy. The second is the use of the contract model, which separates the roles of purchaser and provider. Typically, governments will gazette either single or multiple third parties to collect levies and engage provider services. Government control of the system is indirect, using regulation rather than overt administration.

Belgium, France and the Netherlands provide examples of tightly regulated social insurance schemes built around statutory authorities which set levies for compulsory contribution rates as a percentage of income. This entitles enrolees to a limited range of services without adjustment for risk. In the case of both Belgium and France, the levy is paid to the central authority which then dispenses risk-adjusted prospective payments to private, not-for-profit sickness funds to administer (EOHCS 2000 pp.20-22; van Mossveld & van Son 1999 p.99; van Mossveld & van Son 1999 p.123). In both France and the Netherlands employers co-contribute with employees, though in the Netherlands the levy is paid directly to the fund (Frogner & Anderson 2006 p.98; van Mossveld & van Son 1999 pp.41-44). Both Dutch and French residents can purchase extra insurance packages from the sickness funds or private insurance companies for other health services and to cover the cost of co-payments. In Belgium patients pay for consultations on a fee for service basis, with the funds providing a 75% rebate on claims according to a regulated fee schedule. In both Belgium and the Netherlands groups identified as vulnerable (e.g. low-income earners, widows, orphans, the disabled, retirees etc.) are exempt from either further contributions or out-of-pocket costs (Closon et.al. 1999 p.75; EOHCS 2000 pp.20-22; van Mossveld & van Son 1999 p.42; van Mossveld & van Son 1999 p.100; van Mossveld & van Son 1999 pp.122-124).

Equivalent systems in Germany and Greece are comparatively liberal. In Greece, there are 370 social insurance funds, though the market is dominated by six of the larger organisations. Coverage varies between funds, as does the co-payment required for particular services, ranging from a nominal contribution up to a 25% out-of-pocket expense for items deemed less essential (Petridou et.al.1999 pp.135-136).

Germany's system consists of 249 regulated sickness insurance funds (Frogner & Anderson 2006 p.97). Enrolment is compulsory for all but high income earners and some civil servants, with freedom to choose between competing funds (Frogner & Anderson 2006 p.97; van Mossveld & van Son 1999 p.78). Private health insurance companies can provide either supplementary packages or supersede an enrolee's fund to provide complete coverage (Busse & Schwartz 1999 pp.106-108; Maynard 1993 p.5; van Mossveld & van Son 1999 pp.75-76). The funds are legislated to negotiate independently with physician associations regarding the scope of most reimbursable services and self-determine their own contribution rates necessary to cover expenditure (Busse & Schwartz 1999 p.118; Frogner & Anderson 2006 p.97; McPake et.al. 2002 p.219).

Martin (2003 p.7) argues that multi-payer social insurance systems have a positive effect in terms of competitively lowering both premiums and administrative costs. However it is counter-argued that the deliberate structuring to avoid market failure with voluntary private insurance has constrained competition (McPake et.al. 2002 p.229).

This is because providers are both less responsive to consumer demand, and less cognisant of the public health objectives that aim to maximise social welfare. With revenues assured, insurers also become less sensitive to consumer demand, though more focused on their contractual and statutory requirements. The consumer is assured access to some public goods, and their risk is underwritten for a level of catastrophic insurance. However consumers' access is still rationed broadly according to their ability to pay for subsidised services (see Appendix 1 page 295 for a description of catastrophic insurance).

There are at least three distinct limitations to the use of mandatory universal coverage supported through an untargeted flat rate subsidy of social insurance.

One is that if the subsequent cost exceeds the marginal benefit this will balloon any dead weight loss in allocative efficiency. This is because for a given outlay, there is no discrimination in relative levels of service utilisation between those with the greatest capacity to benefit from those with the least capacity (Feldstein 1999 pp.134-135; McPake et.al. 2002 p.172; Persson & Guzelgun 1998 p.264; Rice 1998 pp.81-82). Public entities typically respond to ballooning costs by restricting resources (Persson & Guzelgun 1998 p.264). This has intuitive logic for those routine medical expenses where, if it were left to an open market, the actuarial value of insuring against the cost of such interventions exceeds most consumers' willingness to pay. For major medical expenses where this scenario is not the case, this constitutes a substitution of explicit exclusion from services for implicit rationing of access using queuing mechanisms (e.g. surgical waiting lists). In turn, this gives rise to an inflationary demand from those willing to supplement cover with private voluntary insurance in order to side step the queue.

The second limitation is the argument that full social subsidy at the point of service increases moral hazard, with over-consumption induced up to the point of zero marginal utility (Feldstein 1999 p.142). The net effect is a welfare loss, because the unit cost of production will invariably exceed the marginal benefit gained (Feldstein 1999 p.142; Rice 1998 p.85). This is countered using price-rationing mechanisms such as deductibles and co-payments, but at the risk of also inducing welfare loss equal to the difference between the out-of-pocket cost and the utility derived from the service (Feldstein 1999 p.144; Rice 1998 p.85-86; Starfield 1998 p.399).

The third limitation is that subsidising either social insurance or voluntary private insurance premiums using public finance raised through taxation is regressive. It is inequitable because it rewards those who can afford the more extensive plans (McPake et.al. 2002 p.231; Starfield 1998 p.399).

Rice (1998 p.163) argues instead that public subsidy of health service costs is most effectively achieved by universal risk pooling using compulsory enrolment in a single public insurance program (i.e. national health insurance). This is achieved by absorbing the bulk of health care expenditure through tax revenue (Persson & Guzelgun 1998 p.267). A positive gradient between levels of income and taxation may then achieve vertical equity by driving redistribution from upper to lower socio-economic classes. This will depend on how progressive the tax regime is, and how utilisation of services varies with income (Persson & Guzelgun 1998 p.267; Ross et.al. 1999 p.11).

It follows that the larger the enrolment for a given insurance scheme, the greater the economies of scale, hence the less the administrative loading factor on premiums. Less is also required with individual risk-adjustments (Hurley 2000 p.81; Persson & Guzelgun 1998 p.263; Rice 1998 p.137). Further, it is argued that compulsory enrolment in a universal risk pool is one significant means of overcoming cream skimming, adverse selection and market failure (Butler 2002 p.34; Feldstein 1999 p.140; Hurley 2000 pp.82-83; McPake et.al. 2002 p.217). The dead-weight loss is avoided with levies positively weighted by income (not risk). This is because of the inverse relationship between socio-economic status and those most in need of service, assuming services have some measure of effectiveness (Persson & Guzelgun 1998 p.270).

However there are two important limitations to the efficiency of tax-based subsidy of health care (McPake et.al 2002 p.237; Rice 1998 pp.35-37). The first is higher levels of income tax creates a general disincentive on a community's economic production, thus constraining the level of redistribution that may otherwise occur. The second is the inability of taxation systems alone to separate the concepts of allocation and distribution. Though the use of income tax is progressive in raising the requisite allocation for health care services, it does not ensure that accessibility is necessarily revealed for according to measured need.

Nevertheless, from a cost control perspective, empirical evidence of tax-based systems across the OECD member states exhibits lower expenditure per capita than social insurance schemes, which in turn demonstrate lower expenditure per capita than private voluntary schemes. Rather than being a product of efficiencies intrinsic to the model, the key reason is probably a general political resistance by electorates to increases in tax levies, particularly where there is not universal access to funded services (McPake et.al. 2002 p.226).

Tax-based systems are distinguished historically by their budget allocation from general government revenue, plus the integration of funding and administration functions (McPake et.al. 2002 p.215). The founding principles of this archetypal system are credited to the United Kingdom's 1942 Beveridge Report, which subsequently led to the establishment of the National Health Service (NHS) in 1948. The Beveridge Report called for a single, comprehensive and universally available system of health care funded publicly through general tax revenues (Marriott & Mable 1998 p.562). Similar Beveridge-style monopsonies built on general taxation have since developed in numerous OECD health systems, including Australia, Canada, Finland, New Zealand, Spain and Sweden (Benedicto 1999 p.152; Bezzola & Martinsson 1998 p.11; Calltorp 1999 p.341; Jarvelin 2002 p.30; Marriott & Mable 1998 p.587; Persson & Guzelgun 1998 p.264).

In Finland and Sweden municipalities are authorised within a national statutory framework to directly levy the bulk of taxes, and with it utilise the revenue for administering the health system (Bezzola & Martinsson 1998 p.11; Jarvelin 2002 p.17; Persson & Guzelgun 1998 p.264; Calltorp 1999 pp.339-340). In Finland some services are also subsidised by the state (Jarvelin 2002 p. 18). Canadian residents have a monopsonistic universal medical insurance (also colloquially labelled Medicare), with provincial governments delegated control of a health budget to operate within their jurisdictions (Frogner & Anderson 2006 p.96; Marriott & Mable 1998 p.611).

Australian federal income tax provisions include a progressive 1.5 % Medicare levy on taxable income. This is deemed an administrative contribution, as it is neither hypothecated nor reflective of a full-cost recovery (Duckett 2000 pp.37-38; Hilless & Healy 2001 p.15). The levy constitutes 17.3% of the Australian Government's annual disbursement on health, and approximately 8.5% of national health expenditure overall (Frogner & Anderson 2006 p.95; Hilless & Healy 2001 p.31).

2.4 Key operational components

The design that health systems take is disparate across the OECD member states. However, one theme common to most is a paternalistic policy framework that attempts to either direct, manipulate and/or constrain utilisation by communities (Rice 1998 p.66). The interplay of fundamental and complementary policy elements is manifest in each system through the application of interdependent operational components (Starfield 1998 p.26).

This analysis draws on a process-oriented perspective of health care delivery, but it takes a top-down approach (Vissers 1998 pp.90-91). The key operational components are nominated broadly as policy direction, consumer eligibility, investment, distribution and delegation.

2.4.1 Policy direction

Evidence suggests that formal health care policies across the OECD member states vacillate between competing philosophical interpretations of efficiency and equity. The principled intent of any particular policy is frequently tempered in any case by pragmatic administrative decisions reflective of the context in which they must be applied. Clearly this embodies as much the complex dynamic of didactic moralities as it does a strong imperative for political expediency. Equally, it reflects the methodological limitations in trying to coherently plan and regulate health care centrally within pluralist systems, where delegations are often divided between levels of government, statutory authorities and private contractors.

Policy concern for notions of efficiency is frequently fixed within the Paretian welfare economics paradigm, at the apparent expense of commitments to distributional equity (Hurley 2000 p.57). Paradoxically, the Pareto criterion has proved to be a restrictive assumption. In truth, some groups in society are invariably worse off than they otherwise might be with an alternate system of distribution and stated policy objectives are frequently not satisfied with any confidence (Hurley 2000 p.61; Reinhardt 1996 p.71).

Evidence of continued policy commitments to equity still remain commonplace amongst OECD states, though they are not universal. Nor are interpretations of the concept consistent (Hurley 2000 p.88; EOHCS 2000 p.14; Mackenbach & Bakker 2003 pp.1409-1410).

A range of OECD states and their regional governments have progressively legitimised the World Health Organisation's (WHO) Health for All strategy, which first dates back to a 1984 initiative from the member states of its European office. This strategy articulates an important philosophical shift in policy from an individualistic focus on the reduction of disease to a social model that seeks to positively influence collective behaviour by addressing the key health determinants, many of which lie beyond the traditional sphere of health care (Coote & Hunter 1996 p.47; Holland et.al. 1999 p.29; Jarvelin 2002 pp.80-81; Kindig & Stoddart 2003 pp.380-381). The strategy in turn draws on the World Health Organisation's renowned 1977 Alma Ata Declaration, which also proved integral to its subsequent 1986 Ottawa Charter for Health Promotion (Kickbusch 2003 pp.383-384).

This policy approach is most evident to date in some European states. Sweden, for example, has a strong history of government involvement in the development of public health initiatives and social services (Kickbusch 2003 pp.384-385). Some Australian policy commitments also reflect this approach. Recent examples include the revised Medicare Plus package and NSW Health's equity statement (NSW Health 2004 p.6; Swerrisen 2004 p.27). Both articulate concepts of solidarity, and identify equitable access to primary medical care for vulnerable social groups as a matter of justice (see Appendix 1 page 325 for a description of primary care).

However primary preventive strategies that use a population health approach present numerous difficulties to policy makers (Kindig & Stoddart 2003 pp.381-382). In many cases the majority of taxpayers or insurance enrolees are not the direct beneficiaries of the initiative. In some cases the benefits are presumed rather than certain. And typically there is a lag time, sometimes over many years, before measurable benefits are identified (Banta 1990 p.457).

Many of the World Health Organisation outcome-focused goals have thus had limited practical application. This is because the development of health policy invariably seeks tangible indicators capable of demonstrating more immediate effects within a political cycle (Coote & Hunter 1996 p.47; Kindig & Stoddart 2003 p.381; Mackenbach & Bakker 2003 p.1410). Many states choose instead to limit their health-for-all-type commitments within pragmatic policies where the disease-state management framework prevails (Decter 2000 p.17; Holland et.al 1999 pp.19-20; Kickbusch 2003 pp.386-387) (see Appendix 1 page 301 for a description of disease-state management). Typically, enhanced access to particular health services according to measures of need is used as the key indicator (Coote & Hunter 1996 p.47; Starfield 1998 p.11).

The intuitive appeal of the disease-state management approach for funding bodies is that, assuming the application of competent care, expenditure and a certain level of outcomes are predictable for targeted population groupings with a known epidemiological history (Decter 2000 p.264). With chronic diseases gradually superseding infectious diseases as the major health challenge facing industrialised societies, the move towards more individualised, discretionary preventive strategies has strong logic (Banta 1990 p.458). The approach is most applicable to the management of chronic disease. This is because an extended period of time is probably necessary to properly recoup the benefits of a rationalised approach to care that administers formal integration of services (Coote & Hunter 1996 p.35; Decter 2000 p.261).

The disease-state management approach is not without its criticisms. It is argued that building policy priorities around disease-states ignores the importance of addressing relevant risk factors, and betrays a limited comprehension of contemporary public health philosophies (Holland et.al. 1999 p.32). As Starfield (1998 p.37) argues, *"…counting individual diagnoses does not adequately represent health."*

The approach is also criticised for its political expediency and lack of coherence (Holland et.al. 1999 p.19). By explicitly setting priorities according to specific disease states, policy becomes the ready target of lobbyists and institutional stakeholders with vested interests. Each new priority will not necessarily substitute for a predecessor. Hence there will develop a creeping commitment of cumulative priorities with decreasing capacity to resource each strategy and a subsequent dilution of benefits (Holland et.al. 1999 p.28).

The overriding implication is that the stated health priorities and targets of many OECD states reflect a prevailing consideration for relative burden of illness (Benedicto 1999 p.156; Decter 2000 p.114; Holland et.al. 1999 p.18; Merkel & Hubel 1999 p.56). For example, the repeated targeting of both cancer and injury in particular reflects that together they account for almost half of all premature deaths across the OECD states (OECD 2001 p.18). Malignancies, injuries and circulatory diseases are in order the three most common causes of premature mortality for women. For men injuries are the most significant, followed by cancers and circulatory disorders (OECD 2001 p.19).

The six national health priority areas adopted by a consensus of the Australian federal and state Health Ministers are dominated by chronic non-communicable disease states. The policy justification for each of the priorities is that they all reflect cost-effective opportunities for prevention and treatment with ready data sources to track progress against set targets (FitzGerald 2006 p.105). However there is clearly an overriding consideration of their relative significance, given that together they generate approximately 70% of the national health burden and 78% of all-cause mortality (Eagar, Garrett & Lin 2001 pp.33-34; FitzGerald 2006 pp.104-105; Hilless & Healy 2001 p.81). The priorities are cardiovascular disease, cancer, injuries, mental health, diabetes and asthma (Australian Institute of Health and Welfare 2006[a] p.60; Eagar, Garrett & Lin 2001 p.39).

Article 152 of the European Union's 1999 Treaty of Amsterdam is acknowledged as an attempt at a broader systems approach in addressing public health priorities. However, in addition to being criticised for its reactionary nature and vagueness, the treaty continues to neglect the health impact created by key social determinants such as poverty, transport, education, housing and the environment (Holland et.al. 1999 p.8; Merkel & Hubel 1999 pp.61-62).

For its part, the United Kingdom's National Health Service Plan (2000) has moved its priorities to predominantly target access for disadvantaged or at-risk population groupings, with particular emphasis on the delivery of primary care. Nonetheless, the disease states of coronary heart disease and cancer remain within the new list of six priorities (Department of Health [UK] 2002 pp.7-8).

There is some attempt also in the United States to cross reference policy consideration of disease states with targeted social parameters. Since 1998 the United States federal government has initiated policies which aim to eliminate the disparities amongst racial and ethnic minority groupings in six areas of health status by the year 2010 (Clancy 2000 [b] p.2). Reporting of performance against priority target areas requires stratification by socio-economic status and race/ethnicity. The rationale for stratification is that it seeks to ensure accountability for care to those considered at the highest risk of morbidity (Clancy 2000 [b] p.4).

2.4.2 *Consumer eligibility*

Another key operational component that defines how a health system addresses efficiency and equity is in its application of eligibility criteria. Most OECD systems seek in some fashion to prescribe non-market boundaries in terms of access, type, quantity and/or quality of services provided. The evidence suggests that this is determined using either statutory and/or bureaucratic mechanisms.

There are numerous examples where OECD states use an explicit statutory framework to define rights to health care, according to some determination of citizenry and/or tax-payer status. In some cases, these statutes adopt an inclusive position with a commitment to universality for all citizens regardless of their means or ability to pay. For example, states such as Finland and Spain commit to support access to health care as a fundamental welfare entitlement within their respective national constitutions, which drives subsequent legislation (Benedicto 1999 p.152; Jarvelin 2002 p.21). Both the Canadian and Dutch constitutions also identify national equity goals in relation to health, though in each case a complex division of responsibilities and vested interests according to regional and organisational boundaries creates divergence in how these are interpreted (Maslove 1998 p.378; van Mossveld & van Sod 1999 p.40).

Other OECD states use statutes and administrative boundaries to adopt an exclusive position that constraints eligibility to health services for all but select groups. In Belgium, for example, incremental legislative amendments over time have created a multi-tiered system of eligibility to health care according to varying degrees of compulsion to participate in its social insurance scheme. On the one hand, most employees and civil servants have comprehensive coverage of their health risks, whilst the self-employed are only covered for high risk events such as hospitalisation. The latter voluntarily purchase supplementary insurance to cover the cost of other health services that they may access (van Mossveld & van Son 1999 p.123).

Means testing is another method of determining exclusive eligibility, this time according to levels of relative socio-economic deprivation. For example, approximately one third of the Irish populace is eligible via a means test for full government subsidy of general practice consultations. In return, the patient is required to register with an accredited general practitioner of their choice, though they are free to change at will (Murphy 1998 p.222).

There is an argument that eligibility should not be an all-or-nothing proposition, and not all those included in the social contract should necessarily be provided equal entitlements. The case for the social gradation of eligibility argues that just distribution is not served best by operating within a veil of ignorance. Instead, those injuries and illnesses deemed to be a product of risk-taking behaviours (e.g. smoking, substance abuse, contact sports etc.) are judged less deserving of care. In these cases, patients should expect a lower priority in the distribution of public resources (Le Grand 1996 pp.159-160).

However this position is open to challenge both for its logical end-point and its practical application. It follows that in this paradigm an individual should only carry responsibility for the expected cost of their consequences, not necessarily the full actualised cost that may occur. The appropriate means to systematically address this approach is through risk-rated insurance premiums (Feldstein 1999 p.193; Le Grand 1996 p.160). It is an unjust response to injury or illness by limiting access to care ex post as a discriminatory rebuke. Additionally, the administrative impost of consistently apportioning degrees of personal responsibility in each case is burdensome (Le Grand 1996 p.160).

Eligibility is also determined as either substantive or procedural. The key ethical challenge for governments in legislating a substantive rights position is in the explicit definition of which services citizens are entitled to and which services they are not (Lenaghan 1996 p.29). Critics argue that attempts by several OECD states to try and explicitly define consumer entitlements within a basic health care package are really a means for establishing an evidence base to exclude services from funding (Coote & Hunter 1996 p.59). The problem is that the use of statutory entitlements to ration core health care services confuses the legislature's long-term role in defining citizen rights with a government's political imperative to constrain short-run costs (Lenaghan 1996 p.29).

There are significant methodological challenges to the basic package approach. Foremost is the paternalistic stance that minimises public choice and local planning flexibility driven by an assumption of homogenous relative need (Daniels 1993 pp.230-231; Lenaghan 1996 p.37). The lack of response to consumers' utilisation experience and preferences is inefficient (Feldstein 1999 p.194).

Other problems include difficulties with both the objective weighting of priorities, and rationalising decisions on the extent benefits should aggregate when comparing multiple services concurrently (Daniels 1993 pp.228-229). The clear risk with methodological error is an inadvertent sub-optimal allocation at the margin as consumers substitute access to services not covered for less appropriate ones that are (e.g. treatment in an emergency department instead of preventive services) (Feldstein 1999 p.233; Bezzola & Martinsson 1998 p.21).

Also, if the definition of core services is too restrictive, many with a willingness to pay will purchase health care from another source. This creates substantial market opportunities for private operators, though it also causes regressive financial inequities for the socially disadvantaged. Ultimately, it increases total national health care expenditure with questionable benefit (Lenaghan 1996 pp.31-32; Maslove 1998 p.376).

There are several examples from across the OECD states where these challenges have proved too burdensome. For example, in 1994 a standing panel of medical experts advising the German government recommended the legislation of a core package of benefits and exclusions. After some further analysis and debate, the political will to pursue this option subsequently waned (Busse & Schwartz 1999 pp.121-122). In 1992 a similar exercise was undertaken in New Zealand, with the aim of explicitly identifying what core health services were priorities for government funding strategies. Eventually it was concluded that focusing instead on potential gains with marginal adjustments in specific priority service areas was more practical (Eagar, Garrett & Lin 2001 p.197).

The reality within the OECD democracies is that the political imperative to be inclusive invariably swamps any scientific and economic rationales for a basic package of entitlements (Coote & Hunter 1996 pp.59-60; Eagar, Garrett & Lin 2001 p.197). A case in point is the Medicaid (US) reform strategy employed in Oregon state (Duckett 1997 p.60). The so-called Oregon Plan purports to use quality-adjusted life-years (QALY) as its scale for comparing costs and benefits with defined health care interventions to determine the relative impact of investment (see Appendix 1 page 329 for a description of quality-adjusted life-years). However this application of quality-adjusted life-years has encountered significant procedural difficulties resulting from incomplete, diverse data sets and questionable process (Lenaghan 1996 p.34).

Critics argue that the reliance on rankings according to cost-benefit ratios creates an unintended predicament at the budget cut-off point where low-cost low-benefit interventions are ranked higher than high-benefit interventions requiring investment in expensive technologies (Reinhardt 1996 p.83). Such has been the social controversy that Oregon administrators modified the initial rankings extensively to an order politically more palatable and less exposed to accusations of discrimination (Rice 1998 p.46). The outcome is the devolution of the process from its original transparent, technical intent to one levered by expert clinical opinion and political expediency (Eagar, Garrett & Lin 2001 p.197).

Arguably it is more important to affirm citizens of their procedural rights to the manner in which services are delivered (Lenaghan 1996 pp.39-40). This manifests as legislation that broadly guarantees the delivery of adequate social, health and medical services.

Many procedural frameworks commit to principles that arise from both the World Health Organisation's 1996 Ljubljana Charter for health care systems and the 1996 Buenos Aires Declaration on family medicine and health care reform. Espoused principles include self-determination, equity, equality, universality, solidarity and social justice (Starfield 1998 pp.397-398). Statutes establish patient rights to processes such as universal insurance cover, choice of provider, health information, informed consent, protection from involuntary care, access to medical records, quality standards, and compensation for iatrogenic outcomes (Bezzola & Martinsson 1998 p.9; Burstrom & Gisin 1998 p.92; Calltorp 1999 p.351; Jarvelin 2002 p.33; Mosbech 1999 p.101; Starfield 1998 p.25; Vallgarda, Krasnik & Vrangbaek 2001 p.79) (see Appendix 1 page 310 for a description of iatrogenic consequences). Common to all is that the state does not prescribe specific types or volumes of interventions that eligible consumers can expect. There is considerable local discretion for providers (Benedicto 1999 p.154; EOHCS 2000 p.78; Jarvelin 2002 p.27).

In both Spain and Finland, procedural rights stem directly from constitutional commitments (Benedicto 1999 p.154; Jarvelin 2002 pp.21-22). In other states such as Belgium, Denmark and Sweden similar procedural frameworks have developed through legislation without a direct constitutional reference (Bezzola & Martinsson 1998 p.9; Burstrom & Gisin 1998 p.92; Calltorp 1999 p.351; EOHCS 2000 p.78; Mosbech 1999 p.101; Vallgarda, Krasnik & Vrangbaek 2001 p.79).

The least prescriptive approach to eligibility is to leave distribution to the market. In this case, access and utilisation becomes a product of preference and willingness to pay (Le Grand 1996 pp.150-151). This scenario is atypical across the OECD states, with the most notable exception being the United States (Marriott & Mable 1998 p.598). With the exception of those enrolled in either the Medicaid or Medicare (US) programs, the only health entitlement guaranteed United States citizens are their right to purchase health insurance if they can afford it (see Appendix 1 pages 319 and 320 for descriptions of the Medicaid and Medicare (US) programs).

Approximately 15% (42.3 million) of the United Sates population have no level of public or private insurance cover (Clancy 2000 [b] p.2; Frogner & Anderson 2006 p.17). These tend to be those who are casually or self-employed and are either unwilling or unable to afford their own premiums (Clancy 2000 [b] p.2; McPake et.al. 2002 pp.230-231). Also the variation in determining eligibility to the Medicaid (US) program across states leaves 23% of those living below the poverty line without insurance. Another 30% of low-income households above the poverty line are also unable to afford any coverage (Duckett 1997 p.24). The net effect, adjusted for both socio-economic indicators and measures of health status, is that uninsured United States citizens receive only 60% of the health care services utilised by their insured peers (Reinhardt 1996 pp.66-67).

2.4.3 Investment

There is no absolute benchmark for determining the appropriate level of investment in health care (Martin 2003 p.5). Expenditure on health care reflects the level of investment that is economically and politically palatable according to expressed preferences, opportunity cost and measured value (FitzGerald 2006 p.108; Wiley 1998 p.80). However Rice (1998 p.51) cautions that public preference is not predetermined and it is not economically predictable. Instead, there is an insipid creep in public expectation of health services over time as a product of experience. Public experience is seen to reflect both the structure of the systems that deliver services and the manipulations of various vested interests.

Accepting that health care is only one input to the social welfare function, this implies that even maintaining health care expenditure at a constant percentage of gross domestic product over time represents a creep upwards in its opportunity cost as gross domestic product itself grows. Combined with the consistent evidence of steadily increasing demand beyond general price inflation and population growth, this opportunity cost is problematic (Brittle & Perera 2000 p.180; Eddy 1994[a] p.326; Evans 1996 p.58; Martin 2003 p.2 OECD 2001 p.62).

At a policy level this leads to a clear point of distinction. In arguing that the absolute level of expenditure at any point in time is a policy irrelevance, critical policy attention should nevertheless be paid to the rate of growth in the proportion of the economy consumed by health systems over time and, in particular, to the proportion of this growth borne by the public sector (Maynard 1993 p.4). Only by explicitly acknowledging and assessing the opportunity cost of the fiscal commitment that this growth creates can it be judged whether there has been any misallocation or excess (Duckett 2000 p.22; Eddy 1994[a] p.325; Martin 2003 pp.5-6).

Most OECD member states are characterised by strong economic growth since 1960. With it there has been marked development of health systems (Brouselle 1998 p.40). Given that it is viewed by most states as a fundamental necessity, Reinhardt (1996 p.95) draws on American economist William J. Baumol's hypothesis that health care expenditure will continue to grow and consume ever increasing proportions of a nation's gross domestic product. This is because of the sector's peculiar inability to constrain price increases with increases in consumption. This theory is referred to colloquially as *Baumol's Disease*.

The growth of health care expenditure in many OECD member states has outstripped growth in the economy, inflation and population expansion. The most apparent cost expansions have occurred in the United States (Altman & Wallack 1996 pp.6-7; Frogner & Anderson 2006 p.10; Reinhardt 1996 p.65). For example, in the thirty year period between 1961 and 1991 health care costs in the United States exceeded the consumer price index (CPI) on average by 1.6% per annum (Eddy 1994[a] p.326). However such calculations need to be treated with caution. This is because the consumer price index has limited application in estimates of health care costs (see Appendix 1 page 296 for a description of the consumer price index). There is an alternate methodology which uses additional patient-weighted price indexes periodically re-weighted to reflect shifts in the actual mix of inputs to health care delivery. Using these calculations, the increase in the cost of actual treatments only increased in the United States at an average of 0.5% per annum in the period 1983-1994, compared with the medical consumer price index estimate of 3.3% per annum (Feldstein 1999 pp.76-77).

The United States commits the most of any OECD member state to health care (13% of gross domestic product), followed next by Switzerland (10.7%) and Germany (10.6%) (Martin 2003 p.2). However United States' data should only be directly compared with the other ten member states (Australia included) whose national health accounts comply with the OECD standardised classifications. The health expenditure data of the other member states are probably underestimates. For example, Austria, Sweden and the United Kingdom vary from the standards in their definitions separating health and social care. Belgium, Ireland and the United Kingdom vary from the standards in their identification of private expenditures (OECD 2001 p.40; Ross et.al. 1999 p.9).

Australia's expenditure on health care has climbed steadily from 5.7% of gross domestic product in 1970 to 9.8% in 2005 (Australian Institute of Health and Welfare 2006[b] p.12; Duckett 2000 p.22; Hilless & Healy 2001 p.34; Martin 2003 p.10). Whereas in 1993 Australia ranked close to the OECD median of 8.0%, it is now substantially above the current OECD median of 8.4% (Frogner & Anderson 2006 p.23). For three decades the true growth in health expenditure was largely masked by the consistent growth in the nation's income, averaging 3.5% per annum (Duckett 1997 p.10; Duckett 2000 pp.31-32; Hilless & Healy 2001 p.82). However since 1999-2000 the growth in real health expenditure has outgrown that in real gross domestic product every year (Australian Institute of Health and Welfare 2006[b] p.13). Initially this growth was driven more by increases in health prices above that in the general economy. Since 2004-2005 however, increases in volume have driven the bulk of change (Australian Institute of Health and Welfare 2006[b] pp.12-13)

Since the 1984 introduction of Medicare (Aust.), the public proportion of expenditure on health care within Australia has gradually declined from approximately 71% to 68% (FitzGerald 2006 p.109; Hilless & Healy 2001 p.38). This is marginally above the OECD median of 67% (Frogner & Anderson 2006 p.29). Public funding is sourced predominantly through taxation, including the compulsory 1.5% Medicare levy on taxable income (Hilless & Healy 2001 p.73; Frogner & Anderson 2006 p.95) (see Appendix 1 page 319 for a description of the Medicare (Aust.) program).

Per capita income is the key variable accounting for the majority of variation in both health care unit price and volumes consumed across the OECD states (Brittle & Perera 2000 p.181; Martin 2003 p.2). The higher a nation's income, the greater the fraction of income devoted to the provision of health care. This suggests a positive elasticity of expenditure with increasing income (Brittle & Perera 2000 p.181; OECD 2001 pp.42-43; Ross et.al. 1999 p.4). Studies of cross-sectional data from OECD states repeatedly demonstrate strong positive relationships between per capita gross domestic product and per capita health expenditures ($PPP) (Arweiler 1998 pp.232-233; Contandriopoulos 1998 p.185). On the strength of this evidence, Arweiler (1998 p.233) concludes: *"Health care therefore becomes a luxury item with the wealthiest consuming the most care. We can conclude that care is rationed according to level of income."*

However, longitudinal data demonstrate that the relationship between national prosperity and health care demand is neither direct nor clear cut. Analysing data from 13 OECD states in the period 1960-1993, Brouselle (1998 p.40) found significant positive relationships between total per capita health expenditure ($PPP) and per capita gross domestic product ($PPP), with elasticity greater than unity. This suggests that per capita health expenditure has grown at an increasing rate the greater per capita gross domestic product.

However Brouselle (1998 p.41) also demonstrated that the positive relationship between health expenditure as a percentage of gross domestic product and per capita gross domestic product ($PPP) had elasticity less than one. This indicates that, whilst the percentage of gross domestic product devoted to health care does increase with per capita gross domestic product, marginal rates of increase will decline the greater a nation's aggregate gross domestic product. This therefore becomes a progressively less sensitive indicator of the change. Brittle & Perera (2000 pp.185-186) reached a similar conclusion with econometric modelling to analyse Australian health care expenditure from 1960-1995. They argued that the association between household income and utilisation of health services is dampened by third party mechanisms, in particular insurance. The consumer is less sensitive to true cost, though clearly the national economy continues to bear the full expenditure. This suggests that per capita gross domestic product may only be useful for describing cross-section expenditure differences between countries (Brittle & Perera 2000 p.181).

Analysing cross sectional price and volume data from 24 OECD states, Arweiler (1998 p.231) examined whether either price levels or the relative price of care were functions of per capita gross domestic product. The author concluded that, whilst wealthy countries have overall higher price levels, elasticity is less than unity with increases in per capita gross domestic product. The increases in relative price in wealthier economies are insufficient to offset the substantial positive pressures on consumption driven by increases in per capita gross domestic product (Arweiler 1998 p.233).

The rapid developments in health care technology over the past 25 years have served to increase rather than reduce the relative price of health care. This is due in part to providers seeking return on increased capital expenditure (Altman & Wallack 1996 p.5).

Feldstein (1999 p.133) argues that technological development has a characteristic 3-stage life cycle. Stage one is the period of non-technology*,* where services costs are low but positive outcomes are limited, and advances are sparing. Stage two (in which the health care sector currently sits) is the stage of halfway-technology, where in return for speculative breakthroughs in quality and positive outcomes, expenses are typically very high. The third and final stage is high-technology, in which there is comprehensive understanding of the process or sector in question, and there is a sophisticated focus on labour-saving problem prevention and early intervention. The net effect is a reduction in expenses in real terms.

The cost of new technologies has also increased substantially due to growth in utilisation. Critics argue that increased utilisation is driven by market demand for the latest, more sophisticated procedure, and with it, qualitative expectations on new technologies' potential to minimise morbidity (Altman & Wallack 1996 p.14; Wiley 1998 p.79).

The association between technology development and utilisation is strengthened by health insurance (Feldstein 1999 pp.133-134; Hurley 2000 p.86). The greater the patient subsidisation through insurance, the more conducive is the return encouraging research and development of technologies without regard for the expense. Insurers almost always succumb over time and provide coverage as the public awareness of established technologies increases, and with it political pressure and/or legal challenges (Rice 1998 pp.46-47).

The progressive introduction of prospective allocation and capitation may break this nexus (Feldstein 1999 p.134). The incentive for providers in this case is to substitute quality-enhancing for cost-reducing technology, and to shift the intervention to a facility with relatively lower fixed costs (e.g. from hospital wards to outpatient clinics) (see Appendix 1 page 291 for a description of capitation).

The historic evidence from industrialised societies demonstrates that the increase in health care expenditure is driven more by changes in consumption patterns per capita, than the general demographic shift towards an increased proportion of elderly (Duckett 2000 p.14; Persson & Guzelgun 1998 p.259). The real growth in expenditure for the aged is a product of the increasing range of services and interventions made available in the market, rather than because there are more aged consumers in the market seeking a constant set of commodities (Evans 1996 p.58). An analysis of longitudinal data from thirteen OECD states by Brouselle (1998 p.44) confirmed that the percentage of population greater than 65 years did not account for any variance in health care expenditures. Similarly, analysing data in the five-year period from 1989 to 1993 from twenty-four OECD states, Contandriopoulos (1998 p.179) found no correlation between the population percentage older than 65 years, and aggregate health care expenditure. However the OECD still projects that, assuming age-related expenditure patterns remain in status quo over time, demographic shift alone will drive an upwards drift in outlay of close to 2% of gross domestic product on average in the first half of the twenty-first century (Martin 2003 p.2).

It is projected that, even with the complete elimination of demand for all services proven to be either of no, equivocal or relatively low value, the growth in health care expenditure per annum will still exceed gross domestic product (Eddy 1994[a] p.328). Regardless of which individual variables prove over time to be the primary cost drivers, as long as, in aggregate, they grow at a rate faster than the gross domestic product, there will be an opportunity cost borne by one social sector or another. With it, health care will have a perennial imperative to identify savings (Eddy 1994[a] pp.326-327). Therein lays the argument for rationing even evidence-based care with sound demonstrations of marginal benefit. With it comes a strong case for being explicit about how services are to be distributed.

2.4.4 Distribution

Concluding a multivariate analysis of longitudinal macroeconomic data from 13 OECD member states over the period 1960-1993, Brouselle (1998 p.52) states:

"… [t]he disparities in costs between the countries were not attributable to any epidemiological or demographic differences in populations. Rather the factors which explain a country's position relative to the average trajectory of change are associated with the manner in which its health system is organised, funded, and regulated."

In other words, a health system is shaped less by the external forces of the broader economy, and more by its own process drivers. Critical then are the underlying processes that direct the distribution of health care.

The delivery of health care across the OECD member states is rarely left to an unregulated competitive market. As evidenced by the evolution of managed care and internal market models within global budget constraints imposed by the state, health care delivery and service development is becoming increasingly process-oriented (Visser 1998 p.89) (see Appendix 1 pages 312 and 314 for further descriptions of internal markets and managed care respectively). Through a mix of organisational, funding and regulatory mechanisms, the resultant distribution of health care in any one system is directed through demand subsidisation and/or supply manipulation.

Insurance is the major third-party mechanism for redirecting distribution in health care (Arweiler 1998 p.235; Brittle & Perera 2000 p.181). Third party subsidisation of health care increases the demand for services as it lowers the price paid by consumers to less than that received by providers. Clearly however the national economy continues to bear the full cost of utilisation.

Brittle & Perera's (2000 p.181) micro-level studies using longitudinal data on the Australian economy demonstrate a far weaker positive relationship than expected when comparing the distributive effect of household income on utilisation of health services. A subsidy-derived reduction in both input costs to the producer and price to the consumer increases output and stimulates consumer demand. The degree to which this occurs is dependent on the relative elasticities of each variable (McPake et.al. 2002 p.172).

Many OECD states seek to control distribution using supply-side mechanisms such as capitation, salary, fixed fee schedules and practice guidelines (Rice 1998 p.92; Starfield 1998 p.52). In some health systems a mix of these options may operate concurrently (Starfield 1998 pp.52-53). This demonstrates a tacit treatment of health care outside the classic reliance on demand elasticities within an unfettered fee-for-service market (Rice 1998 p.97) (see Appendix 1 pages 307 and 332 for descriptions of fee-for-service and salary).

Rice (1998 pp.92-93) argues that public distribution systems necessarily assume a paternalistic stance. The focus is squarely on manipulating provider practice, rather than consumers' revealed preferences. Distribution is manipulated according to factors of production. Systems for underwriting supply are categorised according to whether they are driven by cost (input), output, needs or outcomes (Eagar, Garrett & Lin 2001 p.72-77).

Greece and Spain provide examples of OECD states where cost-based budgeting is still applied to health care. Distribution of finance to regional health services in Greece is driven substantively by projections built on past rounds of fixed expenses, with ad-hoc adjustments for exceptional circumstances and political directives. Greece is notable for its dearth of a policy framework that either systematically adjusts for measures of need or targets specific health indicators (Petridou et.al. 1999 p.132).

Though the Spanish national treasury does apportion budgets to their regional health authorities by head of population, it is unweighted. No further criterion or benchmark is set to control the scale or scope of annual distribution except past rounds of actual expenditure and current measures of demand (Benedicto 1999 pp.155-156). Critics argue that this incremental and reactive approach regressively rewarding indiscriminate expenditure, regardless of service competencies. Given these models rely predominantly on historic accounts of inputs for determining current and future rounds of budget allocation, inherent barriers to change and innovation are apparent (Eagar, Garrett & Lin 2001 p.73; Starfield 1998 p.37).

A key feature of output-based models is the primary pursuit of technical efficiency, rewarding production and creating market incentives to minimise input costs. Depending on how funds are distributed amongst providers in relation to the output produced, these models can be further categorised as either payment or budget-share systems (Eagar, Garrett & Lin 2001 p.79).

For example, where there is a split in entity between the purchaser and provider, requisite contractual commitments typically adopt a payment version of an output-based model, with remuneration specified according to agreed target volume and/or unit price schedules (Eagar, Garrett & Lin 2001 pp.80-81). Applications of casemix systems, in their various guises, are well-documented examples of such models (Eagar, Garrett & Lin 2001 p.42; Starfield 1998 p.38) (see Appendix 1 pages 295 and 328 for descriptions of casemix systems and purchaser-provider split respectively). Alternatively, a formal agreement may be set between entities according to total outlay, in return for the achievement of set service objectives. Objectives commonly reflect a needs-based approach to planning (Eagar, Garrett & Lin 2001 p.80).

Typically, output-based models remunerate according to some preconceived calculations of average cost per diagnosis (Starfield 1998 p.39). This includes a built-in profit margin for privately-provided services. Though this may establish some level of equity between competing providers, there is no intrinsic incentive for the provider to pursue either quality improvement or enhanced outcomes (Eagar, Garrett & Lin 2001 p.78). Distribution according to output allocates resources according to current utilisation patterns, without any intrinsic controls to discern demand from genuine need. Consequently, the models risk a regressive inequity according to levels of social advantage (Eagar, Garrett & Lin 2001 pp.77-78).

By contrast, needs-based models have the common aim of redistributing health care resources according to determinations of relative need (Eagar, Garrett & Lin 2001 p.74). However defining and measuring need within a normative analysis of health care creates considerable operational difficulty (Holland et.al. 1999 p.27; Hurley 2000 p.70).

Apportioning of resources according to predetermined definitions of need is evidenced at both the individual and the population levels. Examples of the individual level include the use of capitated managed care plans in Switzerland and the United States, plus the Australian coordinated care trials (Bezzola & Martinsson 1998 p.17; Eagar, Garrett & Lin 2001 pp.74-75). In the privatised United States system, a consumer has a variety of competing options for enrolment in a managed care plan. Capitation introduces a price rationing mechanism on demand, in return for an insured set of health care cover (Reinhardt 1996 p.81). Though capitated managed care eliminates perverse incentives for demand inducement, it is substituted for an equally perverse incentive to both under-service and cream-skim low risk enrolees. Strategies to contain this include both regulations to ensure universality and adequate consumer choice, plus the use of cost-weights that accurately reflect likely utilisation (Marriott & Mable 1998 p.645; Rice 1998 p.122).

Price rationing has less of an imperative where public regulation generates uniformity in out-of-pocket expenses. Examples of capitated population-based distributions are found within United Kingdom and New Zealand. The evolution of general practice fund holding in both these countries relied on the prospective payment of individual case funding according to providers' accruement of patient rosters (Marriott & Mable 1998 p.629; McDonald et.al. 2007 pp.47-48) (see Appendix 1 pages 308 and 331 for descriptions of fund holding and rostering respectively).

Population-based funding according to comparative need is more likely to incorporate concepts of equity in distribution (Eagar, Garrett & Lin 2001 p.75; Marriott & Mable 1998 p.633). Work since the 1960's by the United Kingdom's Resource Allocation Working Party (RAWP) has been influential with this approach. This model proved the foundation for the development of population-based distribution models by a range of health authorities in Australia, Canada and New Zealand (Eckstein 2001 p.86). For example, the Resource Distribution Formula (RDF) implemented by New South Wales applies resource allocation to area health services using weighted population formulae (Eagar, Garrett & Lin 2001 p.42). In 1991 New Zealand introduced per capita funding to its newly-gazetted regional health authorities, weighted for age, gender, ethnicity, rurality and other socio-economic indicators (Marriott & Mable 1998 p.587). In 1993, Finland adopted a population-based approach towards national subsidies to municipalities for the delivery of health care. Again the per-capita allocation is weighted for age, indices of morbidity and levels of remoteness (Jarvelin 2002 p.73).

There is a logistical difficulty with population-based approaches. How to adequately determine the true scale of community access to services from within the nominated geographic boundaries remains questionable. This is because cross-boundary flows create substantial variation from census estimates of an administrative area's resident population (Marriott & Mable 1998 p.635). Needs-based funding models also rely substantively on the motives of providers for ensuring the delivery of an appropriate range and standard of services. The providers carry a substantive portion of the risk once allocated a global budget for a given timeframe. However this is limited because there are no intrinsic controls within the resource distribution mechanism to ensure a pursuit of technical efficiency amongst competing providers (Eagar, Garrett & Lin 2001 pp.76-77).

Distribution according to indicators of quantifiable outcome is a progression on the same paradigm that underpins needs-based funding. Effectively, resources are systematically transferred from services categorised as low value and overused to those categorised as high value and underused (Eddy 1994[b] p.817). It is argued that this population-based rationing approach can be achieved either implicitly through a manipulation of incentives or explicitly through the definition of eligibility criteria. It is driven in either case by evidence-based demographic and epidemiological indicators (e.g. age, gender, risk factors etc.) (Eddy 1994[b] p.820).

2.4.5 Delegation

Along with wider public sector reforms, there has been significant reorientation of health system delegations across many OECD states. This is a response to the progressive rate of growth in health care expenditure exceeding aggregate economic growth for much of the 1970's and 1980's (Altman & Wallack 1996 p.2; Contandriopoulos 1998 p.183; Hilless & Healy 2001 p.38; Merkel & Hubel 1999 p.55; OECD 2001 p.40).

Most OECD states have sought to create comprehensive regulatory mechanisms dovetailing health care investment and distribution within the gambit of broader national objectives (Altman & Wallack 1996 p.8; Starfield 1998 p.64). Starfield (1998 pp.345-346) argues that the greater the regulation of distribution, the stronger is a state's primary care system in particular. Highly regulated health systems such as that found in Denmark, Finland, the Netherlands, Spain and the United Kingdom are examples.

OECD governments' historic struggle to effectively direct funding levels in key areas, implement cohesive rationing mechanisms and establish appropriate payments incentives to promote performance improvement from providers is well documented (Duckett 2000 p.234; Eagar, Garrett & Lin 2001 p.46; McPake et.al. 2002 p.207). A key process is how respective systems delegate the authority to execute investment and distribution decisions. This delegation occurs at several tiers, including governance, purchasing and provision.

Whether health systems are better served by overarching control from a centralised authority or decentralised units is a point of conjecture (Rice 1998 p.136). Advocates of centralised authority cite the dramatic reforms in New Zealand and the United Kingdom as examples of what can be achieved when the state directly administers the health service portfolio, rather than delegating its responsibility to various tiers of government and statutory authorities (Marriott & Mable 1998 p.557). Ironically, assessments of decentralisation also point to the United Kingdom, which has a tradition of pursuing efficiency through devolving authority to smaller-scale regional entities with capitated budget allocations (Decter 2000 pp.22; Starfield p.58). This is a model which several Canadian provinces are now seeking to mimic with their regional health authorities. Even more ironically, the Canadian provinces have scaled up to achieve this, by absorbing and centralising responsibilities once previously the domain of local hospital boards (Decter 2000 pp.22-23).

Decentralised responsibility for publicly funded health care has long been a feature of some OECD states (Rice 1998 p.136; Starfield 1998 p.58). In the case of Denmark, for example, its national parliament deliberately rescinded responsibility for the financing and provision of virtually all health functions in 1970, delegating it to the level of county and municipal government (Vallgarda, Krasnik & Vrangbaek 2001 p.19; van Mossveld & van Son 1999 p.60). Federal input to health care in Germany is limited to but a few specific areas, with all other aspects the responsibility of the sixteen provincial Lander (Busse & Schwartz 1999 p.105). In Belgium and Canada the organisation and delivery of health care is delegated explicitly by the respective national constitutions to the jurisdiction of the provincial governments (Closon, Crainich & Swartenbroek 1999 p.70; Maslove 1998 p.379; van Mossveld & van Son 1999 p.122). This is also the case for public hospitals in Australia, though not medical and dental services, pharmaceuticals or residential aged care (Hilless & Healy 2001 p.12).

There are numerous cases in which states that historically lack direct statutory powers over the health care portfolio instead engineer top-down control through other means. Typically using their control of tax-based revenue, many seek leverage over supply by becoming the monopsony funder of health care (Rice 1998 p.137). For example, Denmark abolished its system of privatised insurance schemes for medical care in favour of a tax-funded monopsonic national health security system (NHSS), only three years after decentralising its authority (Vallgarda, Krasnik & Vrangbaek 2001 p.13; van Mossveld & van Son 1999 p.61). The national health security system sanctions tax provisions and weighting of annual subsidies to the municipalities responsible for the delivery of health care services, who in turn administer provider reimbursement for services according to rates negotiated between the association of county councils and the respective professional associations (Mosbech 1999 pp.89-90; Vallgarda, Krasnik & Vrangbaek 2001 p.73).

Similarly, when faced with the familiar spiral in health care expenditures of the early 1970's, both the Dutch and German governments centralised health care budgets and began to effectively administer the distribution of funds to private payer groups. The key constraint introduced in both systems was to link premiums to wages, hence tying health care expenditure inexorably to the performance of their overall economies (Altman & Wallack 1996 pp.22-23).

Both the Australian and Canadian federal governments have used interpretations of sections within their respective constitutions in relation to allocation of funds and grants to indirectly leverage policy direction on health care (DeVoe 2001 p.57; Eagar, Garrett & Lin 2001 p.26; Hilless & Healy 2001 p.18; Marriott & Mable 1998 p.609; Maslove 1998 p.379). The most notable outcomes for Australia have been the evolution since 1984 of the 5-year health care agreements, which bind the provincial states to funding grants from the Australian Government in return for meeting prioritised targets (Hilless & Healy 2001 p.27; Ross et.al. 1999 pp.31-32). The Canadian federal government have historically used discretionary fiscal penalties attached to their subsidisation of provinces through established programs financing (EPF). This enforces compliance with the otherwise non-binding principles of the *Canada Health Act (Can)* (Marriott & Mable 1998 pp.609-610; Maslove 1998 pp.392-393).

Some OECD states have attempted to implement the managed competition model, in which health care investment and distribution is delegated to a regulated market. However there is little empirical evidence of managed competition principles being adopted in full. For example, the Netherlands ultimately tempered the full recommendations of the well-documented Dekker Report to amalgamate public and private insurance schemes into one competitive market (Marriott & Mable 1998 p.573). Instead, a two-tiered system persists. At one level, the government provides universal coverage against long term or high cost treatment, in return for means-adjusted contributions. At the next level, standard coverage is provided using compulsory income-adjusted insurance levies on both employers and employees (Marriott & Mable 1998 pp.575-576). Funds are first pooled centrally by the government, and then divided amongst a range of gazetted sickness funds using a weighted capitation formula depending on their roster of enrolees. The sickness funds in turn must market what services they insure, and openly compete for enrolees (Marriott & Mable 1998 pp.576-577). Sickness funds purchase services on behalf of their enrolees. In some cases the funds are vertically integrated with provider practices or institutions (Marriott & Mable 1998 p.579).

One of the featured reforms over the past decade has been the convergence of tax-based systems towards some elements of the social insurance model. A distinctive feature is the shift in risk for future expenditure growth to the delegated fund holder, whether that is the provider directly or via a purchasing agent. One classic method of applying key managed competition mechanisms is to use an internal market model. This market-style reform splits the purchaser and provider functions (Coote & Hunter 1996 p.27; Starfield 1998 p.57).

There are at least two theoretical rationales for adopting a purchaser-provider split. The first is the reorientation of the purchasing entity's role to concentrate on strategic planning free of the micro-management detail required for service delivery. The second is an increased emphasis on client choice and discretion, rather than the vested interests of the provider (Coote & Hunter 1996 pp.27-28; Podger 2006 p.136).

Finland, New Zealand, Sweden and the United Kingdom all provide examples where the internal market mechanism has been applied within a tax-based system using a monopsonistic public purchaser. This is intended to maintain the egalitarian principle of solidarity (Bezzola & Martinsson 1998 p.11; Decter 2000 p.20; Duckett 2000 pp.58-59; Jarvelin 2002 pp.22-23; Marriott & Mable 1998 p.584). It is the monopsonistic purchaser's role to contract services from gazetted provider groups (e.g. hospital trusts, diagnostic services etc.) (Calnan & Gabe 2001 p.120; Decter 2000 p.194; Marriott & Mable 1998 p.561). In practice this purchasing function is delegated to regional government, regional health authorities, or general practice fund holders acting as government agents. In each case they have the responsibility to procure services on behalf of their patient registers (Decter 2000 p.194; Hurley 2000 p.77; Jarvelin 2002 pp.22-23; Starfield 1998 p.56).

The general principle revolves around a prospective per capita allocation of funds following each patient who is left, in theory, to choose between fund holding providers. The concept aims deliberately to create a tension between competing providers who should have an incentive to encroach on neighbouring catchment populations. It is presumed that by doing so, providers will seek to value-add to the scale of their prospective payments (Decter 2000 p.197).

Finland, New Zealand, Sweden and the United Kingdom have all retracted over time from the original concept. The main reasons include the presence of natural provider monopolies, substantial information asymmetries between parties and incomplete or insensitive contracting arrangements (Calltorp 1999 pp.343-344; Decter 2000 pp.20-21; Duckett 2000 p.236; Martin 2003 p.6-7; McPake et.al. 2002 p.215; Starfield 1998 p.398).

The model has several identified risks. One is the onus on contractual agreements which increases transactional costs (Coote & Hunter 1996 pp.27-28; Hilless & Healy 2001 p.83). Another is that separation may lead to service fragmentation and loss of continuity of care, particularly in complex cases (Coote & Hunter 1996 pp.27-28). In addition, there are many perverse incentives for stakeholders (Coote & Hunter 1996 p.31; Jarvelin 2002 p.31). They include the risk of cost-shifting, information gaming to manipulate budget allocations, deferment of outcome measures for process indicators (e.g. activity outputs), and the adverse selection of clientele. The model also creates a perverse incentive for opportunistic behaviour by providers. Providers try and develop referral protocols that corral the local catchment into continuing exclusive utilisation of their facilities and services. This impedes by stealth any discretion that is left to the individual patient (Decter 2000 p.197).

In some cases the application of the model is diluted by inadvertent elements that undermine market behaviour. For example, in Sweden the paucity of providers in rural and outer metropolitan areas detracts from any genuine competition (Bezzola & Martinsson 1998 p.23; Starfield 1998 p.343). In Finland, public funding applies an equalisation mechanism to underwrite hospitals with high costs (see Appendix 1 page 328 for a description of public funding). This removes price signals for municipalities when purchasing secondary care services for their constituencies. The municipalities rarely purchase outside of their local hospital district, and typically negotiate agreed annual volumes and prices without a contractual commitment. In practice there is insufficient separation for the purchaser-provider split model to operate (Jarvelin 2002 pp.23-24).

2.5 System evaluation

Unlike most other commodities, health care is not consumed for the direct utility it provides. Rather it is but one input to producing a desired state of good health (Hurley 2000 p.68).

Interest in the marginal cost to benefit ratio of strategies, rather than simply the scale of the investment per se, increasingly occupies health policy development (Duckett 2000 p.22). The evidence suggests that the measures of efficiency and/or equity invariably use evaluations of either access or outcomes as proxy indicators.

2.5.1 Access

Without change to the living and working conditions of the disadvantaged in society, access to health care only has a minor impact on health status inequities (Eagar, Garrett & Lin 2001 p.22; Evans 196 p.57; Holland et.al. 1999 p.2; Mullen 1998 p.10). The primacy afforded measures of access betray a minimalist libertarian ethos that only equates indicators of equity with demonstration of opportunity (i.e. potential accessibility). A difficulty with this position is that equality of access is a process measure premised on entitlements rather than execution. It does not necessarily equate with equality of either consumption or utility (Hurley 2000 pp.89-90; Starfield 1998 pp.400-401) (see Appendix 1 page 284 for a description of access).

It is difficult to directly measure the effects of distribution on equality of access because it is independent of both demand and utilisation (Hurley 2000 p.90). Nevertheless, empirical evidence supporting Tudor Hart's (1971) so-called *inverse care law* indicates that the greater the diversity in distribution of services, the more pronounced inequities in health status become. Invariably it is those most in need that are least likely to access services (Harris & Furler 2002 p.35; Starfield 1998 pp.401-402). This is particularly the case for preventive services such as dentistry, immunisation and cancer screenings (Coote & Hunter 1996 p.42; Harris & Furler 2002 p.35; Smith et.al. 2002 p.19). For example, repeated studies of the United Kingdom demonstrate that the relative proportion of health care resources consumed increases with higher socioeconomic status, despite all citizens supposedly having universal access to a publicly funded system. This indicates that social inequity persists even where ability to pay is not a primary concern (Connelly & Doessel 2000 p.44).

Any links between socio-economic status, race/ethnicity and under-utilisation of services are varied and complex. Apart from service affordability, barriers to access for the socially disadvantaged may include geographic distance, transportation, education, literacy, health beliefs, cultural compatibility, patient attitudes and preferences, competing social demands, provider bias and waiting times (Clancy 2000 [b] p.4; Harris & Furler 2002 p.36). It is open to question whether the quality of service provided for equivalent presentations, in terms of length of consultation and rates of referral for investigations, are always equal across the social strata.

In some cases variations in access are also independent of socioeconomic status. For example, the Danish health system is committed to universal coverage and has high levels of redistribution. Despite this, its substantial decentralisation creates significant geographic disparities in surgical waiting times, dispersion of medical technology, diagnostic screening rates and access to high cost pharmaceuticals. These discrepancies are all independent of demographic and epidemiological profiles (Mosbech 1999 p.96; Vallgarda, Krasnik & Vrangbaek 2001 p.25). Similarly, one in six fund holding health authorities in the United Kingdom withhold certain non-critical treatments from public subsidy (e.g. in-vitero fertilisation, tattoo removal, cosmetic surgery, gender reassignment etc) (Lenaghan 1996 p.10). The fundamental difficulty is not only the variation, but also the inconsistency in criteria applied between regions to determine exclusions. Hence, a side effect of the internal market in practice is that access is determined according to geographic location, independent of need (Lenaghan 1996 p.11).

2.5.2 Outcomes

Defining the relative contribution of health care to the social welfare function is elusive. Epidemiological analyses have a well-established track record of correlating health status gradients with population cohorts defined by a variety of social determinants (e.g. residence, age, gender, genetics, ethnicity, social class and social mobility) (Connelly & Doessel 2000 p.44; Evans 1996 p.44; Starfield 1998 p.8).

However it is debatable to what degree inequities in health care are accountable for any disparities (Clancy 2000 [b] p.5). These analyses too often remain descriptive only of total need, and do not indicate what the marginal impact would be of increased medical care on a given cohort's health status (Connelly & Doessel 2000 p.42).

Studies first credited to authors such as McKeown (1979) and McKinlay & McKinlay (1977) both pursue a series of epidemiological analyses of historical mortality data since the 18th century. Both studies argue that the progressive introduction of health services did not demonstrate an effective impact on population health status at all until well into the fourth decade of the 20th century (Connelly & Doessel 2000 p.41; Szreter 2003 p.427). Converting this argument to a theoretical social welfare function, where output is population health status, Connelly & Doessel (2000 p.41) speculate that the total production curve would have until relatively recently be graphed virtually as a horizontal line. They argued that, in the meantime, the significant improvements in environmental conditions over the past three centuries (e.g. sanitation, nutrition etc.) have displaced this production curve vertically.

However critics argue that McKeown's (1979) analysis is flawed because it incorrectly uses improvements in nutrition as an imprecise proxy indicator of the economic growth by the industrialising states of Europe and North America. This betrays a neo-liberal bias which accepts that the dominance of laissez-faire capitalism over time has had a benevolent trickle-down effect on the health of the masses (Szreter 2003 pp.425-427). Instead, it is argued that national security fears and imperialistic rivalries drove the political acceptance of increased taxes by the urban middle classes. Caring externalities for an enhanced supply of manpower saw the development of publicly-funded sanitation works and broad-scale social welfare systems (Szreter 2003 pp.425-426).

The World Bank (1993) in part examined the correlation between life expectancy and income (PPP) per capita from a sample of nations, adjusted to constant values (Evans 1996 pp.43-44). The distribution demonstrates a steady upward translation for each nation across the decades, revealing a clear positive association between life expectancy and prosperity. However the graph of each set of time series data demonstrates a curvilinear relationship with life expectancy plateauing to the horizontal as income per capita increased. Beyond some critical threshold, there is a declining marginal return in health status for increased income per capita (PPP).

Typically, measures of life expectancy and infant mortality only show weak, non-linear associations with macroeconomic indicators (e.g. expenditure on health care, income security, education or labour market programs as percentages of gross domestic product) in both cross-sectional and longitudinal studies of OECD states (Brouselle 1998 p.44; Centre for International Statistics 1998 pp.158-160; Hay 2006 p.7).

However, the Centre for International Statistics (1998, pp.164-165) did establish a significant positive correlation (albeit with a relatively large risk of Type 1 error at $p < 0.1$) between life expectancy and share of national income held by the lowest forty percent of households, using cross-sectional data from nineteen OECD states. Similar significant findings repeatedly demonstrate this association, regardless of whether the variable used to indicate social disadvantage is income, occupation or employment (Duckett 2000 p.226; Eagar, Garrett & Lin 2001 p.35). This is consistent with the extra-welfarist argument that a society's health gain is more influenced by the normative distribution of investment, rather than its absolute scale (Starfield 1998 p.8).

Some evidence indicates an inverse relationship between the ratios of medical practitioners per capita with measures of premature mortality (OECD 2001 p.18). This is particularly the case with primary care physicians (Coote & Hunter 1996 p.42; Harris & Furler 2002 p.35; Macinko, Starfield & Shi 2007 p.115). Studies consistently report significant impacts on chosen indicators compared with primary care physician to population ratios, independent of social factors such as per capita income. Indicators include age-adjusted mortality, neonatal mortality, life expectancy, death from cancer and cardiac-related diseases, immunisation rates, hypertension, use of prescribed medicines, plus self-perceived general health (Blumenthal et.al. 1995 pp.257-258; Starfield 1998 p.15) (see Appendix 1 pages 309 and 325 for further descriptions of general practice and primary care physicians respectively).

Nevertheless, there is no outcomes-focused framework as a point of reference for general practice (Swerrisen 2004 p.9). Establishing valid links between general practice activity and population-based indicators is difficult and is a substantial area for future research (Tilyard 2004 p.8).

2.6 Conclusion

Resource scarcity is an economic reality. It is evident from international examples that health care priority setting betrays a tension between the key elements of efficiency and equity (Duckett 2000 p.228; Eagar, Garrett & Lin 2001 pp.188-189; Feldstein 1999 p.175; Hay 2006 p.2; Le Grand 1996 p.151; Mooney & Newberry 1999 p.42; Starfield 1998 p.398). The literature demonstrates that policy rationales are also cross-referenced with the complementary elements of resource rationing and financial risk (Daniels 1993 p.224; Eagar, Garrett & Lin 2001 pp.188; Le Grand 1996 p.150).

Clearly there is no theoretical consensus on how policy should direct health systems in their respective means of production and distribution. The literature identifies libertarianism, utilitarianism, communitarianism and egalitarianism as the four competing paradigms that influence health care directives. Yet in reality, any ardent commitment to one or another is rare. The evidence suggests that a prevalence of either pragmatism or political expediency is often closer to the reality (Hurley 2000 p.87).

As diverse as the health systems of the OECD member states appear, they all portray evidence of five key interdependent components. These include a policy framework, consumer eligibility, sizeable economic investment, distribution mechanisms plus varying levels of decision-making delegation.

The most tangible expression of health care prioritisation for many OECD member states is demonstrated in terms of explicit goals and targets. Though acknowledgment of the World Health Organisation's push for a more holistic social perspective on health is evident within policy statements, many states' actual planning goals and targets continue to operate predominantly within a disease state framework (Eagar, Garrett & Lin 2001 p.39). This approach reflects the pervasive impact created by the burden of disease. The systematic pursuits of efficiencies and marginal gains remain largely focused within this context. Australian policy is consistent with this approach (Australian Institute of Health and Welfare & Department of Health and Ageing 1998 pp.55-56; Australian Institute of Health and Welfare 2006[a] p.60).

Citizens of most OECD states are afforded at least procedural rights to some level of health care. Though some states have attempted substantive rights using a basic package of benefits, they typically have struggled with defining adequate scope and volume and thus are challenged with the resultant inequities and inefficiencies.

Many OECD economies have demonstrated a strong rate of growth since the 1960's. In all cases the increasing scale of investment in health care has exceeded this growth. Prosperity, as measured by per capita gross domestic product, is a significant contributor to investment in health care. Other determinants are the increase in quantities demanded created by growth in third party subsidisation, the cost-accumulating impact of health technology development and the increased utilisation of primary care services (McPake et.al. 2002 p.231).

Consistent with evidence from many of the OECD states, a persistent stratification in health status according to income distribution remains the most significant indicator of recognised social vulnerability in Australia (Connelly & Doessel 2000 p.44; Evans 1996 p.44; Starfield 1998 p.8). In Australia this is exacerbated by indigenous status and geographic remoteness, independent from other socioeconomic factors.

Measured in broad terms, the impact on relative mortality correlates only weakly with investment as a proportion of gross domestic product in most forms of social welfare, and becomes progressively less relevant as the investment increases. The inference is that the proportional distribution of investment, rather than the aggregate allocation, is more critical in addressing inequities in outcome.

Most funders of health care have moved away from solely using historic cost-based models to determine distribution. Increasingly health systems have applied either output funding in the pursuit of technical efficiency and/or needs-based population funding formulae in the pursuit of equity.

A common element in directing and determining access in virtually all health systems is government support for risk sharing, using an insurance mechanism. Most OECD member states demonstrate the capacity to socialise some of the cost of health care, though not all accept universal coverage for their citizens as a right.

Public health insurance schemes are broadly grouped within at least two models. The first is a tax-based system that integrates a monopsonic purchaser with provider institutions. The second is a social insurance system that explicitly separates purchaser and provider roles, and engages each on a contractual basis. Increasingly, evidence points to a complex convergence of elements between the two models. An important corollary to these processes is how respective systems delegate the authority to execute investment and distribution decisions. This delegation occurs at several tiers, including governance, purchasing and provision.

At least two proxy indicators are used to evaluate the relative effectiveness of a health system. One is access to specified services. The other is the tangible outcomes that the system is able to produce. The feasibility of establishing associations between marginal redistribution and health outcomes remains open to question. But there is some evidence to indicate a positive association between increased utilisation of primary care and outcomes for socially vulnerable groups.

CHAPTER THREE - A systems analysis of general practice

3.1 Introduction

General practice is at the core of primary medical care in Australia. General practice is the dominant primary care provider for a range of critical functions, including diagnosis and treatment of injury and illness, ordering of diagnostics, prescription of pharmaceuticals, and referral to other services (Productivity Commission 2003 p.xvii).

In order to provide some context for the position of general practice in Australia, it is important to firstly understand the position of general practice within the broader domain of medicine across developed societies. Some significant trends affecting primary medical care across the OECD member states are then discussed. Congruency between the outlined dimensions and developments in Australian general practice is demonstrated.

3.2 The dimensions of medical practice

A medical practitioner typically functions within at least three interdependent social dimensions, and may do so in all three simultaneously. These broad dimensions are that of an agent, firm and professional. Though not mutually exclusive, it is noteworthy that the broad objectives organised medicine sets for itself within these dimensions are not necessarily congruent with the fundamental and complementary elements pervading much of health care policy across the OECD member states.

3.2.1 Agent

In classic contract terms, the medical provider's role is one of agency on behalf of their principals (i.e. patients*)* (Scott 2000 p.1178). With its exclusive control of particular competencies and their oft-acknowledged status in most communities as a body of skilled professionals, by definition medicine assumes an agency-like position in performing many duties (see Appendix 1 page 284 for a description of agency).

The medical profession espouses a tradition of a deontological morality. This means that the value of a decision is in its rationale, regardless of the resultant outcome it produces. This paradigm is consistent with assumptions regarding an agency relationship (Smith 1992 p.56). The roots of this deontological morality date back to the ancient Hippocratic Oath. Medical graduates profess commitments to serving the sick, maintaining health and placing the interests of the patient before that of the practitioner (Pennington 1990 pp.242-243). This is echoed further in contemporary biomedical ethics that commit to beneficence and non-maleficence (Smith 1992 p.56).

The profession assumes that an ethical practitioner is one who will not compromise allegiance to their patient in deference to macro-level concerns for resource consumption or personal profit (Pennington 1990 pp.243-244). Clinicians will not necessarily accept or appreciate efficiency as the prime criterion for ranking and prioritising discrete sets of interventions (Hershey et.al. 2003 pp.87-88). Clinicians' view their prime moral obligation is to provide technically-correct care based on sound medical indications and patient preference (Cohen 1994 p.785; Jonsen, Siegler & Winslade 1992 p.138). Contemporary medical standards of care do not accept the subordination of individual needs to the broader needs of society, except for very particular circumstances (e.g. disasters, war zones etc.) (Andrews 1991 pp.7-8; Jonsen Siegler & Winslade 1992 p.142).

Medicine's ethical position finds further imperative in Australian common law. The fiduciary-like principle of 'uberrima fides' is incumbent on the practice of many professions. Reflected in medico-legal precedent, it holds that once a particular relationship of proximity is established, a provider owes an independent and non-delegable duty to ensure that any treatments undertaken are performed with reasonable care (MacFarlane 1995 pp.99-100; Pennington 1990 p.244). A provider's duty of care to continue providing treatment to existing patients overrides the duty to provide care to potential patients in the future, all else being equal and regardless of relative utilities (Jonsen et.al. 1992 pp.138-139). Rulings in cases such as *Albrighton v Royal Prince Alfred Hospital [1980] 2 NSWLR 542*, have established the requirement on providers, having accepted a patient, to *"…make available all the therapeutic skill and devices which it is reasonably able to deploy"* (MacFarlane 1995 p.41).

Subsequent to a landmark ruling in the High Court case of *Rogers v Whittaker [1992] 175 CLR 479*, the standard of care in Australia is determined objectively by the courts (rather than by professional peers - the so-called 'Bolam test'). In dismissing allegations of negligence, the court must be satisfied that reasonable care has been taken to avoid foreseeable risk (MacFarlane 1995 pp.118-123). The evidence indicates that the judiciary's considerations are substantially influenced by both the principles of medical registration statutes (even where there is no specific provisions in the legislation for civil action) and the prevailing expectations of the community regarding standards of care (Fleming 1992 pp.148-149; Trindade & Cane 1993 p.410).

This is no mute point. Seddon et.al (2001 pp.153-154) conducted a systematic review of ninety peer-reviewed studies reporting on the clinical quality of general practice mainly within the United Kingdom, and to a lesser extends across Australia and New Zealand. The majority focused on the quality of care provided for chronic conditions (cardiovascular disease, hypertension, diabetes mellitus, and asthma), whilst the remainder assessed either preventive or acute care. Despite methodological limitations the review concluded that, in almost all cases, the processes of care did not attain standards either set out in national guidelines or by the researchers' themselves (Seddon et.al. 2001 p.156).

The evidence suggests that this agency function is neither absolute nor perfect (Hurley 2000 p.77; Scott 2000 p.1180). Scott (2000 p.1178) argues that the agency relationship becomes increasingly ambiguous when continuity of care and long term relationships between provider and the patient are the expected norm. On one hand, both the average length of consultation and pathology referrals decline with the longevity of a patient-provider relationship. These may be proxy indicators of some correction in information asymmetry. On the other hand there is a positive association between the longevity of the relationship and volumes of pharmaceutical prescriptions, medical certificates and specialist referrals (Scott 2000 p.1179).

There is some evidence that ethical and legal imperatives create a strong perverse incentive for clinicians to practice defensive medicine. This means that clinicians would prefer the risk of over-servicing, rather than face either negative peer review or litigation for actions in negligence (Andrews 1991 pp.7-8; Jonsen et.al. 1992 pp.138-139; Pflaum 2001 p.11; Starfield 1998 p.124). Though the absolute number of negligence actions in Australia against medical providers is still relatively small, the rate has nevertheless quadrupled over a 20-year period (Newell & Nisselle 2005 p.351). Within the last decade, this has included a disproportionate increase in claims of "failure to diagnose" against general practitioners. Often, successful cases have revolved around a general practitioner's delay in first identifying potentially fatal conditions and directly-related damages are subsequently proven (Newell & Nisselle 2005 p.532).

Therein lays the archetypal resistance of the medical profession to third party intervention, particularly where a constraint of practice is either perceived or revealed (Jonsen et.al. 1992 p.138). Most physicians fear that outside intervention will expose them to a conflict of interest between the third party and their patient (Duckett 2000 p.238).

Patient preference does not provide any counterpoint to the imperatives driving defensive practice. From a review of sociological research literature into public participation in health care decision making, Calnan & Gabe (2001 p.126) conclude that whilst lay people on the whole do wish to be informed and consulted about its planning and provision, most do not wish to participate in health-related decision making at the service level. The overall preference is to defer this responsibility to the relevant managers and clinicians. This same preference would appear to extend to the decision making processes about one's own personal health care in times of illness. This belies the primacy often given to the patient's need for an informed choice (Calnan & Gabe 2001 p.128) (see Appendix 1 page 312 for description of informed choice).

The principal has an imperfect ability to fully observe their agent's actions. This creates considerable disadvantage in defining suitable incentives within an outcome-dependent contract (McPake et.al. 2002 p.168). But rather than being necessarily subsumed in an absolute obsequiousness to the directives of their provider, the argument follows that many individuals do in fact appreciate third party intervention to help overcome their information asymmetry. At least two classic third party interventions aim to systematically foster proper agency (Hurley 2000 pp.76-77; McPake et.al. 2002 p.225; Scott 2000 p.1178). One is to modify provider preferences through the use of professional cultural mores that eschew indiscrete self-interest. The other is to dampen competitive market dynamics using supply-side regulatory constraints such as licensure, fee schedules and limitations on advertising.

Modelling suggests that many medical practitioners do derive utility from a positive professional reputation amongst their peers, and the subsequent status that that may induce. In turn this acts as a partial counterpoint to profit-maximising behaviour where it compromises contemporary definitions of sound clinical practice (Scott 2000 p.1185) (see Appendix 1 page 327 for descriptions of profit and profit maximisation).

There are numerous examples of supply-side regulatory constraints from across OECD member states. The Belgian government has a ‘numerus clausus’ mechanism, which progressively limits the number of new practice accreditations, whilst providing incentives for elderly practitioners to retire early (EOHCS 2000 p.16). Danish counties have a well-established tradition of negotiating with medicine's representative association in relation to maximum limits to the number of general practice licenses available within their respective jurisdictions. In the absence of a license, a general practitioner is not legally entitled to levy a fee from their patient (Vallgarda, Krasnik & Vrangbaek 2001 p.41). Since 1993 the German government has legislated maximum quotas of ambulatory care physicians that sickness funds can negotiate remunerable services for on behalf of their constituents (Busse & Schwartz 1993 p.119). In 1996 the Australian Government implemented limits on the volume of provider numbers available for medical graduates and restrictions on the registration of overseas-trained practitioners (Duckett 2000 p.202).

Whilst these strategies have a quality improvement and minimum standards dimension, each in practice has limitations and the resultant welfare effect is often contradictory. For example, they can drive cost inflation and predispose providers to developing monopoly powers. The subsequent pursuit of professional objectives is not necessarily consistent with either patient preferences or efficiency targets (Maynard 1993 p.8). This increases the onus on regulation to corral provider behaviour, though frequently government administrators also face an information asymmetry problem compared with clinicians. Typically the compromise has been to defer the responsibility to the professions to self-regulate (e.g. registration boards, colleges etc.) (Palmer & Short 2000 p.48). This then has the inherent risk of bias and conflict of interest.

3.2.2 Firm

All medical providers source their income from a mix of government payment, insurance claims or direct consumer payment at the point of care (Duckett 2000 p.27; Starfield 1998 p.52). Scott (2000 p.1187) categorises modes of provider remuneration as salary, capitation, or fee-for-service.

Fee-for-service schemes represent the traditional payment model for private providers (Burstrom & Gisin 1998 p.93; Eagar, Garrett & Lin 2001 pp.77-p.79). Commonly providers or their employer organisations are reimbursed a guaranteed fee for each episode of care delivered. Often the unit price is regulated and adjusted for casemix, with total cost varying largely according to volume (Duckett 2000 pp.57-58; Eagar, Garrett & Lin 2001 p.79). By design, funding is uncapped and providers operate as profit centres, where revenue increases in direct proportion to activity (Reinhardt 1996 p.79). The financial risk is born by the funding entity with providers motivated to exhaust all options for patient diagnosis and treatment (Reinhardt 1996 pp.80; Starfield 1998 p.55). Where patient willingness to pay is observable, the provider has a financial enticement to exploit it (Reinhardt 1996 pp.80-81).

Observation studies indicate that practice behaviour is influenced by its mode of payment (Greco & Eisenberg 1993 p.1273; Ross 1999 p.31; Starfield 1998 pp.55-56). For example, Krasnik et.al (1990 pp.1699-1700) followed the practices of general practitioners in Copenhagen before and after a change from prospective payments to a fee-for-service system. They found that, where particular examinations and treatments attracted relatively greater payments, supply increased significantly over a sustained period. It was also noted that levels of prescription and referral fell in the same period, with the providers delivering many of the services themselves in more intensive consultations. However there is also evidence that time-based fee-for-service payments provide an incentive for shorter consultations with increased referral and prescription. This suggests that fee-for-service only encourages a more intensive work effort within consultations where payments are content-based (Scott 2000 p.1189).

Using a case study design, Burstrom & Gisin (1998 pp.97-98) compared and contrasted services provided under the distinctly different remuneration systems evident in Sweden and Switzerland. It was concluded that payment systems do influence physician behaviour. The Swiss fee for service model was more likely to induce provider activity than the fixed salaries in Sweden (Burstrom & Gisin 1998 pp.102-103). Fee-for-service also creates a moral hazard to seek shorter, less material-intensive consultations. This cream skimming effect is typically to the detriment of population health activities and chronic disease care (Burstrom & Gisin 1998 p.108; Powell-Davies et.al. 2006 pp.5-6).

Historically, providers have shown a preference for fee-for-service because of the discretion it allows in determining the amount of treatment delivered (Burstrom & Gisin 1998 p.105). There are at least three advantages enjoyed by the provider with fee-for-service. One is that fee-for-service usually requires less disclosure of data for scrutiny by third parties. Another is that new treatments not yet listed in a fee schedule allow the provider a free rein to set their own price. Finally, fee schedules invariably lag behind technological progress where the provider often achieves efficiencies in production.

The simplest provider payment model is a commercial contract model, which is typical of many open market transactions (Duckett 2000 p.56). This model leaves the consumer liable for paying the provider directly at the point of care for the cost of service.

An alternative is for the consumer to make payment to an organisation rather than the provider. In turn, the providers are salaried either on a permanent or sessional basis by an employer organisation (Duckett 2000 p.57). For example, the vast majority of medical practitioners in Sweden are county council employees on fixed salaries (Burstrom & Gisin 1998 p.92). Medical officer contracting within public hospitals and community health centres are examples of a similar model in operation within Australia.

In the absence of third party intervention or subsidy, either version of the payment model clearly places the consumer at a distinct disadvantage in most transactions. Information asymmetry impedes consumers reaching an optimal contract with providers in an open market environment. Also, the model is regressive, as the consumer must absorb the full cost of care. This creates inequities for the socially disadvantaged (Duckett 2000 p.58).

Therein lays the argument to engage a risk-pooling third party to break this nexus, and negotiate with providers on behalf of the patient. Typically, private insurers, social insurance carriers or government authorities adopt this role (Bezzola & Martinsson 1998 p.24). Compulsory taxation-funded schemes accept a broad risk pool and overcome the inequities inherent with the commercial contract model. However voluntary private insurance schemes fail to address this objective, where the cost of an identified set of services are subsidised in return for a pre-paid premium to the insurer.

The third party-payer model engenders a fundamental tension. On one hand, providers will resist third party imposition on their practice, given the threat this may present to their agency role. On the other hand, funding authorities have a vested interest in containing costs. One common strategy is to use provider revenue disincentives to corral utilisation (Duckett 2000 p.58).

The use of casemix systems, now prevalent in the acute care sector, is an example. Medicare (US) was the first funding authority to adopt the Diagnostic-Related-Groups (DRG) system of predetermined payments in 1983 – a strategy soon adopted by other United States third party payers through the 1980's (Altman & Wallack 1996 p.12). In the period 1983-1993 the United States witnessed the acute hospital proportion of health care budgets decline from a high of 29.1% to 23.5%, driven mostly by reductions in inpatients' average length of stay (Altman & Wallack 1996 pp.9-10; Maynard 1993 p.9). However, the DRG system itself did not actually cut costs, given the real cost of a hospital admission in the United States continued to grow between 4-5% per annum over the period 1986-1992. Instead, the growth rate in acute care costs was curbed relative to the growth in expenditure in other sections of the market, notably primary and ambulatory care (Altman & Wallack 1996 p.26).

There are international examples of punitive constraints applied to provider fee rates. After the Belgian government made several attempts in the 1980's to cap ballooning expenditure on diagnostic testing, in 1990 it introduced radical reductions to fees for outpatient tests and regular auditing of provider prescribing behaviour (EOHCS 2000 pp.75-76). Medicare (US) established a commission for its Part B payments to medical providers. Premised on a review of practice costs and patterns, in 1996 it implemented a resource-based relative value scale. This schedule specifies standardised relative value units for services, with some adjustment for cost differentials in various geographic areas. Progressive price per unit adjustments allow for inflation and other variables (Duckett 1997 pp.49-50). Total expenditure is capped using a volume performance standard system (Altman & Wallack 1996 p.17; Duckett 1997 p.51). The standard divides funding into surgical services, non-surgical services and primary care streams. For each stream, biennial activity target rates are set, with estimates included for service growth (Duckett 1997 pp.50-51). Where total expenditure at the 2-yearly review for a stream has exceeded target, the unit payment is weighted downward by the value scale for the ensuing period (Duckett 1997 p.53).

The most significant alternative to payment models has been the development of prospective payment systems between purchasers and providers (Duckett 2000 pp.58-59). Prospective payment introduces a contractual control on supply. Providers must operate as cost centres, where increased activity over a given timeframe reduces their revenue (Reinhardt 1996 p.81). Prospective payment encourages the provider to consider marginal costs and seek efficiency through control of both the volume and mix of activity (Starfield 1998 p.55). Managed care contracts with Medicare (US) enrolees provide evidence that this approach can reduce costs (Feldstein 1999 p.140). Medicare (US) contracts health maintenance organisations with a prospective allocation at 95% of the average cost of eligible enrolees. Results demonstrate that government payments still exceed actual outlays by 6%. This represents an 11% saving in government expenditure compared with the historic baseline.

It follows that the practitioner will only provide a service up to their own point of zero utility (Burstrom & Gisin 1998 pp.95-96; Duckett 1997 p.31; Eagar, Garret & Lin 2001 p.80). The model implicitly introduces both a rationing mechanism, and an incentive to develop cost-reducing technologies (Hurley 2000 p.86; Reinhardt 1996 p.83). At some point increase in demand will be met with increased waiting times for the patient, which in turn is only alleviated by either an adjustment to contract terms or the introduction of more providers (Burstrom & Gisin 1998 pp.95-96).

Pivotal in prospective payment models is the identification and adjustment for risk in contract terms, depending on the respective profiles of both consumers and services in question (Duckett 2000 pp.58-59; Eagar, Garrett & Lin 2001 p.80). The problem is in determining a fair and reasonable level of capitation, given the substantial random element within any measured utilisation pattern (Duckett 1997 pp.96-97). In the absence of a reasonable capitation rate, a clear limitation is the perverse incentive for the purchasing agents on one hand to cream skim a low risk consumer profile in pursuit of a enhanced profit margins, whilst cost shifting high risk clients to other providers. This creates both obvious inequities for those excluded from service, and inefficiencies in the model (Duckett 1997 p.97; Duckett 2000 pp.58-59; McPake et.al. 2002 pp.178-179).

A further risk is the moral hazard for medical providers to under-service their patients where care is necessary, in order to maximise profit (Duckett 1997 p.90; Martin 2003 p.4; McPake et.al. 2002 p.179; Pauly 2000 p.550; Starfield 1998 p.55). At least two elements serve to constrain this perverse behaviour. One is providers' concern for their own professional reputation and the other is market competition between providers (Pauly 2000 pp.550-551).

However, the reliance on market competition presumes that no one provider has a monopoly and that there are no limits to consumer sovereignty in choosing between alternate providers. In practice however, a patient may not have full autonomy. For example, in the United States often it is a third party such as an employer or government agency (e.g. Medicaid) that selects the managed care plan (Duckett 1997 p.90; Feldstein 1999 p.177; Starfield 1998 p.63).

One means to limit the moral hazard and increase financial accountability is to insist that providers operate as not-for-profit entities. Further means to test accountability include stringent regulation and sanctions for sub-standard performance (Duckett 2000 p.238).

There are numerous adaptations of budget sharing using prospective payments evident from across the OECD member states. However, once distributed, it is clear that prospective payments do not determine how participating practitioners are subsequently remunerated. Depending on the system, prospective payments are blended with other payment modes such as fee for service and performance bonuses in order to balance the competing incentives of key stakeholders (Marriott & Mable 1998 p.624; Rice 1998 p.127; Scott 2000 p.1188).

For example Irish general practitioners accredited as general medical service (GMS) providers receive a capitation payment weighted by age, gender and geographic location for a roster of means-tested eligible patients. Participating general practitioners also receive additional conditions and benefits including paid leave, pensions and support for continuing education. Ineligible patients (average 56% of a typical practice roster) pay an unsubsidised fee-for-service (Murphy 1998 p.223). Commencing in 2006, Dutch general practitioners receive a capitation payment from sickness funds for each patient enrolled on their list, plus a fee per consultation (Frogner & Anderson 2006 p.99).

Examples of provider remuneration within more integrated systems such as managed care plans are most evident to date in Switzerland and the United States (Ford & Kissick 1995 pp.64-65; Persson & Guzelgun 1998 p.268; Robinson 1999 p.1259). In addition to risk sharing, funding entities have also turned to fee-pricing mechanisms to influence practice. For example, many managed care plans in both Switzerland and the United States include payment withholds. This is where later payment depends on either physician or overall plan performance, periodic profit sharing, or through equity incentives in the managed care organisation (Bezzola & Martinsson 1998 p.22; Duckett 1997 p.33; Rice 1998 p.127; Starfield 1998 p.57).

In the absence of specific weighting of payment incentives linked to the realisation of public health goals, there remains the risk that providers will continue to supply their better-recompensed services to low risk clientele and those with ready access (Bezzola & Martinsson 1998 p.22). Haber & Mitchell (1999/2000 p.447) used a modified case-control study to analyse Medicare (US) claims from the year prior to significant unweighted increases in provider recompense with that from its second year of implementation. Subjects were grouped as vulnerable or non-vulnerable by residency, age, disability and race (Haber & Mitchell 1999/2000 p.446). Using a multivariate regression analysis the study concluded that measured gaps in access between non-vulnerable and vulnerable subjects persisted across the three-year timeframe of the study (Haber & Mitchell 1999/2000 pp.458-459).

Hence, one rationale for weighting target payments should be to reward providers for actively seeking to improve levels of realised access by targeted groups (Blumenthal et.al. 1995 p.253). For example, general practitioners in the United Kingdom are provided scaled annual bonuses for achieving percentage population targets (70% & 90%) with child immunisation rates and cervical screening of eligible women (50% & 80%). Additional payments are also provided for general practitioners working in socioeconomically deprived areas and where it is demonstrated that the consultation addresses either cardiovascular disease, diabetes mellitus, asthma or childhood development (Clancy 2000 [b] p.4; Giuffrida et.al. 2000 p.1; Marriott & Mable 1998 pp.569-570). Similar specific disease management weightings also apply to general practice consultations in the Netherlands (Marriott & Mable 1998 p.580).

3.2.3 Professional

Few would argue with Palmer & Short's (2000 p.48) description of medical practice as *"…the archetypal 'professional' occupation".* Despite repeated challenges it has long put to good effect a variety of means to exempt itself from external scrutiny and preserve its monopoly of the health service market (see Appendix 1 page 326 for a description of professionalism).

Medicine established itself as the dominant health care provider because it was early to undergo the process of professionalisation across the industrialised world (Palmer & Short 2000 p.48). This is credited to an early commitment to collective organisation during the 19th century, through the establishment of recognised medical associations. Repeatedly organised representation has afforded the occupation considerable advantages. This includes brokering exclusive entitlements from funders and legislators, monopolising the health services market, and engineering autonomy through self-regulation (DeVoe 2001 p.61; Dewdney 1989 p.94; Ross et.al. 1999 p.34; Vallgarda, Krasnik & Vrangbaek 2001 p.11).

In many cases across the OECD states organised medicine has engineered a patriarchal dominance over clinical practice, often enforced through statutory mechanisms. A good example is Germany. Physicians' associations have an exclusive statutory entitlement for the provision of ambulatory medical care (Busse & Schwartz 1999 pp.112-114). This includes a mandate to provide prescribed schedules of preventive screenings and immunisations. Similarly, only registered medical practitioners in Australia have the authority to admit patients to hospitals and in the vast majority of cases, prescribe medications or refer for diagnostic procedures (Palmer & Short 2000 p.48).

Arguably, political lobbying by the medical profession is most effective when health care is only one of an elected entity's responsibilities within a multi-dimensional portfolio of state policies (Burstrom & Gisin 1998 pp.105-106). Assuming a non-uniform distribution of preferences between policies in this political environment, the argument follows that there is ideal opportunity for organised groups to participate in vote trade-offs. For example, medical representatives may credibly promise to support certain politicians on issues not pertaining to health care, in return for favourable conditions within their own sphere of activity.

A historic case in point is the position of organised medicine within the United Kingdom. The British Medical Association (BMA) asserted considerable influence over the Lloyd George government via the use of public threats to withhold service, to gain concessions with the introduction of the *National Insurance Act 1911 (UK)* (DeVoe 2001 p.62). From this point, it is argued, the British Medical Association gained substantial legitimacy as key a player in the parliament's ongoing debates on national health insurance (DeVoe 2001 p.63). Consequently, when constitutional amendments were proposed in the 1940's to allow formation of what is now the National Health Service, pressure and opposition from the British Medical Association ensured several concessions at least were secured to protect their interests.

The Australian Medical Association (AMA), a derivative of its British predecessor, has dominated the role of collective representation in Australia. More recently other smaller associations with diverging political persuasions, such as the leftist Doctors Reform Society, have also emerged (Dewdney 1989 p.94; Palmer & Short 2000 p.45). The Australian Medical Association has proved a major player in influencing federal health policy subsequent to the 1946 constitutional amendment which expanded the Australian Government's jurisdiction over health and welfare. This is particularly the case with the design of health insurance (DeVoe 2001 p.59).

The Australian Medical Association has a track record for opposing the introduction of a national health insurance system in Australia since it was first proposed in 1938. It successfully argued for several decades that a national health insurance system presented a serious impediment to effective practise and professional autonomy (DeVoe 2001 pp.59-60; Hilless & Healy 2001 p.13).

Beginning with the Menzies Liberal coalition government of the early 1950's, the Australian Medical Association strongly influenced the design of a voluntary health insurance scheme, known as the Page plan (DeVoe 2001 p.60). What evolved subsequently is a relationship DeVoe (2001 p.60) describes as a *"…corporatist-style model of interaction…"* where the Australian Medical Association was afforded considerable implicit power to veto government decisions on health policy. In return, the medical profession spared the government from industrial action and social unrest. This corporate partner relationship continued in status quo until the election of the Whitlam Labor government in 1972. Challenged by Labor's reforms for universal public health insurance, DeVoe (2001 p.60) asserts that the Australian Medical Association reverted to the role of a *"…pressure group…"* where it relied on political lobbying, media campaigns and industrial action (DeVoe 2001 p.65). The Australian Medical Association had significant influence with the subsequent election of Fraser's Liberal coalition government in late 1975, and in turn came the progressive dismantling of the Medibank scheme and support for a return to voluntary private health insurance schemes (DeVoe 2001 p.65).

Not until 1984 were Australian citizens' afforded universal access to a stable tax-based system, when the then Hawke Labor government successfully enacted the Medicare (Aust) scheme. This was not without considerable opposition and unrest once more from organised medicine (Duckett 2000 p.34; Hilless & Healy 2001 p.87).

There are also numerous examples where organised medicine has used a dominant market position to both thwart third party intervention and quash competition. Since the

1930's medical societies in the United States have been hostile to attempts by insurance companies' in reducing premiums using constraints on physician utilisation (Feldstein 1999 pp.214-215). In some cases this threatened expulsions of physician members who participated in the insurance plans plus the establishment of rival insurance plans more empathetic to physicians' interests. This nexus was not broken until a series of rulings by the United States Supreme Court in the late 1970's against the so-called learned professions for breaching anti-trust laws using anti-competitive behaviour. This subsequently encouraged the United States Federal Trade Commission to begin constraining the actions of the medical societies.

Frequently, organised medicine has also brokered for itself self-regulation and quality review. For example, in Germany, the control of over-servicing is left in the domain of physicians' associations (Busse & Schwartz 1999 p.119). The associations are delegated responsibility for negotiating members' prospective payments from sickness funds for defined benefits provided to constituents, with the mix weighted according to a nationally-agreed unified value scale. If a particular provider is deemed to be delivering an excessive level of a particular service compared with their peers, it is the fund-holding physician association that deems whether a financial penalty should be levied.

Medical colleges and societies have considerable control over entry, training and examination requirements to each of the major specialties in Australia, including general practice (Dewdney 1989 p.94; Ross et.al. 1999 p.34). The Australian medical colleges have proved particularly effective over time in levering consultative roles with relevant committees of governments and other authorities. This is ostensibly to provide expert opinion on matters pertaining to health care.

3.3 Trends in primary medical care

Despite its pursuit of a unique social position, medical practice is not insulated from the significant health care reforms pervasive across OECD member states. In particular, several influential trends have occurred over time in the delivery of primary medical care. The most important trends include horizontal integration, vertical integration, gate keeping and fund holding.

3.3.1 *Horizontal integration*

General practitioners have historically favoured proprietorship in solo or small group practice, where they have ownership of the assets and full share of the profits. Typically, quality improvement has been accepted where it equated with equity growth and an enhanced value for their "good-will" (Robinson 2001 pp.168-169). However, now faced with a variety of systematic attempts to constrain and direct their revenue base, one straightforward approach to minimise practice costs has been to seek economies of scale through horizontal integration. For example, general practitioners typically develop group practices in order to share overhead costs (Decter 2000 p.78; Marriott & Mable 1998 p.571; Vallgarda, Krasnik & Vrangbaek 2001 p.40). Some Australian-based evidence indicates that moving from solo general practice to a four-doctor group practice reduces administrative overheads by approximately 14% per clinician (Hall 2006 pp.20-21).

Further evidence indicates that some practitioners value the marginal gain in sharing financial and malpractice risks through a partnership or group practice more than accruing all the benefits of their labour in solo practice (Scott 2000 pp.1190-1191). However, in a risk-averse environment where both revenue and costs are shared equally, there is also a perverse incentive for free riding behaviour. This subsequently risks a loss of work effort and efficiency. Some providers avoid partnerships for this same reason, though this is more apparent with the higher-risk specialities than general practice (Scott 2000 p.1191).

As an alternative to group practice, some practitioners have instead maintained their independence whilst seeking some economies of scale by collaborating through various types of physician networks that provide management, business and professional support (Decter 2000 p.82; Marriott & Mable 1998 p.623; Robinson 2001 p.169; Safran, Tarlov & Rogers 1994 p.1580) (see Appendix 1 page 311 for a description of independent practitioner associations). In Australia, this has mainly manifested through the Divisions of General Practice initiative, plus other more-localised serviced-office arrangements (Fitzgerald 2002 p.90).

Interestingly, the Blair Labor government took this concept one step further in the United Kingdom. Following the introduction of its *Health Care Act 1999 (UK)*, primary care groups (PCG) were commissioned, with mandatory, geographically-defined practice membership (Calnan & Gabe 2001 p.125; Decter 2000 pp.84-85; Mullen 1998 p.10). By 2002, most primary care groups matured to the status of a primary care trust (Weller & Maynard 2004 p.109). Trusts are governed by an appointed community board, independent of the local health authority (Bindman, Weiner & Majeed 2001 p.133; McDonald et.al. 2007 p.47).

However, Smith & Sibthorpe (2007 pp.8-9) argue that, over time, these once-general practitioner led primary care trusts have now acquiesced into an overtly government-driven system. This demonstrates the tensions that arise where the horizontal integration of local practices is dependent on government funding. The first is the balance between responding to locally-identified needs whilst addressing contractual obligations to meet national targets. The second is the government's tendency to apply increasing bureaucratic control and rationalise contracts with fewer, larger organisations whilst trying to maintain genuine engagement with local providers (Wilkin 2002 p.542).

3.3.2 Vertical integration

Since 1998, publicly-listed corporations have actively invested in Australian general practice (Fitzgerald 2002 pp.90-91; Productivity Commission 2003 p.13). Market-share has often been established in an area by paying-out existing practice principals with substantial lump-sums for their "goodwill" and then consolidating groups of contracted general practitioners into larger medical centres. Often these corporate medical centres include co-located diagnostic and day-procedural services. The intent is to create a profitable vertical integration of patient referral pathways (Fitzgerald 2002 pp.90-91) (see Appendix 1 page 338 for a description of vertical integration).

This development appears contrary to general practice's traditional distrust of contracting or employment within large, corporate organisations. Though concern persist that corporatisation may compromise the basic principal-agent relationship, such organisations continue to expand (Fitzgerald 2002 p.90; Komesaroff 1999 p.267; Productivity Commission 2003 p.13).

The maturation of managed care programs in the United States provides the strongest example where the trend towards comprehensive integration has been explicitly pursued. Vertical integration has been driven by the assimilation of intermediaries (e.g. health maintenance organisations), insurers and/or provider groups in pursuit of greater market share and economies of scale (Altman & Wallack 1996 p.4; Decter 2000 p.79; Marriott & Mable 1998 p.607).

The true extent to which managed care plans have had an impact on reducing overall costs to health care is not clear. On the one hand, if enrolees in managed care plans are not a representative sample of the broader population because of either cream skimming or access barriers, then plan savings indicate a likely cost shift to other sectors of the health system. On the other hand, if particular plans' conditions inadvertently attract a disproportionate number of high risk enrolees, insurers will suffer the effects of adverse selection and ultimately a cost spiral in the long term (Bezzola & Martinsson 1998 p.23).

The first round of COAG coordinated care trials are an Australian example of the managed care model applied exclusively to particular individuals with identified high support needs, rather than population grouping or communities (Eagar, Garrett & Lin 2001 p.74). Progressively introduced since 1996, the pilot studies assessed the ability of agencies to pool set funds and case-manage chronically ill patients. The aim was to improve their access to a full range of services, particularly in addition to that found within the Medicare Benefits Schedule (Duckett 1997 pp.92-93; Eagar, Garrett & Lin 2001 p.74; National Evaluation of the Coordinated Care Trials 2001). The fund pooling concept was originally intended to demonstrate efficiencies achieved from the application of fund holding a prospective, capped allocation. This objective was not always been realised in practice (Eagar, Garrett & Lin 2001 p.53). Many were unable to demonstrate any technical efficiency by pooling multiple agencies' existing resources. In some cases increased community service expenditure was evident (National Evaluation of the Coordinated Care Trials 2001).

3.3.4 Fund holding

General practice fund holding is designed to lever a medico-administrative control on consumer demand (Calnan & Gabe 2001 p.120). By delegating a general practitioner to place non-emergency service contracts for their registered patients, they become a surrogate consumer on-behalf of their patient, with the individual surrendering their sovereignty to choose. Though frequently associated in the literature with some elements of the purchaser-provider split model, Coote & Hunter (1996 p.28) argue that general practice fund holding is paradoxical. The general practitioner has an inherent conflict of interest between assuming the role as a broker on behalf of the funding entity and yet remaining one of the key providers from who services are purchased (Coote & Hunter 1996 p.28; Decter 2000 p.194).

Following the introduction of voluntary general practice fund holding in the United Kingdom by the Thatcher conservative government, waiting times for referrals and returns on test results shortened. However, a 2-tiered service evolved, to the detriment of those patients not registered with fund holding practices (Calnan & Gabe 2001 pp.121-122; Marriott & Mable 1998 p.567). Subsequently, the Blair Labor government sought to ameliorate the worst aspects of these quasi-market inequities through the introduction of its *Health Care Act 1999 (UK)* (Calnan & Gabe 2001 p.127). As already noted, this statute modifies and extends on the concept of general practice fund holding by requiring primary care groups to be compulsory and universal in their coverage of specified populations (Calnan & Gabe 2001 p.125; Decter 2000 pp.84-85; Mullen 1998 p.10).

Approximately 300 of the groups now have trust status within England. Their service areas are aligned to local government boundaries, servicing catchments of 100,000-250,000 residents (FitzGerald 2006 p.122; McDonald et.al. 2007 pp.47-48).

However the primary care group model does not resolve the issue for many individuals who have little true choice of group with which to register. Without having ever to test it, the risk is that primary care groups may assume prior consent from its registered clientele in restricting services or referrals as it sees fit (Mullen 1998 p.20). Regulatory interventions to mandate a minimum set of standardised services is required to prevent this scenario (Mullen 1998 p.21).

3.4 General practice in Australia

3.4.1 Supply

In 2001-02 approximately 24,300 non-specialist medical practitioners in Australia billed the Medicare Benefits Schedule (MBS) from a primary care setting (Productivity Commission 2003 pp.9-10). Of these, 90% were either vocationally registered general practitioners (GPs) or general practice registrars training for vocational registration (Pflaum 2001 p.88; Ross et.al. 1999 p.49). The remainder are categorised as other medical practitioners (OMPs), who receive a lower level rebate from Medicare (Aust.) for their services (Productivity Commission 2003 p.10).

Approximately 90% of Australian general practitioners operate from within a private practice, with the commercial arrangements ranging from the clinicians being their own business principals to being contracted or salaried employees of corporate entities. 66% of general practitioners worked within practices of three or more providers, whilst 19% continued as solo practitioners (Productivity Commission 2003 p.13).

A substantial maldistribution of general practitioners persists in Australia according to geographic location. The provider to population ratio deteriorates progressively as rurality and remoteness increases (Podger 2006 p.143).

General practitioners themselves only constitute approximately 38% of the workforce employed within general practices. The majority consist of administrative and clerical staff (46%), and the remainder are other support staff (11%) plus practice nurses (6%). This indicates that there is significant clinical support and administrative on-costs involved in order for the general practitioner to deliver and claim rebates for the range of services and consultations that are recorded by the Health Insurance Commission (now known as Medicare Australia) (Productivity Commission 2003 p.14).

Workforce studies identify several trends developing in Australian general practice in the decade since 1994/95. These included an increasing feminisation, decreasing average practice sessions per week, and an increasing proportion working in group practices of five or more general practitioners (Britt et.al 2002 p.14; Pflaum 2001 p.16; Productivity Commission 2003 p.12).

3.4.2 Demand

Both Richardson (1998 p.2) and Duckett (2000 p.233) argue that any effect created by impediments to access is outweighed by the paucity of price signals on the demand for general practice. Demand is unconstrained regardless of consideration for either relative need or evidence-based practice. Australian consumers have an almost unrestrained choice of heavily subsidised general practice services through the open-ended structure of the Medicare Benefits Schedule.

There are some clear demand characteristics that drive the growth in general practice utilisation (Scott 2000 p.1182). In general, higher levels of consultation correlate positively with increased morbidity (especially chronic conditions), low socioeconomic status, and the very young, elderly and female patients.

In Australian general practice, 57.0% of females and 45.1% of male patients are aged 45 years or older (Sayer et.al. 2000 p.32). 57.2% of male patients are overweight or obese, and likewise 47.0% of female patients. Both are a substantially higher proportion than the national average. A disproportionately high level of general practice encounters dealing with overweight and obesity are associated with co-morbidities such as hypertension, lipid disorders, depression and diabetes mellitus (Sayer et.al 2000 p.13; Senes & Britt 2001 pp.44-45).

The most common morbidities driving demand in general practice relate to the respiratory, dermatological, musculoskeletal or circulatory systems. Combined, they account for 48.9% of all problems seen in general practice (Britt et.al. 2007 pp.33-34). Hypertension is the most frequent single problem managed overall (6.5%). By contrast, new presentations for hypertension are less common, indicating its prevalence as recall presentations (Britt et.al. 2007 pp.38-39).

Other common single problems are, in order, upper respiratory tract infection (4.2%), immunisation (3.4%), depression (2.5%) diabetes mellitus (2.4%), lipid disorders (2.3%), osteoarthritis (1.8%) and back pain (1.8%) (Britt et.al. 2007 pp.36-37). Over a six-year period from 1999/2000 to 2005/2006, the most significant increases in reported management rates were with general and unspecified problems, endocrine/metabolic problems (notably with lipid disorders and diabetes mellitus) plus male genital system problems (Britt et.al. 2007 p.85).

Given the open-ended fee for service nature of the Medicare Benefits Schedule, there remains some conjecture whether factors other than clinical or social variables have served to stimulate demand growth. With a retrospective analysis of longitudinal Australian data over a 30-year period, Brittle & Perera (2000 p.185) did establish that the ratio of practicing physicians to population is a positive co-efficient variable for utilisation, though it did not achieve statistical significance. Consequently their results suggest that supplier induced demand may exist, though it fails to be conclusive.

Demand-side strategies designed to constrain the uncapped costs of Medicare (Aust.) are problematic, if the trade-off requires reduced choice. For one, it is a high-risk political strategy, which would test the support of the Australian electorate. Also, there are implications for the social welfare function. The inherent risk in constraining demand across the board is that utilisation could decline unnecessarily relative to indicators of need. Any reductions will have a compounding effect on existing barriers to access.

3.4.3 Need

International evidence demonstrates a strong positive association between measures of health status and stratification according to income distribution (Centre for International Statistics 1998, pp.164-165). This indicates that income distribution within a particular society is more important as a determinant of health status than the absolute wealth of that society's economy (Connelly & Doessel 2000 pp.43-44; OECD 2001 p.62). The argument follows that the normative value of one's socio-economic status is a more relevant indicator than the positive value.

Australian residents with low socio-economic status continue to demonstrate higher rates of mortality, morbidity and disability for all age groups (Australian Institute of Health and Welfare 2006[a] pp.234-235). The clear implication for government policy is the strong influence of the social wage as a health determinant (Duckett 1997 p.69).

Aboriginal Australians continue to have significantly higher rates of infant mortality, low-weight births, age-adjusted hospitalisations, obesity and prevalence of chronic diseases such as diabetes mellitus and asthma (Australian Institute of Health and Welfare 2006[a] pp.224-230). Age-specific mortality rates amongst Aboriginal Australians in excess of that found with the general population are most notable with diseases of the circulatory, respiratory and endocrine systems (Hilless & Healy 2001 pp.7-8). Mortality rates are significantly higher than the total Australian rate for cancers of the cervix, liver, lungs, thyroid and uterus. Mortality rates are also comparatively higher for Aboriginal Australians under the age of 64 years for cancers of the oesophagus, oropharynx, and pancreas (Condon et.al. 2004 pp.505-506; National Cervical Screening Program 2005 p.6). Accepting that the level of aboriginality identified in the national census and other standard health databases is under-reported, then calculations of relative disadvantage in terms of health status for Aboriginal Australians are probably under-estimates (Hilless & Healy 2001 p.7).

Residents of remote communities demonstrate significantly higher rates of age-adjusted mortality and morbidity. There are particularly high prevalence rates for episodes of injury, suicide, cardiovascular disease and respiratory diseases (Australian Institute of Health and Welfare 2006[a] pp.243-244; National Cervical Screening

Program 2005 p.6). Though rurality is clearly a negative determinant of access to health care, the differentials in health status also reflect the greater levels of relative socio-economic disadvantage (Australian Institute of Health and Welfare 2006[a] pp.243-244; Eagar, Garrett & Lin 2001 p.36).

Table 1: Population estimates as a percentage of total population of designated vulnerable social groupings

Please see print copy for Table 1

Ref: ABS 2003; ABS 2004; AIHW 2002[a]; AIHW 2005; Dunn, Sadkowsky & Jeffs 2002

Table 1 provides a matrix of vulnerable social groups within Australia's 2003 estimated residential population. The matrix includes three co-identifiers of vulnerability – socioeconomic status, indigenous status and remoteness.

The percentage figures in each cell are mutually exclusive, representing only the cross-referenced variables that constitute the cell. The white cells highlighted with red bordering represent that portion of each group which probably does not have another co-identifier of vulnerability. For example, 21.9% of the population is of low socioeconomic status, but are not indigenous and do not live in remote zones. A further 0.6% is indigenous people with low socioeconomic status. A further 1.5% is remote residents with low socioeconomic status. 0.5% of the population (the red-bordered cell within the bottom-right corner of the matrix) have all three identifiers. The sum-total of each column equals the separate totals for each respective group identified at the top of the table. Summation of all the red-bordered white cells provides the net proportion of the population with identified social vulnerability. This equals approximately 5.2 million people (26.4% of the 2003 estimated residential population).

3.4.4 Utilisation

The most significant growth in health care expenditure in contemporary times has occurred with ambulatory medicine, of which general practice has played its part (Duckett 2000 pp.26-27; Hilless & Healy 2001 p.40). By far the most common service provided by general practitioners in 2001-02 was the prescription, advice or supply of pharmaceuticals, (58% of all consultations) (Productivity Commission 2003 p.11). Other services included non-pharmacological interventions in (40%), referrals for diagnostics (20%) and referrals to other services in (10%).

Much of this growth is attributable to the 1984 introduction of the Medicare Benefits Schedule (Duckett 2000 p.195). Operating in an open fee-for-service environment, the schedule rebate effectively created a floor-price, which removed the competitive impetus for general practices to lower their charges where there is over-supply (Pflaum 2001 p.54; Ross et.al. 1999 p.48).

Since 1984 the utilisation per capita of the Medicare Benefits Schedule by general practice grew rapidly in the period up to 1989/1990 at a mean rate of 4% per annum. It then slowed to a more modest mean rate of 0.8% per annum in the period up to 1998/1999 (Power & Aloizos 2000 p.163; Wilton & Smith 1999 pp.79-80).

Aside from the increase proportionate to population growth, this reflects a substantial rise in the volume of items claimed per capita (Australian Institute of Health and Welfare 2006[a] pp.344-345). Some demand-side drivers proposed in the literature include increasing life expectancies, an ageing demographic, increasing household incomes plus greater consumer expectations (Pflaum 2001 p.54; Powell Davies et.al. 2006 p.4). Supply-side factors also include a significant shift in health care from institutional to community settings, an improved evidence-base for interventions through medical research, plus technological advances that improved diagnostic and therapeutic options (Pflaum 2001 p.54; Powell Davies et.al. 2006 p.4).

The vast majority of increases in items of service are due to uptake of therapeutic nuclear medicine, diagnostic imaging and pathology tests (Australian Institute of Health and Welfare 2006[a] p.345). A recognised primary driver is the referral practices of general practitioners (Australian Institute of Health and Welfare 2006[a] p.350; Britt et.al. 2007 pp.109-110; Wilton & Smith 1999 pp.79-80).

Evidence is that the growth in utilisation has been far from uniform across all the social strata. Under-utilisation also relates to geographic dispersion and the availability of certain services (Scott 2000 p.1182). Under-utilisation of general practice by Aboriginals, low income earners and residents of remote areas is well-reported in the literature. In particular there is a lower uptake of preventive and early intervention services such as immunisation and cancer screening tests (Australian Institute of Health and Welfare 2000 pp.213, 220; McDermott 1995 pp.73-74; National Preventive & Community Medicine Committee 2002 S.1 p.v; Pflaum et.al. 2001 p.53).

Aboriginal patients only account for 1% of general practice encounters. A substantially higher proportion of Aboriginal patients are likely to be new presentations (15% compared with 9.2% of the general population). There is a significantly higher rate of health care cardholders amongst Aboriginal patients (70% compared with 41.9%) (Britt et.al. 2002 p.117). Only 27.7% of general practitioners have at least one encounter per annum with an Aboriginal patient. There is a positive association between the 2.6% general practitioners who have more than forty encounters in one year and their proximity to an Aboriginal community-controlled health service (Britt et.al. 2002 p.114). Only 54.6% of general practitioners who had at least one encounter with an Aboriginal patient practised in a capital city. 4.4% practised in remote areas (Britt et.al. 2002 p.115).

3.4.5 Remuneration

General practice accounts for approximately 8% of Australia's total expenditure on health care. Approximately 89% of income for general practice is generated through fee for service arrangements. This includes the Medicare Benefits Schedule, patient co-payments, insurance schemes (e.g. workers compensation), and publicly-sponsored programs (e.g. Veterans' Affairs) (Productivity Commission 2003 pp.15-16).

Some evidence indicates that levels of fee-for-service as the primary source of income are less in rural and remote areas. For example, survey data of general practitioners from New South Wales and Queensland working in rural and remote communities indicates that fee for service arrangements are the primary source of income for 61.6% of respondents. The remainder reported the primary source as either a salary or wage with state health services, local government, non-government organisations, and Aboriginal community controlled services, or private practice. In the 11.8% of cases with state health services, salaried terms also included rights to private practice (Health Workforce Queensland & NSW Rural Doctors Network 2006 p.11).

The majority of consultations provided by general practitioners (93.9%) are claimable through the Medicare Benefits Schedule, though this source only accounts for 63% of general practice revenue (Britt et.al. 2002 p.21; Productivity Commission 2003 pp.15-16). This probably indicates the differential between bulk-billing of general practice non-referred attendances and associated patient co-payments (Duckett 2000 p.199; Hilless & Healy 2001 p.32; Productivity Commission 2003 p.16).

The Medicare Benefits Schedule is one major component of Australia's Medicare (Aust.) scheme. The schedule was introduced in February 1984 following the *Health Insurance Act 1983 (Cwth.)*. Operating as an open-ended universal insurance scheme underwritten by general tax revenue, the Medicare Benefits Schedule provides a patient rebate for ambulatory medical care (including general practice, diagnostics and specialist care), according to categorised pre-set schedules determined by either consultation time and/or type of procedure performed (Australian Institute of Health and Welfare 2000 p.297; Palmer & Short 2000 pp.63-64). Despite its widespread acceptance, the structure of the schedule is criticised for encouraging individualised, short-term clinical interventions, to the detriment of preventive and population health initiatives (Segal 1998 pp.271-272).

3.4.6 Incentive programs

Arising from policy recommendations in the 1997 General Practice Strategy review, the Australian Government has moved remuneration of general practice incrementally towards a blended payment model and gradually away from its historic reliance solely on fee for service (Ross et.al. 1999 p.33). Such caution reflects an apprehension that more complex modes of remuneration bring with it an inherent administrative burden and extra cost for the government. Though historically non-price mechanisms have been preferred as a means of trying to direct and monitor practice behaviour, the shift towards financial incentives is tacit acknowledgement of the evidence that other means have proved incapable of restraining the growth in health care costs and variability in practice (Robinson 2001 pp.164-165).

One key element in this strategy is the Practice Incentive Program (PIP) lump sum bonuses. Practices must maintain accreditation according to standards established by the Royal Australian College of General Practice (RACGP) to be eligible for these payments. Also, in some cases, they must pursue extra training (e.g. for Mental Health initiatives). Once eligible, practices may pursue one-off payments weighted by caseload size and rurality for the implementation of further quality initiatives such as the provision of minimal datasets, electronic prescribing, patient recall systems plus establishment of after-hours on-call rosters.

More recent initiatives have focused on the management of chronic illness and disease. This includes weighted fees that aim to encourage a move away from high volume episodic style of care and to better reflect the need for a more holistic, ongoing case coordination (Productivity Commission 2003 p.44; GP Red Tape Taskforce 2003[a] p.7; GP Red Tape Taskforce 2003[b] p.4). Foremost amongst these include the PIP-linked Service Incentive Payments (SIP), Enhanced Primary Care (EPC) and Home Medication Review (HMR) initiatives.

These incentives are paid on a fee-for-service basis for claims by general practitioners that address designated aboriginal health, asthma, cervical screening, diabetes mellitus and/or mental health care planning criteria (GP Red Tape Taskforce 2003[a] p.4; Powell-Davies et.al. 2006 pp.5-6; Productivity Commission 2003 p.20-22; Wilkinson et.al. 2002 p.4). The Enhanced Primary Care initiative constitutes a bundle of items which aim to improve and extend general practitioner involvement in the coordinated care of elderly, disabled and chronically ill patients with complex needs (Acute and Coordinated Care Branch 1999 pp.1-2; Wilkinson et.al. 2002 pp.1-2; Productivity Commission 2003 p.23).

The uptake of incentive items has been sporadic, with wide variation across general practice (GP Red Tape Taskforce 2003[a] p.9; Productivity Commission 2003 p.24). Using a qualitative study design, Oldroyd et.al (2003 p.30) examined general practitioners' views on the various incentive items. The complexity and administrative burden of most of the incentive items were largely viewed as counter-productive and self-defeating in addressing quality of care (Oldroyd et.al 2003 pp.32-33).

The Productivity Commission (2003 p.205) identified that activity related to the incentives together accounted for more than 47.0% of all administrative costs in general practice. Accepting that some administrative costs are inevitable, the

Productivity Commission (2003 p.44) concluded that this is still substantially *"…different and more complex than normal Medicare Benefits Schedule items"*. The GP Red Tape Taskforce (2003[a] p.10) concurred, noting that uptake was impeded by some financial elements that appear *"…prescriptive and complex"*. Evidence available to the Australian Government's GP Red Tape Taskforce suggests that levels of uptake were dependent on the quality of information systems and practice management available plus the relative levels of support from the local Division of General Practice.

3.5 Conclusion

How general practice is delivered in Australia is indicative of contemporary medical practice across many OECD member states. It is evident that medical practice functions within at least three interdependent social dimensions, and may do so in all three simultaneously. In the first dimension, medical practitioners assume a duty of agency, underpinned by strong ethical and legal imperatives. In reality, the same imperatives may divert clinicians towards the practice of defensive medicine. This certainly provides one rationale for the medical profession's typical resistance to third party intervention, particularly where a constraint of practice is either perceived or revealed. Nonetheless, for a principal hamstrung by information asymmetry in an environment fraught with imperfect agency, it is a rational response to actively seek third party intervention through standards compliance, licensure and/or regulation. This accounts for a persistent tension in the delivery of clinical care. Ironically, neo-classical interventions aimed at systematically fostering proper agency also have a contradictory impact. This includes cost inflation and provider monopoly powers with subsequent pursuit of professional objectives not necessarily consistent with either patient preferences or targets for efficient use of resources.

The second dimension has medical providers performing as firms within a quasi-market environment. Typically services are delivered as business transactions in exchange for revenue. There is empirical evidence to suggest medical provider behaviour is influenced by their mode of remuneration, with characteristic differences in response according to whether their payment is a capped prospective allocation or retrospective fee for service. In each case regulatory adjustment, weightings and incentives are required to address both the benefits and risks to the public funders in terms of efficiency, and to the consumer in terms of equity. The rational consumer again seeks third party intervention to offset the uncertainty and significant risk of costly interventions using insurance mechanisms. In turn this too generates tension in the system, with medical providers resisting any model where they consider a third party will attempt to impose limitations on their practice, given the apparent threat this may place on accountability to their patient.

The third dimension is medicine's socio-political leverage as a profession. Medicine is the dominant health care provider because of the occupation's early commitment to collective organisation, achieved through the establishment of recognised medical associations, colleges and societies. Organised representation has afforded the occupation considerable advantage across the OECD states in negotiating exclusive entitlements from funders and legislators. Political organisation has frequently been a vehicle used to try and insulate associates from external scrutiny, using the need for professional autonomy as an ideological defence.

Nevertheless, the medical profession's common pursuit of a unique social position has not sheltered it against significant health care reforms pervading OECD economies. A common trend in many cases has been horizontal integration, with general practitioners frequently developing group practices, and in some cases progressing to form various types of physician networks for management and business support. Another trend, most evident to date with the maturation of managed care programs in the United States, has been the vertical integration of primary care with hospitals and diagnostic services. This has been driven often by the assimilation of managed care organisations, insurers and/or provider groups in pursuit of greater market share and economies of scale. In many health care systems, general practice has also grown to assume a gate keeping function, albeit accompanied in most cases by caveats and exceptions. Finally, New Zealand and the United Kingdom provide specific examples to date where general practice fund holding has been implemented as a means of leveraging medico-administrative control on consumer demand. Effectively this model is designed to reduce cost through shifting the volume risk to the gate keeper. Inadvertently though, it has also served to inflate transaction costs by making explicit the contractual relationship between funding entities and provider groups.

Since the introduction of Medicare (Aust.), the utilisation per capita of general practice has increased significantly. The volume of diagnostic imaging and pathology tests per capita referred by general practitioners in this same time has been even more dramatic. With its current open-ended fee-for-service structure, the Medicare Benefits Schedule offers little to systematically check a continued growth in demand. Though there have been some recent attempts to temper supply of diagnostic services with mechanisms that regulate unit rebates, a medical practitioner is at liberty to levy fees at a market rate, with the Medicare Benefits Schedule rebate only offering a part-subsidy for the care provided. Further, in some specific cases, policy has also encouraged the Australian general practitioner to develop a pivotal role in generating diagnostic activity.

Some evidence indicates that supplier-induced demand may exist, though it fails to be conclusive (see Appendix 1 page 334 for a description of supplier-induced demand). However the question remains whether such a dramatic growth in utilisation truly reflects a social investment in addressing genuine need. Certainly socially vulnerable groups in Australia, including Aboriginals, low income earners and residents of remote areas, continue to demonstrate under-utilisation of general practice services, including preventive and early intervention services.

Cognisant of the disparities in distribution, the Australian Government is seeking to manipulate incentives for the delivery of targeted primary care services and procedures. Good examples in recent times have included general practice incentives for childhood immunisation, Enhanced Primary Care (EPC) packages, and most recently the introduction of Practice Incentive Payments (PIP). Also options for market substitution of general practice services are being tentatively explored, with recent trials and implementation of nurse practitioner models proving the most challenging and contentious.

The next chapter draws on the empirical evidence explored in this chapter. A model for marginal redistribution of general practice diagnostic referrals is developed. The model's potential for enhancing the social welfare function through increased uptake of specific evidence-based screenings by socially vulnerable groups is discussed.

CHAPTER FOUR - The distribution of general practice-referred diagnostic services in Australia

4.1 Introduction

It is in the public interest to identify any potential for enhancing the net benefit arising from the redistribution of general practice diagnostic referrals. To do so requires an understanding of the volumes, mix, and changes over time in general practice-referred diagnostics (Starfield 1998 pp.389-390). It also requires an appreciation of clinical quality and the available standards that apply (Duckett 2000 pp.9-11; Swerrisen 2004 p.38).

This chapter considers the nature of general practice referrals for diagnostic testing. The available evidence on relative effectiveness and efficacy is reviewed (see Appendix 1 page 304 for descriptions of effectiveness and efficacy) (Australian Institute of Health and Welfare & Department of Health and Ageing 1998 pp.55-56; Australian Institute of Health and Welfare 2006[a] p.74; National Health & Medical Research Council 1996 pp.14, 106-107).

4.2 General practice-referred diagnostic testing

4.2.1 The scope of diagnostic testing

The term diagnostic testing has a variety of interpretations, depending upon the context. For the purposes of this study, the term refers specifically to the medical imaging and pathology tests referred by a medical practitioner that are recorded and subsidised by Medicare Australia.

The data sets of this activity and expenditure are categorised within the Medicare Benefit Schedule. Medical imaging items are within the schedule's Category 5. This study excludes the magnetic resonance imaging (MRI) items within the sub-category Group I5 because a general practitioner cannot refer a patient for these tests (Britt et.al. 2004 p.87). Pathology items are within the schedule's Category 6.

4.2.2 General practice referrals for diagnostic testing

General practice attendances account for 30% of all benefits paid through Medicare (Aust.). Pathology and diagnostic imaging services generated from a general practice referral account for a further 30% (Duckett 2000 p.195; Pflaum et.al. 2001 pp.53-54).

Drawing on data from the Australian Morbidity and Treatment Survey, Butler & Britt (2001 pp.6-7) estimate that flow-on medical imaging and pathology tests account for 18.8% of the total average cost generated per general practitioner encounter.

The progressive growth in general practice utilisation per capita since the 1984 introduction of Medicare (Aust.) has been accompanied by a disproportionate increase in pathology and medical imaging services. With a per capita growth rate per annum often more than double that of general practice utilisation, diagnostic testing rose from 1.7 tests per person in 1984/1985 to 4.2 tests per person in 2002/2003 (Conyers 1998 p.8; Harvey, Clark & Visser 2003 p.7; Martins 2006 p.22). The majority of increases in referral rates for both medical imaging and pathology tests arose from general practice (Britt, Miller & Knox 2001 p.110).

The disproportionate growth in general practice referrals indicates that there is a risk of over-servicing and unnecessary testing (Hammett & Harris 2002 p.124). The wide variation in ordering rates between providers in similar settings also suggests that a portion of these investigations are excessive or unwarranted (Stuart, Crooks & Porton 2002 p.131). For every ten unnecessary tests that a healthy individual undergoes, there is an estimated 40% chance of at least one false-positive result (Hammett & Harris 2002 p.124). Some argue that the predominance of harm caused by medical practice arises from errors of commission due to unnecessary treatments, rather than errors of omission (Starfield 1998 p.124; White 2002 pp.153-154).

4.2.2.1 General practice referrals for medical imaging orders

Medical imaging orders are categorised within one of five broad groupings. They are diagnostic radiology, ultrasound, computerised tomography (CT), nuclear medicine imaging and magnetic resonance imaging (MRI). Diagnostic radiology accounts for 54.2% of all imaging orders by general practitioners, followed by ultrasound (32.7%) and computerised tomography scans (11.4%) (Britt et.al. 2007 p.63-64). On average, diagnostic imaging is ordered in 8.8% of general practice consultations (Britt et.al. 2007 p.64).

There are currently two sets of recognised medical imaging guidelines. These are produced by the Royal Australian and New Zealand College of Radiologists (RANZCR) and the American College of Radiology (ACR) (Britt, Miller & Knox 2001 pp.113-114). Britt, Miller & Knox (2001 pp.17-18) monitored rates of imaging orders by general practitioners over a 12 month period and concluded that in the majority of presentations imaging orders by general practitioners were consistent with the available guidelines.

4.2.2.2 General practice referrals for pathology orders

General practice referrals consistently account for 70% of all pathology services claimed from the Medicare Benefits Schedule (Britt, Knox & Miller 2003 p.1; Deeble & Lewis-Hughes 1991 p.32). With the specific exclusion of Papanicolaou (Pap) smears, the BEACH studies identify a significant 22.1% increase over three years ($p<0.0001$) in the mean number of pathology orders per one-hundred overall problems managed by general practice (an increased of 3.6 investigations per problem) (Britt, Knox & Miller 2003 p.16). However there was a marginal 1.2% decline in cytopathology tests in this same period (Britt, Knox and Miller 2003 p.1).

Whilst this itself is a remarkable increase, general practice-referred pathology testing in the United Kingdom increased by an estimated 83% over a three-year period (2000-2004). Some suggested drivers include the development of new tests, the effect of new guidelines and changes in primary care contracts with National Health Service. However, a substantial proportion of this increase over time could not be reasonably explained (Thomas et.al. 2006 p.1990)

The most significant increases in Australia have occurred in the relatively low cost, high volume chemical pathology and haematology tests. These items have long accounted for the bulk of expenditure on pathology testing (Britt et.al. 2007 p.99; Hammet & Harris 2002 p.124). For example, Deeble & Lewis-Hughes (1991 p.34) reported that, in 1988-1989, chemical pathology and haematology tests accounted for 63.8% of all pathology services and had both shown significant growth in activity over the previous five years (78.3% and 37.4% respectively).

As in the United Kingdom, it is not clear what factors are driving this trend (Britt, Knox & Miller 2003 p.61). Numerous studies speculate that changes in guidelines relating to the management and secondary prevention of diabetes mellitus and cardiovascular disease have intensified levels of monitoring (Britt et.al. 2002 p.74; Britt, Knox & Miller 2003 p.61; Senes & Britt 2001 pp.9-26; National Centre for Monitoring Diabetes 2002 p.84; National Divisions Diabetes Program 2003 [a] p.7; National Divisions Diabetes Program 2003 [b] p.3; NSW Health 1996 p.14; NSW Health 1998 p.8).

Richardson (1991 p.50) argues that testing continues to grow because of its ready accessibility. Pathology services face fewer constraints to supply than most medical providers. It is amenable to high patient turnover which is not directly reliant on the availability of pathologists. This is due to increasing levels of automation and extensive use of technical staff for collection and processing (White 2002 p.153). In some cases, tests are performed under the supervision of a medical scientist and reported to the referring clinician without any interpretation from a pathologist (Deeble & Lewis-Hughes 1991 p.71).

Survey evidence reveals that 25% of tests ordered by general practice are intended primarily to reassure the patient (Harvey, Clark & Visser 2003 p.29). Given the imperative on providers to practice defensive medicine, as discussed in Chapter Three, this is not necessarily an irrational response. Nevertheless, if this finding is reliable, it does indicate that there is a reasonable portion of referral activity that is amenable to change without compromising clinical standards.

Other studies have repeatedly identified an inefficient use of pathology services by referring medical providers (Deeble & Lewis-Hughes 1991 p.53; Harvey, Clark & Visser 2003 pp.31-32; Richardson 1991 p.50; White 2002 p.154). This includes a substantial portion of ordering that is superfluous to need, redundant and/or inappropriate. It also includes evidence of cases where subsequent results are ignored even when abnormal findings are present. The latter practice behaviour, in particular, belies the legal precedent in Australian tort law which squarely places a duty on medical providers to ensure systematic follow-up of test results (Newell & Nisselle 2005 p.510). The duty of care includes a responsibility to record results, make reasonable efforts to inform patients of their results and to offer appropriate treatment as a consequence.

Estimates of inappropriate pathology testing reported in the literature range from 4.5% up to 95%, depending on the methodology used in the audits (Conyers 1998 p.8).The problem is that it is difficult to define good quality use of pathology tests because there is a dearth of clinical guidelines based on rigorous evidence from either randomised control trials or sound met-analyses (Britt, Knox & Miller 2003 p.59; Harvey, Clark & Visser 2003 pp.33-34). Only in recent years has a Standards for Reporting of Diagnostic Accuracy (STARDS) checklist been published to assist providers in critiquing the methodology of systematic reviews. Harvey, Clark & Visser (2003 p.30) argue that reviews in this field have historically over-estimated testing effect, due to bias and poor study design.

The Royal College of Pathologists of Australasia (RCPA) does produce a manual for the use and interpretation of pathology tests (Harvey, Clark & Visser 2003 p.9). However, the independent authority of the RCPA manual is open to criticism, given that it is produced by the representative body whose members stand to benefit from test referrals (Harvey, Clark & Visser 2003 p.9).

Numerous other agencies also advise on the use of pathology testing. These include the Royal Australian College of General Practice (RACGP), National Prescribing Service, Therapeutic Guidelines Ltd and the National Health and Medical Research Council (NH&MRC). Whilst this is indicative that the relevance of pathology testing in the field extends well beyond the specialty discipline itself, it also highlights that no definitive standards have yet been established (Harvey, Clark & Visser 2003 pp.7-8).

4.3 Identifying diagnostic tests that are over-referred by general practice

It is questionable whether the dramatic growth in diagnostic referrals from general practice is a worthwhile public investment that has produced a net social benefit (Duckett 1995 p.122-124). However, it is not apparent from the literature that a comprehensive series of appropriate diagnostic testing referral rates to address necessary clinical care have yet been reliably quantified (Cummings & Mays 1999 p.16; Hammett & Harris 2002 p.124; Stuart, Crooks & Porton 2002 pp.134; Thomas et.al. 2006 p.1993). Furthermore, the Australian health system has inadvertently created incentives for medical referrers to err on the side of testing rather than not (Pflaum 2001 p.11).

This section highlights the relatively small number of items where it is generally accepted in the literature that the current levels of referral are higher than necessary based on the available evidence. It includes those tests that fail to demonstrate at least modest sensitivity and specificity for the targeted disease states. It also includes some areas of ambiguity for which the existing guidelines give little direction in general practice (Britt, Miller & Knox 2001 p.115).

4.3.1 *Plain film x-rays for ankle injuries*

The rates of imaging ordered by general practitioners for ankle injuries exceed that expected when applying the validated Ottawa decision rules for imaging (Britt, Miller & Knox 2001 p.85).

4.3.2 *Plain film x-rays for arm and wrist injuries*

There are high x-ray order rates for new contacts with fractures (61.5/100) plus sprains and strains (25.6/100). The wrist or arm is the most common body part suspected of fracture on presentation to participating general practitioners, and subsequently referred for x-ray. Plain x-ray is recognised as the appropriate diagnostic test of choice, but existing guidelines do not currently give general practitioners any direction in reliably selecting patients most likely to have true positive results.

4.3.3 *Plain film x-rays for low back pain*

Plain x-rays do have reasonable sensitivity and specificity for detecting pathological causes of low back pain, such as malignancies, osteomyelitis and spondylitis (Yelland 2004 p.416). However, plain x-rays of the lumbar spine provide limited diagnostic value for the assessment of acute non-specific low back pain (Australian Acute Musculoskeletal Pain Guidelines Group 2004 p.22). In the absence of trauma, it also has limited use in defining the cause of acute thoracic spinal pain (Australian Acute Musculoskeletal Pain Guidelines Group 2004 p.33). The association between low back pain and degenerative changes on plain x-ray is also weak (Yelland 2004 pp.416-417).

Plain x-rays of the lumbosacral spine account for 3.4% of all diagnostic imaging ordered by general practice. Computer tomography scans of the same region account for a further 0.8% (Yelland 2004 p.415). Compared with the 1987 Quebec task force on spinal disorders guidelines the order rate for back pain (17.3/100) by general practitioners is excessive (Britt, Miller & Knox 2001 pp.88-89). In the absence of complicating factors (>70 years, osteoporosis, weight loss, malignancy, fever, intravenous drug use or immunosuppression), the guidelines have long recommended against imaging for back pain within the first seven weeks of onset. Even then any positive return is poor. Evidence indicates that the benefit of immediate x-ray of all back pain presentations compared with delaying medical imaging for those who have not improved within 4-8 weeks was immaterial. This is despite a ten-fold increase in cost and greater radiation exposure (Yelland 2004 p.416).

4.3.4 Plain film x-rays of the chest

The low ordering rate for chest x-rays by general practitioners where a specific problem is identified (e.g. asthma, chronic obstructive airways disease) or an abnormal physical finding is present (e.g. haemoptysis, pneumonia, dyspnoea, pleurisy, hypoxemia or leucocytosis) is consistent with the guidelines (Britt, Miller & Knox 2001 p.52).

However ordering rates per 100 consultations are consistently higher where only non-specific or uncertain findings are identified, such as cough (11.8/100), chest pain with no other symptoms (15.9/100), chest symptom/complaint (9.2/100), and other respiratory diseases (12.1/100). The problem is that chest x-rays for acute respiratory illness generally have poor sensitivity and specificity for patients in the absence of positive physical findings and/or significant risk factors (e.g. cardiovascular disease, dementia). Chest x-rays are also less reliable for patients under the age of 40 years (Britt, Miller & Knox 2001 p.52).

Another difficulty arises with orders for cardiac failure, the seventh most common identified reason to refer for a chest x-ray. Though echocardiographs have significantly greater sensitivity and specificity, the guidelines do not address it because it is generally a service provided by cardiologists rather than radiologists. As with magnetic resonance imaging, general practitioners are not permitted to refer directly for echocardiography (Britt, Miller & Knox 2001 p.52).

4.3.5 Plain film x-rays for knee injuries

Three published sets of rules (Bauer, Ottawa and Pittsburgh) provide indication for the appropriate use of plain x-ray in diagnosing a fracture with traumatic knee pain. The Pittsburgh knee rules have demonstrated the greatest predictive value (Australian Acute Musculoskeletal Pain Guidelines Group 2004 p.64). Indications for patients presenting with acute knee pain following a fall or blunt trauma, include: age 11 years or younger, age 55 years and older or inability to weight-bear four full steps on presentation to the emergency department (Australian Acute Musculoskeletal Pain Guidelines Group 2004 pp.64-65).

A computer tomography (CT) scan is indicated when a fracture is suspected on plain film of the knee. Ultrasound is indicated in the presence of swelling or where potential rupture of anterior structures is suspected (Australian Acute Musculoskeletal Pain Guidelines Group 2004 p.54).

The high rates of ordering by Australian general practitioners (41.9/100) do not currently fit the American College of Radiology appropriateness criteria. Subsequently, x-rays of knees have the lowest positive return for diagnosis of clinically significant fractures (Britt, Miller & Knox 2001 p.85).

4.3.6 Plain film x-rays for osteoarthritis

Osteoarthritis in the joints of the spine and limbs is the third most common problem imaged, although the x-ray order rate by general practice per problem-specific encounters is relatively low (13.9/100). Plain film x-ray is relatively insensitive to all but gross joint changes. In the absence of guidelines to assist general practice in how to most effectively monitor the disease, it is unclear whether the volume of orders is warranted (Britt, Miller & Knox 2001 p.92).

4.3.7 Computer tomography (CT) scans for headache

General practice-order rate of computerised tomography scans for headache in the absence of relevant clinical signs (e.g. neurological abnormalities, altered mental state, nausea and vomiting) or high risk factors (e.g. positive HIV status) exceed that which is expected if following the American College of Radiology appropriateness criteria. There is an extremely low positive return rate of only 0.4-0.5%. The criteria only recommend computerised tomography scans as the modality of choice where intracranial bleeding is suspected. The documented incidence of sub-arachnoid haemorrhage is only 9 per 100,000 (Britt, Miller & Knox 2001 p.107).

The American College of Radiology guidelines instead recommend magnetic resonance imaging for virtually all other presentations related to traumatic isolated headaches. However Australian general practitioners are not currently able to refer patients for this modality. This may explain the relatively high rate of computerised tomography referrals as an inferior substitute (Britt, Miller & Knox 2001 p.106).

4.3.8 Common chemistry and haematology tests

In lieu of consistent clinical evidence, Hammett & Harris (2002 p.124) argue that attempts to reduce inappropriate levels of pathology orders should focus on delivering measurable reductions in the cheap, common chemistry and haematology tests. This is because it is the sheer volume of these tests that is driving the overall cost of diagnostic investigations.

Echoing these sentiments, Harvey, Clark & Visser (2003 p.35) recommend that, in absence of broadly accepted targets, consensus-based guidelines should be developed to mitigate the inherent risk of harm to patients from under-investigation. Specifically, Harvey, Clark & Visser (2003 p.36) recommend the adoption of norms indicated within the BEACH studies as the benchmark. Drawing on the evidence from the BEACH studies, this would indicate that the target items should include full blood counts (FBC), erythrocyte sedimentation rates (ESR), electrolytes, urea and creatinine (EUC), plus liver function tests (LFT) (Britt et.al. 2007 p.61).

4.3.9 Sputum cytology

Sputum cytology demonstrated particularly poor levels of sensitivity in the screening and diagnosis of lung pathology (Australian Cancer Network 2004 p.32; Morrison & Woolf 1990 p.265; National Health & Medical Research Council 1996 p.60).

4.4 Conclusion

There has been progressive growth in general practice utilisation per capita since the introduction of Medicare (Aust.) (Swerrisen 2004 p.9). It is debatable whether the disproportionate increase in pathology and medical imaging services per capita referred by general practice over this same period truly reflects a worthwhile public investment (Duckett 1995 p.122-124). This is because over-servicing and unnecessary testing generates unnecessary treatment and risks iatrogenic harm (Britt, Knox & Miller 2003 p.13; Britt, Miller & Knox 2001 p.110; Conyers 1998 p.8; Hammett & Harris 2002 p.124).

Nonetheless, the evidence base for unequivocally targeting savings with specific items that are over-referred is weak. This chapter only identifies a relatively small number of items where it is generally accepted in the literature that current levels of referral are higher than necessary.

In the next chapter, the evidence base for supporting discretionary increases in certain general practice-referred diagnostic tests is discussed. Particular attention is paid to diagnostic testing for certain types of cancer, cardiovascular disease and diabetes mellitus, because of their significance as national health priority area targets (Duckett 2000 pp.9-11; Swerrisen 2004 p.38).

CHAPTER FIVE – Diagnostic screening for cancer, cardiovascular disease and diabetes mellitus

5.1 Introduction

In some cases, discretionary increases are necessary in general practice referrals for diagnostic testing if national priority targets are to be met (Duckett 2000 pp.9-11; Swerrisen 2004 p.38). In particular, the detection and monitoring of cancer, cardiovascular disease and diabetes mellitus rely on the use of diagnostic testing as defined in this study (Australian Institute of Health and Welfare & Department of Health and Ageing 1998 pp.55-56; Australian Institute of Health and Welfare 2006[a] p.74; National Health & Medical Research Council 1996 pp.106-107).

However, for the most part, cost-effectiveness studies do not support the application of a population-based approach using broad screening programs of asymptomatic persons defined by non-clinical determinants such as age and gender (Australian Institute of Health and Welfare & Department of Health and Ageing 1998 pp.55-56; National Health & Medical Research Council 1996 pp.14, 106-107). In some cases this is because tests lack sufficient positive predictive value (Deeble & Lewis-Hughes 1991 p.59). In other cases the tests may demonstrate a high degree of sensitivity to detect early-stage disease in asymptomatic individuals. However once adjustments for lead-time and length biases are made, it makes no difference in terms of eliminating, delaying or changing the course of a disease with the treatments that are available (Woolf 1990[a] p.6).

Careful consideration of the available evidence on the diagnostic tests for the disease states in question is required. This will help determine what items can be supported in the redistribution model, which will allow appropriate increases in the population screening for the targeted disease states.

5.2 Diagnostic screening for cancer, cardiovascular disease and diabetes mellitus

5.2.1 Priority disease states that rely on medical imaging or pathology testing for screening and definitive diagnosis

Cancer, cardiovascular disease and diabetes mellitus are all broad disease-states that attract considerable health policy attention. This is because each disease state contributes a significant disease burden and has an identifiable series of major risk factors. In each case the primary source of detection and definitive diagnosis is through either medical imaging or pathology testing.

Given this, it is important to identify those cases where population screening of asymptomatic persons is recommended as an effective early intervention strategy (Australian Health Technology Advisory Committee 2000 pp.3-6; National Health & Medical Research Council 1996 pp.xix-xx) (see Appendix 1 pages 322 and 334 for descriptions of population screening, sensitivity and specificity).

5.2.2 Screening for cancer

The World Health Organisation predicts that the rates of cancer diagnosis worldwide will double over the first two decades of the twenty first century. This will be driven largely by lifestyle factors, most particularly levels of smoking (Eaton 2003 p.728). The national health priority area portfolio specifically targets eight types of cancer. They include cancers of the female breast, cervix, lung, colorectum, prostate plus melanoma, non-Hodgkin's lymphoma, and non-melanocytic skin cancers (Australian Institute of Health and Welfare 2006[a] p.74) (see Appendix 1 page 285 for a description of cancer).

For most of these pathologies mass screening of asymptomatic persons is not recommended as an effective preventive strategy (Australian Health Technology Advisory Committee 2000 pp.3-6; National Health & Medical Research Council 1996 pp.xix-xx; Perkins et.al. 2003 p.1075).

Exceptions to this include screening for cancers of the female breast and cervix for targeted population sub-groups (National Health & Medical Research Council 1996 p.xxi). Subsequently, cervical and breast screening rates have been included as key performance indicators in the public health outcome funding agreements between the Australian Government and the states (Hilless & Healy 2001 p.50). The Australian Government is also now phasing-in a nationally coordinated, population-based colorectal cancer screening program (Australian Cancer Network 2005 p.41; Nogrady 2006 p.23).

The evidence on the limitations of screening asymptomatic subjects for either lung or prostate cancer is discussed below. However initial screening tests for melanoma, non-

Hodgkin's lymphoma and non-melanocytic skin cancers are not considered in this chapter. This is because initial detection is reliant on physical examination by a physician, rather than medical imaging or pathology testing.

5.2.2.1 Breast cancer screening

There is considerable political support across numerous OECD states for implementing and maintaining population-based mammography screening programs. However compliance varies widely (Calltorp 1999 p.348; Jacobzone, Jee-Hughes & Moise 1999 pp.29-30; Jarvelin 2002 p.53; Tu, Kemper & Wong 1999/2000 p.4). The policy imperative derives from a considerable body of evidence that demonstrates a significantly lower relative risk of death from breast cancer amongst women aged 50 to 74 years who undertook regular screening compared with control groups. Regular mammography screening is credited for large part of the measured improvement in the 5-year relative survival ratio in many OECD states, including Australia. Reported mortality rates at twelve-year follow-up are reduced by as much as 20-30% (Jacobzone, Jee-Hughes & Moise 1999 p.29; National Health & Medical Research Council 1996 p.106-107; O'Malley, Fletcher & Morrison 1990 pp.252-255). This is attributed both to increased rates of early detection, and improvements in therapeutic interventions, most particularly for patients under the age of 60 years (Australian Institute of Health and Welfare 2000 p.68; Jacobzone, Jee-Hughes & Moise 1999 pp.32-33).

X-ray mammography has progressively become the modality of choice for primary diagnosis of breast lesions across the OECD states. This is because of its demonstrated ability to detect small tumours that would otherwise be missed by other methods such as physical examination by a physician or self-examination (Jacobzone, Jee-Hughes & Moise 1999 p.29). Nevertheless mammography only has moderate specificity and produces relatively high rates of false positives (National Health & Medical Research Council 1996 P.105) (see Appendix 1 page 307 for a description of false negatives and false positives).

A positive effect is not demonstrated with women in the 40 to 49 years cohort. The limited evidence on the effectiveness of treatment plus the iatrogenic risks and impact of unnecessary care from false positives outweighs the value of the small number of true malignancies detected (O'Malley, Fletcher & Morrison 1990 pp.255-256). For these reasons both the National Health and Medical Research Council (1996 p.106-

107) and the National Preventive and Community Medicine Committee (2002 p.35) guidelines for general practice only recommend biannual screening for women aged 50-69 years.

Jointly funded by the Australian and state governments, the BreastScreen Australia program is consistent with these recommendations. The program aims to provide free-of-charge biannual mammographic screenings and follow up with any suspicious lesions for women aged 50 to 69 years (Britt, Miller & Knox 2001 p.57; Sayer et.al. 2000 p.35). In 2002/2003 the participation rate of the target population was 56.1%, which remains below the national target for compliance over a two-year period set at 70% (Australian Institute of Health and Welfare 2006[a] p.334; National Health & Medical Research Council 1996 p.106-107; Sayer et.al. 2000 p.35).

A medical referral is not required to attend a BreastScreen Australia unit (Australian Institute of Health and Welfare 2006[a] p.334; Britt, Miller & Knox 2001 p.57; Sayer et.al. 2000 p.35). Nevertheless, general practice still makes a significant contribution to the detection and management of breast cancer in Australia. General practice orders an estimated 365,000 mammograms per annum, of which up to 116,000 are referred to BreastScreen Australia units (i.e. 16.6% of that program's activity) (Britt, Miller & Knox 2001 p.57). None of BreastScreen Australia activity is recorded by Medicare Australia (formerly known as the Health Insurance Commission) as benefits are not claimed through the Medicare Benefits Schedule (Britt, Miller & Knox 2001 p.110).

The majority of general practice referrals to diagnostic providers that are recorded as claims on the Medicare Benefits Schedule are for investigation of presenting symptoms or monitoring of known pathologies (e.g. palpable lumps, breast pain, fibrocystic disease etc.), rather than asymptomatic screenings (Britt, Miller & Knox 2001 pp.53-54). In nearly 40% of cases, an order for ultrasound either accompanies or follows the mammography order to define pathological findings (e.g. differentiating between cysts and solid masses). For women under the age of 30, ultrasound is the preferred modality for primary diagnosis (Britt, Miller & Knox 2001 p.110). These referral patterns are consistent with the guidelines of both the Royal Australian and New Zealand College of Radiologists and the American College of Radiology (Britt, Miller & Knox 2001 p.57).

5.2.2.2 Cervical cancer screening

Evidence from both cohort and case control studies demonstrates a reduction in the incidence of invasive malignancies associated with increased cervical screening compliance and early intervention (Herbert 2000 [a] p.201; Herbert 2000 [b] p.75; National Health & Medical Research Council 1996 p.99; Wellensiek et.al. 2002 p.377; Woolfe 1990[b] p.320). If all eligible women were screened regularly, it is estimated that 90% of cervical cancers would be prevented (Davy & Shorne 2006 p.33).The evidence supporting periodic Pap smears has persuaded numerous OECD states to adopt population screening programs (Woolfe 1990[b] p.320). For example, in Finland both the incidence and mortality rate from cervical cancer have reduced by 80% since the introduction of a screening program (Wellensiek et.al 2002 p.377).

However, internationally there is not complete consensus on screening guidelines. In the United Kingdom screening is recommended for women aged 20-64 years at least once every five years, and targets 80% coverage of women aged 25-64 years. Regional health authorities have the flexibility to opt for recall systems of three years, five years or a mixture between the two (Herbert 2000 [b] p.76; McGahan, Blanks and Moss 2001 pp.354-355). The British Society of Clinical Cytology takes a conservative stance and strongly recommends the three-year interval, most particularly for women in their reproductive years where the risk of an undetected or under-rated cytological abnormality progressing to invasive cancer is highest (Herbert [b] 2000 pp.78-79).

The American Cancer Society guidelines recommend annual screening for women from the age of eighteen or after the onset of sexual activity, whichever comes first. Rather than setting an upper age limit, the guidelines recommend that after three consecutive negative Pap smears screening may be less frequent, at the discretion of the patient's physician (Smith et.al. 2002 pp.12-13; Woolf 1990[b] p.320). Despite these recommendations, the lack of a universal health insurance system leaves the United States conspicuous without a population screening program for cervical cancer. Many low-income, indigent and elderly women in the United States do not have ready access to cervical screening (Fahs & Mandelblatt 1990 p.442).

The Australian guidelines recommend screening every two years for asymptomatic women aged between 20 to 69 years who have ever been sexually active and have an intact uterus. The guidelines recommend that screening cease at age 70 years where two normal results have been obtained within the preceding five years (Australian

Institute of Health and Welfare & Dept of Health and Ageing 2000 p.7; National Health & Medical Research Council 1996 p.100). The National Preventive and Community Medicine Committee (2002 p.34) guidelines for general practice concur with this, though they recommend that screening should commence from the age of 18.

More frequent rates of screening are not recommended in the Australian guidelines for high risk groups, with the exception of those patients with a history of histologically confirmed high grade abnormalities. In these cases annual re-screening is recommended. Re-screening post-treatment following a low-grade abnormality is also recommended earlier than the two-year interval, until at least two consecutive Pap smears are negative (National Cervical Screening Program 2005 p.48; National Preventive and Community Medicine Committee 2002 p.34).

Australia's national cervical screening program commenced for most states in 1995. Queensland commenced in 1998 (Australian Institute of Health and Welfare & Dept of Health and Ageing 2000 p.7). The program consists of state-based registries to measure utilisation by women aged 20 to 69 years, provide periodic reminders, track follow up for abnormal results and maintain cervical screening histories to assist providers with reporting requirements (National Cervical Screening Program 2005 p.6; Australian Institute of Health and Welfare 2006[a] p.336). The aged-standardised participation rate of women in the target 20-69 years age group is 60.7%. In 2002-2003, 98% of all Pap smears were performed on women in the target age group (Davy & Shorne 2006 p.35).

Australia's two year cervical re-screening interval is short by international standards (Farnsworth & Mitchell 2003 p.653). Case control studies and mathematical modelling projects that biennial or three-year screening only offers a slight benefit for reducing the risk of invasive cervical cancer compared with a five-year interval (Woolf 1990[b] p.320). For example, both Finland and the Netherlands have incidence and mortality rates equal to or better than Australia, yet both only provide screenings at five-year intervals for women aged 30-60. Neither recommends colposcopic investigations following low-grade abnormalities identified by Pap smears (National Cervical Screening Program 2005 pp.44-45).

Participation rates are lowest amongst women aged over 60 years and women with low socioeconomic status (Condon et.al. 2004 p.506; Davy & Shorne 2006 p.35; McGahan et.al. 2001 p.362). Other factors that influence participation rates identified in the literature include the general education status of the patient, their specific knowledge concerning cervical screening, cultural mores, anxiety about physical privacy and access to female providers (Condon et.al. 2004 p.506; McGahan et.al. 2001 p.362; Watkins et.al. 2002 pp.477-478; Wellensiek et.al. 2002 p.382).

General practice currently provides 80% of the Pap smear tests for cervical screening in Australia. Subsequently it is the primary source of cytology specimens referred to pathology laboratories (Australian Institute of Health and Welfare 2006[a] p.336; National Health & Medical Research Council 1996 p.99).

Cytology screening aims to detect treatable pre-cancerous lesions before their progression to invasive malignancies, rather than to identify malignancies themselves. Testing seeks to identify cervical intraepithelial neoplasia (CIN), graded according to the severity of dysplasia. The Pap smear test remains the conventional procedure in use, though liquid-based monolayer cytology alone or in combination with human papilloma virus DNA testing is being used in OECD states such as Switzerland and the United States (Coste et.al 2003 p.2; National Health & Medical Research Council 1996 pp.99-100; Woolf 1990[b] p.319). Though available in Australia, the Health Technology Advisory Committee has not supported a rebate through the Medicare Benefits Schedule for either of the new technologies (Davy & Shorne 2006 p.37; Farnsworth & Mitchell 2003 p.654; Zardawi 2002 p.332). Comparison of the three procedures established that monolayer cytology is less reliable, less valid and more expensive than the Pap smear (Coste et.al 2003 pp.2-3; Davy & Shorne 2006 p.37). Even in combination with the human papilloma virus DNA testing, it is no more effective than the conventional method (Coste et.al 2003 pp.2-3).

The Pap smear is more effective at identifying cytology leading to squamous cell carcinoma than adenocarcinomas. This is because of difficulties sampling cells from areas where adenocarcinomas arise and problems with pathological interpretation (National Cervical Screening Program 2005 p.7). The test has false negative rate reported as high as 24% and a further under-grading rate as high as 39% (Fahs & Mandelblatt 1990 p.445; National Health & Medical Research Council 1996 p.99; Shaw 2002 p.1; Woolf 1990[b] p.319). Another difficulty with the Pap smear test is its poor sensitivity to human papilloma virus and its inability to differentiate between the twenty serotypes known to infect the cervix (National Health & Medical Research Council 1996 p.99).

Targeted re-screening and 10% random re-screening are methods used by laboratories to control Pap smear error rates. An alternate process adopted by the United Kingdom's cervical screening program is rapid review. This process involves the re-examination of all negative and inadequate smears briefly by another cytologist prior to issue (Herbert 2000 [b] p.78; Faraker 1998 pp.71-72). This method is still clearly reliant on professional judgement. However there is some concern expressed that rapid review is applied as an auditing tool to definitively judge substandard performance of cytologists, rather than as one means by which to improve screening sensitivity (Slater 1998 pp.82-83).

There is some speculation that improving mortality rates with cervical screening is partly an artefact of widening definitions for categorising abnormality, and the subsequent very large increase in numbers treated (Raffle et.al 2003 p.4). In low-risk cases further investigations (e.g. colposcopy) and treatment are unwarranted because of the iatrogenic risks. This includes anxiety, psychosexual dysfunction, infections and haemorrhage (National Cervical Screening Program 2005 p.46). It may also lead to undue exposure to chemotherapy, radiotherapy and the prophylactic removal of other at-risk organs such as the colon, ovaries, breast and oesophagus (Raffle et.al 2003 p.4-5). Nevertheless, the lifetime risk of a woman in Australia undergoing a colposcopy is 76.8%. This suggests that there is currently significant over-investigation of screen-detected abnormalities (Farnsworth & Mitchell 2003 p.653).

Women with a history of negative cytology during their reproductive years are at very low risk of developing a cervical neoplasia thereafter (Cruickshank 2001 p.352; Herbert 2000 [b] p.77; Woolf 1990[b] p.321). Conversely unscreened post-menopausal women have the highest risk of cervical intraepithelial neoplasia progressing to malignancy (Cruickshank 2001 p.352; Herbert 2000 [b] p.77; Woolf 1990[b] p.321). The transition time from localised to more invasive stages of cervical carcinoma may also be up to four times more rapid in elderly women than with younger women (Fahs & Mandelblatt 1990 p.442). Even so, the lifetime risk of an unscreened woman in Australia actually developing cervical cancer is 1.58% (Farnsworth & Mitchell 2003 p.653).

Cruickshank (2001 p.352) subsequently argues that screening resources for women over the age of 50 years should only be focused on those who have had a preceding positive smear, and those who have previously been non-compliant with screening. Herbert (2000 [b] pp.78-79) cautions against this, noting that the marked limitations to the accuracy and sensitivity of the screening procedure do not provide sufficient confidence to justify early cessation at least before the age of 60 years, and only for women with a history of routine screening and negative cytology.

Recently a polyvalent vaccine program has commenced in Australia that targets the prevention of infection from the human papilloma virus (HPV) genotypes which account for 70% of cervical cancers and 50% of high-grade abnormalities (CIN 2 and 3) (Foran 2006 p.39; Wain 2006 p.55). Evidence over time may subsequently justify extending the screening interval (Foran 2006 p.40; Wain 2006 p.55). However, the recommendation for regular Pap smears in sexually active women still stands, because the vaccines will not alter the natural history of established HPV infections present at the time of immunisation. Nor do they protect against the 13 other HPV genotypes responsible for the residual 30% of cervical cancers (Foran 2006 pp.40-41; Wain 2006 p.56; Wallace, Weisberg & McCaffery 2007 p.97). The primary target group for vaccination at present are females aged 9-26 years, ideally before they become sexual active (Wain 2006 p.55; Wallace, Weisberg & McCaffery 2007 p.97). The immune response is 2-3 fold higher if given between the ages of 9-12 years, than if given at 23 years (Foran 2006 p.39). Evidence also indicates its effectiveness in males aged 9-15 years (Foran 2006 p.41; Wain 2006 p.55).

5.2.2.3 Colorectal cancer screening

Detection and endoscopic removal of adenomatous polyps from the bowel wall prevents malignant transformation and reduces the reported incidence of cancer by 16% to 20% (Australian Cancer Network 2005 p.34; Fludger et.al. 2002 p.1444; Goldsmith, Hutchinson & Hurley 2006 p.14). In addition the early detection of carcinomas allows earlier treatment with reported reductions in mortality ranging from 15% to 33%, depending on whether the screening interval was biennial or annual (Australian Cancer Network 2005 p.34; Bolin & Korman 1999 p.245; Cancer Council Australia 2005[a] p.2; Fludger et.al. 2002 p.1444; Goldsmith, Hutchinson & Hurley 2006 p.14; Mendelson & Forbes 2000 p.416).

However not all true positive subjects stand to benefit from screening. Such is the lead time with the natural history of colorectal cancer, autopsy studies estimate that 2% to 3% of patients will die from some other cause before experiencing any morbidity or mortality from the malignancy. This is pertinent for patients over the age of 60 years. This must be weighed against the potential harm of interventions that may occur later in life in the absence of screening (Knight, Fielding & Battista 1990 pp.298-299).

Numerous screening options are detailed in the literature. They include faecal occult blood tests (FOBT), sigmoidoscopy, colonoscopy, barium enemas, and computerised tomographic colonography.

The faecal occult blood test is the cheapest of the non-invasive options. There are two types of faecal occult blood test. Guaiac-based tests detect the psuedoperoxidase activity of haemoglobin. Immunochemical tests utilise antibodies against human haemoglobin (Australian Cancer Network 2005 p.36; Knight, Fielding & Battista 1990 p.297).

Randomised controlled trials indicates that biennial population-based faecal occult blood test screening for small volumes of blood loss from adenomatous lesions in the colon of asymptomatic subjects aged 45 to 50 years and over reduces disease-specific mortality by 15-21% over a 8-18 year period (Australian Cancer Network 2005 p.33; Fludger et.al. 2002 p.1444; Goldsmith, Hutchison & Hurley 2006 p.14; Winawer 2003 p.126). Goldsmith, Hutchison & Hurley (2006 p.16) also conclude from a review of cost effectiveness analyses that faecal occult blood test screening in average-risk adults over the age of 50 years has worth from a public health perspective and should prove cost-saving from a societal perspective.

However the faecal occult blood test is limited by poor sensitivity and a false-positive rate of 2-13% (Mendelson & Forbes 2000 p.416; Olynyk et.al. 1996 p.75). Therefore, the positive predictive value of the faecal occult blood test is also limited, at only 25.6% (Gellert & Norton 2007 p.14) (see Appendix 1 page 323 for a description of positive predictive value). This is because the detection of blood in faeces does not always correspond with a definitive diagnosis. For example, the digestion of foods high in either iron or ascorbic acid (vitamin C) increases levels of peroxidase in the gastrointestinal tract. In addition, gastrointestinal blood loss of 0.5-2.0 ml/day is considered normal, and is distributed non-uniformally in the faeces. More significant bleeding can also result from both benign and malignant conditions other than adenomas and colorectal cancer (Knight, Fields & Battista 1990 p.297).

The guaiac faecal occult blood test is cheaper than its immunochemical equivalent and has a higher positive predictive value, with few false negative results. However guaiac testing requires dietary modification for 3 days prior and necessitates a more complicated sampling method (Australian Cancer Network 2005 pp.36-37; Nogrady

2006 p.22; Knight, Fields & Battista 1990 p.297; Winawer 2003 p.126). It is also less likely to detect upper gastrointestinal bleeding because haemoglobin psuedoperoxidase activity declines with chemical interaction the further it passes through the tract (Knight, Fielding & Battista 1990 p.297).

The immunochemical faecal occult blood test has higher specificity for human haemoglobin. This produces fewer false positive results due to the presence of dietary perioxidases (Knight, Fielding & Battista 1990 p.297). Testing also does not require dietary modifications. For these reasons the immunochemical faecal occult blood test is arguably more reliable and more likely to attain higher participation rates (Australian Cancer Network 2005 pp.36-37; Nogrady 2006 p.22; Winawer 2003 p.126).

Colonoscopy is the recommended follow-up procedure to investigate positive faecal occult blood test screenings and sigmoidoscopies (Cancer Council Australia 2005[a] p.3; Nadel et.al. 2005 p.92). The procedure has a high degree of accuracy and is efficient because it can be combined with a therapeutic intervention (polypectomy) (Mendelson & Forbes 2000 p.416; Nicholson et.al. 2000 p.430). At both five and ten year-intervals its cost effectiveness is better than that of flexible sigmoidoscopy, even when combined with faecal occult blood testing. Nevertheless it is it is not recommended for population screening because the evidence of any incremental benefits is outweighed by the expense, invasiveness and a 1:1,000 risk of a perforated colon (Australian Cancer Network 2005 p.37; Cancer Council Australia 2005[a] p.3; Gellert & Norton 2007 p.13-14; Nogrady 2006 p.21; Rozen, Winawer & Waye 2002 p.756; Winawer 2003 pp.126-127).

However the National Preventive and Community Medicine Committee (2002 p.37) does note evidence which supports the use of screening colonoscopy for high risk groups every one to two years from the age of 25 years (National Preventive and Community Medicine Committee 2002 p.37). Internationally, Winawer (2003 p. 127) limits recommendations for a colonoscopy to only every ten years for persons with a family history of relatives with colorectal cancer or adenomas before the age of 60 years. For the latter group it is a two-stage approach involving initially a faecal occult blood test and/or a flexible sigmoidoscopy followed by a diagnostic colonoscopy only where the first level screening test is positive.

Flexible sigmoidoscopy has higher diagnostic sensitivity than rigid sigmoidoscopy (Australian Cancer Network 2005 p.37; Olynyk et.al. 1996 p.75). It also has a relatively low risk of perforating the bowel, at 1:40,000 (Cancer Council Australia 2005[a] p.3). However the procedure is only capable of reaching colorectal cancers and adenomas 6 mm or greater in size, that lay distal to the splenic flexure (50-60% of the total diagnosed). Studies indicate that these rectosigmoid polyps and malignancies are an insensitive marker for proximal colon cancer. Screening using flexible sigmoidoscopy alone will fail to detect 70-80% of proximal colon cancers (Australian Cancer Network 2005 p.37; Bolin & Korman 1999 p.244; Cancer Council Australia 2005[a] p.3; Mendelson & Forbes 2000 p.416; Nicholson et.al. 2000 p.429). Noting that the procedure also has limitations due to cost and evidence of subject non-compliance, studies indicate that annual screenings offer no more beneficial effect than an interval of five years or possibly greater. For these reasons it is not recommended to repeat the procedure at any less than a five year interval (Australian Cancer Network 2005 p.37; Nicholson et.al. 2000 p.430; Olynyk et.al. 1996 p.75; Winawer 2003 pp.126-127).

The double contrast barium enema is another diagnostic option (Winawer 2003 pp. 127). Its lack of specificity is a major drawback. The 20% of cases or more where it does identify a lesion requires a follow-up with a flexible sigmoidoscopy or colonoscopy for more definitive diagnosis (Bolin & Korman 1999 p.244; Mendelson & Forbes 2000 p.416). Though less risky than a colonoscopy, barium enemas still result in a bowel perforation on average with 1 in every 5,000 cases (Knight, Fielding & Battista 1990 p.299). It also exposes the patient to a substantial radiation dose (Mendelson & Forbes 2000 p.416). Cost-effectiveness studies indicate that annual screenings offer no more beneficial effect than an interval of up to five years. Recommendations therefore limit its application to this length of interval (Knight, Fielding & Battista 1990 p.302; Winawer 2003 pp. 127).

Computerised tomographic colonography is currently being assessed as an alternate diagnostic test to colonoscopy. Testing is expensive and requires patient preparation. Positive results still require a follow-up colonoscopy because it lacks sensitivity for small polyps and in some cases a polypectomy and biopsy are necessary. It also exposes patients to some radiation, though this is substantially less than that for a double contrast barium enema (Australian Cancer Network 2005 p.37; Gellert & Norton 2007 p.15; Mendelson & Forbes 2000 p.417). It currently is not recommended by the Cancer Council Australia for population screening (Cancer Council Australia 2005[a] p.4).

Implementation of screening programs for colorectal cancer varies across the OECD states. The most established program of wide-scale faecal occult blood test screening comes from Germany. The former West Germany commenced its program in 1977, and expanded into former East Germany post-unification in 1990. Japan commenced a program of subsidised annual immunochemical faecal occult blood test screening for citizens over 40 years of age in 1992. The Czech Republic commenced a program of biennial guaiac faecal occult blood test screening for persons over 50 years in 2001. Italy provides free colonoscopy screening every 5 years for the average risk population from the age of 45 years, and is piloting studies in the use flexible sigmoidoscopy. Similar to the situations in France and Iceland, Italy is also considering recommendations to publicly resource the implementation of a national faecal occult blood test screening program. A variety of pilot screening studies using a guaiac faecal occult blood test and/or flexible sigmoidoscopy are also underway in Austria, Denmark, Spain and the United Kingdom (Rozen, Winawer & Waye 2002 pp.756-757).

Neither Canada nor the United States have publicly-funded colorectal cancer screening programs, despite the Canadian Task Force on Preventive Health Care, National Committee on Colorectal Cancer Screening (Can) and the American Cancer Society guidelines all recommending that adults at average risk should begin colorectal cancer screening at the age of 50 (Goldsmith, Hutchison & Hurley 2006 p.14; Knight, Fielding & Battista 1990 p.295; Rozen, Winawer & Waye 2002 p.757). In both nations the recommended method is an annual faecal occult blood test, whilst the American Cancer Society also propose a five-yearly flexible sigmoidoscopy as an alternative (Goldsmith, Hutchison & Hurley 2006 p.14; Rozen, Winawer & Waye 2002 p.757; Smith et.al. 2002 p.12). Some states such as Minnesota are trialling a faecal occult blood test screening program, whilst Medicare (US) covers screening colonoscopy every 10 years in average risk enrolees (Rozen, Winawer & Waye 2002 p.757).

From November 2002 to June 2004 the Australian Government funded a pilot population screening program of 50,000 asymptomatic subjects aged 50-75 years in Adelaide, Mackay and Melbourne using immunochemical faecal occult blood testing (Australian Cancer Network 2005 p.34; Australian Institute of Health and Welfare 2006[a] p.337; Rozen, Winawer & Waye 2002 pp.755-756). Based on the positive results of this pilot, the Australian Government has begun to phase in a nationally coordinated, population-based colorectal cancer screening program. The first phase commencing in 2006 began directly mailing immunochemical faecal occult blood test home-kits to people turning 55 and 65 over the 3 year period plus all the participants of the pilot program. Pending the evaluation of this phase in 2007-2008, the aim will be to extend the program to biennial screening of all residents aged 55-74 years by 2016 (Australian Cancer Network 2005 p.41; Australian Institute of Health and Welfare 2006[a] p.337; Gellert & Norton 2007 pp.13-14; Nogrady 2006 p.23).

Though participants are encouraged to nominate a general practitioner to receive results when returning their faecal occult blood test sample, it is noteworthy that the pathology testing will be patient-initiated and referred (Nogrady 2006 p.22). Randomised trials have demonstrated that the procedure is most reliable when conducted using home testing, collecting two samples from each of three consecutive bowel motions. In-office testing is less reliable because, typically, only single samples are collected (Nadel et.al. 2005 p.92). Along with the patient the general practitioner will receive a copy of the test results. In most cases the general practitioner will assume the duty of care to consult with the patient and refer for further diagnostic evaluation in the case of a positive result. However the general practitioner will have the option of notifying the newly-established national bowel cancer screening register that they do not intend on following-up with a particular participant. The duty of care then reverts to the register (Nogrady 2006 p.22).

Even where there are screening programs in place, the evidence repeatedly indicates that compliance and acceptability remains an issue (Goldsmith, Hutchinson & Hurley 2006 p.14; Nadel et.al. 2005 p.92; Rozen, Winawer & Waye 2002 p.756; Smith et.al. 2002 p.18). One unique feature of faecal occult blood testing that probably impedes compliance and effectiveness is that it relies on a significant degree of preparation and action by the patient outside the realms of the consultation room (Knight, Fielding & Battista 1990 p.303). On the other hand, fewer patients readily accept the more invasive options (Rozen, Winawer & Waye 2002 pp.756-757).

5.2.2.4 Lung cancer screening

Assessments of chest radiography and sputum cytology for use in the diagnostic screening of lung cancer rely on randomised controlled trials in the United States and Czechoslovakia dating back to the 1960's and 1970's (Australian Cancer Network 2004 p.32; Morrison & Woolf 1990 p.265; National Health & Medical Research Council 1996 p.60). Results indicated that both modalities lack sufficient sensitivity. Even with repeated screenings of high-risk individuals using both modalities, the studies showed nearly half of all lung cancers will not be diagnosed until the individual becomes symptomatic (Morrison & Woolf 1990 pp.265-266; National Health & Medical Research Council 1996 p.60).

Despite evidence indicating its lack of efficacy, screening for lung cancer and other pulmonary diseases using plain film chest x-rays remains prevalent across numerous OECD states, including Australia (Mauri et.al. 2006 p.654). Even after the introduction of clinical guidelines, reduction in its use has been marginal and statistically non-significant (Mauri et.al. 2006 p.652).

Plain chest films are three-fold more sensitive than sputum cytology, yet still miss an estimated 30% of lung cancers. The modality lacks the resolution to diagnose early stage cancers (nodules ≤ 1cm) in the lung, where resection can improve five-year survival rates compared with usual care outcomes (Australian Cancer Network 2004 pp.33-34; Millward 2001 pp.8-9). The procedure also has a high error rate, because it relies on the interpretations of radiologists plus sub-optimal exposure and/or poor positioning can either fail to detect or obscure pulmonary nodules. Most errors are false negatives, although reports of incorrect diagnoses due to film artefact or indeterminate findings requiring further investigation range from 10-20% (Morrison & Woolf 1990 p.265; National Health & Medical Research Council 1996 p.60).

Because of poor specificity and the low prevalence rate of lung cancer within the general population, chest radiography has a very low positive predictive value. For every lesion confirmed with follow-up bronchoscopy, needle aspiration or thoracotomy, one hundred have a false positive finding on plain film (Morrison & Woolf 1990 p.266; National Health & Medical Research Council 1996 p.60).

Recent uncontrolled studies in Finland, Germany, Japan and the United States indicate an increased sensitivity of low-dose helical computer tomography (CT) for detecting peripheral adenocarcinomas and small cell lung cancers less than 2cm in diameter and in stage I, compared with plain chest radiography. This is because it is able to provide axial images of the lungs and mediastinum with a superior, unhindered contrast resolution (Australian Cancer Network 2004 pp.33-34). However, randomised controlled trials are still necessary to adjust for length-time, lead-time and over-diagnosis bias in measures of survival and disease-specific mortality (Australian Cancer Network 2004 pp.33-34; Millward 2001 pp.8-9; Smith et.al. 2002 p.16). Other issues also include appropriate at-risk subject identification, high false-positive and false-negative rates plus cost (Australian Cancer Network 2004 pp.34-35; Millward

2001 p.8-9). Potentially adverse consequences from subsequent fine needle biopsies on frequently benign small nodules needs also to be considered (Manser et.al. 2001 p.11).

Detection of biomarkers in either in sputum or bronchoalveolar lavage samples, fluorescence bronchoscopy and positron emission tomography (PET) are other methods currently under investigation for early detection of pulmonary nodules and lung cancer in asymptomatic subjects (Australian Cancer Network 2004 pp.35-36; Morris 1999 p.527). However, none to date have been assessed as single screening technique in large randomised controlled trials (Australian Cancer Network 2004 pp.35-36).

Because of the limited information still available, the Australian Cancer Network's guidelines endorse the earlier conclusion of the National Health and Medical Research Council. Neither organisation recommends the routine screening of asymptomatic adults at risk for lung cancer (Australian Cancer Network 2004 p.33; National Health & Medical Research Council 1996 p.61). This is consistent with the American Cancer Society guidelines, which also do not support screening asymptomatic individuals at risk of lung cancer (Smith et.al. 2002 p.16).

5.2.2.5 Prostate cancer screening

The prostate-specific antigen (PSA) test has been available since 1990 (Australian Institute of Health and Welfare 2000 pp.64-65). It does not screen directly for prostate cancer. Instead, it indicates a continuum of risk at all values, without a definitive threshold (Steginga & Gardiner 2007 p.501). This detracts from both its sensitivity and specificity, with false positive results in up to 44-55% of tests, depending on the threshold level chosen (Gottlieb 2003 p.1231; Pinnock 2004 p.380). Benign causes of raised prostate-specific antigen levels include natural fluctuations, normal enlargement of the prostate with age, recent ejaculation and inflammation (Gottlieb 2003 p.1231).

A trans-rectal ultrasound-guided needle biopsy (TRUS) is required to confirm the diagnosis of prostate cancer following either a prostate-specific antigen test or digital rectal examination (Ilic, O'Connor, Green & Wilt 2006 p.2; Moran et.al. 2000 p.316; Steginga & Gardiner 2007 p.501). The majority of TRUS needle biopsies are performed on men with serum PSA levels of 4-10 ng/mL, with most returning negative results (Steginga & Gardiner 2007 p.501).

The American Cancer Society guidelines recommend that annual prostate-specific antigen testing in combination with digital rectal examination should be offered to all men from the age of 50 who have a life expectancy of at least 10 years. The guidelines also recommend that screening should begin at 45 years for higher-risk men, such as African-Americans and men with a family history of first degree relatives with a positive diagnosis at a young age (Smith et.al. 2002 p.15). However, these recommendations are not supported by the US Preventive Services Task Force (Moran et.al. 2000 p.316).

The Cancer Council Australia also does not support population screening for prostate cancer. This is because the available tests are unable to differentiate between the majority of malignancies that will not cause harm within the typical lifespan and those that are progressive and/or lethal (Cancer Council Australia 2005[b] p.1; Ilic, O'Connor, Green & Wilt 2006 p.8; Lu-Yao et.al 2002 pp.740-741; Pinnock 2004 p.379). There is an almost 8:1 ratio of incidence to prostate cancer-specific mortality, indicating that the majority of men diagnosed with the disease do not die from it. The increased cost and risk of iatrogenic outcomes from follow-up interventions, such as radical prostatectomy radiotherapy and hormonal therapy, outweigh any positive impact on mortality rates that increased screening rates produce (Ilic et.al. 2006 p.2; Lu-Yao et.al. 2002 pp.741-742; Scher 2007; Steginga & Gardiner 2007 p.501). All the treatments have considerable risk of adverse effects, including erectile dysfunction (20-70% of cases), urinary incontinence (15-50%) and bowel problems (6-25%) (Cancer Council Australia 2005[b] p.3). No benefit from screening or subsequent treatment is estimated for men whose life expectancy is 10-15 years or less (Ilic, O'Connor, Green & Wilt 2006 p.8; Perkins et.al. 2003 p.1080).

Nevertheless, referrals for prostate-specific antigen testing are widespread in Australian general practice. Some evidence indicates that this is driven by demand from ill-informed male patients over-estimating their risk (Pinnock 2004 p.379; Ward et.al. 1997 p.251). Ward et.al. (1997 p.250) identified that this anxiety and a history of persistent urinary tract symptoms were indentified as the two independent variables significantly associated with having a prostate screening test. This is despite the lack of any evidence to indicate the risk of prostate cancer in men with uncomplicated lower urinary tract symptoms is any greater than asymptomatic men. Other evidence also indicates that it is driven by general practitioners' perception of a medico-legal risk if they do not respond to a patient's request (McNeil & O'Brien 1999 p.345).

5.2.3 Screening for cardiovascular disease

Cardiovascular disease incorporates a spectrum of disorders, which are often inter-related (Australian Institute of Health and Welfare 2006[a] p.60; Britt, Miller & Knox 2001 p.73; National Health & Medical Research Council 1996 p.29; Senes & Britt 2001 p.14). It accounts for 36% of all-cause premature mortality and an estimated 17% of the total disease burden in Australia (Australian Institute of Health and Welfare 2006[a] p.60). Common co-morbidities include hypertension, diabetes mellitus and lipid disorders (JBS 2 Working Party 2005 p.v40; Senes & Britt 2001 pp.8-9) (see Appendix 1 page 292 for a description of cardiovascular disease).

5.2.3.1 Dislipidaemia screening

The three components of the arthrogenic lipoprotein phenotype are elevated triglycerides, elevated small LDL-cholesterol and depressed HDL-cholesterol (National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand 2001 S.68). However, lipoprotein levels are only one factor in determining cardiovascular risk (JBS 2 Working Party 2005 p.v29). This measure alone remains a poor predictor of developing frank cardiovascular disease in young men, women and the elderly (National Preventive and Community Medicine Committee 2002 p.22; Taylor et.al. 1990 p.438; Woolf 1990[c] p.405). There is little evidence that a reduction in serum cholesterol levels reduces overall mortality risk of the population in the absence of frank cardiovascular symptoms (National Preventive and Community Medicine Committee 2002 p.22; Woolf 1990[c] p.407).

Despite these limitations, the national health priority area initiative adopts the proportion of adults aged 20-69 with high serum cholesterol as the indicator of population risk for cardiac, vascular and cerebrovascular disease (Australian Institute Of Health & Welfare & Department of Health and Ageing 1999 p.47; Senes & Britt 2001 p.38). This is because studies repeatedly demonstrate that reductions in serum cholesterol do decrease the incidence of frank coronary heart disease, acute myocardial infarcts and coronary-related death in both patients with established atherosclerosis and asymptomatic individuals at high risk of developing cardiovascular disease. Whilst the relative benefits are the same for all regardless of their cardiovascular risk status, the absolute benefits are a function of the total baseline risk (JBS 2 Working Party 2005 p.v29) (see Appendix 1 page 302 for further description of dislipidaemia).

Seminal findings from the large, prospective Framingham Heart Study advocate serum HDL-cholesterol concentration levels as the single most important marker inversely proportional to atherogenesis (Grundy et.al. 1998 p.1882; National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand 2001 S.64). The INTERHEART study confirms the importance of this indicator (National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand 2005 p.279).

For these reasons, the recognised standard lipid measure for estimating the overall risk of cardiovascular disease is elevated total cholesterol to HDL-cholesterol ratio ≥ 6.0 (JBS 2 Working Party 2005 v.29). This can normally be measured non-fasting (National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand 2001 S.80). The Joint British Societies Working Party (2005 v.32) recommends that this should be included as part of an overall cardiovascular disease risk assessment.

The JBS 2 Working Party (2005 v.31) recommend that all adults over the age of 40 years should have total cholesterol and HDL-cholesterol measured opportunistically by general practitioners. Patients at high absolute risk of cardiovascular disease and those with established atherosclerotic disease should have lipids monitored at least once per annum. In total, 32.4% of Australian general practice encounters with adult patients include a cholesterol check (Sayer et.al. 2000 pp.32-33). Hypercholesterolemia is identified in up to 36% of those screened. Approximately half of these subjects subsequently require prescription of therapeutic medication (Sayer et al 2000 p.34).

Evidence indicates that a reduction in serum cholesterol using drug therapy and dietary modification has a substantial beneficial impact on the premature mortality and morbidity of asymptomatic middle aged men up the age of 65 years (Australian Institute of Health and Welfare & Department of Health and Ageing 1999 pp.104-105; National Health & Medical Research Council 1996 p.11; Taylor et.al. 1990 p.437). For a given reduction in serum cholesterol levels, the degree of benefit is larger the greater the severity of hypercholesterolaemia (Woolf 1990[c] p.405).

Based on these findings, the National Health and Medical Research Council guidelines (1996 p.11) limit recommendations for hypercholesterolaemia screening to only asymptomatic men aged 45-64 years. The National Health and Community Medicine Committee guidelines (2002 p.22) for general practice support this, though routine screening is only recommended every five years for patients with a low absolute risk.

The five-year interval is consistent with recommendations reported previously in the literature that were initially based on expert opinion (Woolf 1990[c] p.408).

It is also likely that measures of the apoprotein ratio (ApoB/ApoA1) will gain in significance with future guidelines. This is because it is the single most powerful predictor of myocardial infarction, particularly in the presence of elevated triglyceride levels (National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand 2005 p.285; Tonkin, Chen & Nelson 2006 p.15). Apoprotein B (ApoB) is a measure of the total number of arthrogenic particles, whilst apoprotein A1 (ApoA1), is the predominant particle in HDL and creates an antiarthrogenic effect (Colquhoun 2006 p.29; National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand 2005 p.285; Tonkin, Chen & Nelson 2006 p.15).

For patients deemed to be at high risk, screening should be followed by a full fasting lipoprotein profile of total cholesterol, triglycerides, HDL-cholesterol and, where available, LDL-cholesterol (National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand 2001 S80). In asymptomatic patients, it is recommended that lipid values should be measured on several occasions before pharmacotherapy is considered, because of biological and laboratory variations (JBS 2 Working Party 2005 v.31-32).

Under current Australian laboratory conditions testing for serum cholesterol has a substantial margin for error (estimated at a range of up to 0.9 mmol/l either side of the true reading). The recommendation follows that an individual's results should be an average of least two venous cholesterol screens, and if the difference between the first two is greater than 0.8mmol/l, then a third test is required. Repeat testing is also recommended if total cholesterol is raised above 6 mmol/L and low-density lipoproteins are raised above 4 mmol/L (National Health & Medical Research Council 1996 pp.10-11; National Health & Community Medicine Committee guidelines 2002 p.22). However the need to repeat the procedure risks increases non-compliance, particularly where the first reading may be unexceptional. In turn, this increases the likelihood of an inflated rate of false-negatives going unaddressed (National Health & Medical Research Council 1996 p.11).

Additional pathology orders from general practice common for patients with lipid disorders also includes liver function and glucose tolerance tests (Senes & Britt 2001 pp.38-39). The presence of hyperglycaemia contributes to elevated levels of serum cholesterol (National Centre for Monitoring Diabetes 2002 pp.46-47). Testing for microalbuminuria is also an independent marker of increased cardiovascular risk in type II diabetes mellitus patients (New Zealand Guidelines Group 2003 p.40).

5.2.3.2 Testing for carotid artery stenosis

There are numerous radiographic tests available to determine the presence of carotid artery stenosis. Either carotid angiography or arteriography is the standard. This is an invasive procedure where a catheter diffuses contrast medium into the carotid artery in order to identify the site of any thrombus formation. Though renowned for its accuracy, it has a substantial associated risk of inducing either arterial dissection or an embolic stroke and it is not recommended for mass screening (Jacobzone, Jee-Hughes & Moise 1999 p.5; National Health & Medical Research Council 1996 pp.29-30).

Other techniques available include magnetic resonance angiography, B-mode ultrasound, Doppler and duplex scanning, each with varying degrees of specificity and sensitivity. Given the relatively low risk of a stroke or transient ischaemic attack (TIA) even in the presence of a pathological finding, the cost of screening asymptomatic individuals outweighs the benefit. The risks of an adverse event with surgical intervention are high (up to 6.9%) and there is possibly no additional benefit over that provided by pharmacological treatment alone for symptomatic presentations (National Health & Medical Research Council 1996 pp.29-30).

5.2.4 Screening for diabetes mellitus

The burden of illness and mortality from diabetes mellitus is frequently under-estimated. Patients' death certificates typically record the presenting illness (e.g. cardiovascular disease) as the immediate cause of death, though in a percentage of cases this is a complication resulting from an underlying history of diabetes mellitus (Jacobzone, Jee-Hughes & Moise 1999 p.19). Noted pathological associations included ischaemic heart disease, hypertensive disease, stroke, and kidney disease. In terms of all-cause mortality, diabetes mellitus is listed as the underlying cause of death in 2.7% of cases and as an associated cause in a further 6.1% of deaths (Australian Institute of Health and Welfare 2006[a] p.73) (see Appendix 1 page 299 for a description of diabetes mellitus).

Frank symptoms of hyperglycaemia (e.g. polyuria and polydipsia) allow a straightforward diagnosis of diabetes mellitus. However in many cases it remains long undiagnosed because many individuals are asymptomatic for extended periods (Singer et.al. 1990 p.350). A lack of reliable data on the incidence of diabetes mellitus is a common problem across the OECD member states. This is compounded by variations in diagnostic criteria between states and a reluctance to accept the ongoing costs that would accrue with continuous monitoring of populations using annual cross-sectional surveys. For these reasons it is more common to see reports of prevalence rates (Jacobzone, Jee-Hughes & Moise 1999 p.19).

The World Health Organisation (WHO) estimates the prevalence of diabetes mellitus to range between 2% to 10% of populations across OECD states. Until recent times the prevalence of diabetes mellitus (particularly Type II) in Australia was grossly underestimated, because of the dearth of comprehensive blood glucose monitoring. Drawing on billings for pathology tests as a proxy indicator, the National Centre for Monitoring Diabetes (2002 p.30) estimates that at least 3.4% of the Medicare-eligible population have diabetes mellitus.

Prevalence increases with age, most notably between 45 and 75 years of age. Increases in reported prevalence rates over time are due to a combination of factors, including more widespread screening and technical improvements, declining mortality rates, increasing levels of obesity and declining levels of physical activity with ageing populations (Jacobzone, Jee-Hughes & Moise 1999 pp.19-20).

Diabetes mellitus is amongst the most prevalent disease states addressed in Australian general practice. The Bettering the Evaluation and Care of Health (BEACH) studies identify that some type of diabetes mellitus accounted for an estimated 2.4% of all clinical matters addressed (Britt et.al. 2007 p.34). Common presenting co-morbidities include lipid disorders, hypertension, ischaemic heart disease, heart failure and obesity (Senes & Britt 2001 pp.29-30).

Type 1 diabetes mellitus accounts for approximately 10% of all cases diagnosed. There is to date no preventive or curative interventions available (Australian Health Ministers Conference 1999 p.3). Patients diagnosed with this type of the disease require a daily maintenance regime of insulin therapy for life (Australian Institute of Health and Welfare 2006[a] p.68). Because symptoms soon follow the onset of hyperglycaemia, any advantage gained from asymptomatic screening is negated (Senes & Britt 2001 p.26; Singer et.al. 1990 p.359-360).

Gestational diabetes mellitus (GDM) occurs in 6-9% of women during pregnancy, with typical onset during the third trimester as a result of an altered hormonal environment (Senes & Britt 2001 p.32; Singer et.al. 1990 p.350). Its estimated incidence is as high as 20% amongst indigenous women (Senes & Britt 2001 p.32). Significantly 4-6 % of women with gestational diabetes have had no diagnosis of diabetes mellitus prior to pregnancy (Australian Health Ministers Conference 1999 p.3; Australian Institute of Health and Welfare 2000 p.85).

Non-insulin dependent diabetes mellitus (NIDDM or type II) accounts for 83% of diagnosed cases in Australia. This is consistent with evidence from across other OECD states (Australian Institute of Health and Welfare 2006[a] p.70; Jacobzone, Jee-Hughes & Moise 1999 pp.16; Senes & Britt 2001 p.29).

Persons at risk of type II diabetes mellitus may remain asymptomatic for years despite the clinical presence of hyperglycaemia. Cost-effectiveness studies support early detection of hyperglycaemia and associated glycosylated haemoglobin (HbA1c) levels, so that intensive glycaemic control may reduce the prevalence of microvascular and macrovascular complications (New Zealand Guidelines Group 2003 p.26). A complementary reduction in blood lipids reduces the risk of coronary disease (Australian Institute Of Health & Welfare & Department of Health and Ageing 1998 pp.54-55; Jacobzone, Jee-Hughes & Moise 1999 pp.18-19; JBS 2 Working Party 2005 p.v2).

However, reflecting earlier recommendations arising from studies in both the United States and Canada, neither the National Health and Medical Research Council nor the Australian Diabetes Society currently supports systematic population-based screening for hyperglycaemia of asymptomatic adults. This is because there remains insufficient evidence to demonstrate that treatment commenced in the asymptomatic phase is any superior than that begun after symptoms lead to a diagnosis. Instead, opportunistic case detection by general practitioners targeting a range of high-risk population groupings remains the recommended strategy (Australian Centre for Diabetes Strategies 2001 p.128; Australian Institute Of Health & Welfare & Department of Health and Ageing 1998 p.55; Singer et.al. 1990 p.358).

The National Prevention and Community Medicine Committee guidelines (2002 p.31) for general practice are bolder. They recommend screening every three years for people aged 55 years and over, people aged 45 years and over with a first-degree relative who has a confirmed diagnosis of type II diabetes mellitus, Aboriginal Australians, Pacific Islanders, Chinese and people from the Indian sub-continent 35 years and over, women with a history of gestational diabetes and people with a body mass index (BMI) greater than 30. On the other hand, the Diabetes Australia guidelines development consortium is more cautious. It recommends further research is first necessary to evaluate the economic benefit of routinely screening these higher-risk groups (Australian Centre for Diabetes Strategies 2001 p.128).

There is broad consensus across guidelines that diagnostic screening should be performed using a fasting blood glucose sample, with a repeat test on a separate day (Australian Centre for Diabetes Strategies 2001 pp.128-129; National Preventive and Community Medicine Committee 2002 p.32; New Zealand Guidelines Group 2003 p.95). A diagnosis is established where the threshold of 7.0 mmol/l is exceeded. Measures between 5.5-6.9 mmol/l require further cross referencing with a oral glucose tolerance test (OGTT) performed according to the 1999 World Health Organisation (WHO) criteria (Australian Centre for Diabetes Strategies 2001 p.129; National Preventive and Community Medicine Committee 2002 p.32). If plasma glucose results are ≥ 11.1 mmol/l after two hours with the oral glucose tolerance test, a definitive diagnosis for type II diabetes mellitus is confirmed (Australian Institute Of Health & Welfare & Department of Health and Ageing 1998 p.56; Australian Centre for Diabetes Strategies 2001 p.129; JBS 2 Working Party 2005 p.v40).

5.2.5 A summary of general practice-referred diagnostic testing appropriate for population screening

Population screening of asymptomatic subjects is only recommended as an effective preventive strategy in a very limited number of disease states (Australian Health Technology Advisory Committee 2000 pp.3-6; National Health & Medical Research Council 1996 pp.xix-xx; Perkins et.al. 2003 p.1075). Specifically these include:

- Mammography screening for cancer of the female breast in women aged 50-69 every two years (National Preventive & Community Medicine Committee 2002 p.35; National Health and Medical Research Council 1996 p.106-107).
- Pap smears of the cervix in females aged 20-69 every two years (Australian Institute of Health and Welfare & Dept of Health and Ageing 2000 p.7; National Preventive & Community Medicine Committee 2002 p.34; National Health & Medical Research Council 1996 p.100).

- Faecal occult blood testing for cancer of the colorectum in adults aged 55-74 every two years (Australian Cancer Network 2005 p.41; Nogrady 2006 p.23).
- Cholesterol testing for dislipidaemia in men aged 45-64 with a low risk profile every five years (National Health & Community Medicine Committee 2002 p.22; National Health & Medical Research Council 1996 p.11; Woolf 1990[c] p.408).

Of these tests, it is only screening for cervical cancer and dislipidaemia in men aged 45-64 years that relies predominantly on general practice referral (Australian Institute of Health and Welfare 2006[a] p.336; National Health & Community Medicine Committee 2002 p.22; Woolf 1990[c] p.408). For this reason, it is these items that are the particular focus of this study.

5.3 Conclusion

Discretionary increases are necessary in the detection and monitoring of certain types of cancer, cardiovascular disease and diabetes mellitus, if national priority targets are to be met (Australian Institute of Health and Welfare 2006[a] p.74; Duckett 2000 pp.9-11; Swerrisen 2004 p.38). However, in most cases, a population-based approach using broad screening programs is not supported (Deeble & Lewis-Hughes 1991 p.59; National Health & Medical Research Council 1996 pp.14, 106-107; Woolf 1990[a] p.6).

Exceptions include screening for female breast cancer, cervical cancer, colorectal cancer, and dislipidaemia in middle-aged men (Australian Cancer Network 2005 p.41; Australian Institute of Health and Welfare & Dept of Health and Ageing 2000 p.7; Calltorp 1999 p.348; Gellert & Norton 2007 pp.13-14; Jacobzone, Jee-Hughes & Moise 1999 pp.29-30; Nogrady 2006 p.23; National Health and Medical Research Council 1996 p.11). The focus of this study is further narrowed down to cervical screening and cholesterol measures in men aged 45-64 years, because it is access to these particular tests that are initiated predominantly by general practice referral (Australian Institute of Health and Welfare 2006[a] p.336; National Health and Community Medicine Committee 2002 p.22; Woolf 1990[c] p.408).

The next chapter looks beyond the clinical evidence to examine what other factors critically influence general practice referral behaviour.

CHAPTER SIX - Factors that influence general practice referral behaviour

6.1 Introduction

The previous two chapters have described the patterns of general practice-referred diagnostic testing and highlighted where there is probable maldistribution compared with the available evidence base. However, the history of outcomes research in health care strongly indicates that evidence is necessary, though in itself insufficient, to justify let alone stimulate changes in clinical practice. A clinical intervention deemed a best bet on the weight of available evidence does not always equate with being a best buy. Proper execution of any service requires not only the knowledge of best practice, but also a supportive environment with incentives for providers to change (Clancy 2000 [a] p.1; Maynard 1993 pp.13-14).

This chapter explores the range of factors that influence general practice referral behaviour. An appreciation of these influences is critical in the design of any model which seeks to drive a redistribution of general practice-referred diagnostic testing.

6.2 Factors that influence general practice referral behaviour

6.2.1 Clinical indications

The BEACH studies have established a positive association between the rates of diagnostic referrals for new patients in general practice and the rate of problems described only in symptomatic terms (Britt, Miller & Knox 2001 p.46). This has intuitive logic, as initial presentations are more likely to have a degree of diagnostic uncertainty. It is also therefore not surprising that there is a strong relationship between general practice referral rates for pathology and medical imaging orders (Britt, Miller & Knox 2001 p.33).

Other significant predictors of higher medical imaging order rates include higher prevalence of musculoskeletal, urological and gynaecological problems. Musculoskeletal problems alone account for 40.4% of all imaging tests ordered. Plain x-rays of the chest, lumbo-sacral region, knee and ankle together account for 26.3% of all imaging orders. Computerised tomography scans of the head and brain account for a further 3.1% (Britt, Miller & Knox 2001 p.41). Together with digestive, respiratory and gynaecological matters, these presentations account for 70% of total imaging tests ordered (Britt, Miller & Knox 2001 pp.42-43).

The strongest predictors of pathology test ordering in general practice are the rates of problems related to blood and blood-forming organs, plus that related to the endocrine and metabolic systems (e.g. diabetes mellitus and dislipidaemia) (Britt, Knox & Miller 2003 p.60). Other clinical predictors include positive associations with high rates of management for circulatory disease, urinary disorders, plus pregnancy and family planning.

6.2.2 Non-clinical characteristics

6.2.2.1 Patient non-clinical characteristics

One non-clinical predictor of high pathology ordering rates is higher proportions of patients in the 15-64 years age group (Britt, Knox & Miller 2003 p.29). Conversely, there is an inverse relationship between imaging order rates and particular non-clinical patient characteristics. These included the percentage of the caseload that holds health care cards and the percentage of the caseload aged 25-44 years adjusted for morbidity patterns (Britt, Miller & Knox 2001 pp.111-112).

6.2.2.2 Referrer characteristics

Order rates for both medical imaging and pathology are higher if the general practitioner is female, practising in a small rural area or a member of a large group practice (defined as between eleven to fifteen general practitioners) (Britt, Miller & Knox 2001 pp.27-29). Other referrer-related predictors of high pathology ordering rates included general practitioners aged 45-54 years and higher rates of long consultations (Britt, Knox & Miller 2003 p.29).

6.2.2.3 Third party levers

The literature identifies a range of strategies and structures which are applied by third parties external to the patient-doctor consultation. These interventions deliberately set out to influence general practice referral behaviour (Greco & Eisenberg 1993 pp.1271-1272; Harvey 1991 pp.93-94; Scott 2007 p.33). The evidence on these interventions is discussed in the next section.

6.3 Evidence on third-party levers that aim to influence general practice referral behaviour

Third party interventions which deliberately seek to influence general practice referral behaviour encompass a range of strategies and structures. These can be broadly grouped as administrative, clinical governance or financial levers. Though the following sections give a separate description of each, clearly in practice some interventions are complementary.

6.3.1 Administrative levers

6.3.1.1 Regulation and sanctions

Administrative programs to readdress practice can be effective, particularly if reinforced with legislative and regulatory directions. However, this typically requires a policing and/or auditing regime, which must be maintained indefinitely at a recurrent cost. Also, by their nature, bureaucratic processes tend to lack flexibility and discretion. This will tend to ignore the risk of adverse outcomes for outlier cases which may be created by strict adherence to a generalised process (Greco & Eisenberg 1993 p.1273).

Since 1999, agreements on quality and outlays between the Australian Government and the relevant specialist colleges have set nominal price-volume caps for general practice, medical imaging and pathology (Duckett 2000 p.202; Podger & Hagan 1999 p.21; Woodley 2001 p.40). In essence, these agreements attempted to cap two-thirds of all Medicare expenditure (Power & Aloizis 2000 p.163). However, in reality, the restraint is relatively soft. This is because the agreements still incorporate an average growth rate of 5% per annum (Ross et.al. 1999 p.52).

The difficulty with this approach is that it fails to discriminate between diagnostic procedures where over-utilisation is apparent and those where uptake is compatible with available clinical guidelines. It also does not discern those diagnostic procedures where, according to national policy, increased utilisation is a desired outcome.

The risk is a loss of clinical quality with indiscriminate reductions and a contradiction of national policy objectives. Broad financial constraints combined with logistical barriers temper distribution and pose a risk to equitable access (Deeble & Lewis-Hughes 1991 p.55; Woolf 1990[a] p.8). In the absence of mechanisms to reward the discretionary supply of extra services to target populations where clinically warranted, access barriers will be further exaggerated.

In reality a range of institutional, informational, transactional and political constraints may compete with the objectives of a particular regulation. The net result is that incentive manipulation or management is required to support the regulatory framework (Deeble & Lewis-Hughes 1991 p.55). From a government perspective this typically takes the form of tax subsidies, low interest loans and/or profit-share guarantees (McPake et.al. 2002 pp.171-172).

6.3.1.2 Vertical integration of services

Corporatisation of general practice within vertically integrated entities seeks to influence contracted general practitioners' gate keeping referral practises for diagnostic services (Scott 2000 p.1191). This is confirmed in the BEACH studies, which indicate significantly higher rates of medical imaging orders where there is co-ownership of imaging facilities and general practices (Britt, Miller & Knox 2001 p.112).

6.3.1.3 Managed care

The rapid expansion of the managed care model in the United States since 1993 has reduced utilisation of services, including referrals for diagnostic tests (Altman & Wallack 1996 p.26; Duckett 1997 p.35). There is some evidence to indicate that managed care has also curtailed the incomes of both primary care and specialist physicians. Nevertheless, the imperative to cut costs in order to keep premiums competitive creates a threat to service quality in an environment of consumer information asymmetry. This has prompted increased regulatory control of plans and practices to ensure maintenance of standards and reasonable access to necessary services (Duckett 1997 p.35; Martin 2003 p.7; Rice 1998 p124).

Duckett (2000 p.238) argues that a broad, publicly-funded implementation of managed care with mandatory enrolment is unlikely to be politically palatable in Australia. This is because it risks limiting citizens' current entitlement to choose their own general practitioner at will.

6.3.1.4 Intermediary primary care organisations

Canada, New Zealand, United Kingdom and the United Sates all provide examples where the responsibility for general practice funding and program governance has been delegated by government to meso-level primary care organisations (Naccarella et.al 2007 p.42). In a recent analysis of pay-for-performance in Australian general practice Scott et.al (2008 p.21) argues that support from regional administrative infrastructure is now critical to the successful implementation of the increasingly complex blended remuneration systems operating in Australian general practice.

Accepting the argument that the coordinated administration of primary care services is best served by meso-level intermediaries delegated with regional responsibilities, the factors that define how such an entity functions should be considered. These include universality of coverage, competition, profit status and acceptability to both general practice and the government.

6.3.1.4.1 Universality

A key issue in a regional funding model is the level of service coverage the organisation is able to provide, which in turn is largely determined by the participation level of general practice within its designated catchment. Given its population-health intent, any model that seeks to redistribute general practice-referred Medicare rebates assumes an environment of universal coverage for the eligible population. Taken to its logical conclusion, this approach requires the Australian Government to mandate general practice participation in any such model.

Drawing on the United Kingdom example, membership of a primary care group is now mandated, to ensure that funded services apply to all patients within the intermediary catchment, rather than just to those registered with participating practices (Wilkin 2002 p.542). In the United Kingdom, general practices are assigned to a group, without discretion to choose or change. Alternatively, general practices in New Zealand can join the Primary Health Organisation (PHO) of their choice (Bindman, Weiner & Majeed 2001 pp.133-134; McDonald et.al. 2007 p.49).

In the United Kingdom, group boundaries are mutually exclusive and match that of the local health authority. The providers then share a collective responsibility to service their catchment population (Bindman, Weiner & Majeed 2001 pp.133-134). In New Zealand, multiple PHOs may overlap catchments. However, Ashton (2005 p.382) argues that this is an impediment to developing coordinated population health initiatives.

6.3.1.4.2 Competition

The Australian Government may consider opening the role of intermediaries to competition. In this case, a variety of existing entities may tender for a limited number of licenses. This will give rise to a variety of different style intermediaries operating in parallel within the market. Intermediaries may include some Divisions of General Practice, consortia of practices independent of their Division, state health services, corporate entities, and possibly hybrids of each. In reality, such a diverse range of intermediaries would most likely increase transaction costs, and reduce the model's efficiency.

How a corporate entity that vertically integrates general practice with diagnostic services operates would operate as an intermediary is worth consideration (AAPP 2000 p.10). The vertically-integrated corporate is motivated to capture its market. Depending on the dynamics of that market, it can be expected that a profit-maximising corporate will pursue the point of optimal technical efficiency in a range on their production curve that captures either the incentives for their contracted general practices, diagnostic services, or both. This option has two implications for the Australian Government. First, optimisation of the public health objectives may not necessarily be the intermediaries' main priority. Second, it must be accepted that intermediaries may operate as for-profit entities.

6.3.1.4.3 Profit status

The implication of for-profit entities operating as intermediaries draws on the discussion by Marriott & Mable (1998 p.650) regarding favourable returns in provider-led distribution models. In a for-profit environment, the direct incentive for general practice members is to participate so that any favourable return is periodically re-distributed back to the associates as a taxable dividend.

Alternatively, the Australian government could mandate that intermediaries must operate in a not-for-profit environment. Favourable returns would then have to be invested into upgrading practice infrastructure, employing skilled personnel, supporting services, plus delivering continuing education and other quality initiatives (Doran et.al. 2006 p.376; Nicholson et.al. 2008 p.439; Rosenthal et.al. 2005 p.1793).

6.3.1.4.4 Acceptability

Whilst a critical mass is administratively necessary, it is equally important that intermediaries demonstrate a level of flexibility and regional responsiveness. Podger (2006 p.139) argues that most Australian state-level bureaucracies are probably not capable of achieve this.

Following the Australian Government's 2005 introduction of the National Performance Framework for Divisions of General Practice, Naccarella et.al (2007 p.42) argues that the Divisions' network should be the government's vehicle for implementing primary care strategies. Certainly, the Divisions' network is widely recognised as the nearest approximation of organised general practice to date in Australia (Australian Divisions of General Practice 2005; McDonald et.al. 2007 p.49; Primary Health Care Research and Information Service 2006; Smith & Sibthorpe 2007 p.2). This is discussed further in Section 6.4.

6.3.2 Clinical governance levers

6.3.2.1 Practice guidelines

In many cases, clinical protocols are presented as voluntary guidelines, rather than regulatory standards (GP Strategy Review Group 1998 p.216; Ross et.al. 1999 p.30). It is uncommon in the OECD (France being a notable exception) for penalties to apply where providers are non-compliant with set protocols (Ross et.al. 1999 p.30).

There is little evidence, stand alone, that supports the dissemination of guidelines as an effective strategy for changing clinical practice behaviour (Grol & Wensing 2004 S.57; Harvey 1991 pp.94-95). Numerous reasons are speculated in the literature for this.

Practice guidelines attempt to improve the quality of care and often also consider cost effectiveness. However, where the thrust of guidelines are contradictory to the financial incentives within the providers' prevailing payment method, they must be reinforced by another mechanism (e.g. credentialing, utilisation audits) to show an effect. Such methods then invariably confront two problems. One is administrative cost and the other is provider resistance to third-party intervention into their clinical practice (Robinson 2001 pp.166-167; Ube et.al. 2003 p.1735).

Clinicians' appreciation of cost-effectiveness is not necessarily a primary driver of their practice behaviour (some will even argue that it is unethical) (Deeble & Lewis-Hughes 1991 p.60; Hall 2006 p.12). For example, in a United States survey of 900 primary care physicians, Ube et.al (2003 pp.1734-1735) found that the influence of providing cost-effectiveness information on screening recommendations for cervical, colon and breast cancer was weaker than expected. Familiarity with a particular test was a much stronger predictor of its application than its relative cost or efficacy.

Nadel et.al (2005 p.93) also argues that guidelines, in the absence of a supportive education program, will not achieve consistency in clinical practice behaviour. Inconsistency in clinical practice behaviour also follows when there is a lack of clarity and variation between sets of recognised guidelines. This is compounded when guidelines do not necessarily correlate with other, more readily available, information at hand through the medical press. In such circumstances, reports of both general practitioner recall and application of guidelines is low (Sladden & Ward 1999 p.112-113). In addition, providers do not necessarily trust the judgement of expert panels, with some evidence indicating that they are more likely to be influenced by the opinions of their peers (Girgis, Ward & Thomson 1999 pp.364-365; GP Strategy Review Group 1998 pp.216-217; Greco & Eisenberg 1993 p.1272; McNeil & O'Brien 1999 p.345).

Guideline dissemination is more successful in changing practice behaviour when it is accompanied with individual or small-group education (so-called academic detailing) and demonstrations of data that benchmark individual practitioner's performance against the guidelines (Greco & Eisenberg 1993 p.1272; Harvey 1991 p.95). However, this is a resource-consuming and laborious process that requires a committed investment to be implemented and sustained (Greco & Eisenberg 1993 p.1272). Also, there is limited evidence to show that tailoring such interventions to be sensitive to particular providers' organisational, economic, political and social contexts is any more effective than routinely disseminating the guidelines (Grol & Wensing 2004 SS.58-59).

It is impractical to expect guidelines to cover all aspects and so they are generally limited to the most common applications (Deeble & Lewis-Hughes 1991 p.58). The current absence of specific exclusion criteria by diagnosis within guidelines for general practice-referred diagnostic testing is a fundamental difficulty (Britt, Miller & Knox 2001 p.114; Harvey, Clark & Visser 2003 p.34). This is because the prevalence of a clinically significant finding will be lower amongst undifferentiated general practice presentations than in acute or emergency care, hence the predictive value of tests is reduced (Deeble & Lewis-Hughes 1991 p.53; Starfield 1998 pp.32-33).

In emphasising the limitations of evidence and its application within undifferentiated settings such as general practice, the GP Strategy Review Group (1998 p.218) rejected a prescriptive approach to further development and implementation. Instead a framework of education, information dissemination, auditing, monitoring and financial incentives to drive the uptake of clinical guidelines is recommended. Furthermore, it emphasised that the use of financial incentives should be judicious, whilst no penalties should apply where there is deviation from the guidelines (GP Strategy Review Group 1998 pp.218-219).

6.3.2.2 Auditing, education and feedback

Deeble & Lewis-Hughes (1991 p.56) argues that a clinician's ordering habits originate in their medical training, with their experience from terms in teaching hospitals proving most persuasive. The argument follows that, in such an environment where testing is readily available, the emphasis may be sometimes more on diagnostic accuracy than clinical need.

Some evidence indicates that subsequent education, feedback, checklists and reminders are effective in altering practice and increasing compliance with guidelines, though it varies (Deeble & Lewis-Hughes 1991 p.57; Greco & Eisenberg 1993 p.1272; Margolis et.al. 1998 p.515). Some studies demonstrate that prospective reminders that can be immediately acted on at the time of a consult are more effective than retrospective summaries (Greco & Eisenberg 1993 p.1272). The impact of feedback also tends to wane over time with subsequent messages. Typically, providers tend to drift back to prior practice patterns even in the presence of continued feedback (Deeble & Lewis-Hughes 1991 p.59; Ross et.al. 1999 p.31).

Applying a combination of medical education, implementation of a test ordering protocol plus feedback and auditing processes within an Australian metropolitan emergency department setting, Stuart, Crooks & Porton (2002 pp.131-132) demonstrated a significant 40% reduction in test ordering over an six-month intervention period. The decrease was sustained over an 18-month post-intervention period.

Measured decreases in the Stuart, Crooks & Porton (2002 p.133) study were similar for both medical imaging and pathology tests. The largest declines in ordering occurred in microbiology, computer tomography and ultrasound orders. The study also demonstrated 19% reductions in the most common investigations, such as full blood counts and plain film chest x-rays. No measured adverse patient outcomes were subsequently attributed to the intervention. However, the study did not specifically assess for the impact on cases where there was possible under-investigation (Stuart, Crooks & Porton 2002 pp.133-134).

Thomas et.al (2006 p.1993) demonstrated that the application of quarterly feedback on clinical data in a cohort of 22 Scottish general practices reduced pathology ordering of nine targeted tests by 10% compared with controls within a one year period. A similar effect was demonstrated with brief education reminder messages in a parallel cohort of 22 practices. In combination, the two interventions produced a reduction of more than 20% in a further cohort of 21 practices.

These results are similar to findings from earlier Australian, Dutch and United States research reported by Deeble & Lewis-Hughes (1991 p.75). In these studies reductions of 25-33% were reported in different settings following the introduction of education supported by feedback, peer counselling and administrative review. Thomas et.al (2006 p.1995) note, however, that not all studies demonstrate a significant positive effect with the use of feedback. This study suggested that results were probably dependent on the enhancement of feedback with brief education messages and the frequency of the input. Questions remain whether the effect is sustainable after feedback and messages cease.

6.3.3 Financial levers

6.3.3.1 Fund holding

Examples of general practice fund holding come from both New Zealand and the United Kingdom (Cumming & Mays 1999 pp.9-10; Gribben & Coster 1999 pp.122-124; Malcolm 1997 p.1891; Starfield 1998 p.56). The United Kingdom's National Health Service initially viewed general practice fund holding as a mechanism to reduce cost through shifting the volume risk to the gate keeper, who in turn may retain any efficiency savings for practice upgrades. The argument was that profit sharing incentives are readily tracked and should only generate relatively low transaction costs compared with regulation (McPake et.al 2002 pp.174-175).

However some evidence from the United Kingdom indicates that this is only the case if fund holder pre-payments are appropriately specified in terms of price, volume and quality. If payments take the form of block contracts, with little adjustment for casemix or best practice, management allowances plus the transaction costs of contracting will exceed total efficiency savings (Coote & Hunter 1996 p.45; Duckett 2000 p.235).

The United Kingdom's initial experience of voluntary fund holding within the quasi-market environment created an inequitable two-tiered service. This is because referral sources, in the competitive pursuit of income, responded more to purchasing power than social need. It was questionable whether the realised benefits came at the expense of patients not registered with general practice fund holding practices (Calnan & Gabe 2001 pp.121-122; Marriott & Mable 1998 p.567). For this reason, the Blair Labor government commissioned compulsory fund holding primary care groups (PCG) to provide universal coverage of specified populations (Calnan & Gabe 2001 p.127; Decter 2000 pp.84-85; Mullen 1998 p.10).

The Australian Medical Association (AMA) broadly opposes the introduction of fund holding at the individual general practice level. It labels the inherent shift of accountability for public expenditure to the individual provider as an ethical hazard. It points to a paradigm shift in duty of care from the profession’s traditional emphasis on the individual patient encounter to that of a population. With it, it is argued, will come explicit rationing, perverse incentives for cream skimming, higher transaction costs, loss of the universality that underpins Medicare (Aust.), plus limitations to both patients’ choice and access (AMA Federal Council 2004 pp.1-2).

6.3.3.2 Pay-for-performance incentives

Pay-for-performance models are a systematic manipulation of fee-for-service, typically overlayed on existing remuneration schemes to create more complex blended payments (Nicholson et.al. 2008 p.438; Scott et.al. 2008 p.1). Such models attempt to shift the mode of reimbursement from rewarding volume output to rewarding performance according to specified measures and targets (Ashworth & Jones 2008 p.60; Curtin et.al. 2006 p.365; Naccarella et.al. 2007 p.42; Scott 2007 p.31).

The concept draws on the principles of agency theory, where the principal (in this case, a third-party payer, such as an insurer) uses tangible rewards to induce a particular behaviour from the agent. To be effective, the rewards must be equal to or better than the compensation the agent is capable of obtaining in other settings. However, to be efficient, the principal must also try and achieve this at minimal cost (Robinson 2001 pp.150-151). To overcome their inherent risk of information asymmetry with the agent, principals are reliant on timely, comprehensive and accurate systems of data collection and analysis (Nicholson et.al. 2008 p.451).

An incentive system which is both efficient and equitable is one that redistributes existing funding from services categorised as low value and overused to those categorised as high value and underused (Eddy 1994[b] p.817; Rodwin 2004 p. 1328; Starfield 1998 p.406; Van Weel & Del Mar 2004 p.99). One option is to use a relative eligibility threshold for incentive payments, which rewards providers for improvements over a pre-determined threshold (Scott 2007 p.34). However, for those whom this threshold is infeasible, there is only a weak incentive to improve performance. For those whose activity is already over the threshold, there is no incentive to improve because they are essentially rewarded for maintaining the status quo.

An alternative is to pay providers for the rate of improvement. However this approach fails to appropriately reward the best performers, who have relatively small margins to improve further because of ceiling effects (Rosenthal et.al. 2005 p.1792). Instead, Scott (2007 p.35) argues that a pragmatic solution is to reward all high-quality care delivered above an agreed baseline, rather than limit it only to those who attain a pre-defined target threshold.

Using financial incentives to manipulate medical practice may challenge a provider's agency role with self interest, when making clinical decisions (Doran et.al. 2006 p.382; Robinson 2004, p.1328; Scott et.al. 2008 pp.1-2). This can be mitigated by rewarding results with practice infrastructure grants and equipment upgrades, rather than directing payments to individual providers (Naccarella et.al. 2007 p.42).

In many cases, pay-for-performance models reward care-process measures, rather than recognisable health outcomes (Kindig 2006 p.2611; Nicholson et.al. 2008 p.437; Scott 2007 p.34). An early example is the United Kingdom's 1990 introduction of general practice performance targets for cervical screening and childhood immunisation (Ashworth & Jones 2008 p.60; Doran et.al. 2006 p.376). The advantage of care process measures is that they are more readily collected in a timely manner and can be more directly controlled by providers' input (Kindig 2006 p.2612; Scott 2007 p.34). The risk is that, contrary to expectations, positive changes in process measures does not translate into improvements in interim clinical impact targets (e.g. hypertension, hyperlipidaemia thresholds, HbA1c measures) or health status outcomes (Nicholson et.al. 2008 p.439; Veale et.al 2002 pp.1-2).

Health outcome measures are more affected by confounders unrelated to the quality of the health care delivered (Kindig 2006 p.2612; Scott 2007 p.34). Attribution is the foremost confounder to paying for clinical outcomes. This is because in many cases there is a lag time of numerous years between the target intervention and the health benefits that may accrue to the patient. By this time, it is likely that their care has been dispersed across a range of general practitioners (Pham et.al. 2007 p.1134).

As already noted in Chapter Three, the Australian Government has progressively introduced a series of small–scale pay-for-performance incentives to general practice over the last decade (Powell Davies et.al. 2006 pp.7-8; Scott et.al. 2008 p.1). At one level, Practice Incentive Payments (PIP) target funds to accredited practices for quality improvements in areas such as student supervision, computerisation, set up of recall-reminder systems and the delivery of practice nursing and after-hours services (Hordacre et.al. 2006 p.6; Naccarella et.al. 2007 p.42; Woodley 2001 p.41). At another level, Service Incentive Payments (SIP), Enhanced Primary Care (EPC) and Home Medication Review (HMR) items aim to reward individual providers for specific clinical outputs. These include immunisation and cervical screening rates plus chronic disease management processes in aboriginal health, aged care, asthma, diabetes and mental illness (GP Strategy Review Group 1998 pp.235-236; Health Insurance Commission 2002 [c] pp.1-2; Health Insurance Commission 2002 [d] pp.1-2; Hordacre et.al. 2006 p.6; Podger & Hagan 1999 p.20; Powell Davies et.al. 2006 p. 6; Woodley 2001 p.41).

In an environment of imperfect information, the rationale for keeping incentive payments small is that it contains the risk to both the funder and the provider. Conversely, if incentives are too small they will not measurably change clinical practice (Nicholson et.al. 2008 p.446). There is some evidence to indicate that this has been one limitation to uptake of the PIP incentives, given its relative complexity and administrative burden (Scott et.al. 2008 p.22).

Arguably the most comprehensive pay-for-performance program to date is the United Kingdom's 2004 introduction of its Quality and Outcomes Framework (QOF) contracts for general practice (Scott 2007 p.31). The QOF currently encompasses 128 performance indicators, across a range of 80 clinical and 48 practice management domains. It includes measures of process (e.g. testing rates), intermediary impact (e.g. reducing cholesterol levels) and health outcomes (reduced morbidity levels). Payments are in addition to the core funding that practices receive from their primary care trust (Ashworth & Jones 2008 p.60; Doran et.al. 2006 p.376). Achievement of this raft of indicators is now tied directly to 25% of general practitioners' income (Ashworth & Jones 2008 p. 61; Doran et.al. 2006 p.376; Scott 2007 p.31).

Within one year of commencing, the practices attained 83.4% of the quality targets for eligible patients within their QOF contracts (Doran et.al. 2006 p.379; Scott 2007 p.32). This equated to a median 95.5% of the points available for funding (Ashworth & Jones 2008 p.61; Scott 2007 p.32). The QOF has since been criticised for setting some targets too low (e.g. below that indicated in clinical guidelines), not controlling adequately for gaming of data and paying, in some cases, for indicators that lacked a robust evidence base (Ashworth & Jones 2008 p.61; Doran et.al. 2006 p.381). Nevertheless, the results do indicate that well-rewarded pay-for-performance will change practice behaviour almost immediately (Doran et.al. 2006 p.382). What it does not answer is the question of whether the assumed health benefits that should follow are a sufficient return for the scale of investment (Curtin et.al. 2006 p.367).

One United States study of a managed care pay-for-performance program targeting chronic disease measures did demonstrate a positive return on investment after two years of 2.5:1.0 (Curtin et.al. 2006 p.373). It is noteworthy that the fund holder was a not-for-profit health maintenance organisation which remunerated a contracted independent provider organisation with annual incentives, through the existing pool of funds, using a 10% withhold of payment claims (Curtin et.al. 2006 p.367). The incentive payments were also topped by an agreed percentage share of savings accrued by the health maintenance organisation, from the program (Curtin 2006 p.368).

6.3.4 Summary of third-party strategies and structures that can be used to change general practice referral behaviour

Third party interventions which seek to influence general practice referral behaviour can be broadly grouped as administrative, clinical governance or financial levers. The evidence indicates that each is capable of influencing referral practices, depending upon the context. However, all the strategies and structures have either limitations or potential unintended consequences which need to be managed.

It is most likely that any model which seeks to sustain evidence-based redistribution of general practice-referred diagnostic testing in Australia will need to consider a combination of complementary levers.

6.4 The potential role for the Divisions of General Practice network

Following the line of argument in Section 6.3.1.4 above, the Australian Government will be best served by engaging an appropriate network of regional intermediaries if it wishes to effectively drive redistribution of its expenditure on general practice-referred diagnostic testing. On balance, the current Divisions of General Practice network is most likely the group with the potential to deliver such a reform.

Divisions of General Practice are not-for-profit organisations that represent geographically-defined networks of general practices. Though membership is voluntary, approximately 95% of general practitioners across Australia are already registered as a member of a Division (Hordacre et.al. 2006 p.6; McDonald et.al. 2007 p.50; Review Panel 2003 p.94; Smith & Sibthorpe 2007 p.5).

The Australian Government first seeded Divisions of General Practice in 1992-1993 with project grants, as one part of its broad–reaching General Practice Strategy (Hordacre et.al. 2006 p.6; Power & Aloizis 2000 p.161; Review Panel 2003 pp.97-98). This subsequently moved to block–grant funding (Outcome-Based Funding) in 1999 (Hordacre et.al. 2006 p.112; Review Panel 2003 p.100). Outcome-Based Funding grants broadly contract activities across the network, targeting population health initiatives, direct patient care plus general practice workforce support and infrastructure (Review Panel 2003 p.39; Rudd & Steed 2000 p.209). To date, the Australian

Government remains the most significant funding source for the Divisions' network (Review Panel 2003 p.102).

Consistent with the recommendations of the GP Strategy Review Group (1998 p.75), all Divisions of General Practice have established some programs or activities focused on prevention and early intervention (e.g. childhood immunisation, diabetes mellitus) (Hordacre et.al. 2006 p.38; Review Panel 2003 p.18). Scott et.al (2008 p.21) analysed the uptake of financial incentives (PIP and SIP) by Australian general practice in treating diabetes mellitus, as a proxy indicator of quality improvement in care. The analysis concluded that the support and activities of practices' local Division of General Practice was a major determinant in whether or not there was uptake of the incentives.

Most Divisions also systematically support with dissemination of evidence-based guidelines, continuing education programs plus chronic disease management registers for patient recall and clinical audit feedback (Georgiou et.al. 2006 p.77-78).

Rural Divisions already have some limited experience with fund holding through the More Allied Health Services (MAHS) program, where they are engaged by the Australian Government to purchase or provide specified allied health services according to identified local needs (Review Panel 2003 p.78). The Australian Government has also recognised, in the past, the potential capacity for Divisions to fund hold for specific "downstream" services, such as pathology and medical imaging (Population Health Division 1998 p.43).

Nevertheless, there are several limitations to using the current Divisions' network as intermediaries. First, membership is voluntary and the Divisions do not have the authority to directly commission services from general practice on behalf of their nominated service catchments (McDonald et.al. 2007 p.52). Second, there is little, if any, alignment between Division boundaries and that of state and territory health regions. This is seen by the Australian Government as a structural impediment to collaborative planning and service integration (Abbott 2004 p. 35-36; Review Panel 2003 p.56).

6.5 Conclusion

A range of factors influence general practice referral behaviour. Most obviously there are clinical drivers, not the least being diagnostic uncertainty with new, undifferentiated presentations (Britt, Miller & Knox 2001 p.46). However, evidence also indicates that referral rates are affected by characteristics of either the patient or their medical provider, unrelated to clinical indications (Britt, Knox & Miller 2003 p.29).

Furthermore, the literature identifies a range of strategies and structures which are applied by third parties external to the patient-doctor consultation. These interventions deliberately set out to influence general practice referral behaviour (Greco & Eisenberg 1993 pp.1271-1272; Harvey 1991 pp.93-94; Scott 2007 p.33). Such interventions can be broadly grouped as administrative, clinical governance or financial levers. The evidence indicates that each is capable of influencing referral practices, depending upon the context. However, in each case there are either limitations or potential unintended consequences which need to be managed. It is apparent that any redistribution model will need to consider a combination of complementary levers.

This chapter places a particular emphasis on building a redistribution model around an appropriate network of regional intermediaries (Naccarella et.al 2007 p.42; Scott et.al 2008 p.21). Whilst recognising its limitations, the current Divisions of General Practice network is nominated as the most likely group with the potential to deliver such a reform.

It is important to understand what the scope and scale of any required redistribution between over- and under-referred items is possible to achieve improved social benefit. Chapter Seven assesses this by streaming diagnostic items listed within the Medicare Benefits Schedule according to the available evidence in the literature. It then examines Medicare Benefit Schedule data for the financial year 2002/03 to establish a baseline evaluation of the distribution of general practice-referred diagnostic services and the public cost that this generates. These processes are key building blocks for the modelling in subsequent chapters.

CHAPTER SEVEN - A description and analysis of the baseline dataset: the distribution of general practice-referred diagnostic services Australia-wide in 2002/2003

7.1 Introduction

The first step in modelling a change in the distribution of general practice-referred diagnostic services is to evaluate the status quo and establish a set of baseline measures for comparison. In this case it is important to provide a description of services in terms of the volume and rate of delivery, the geographic distribution of services and the cost to Medicare Australia through benefits claimed by providers.

The key discretionary variables that influence measures of volume, cost and distribution of this activity are identified. These are applied by broadly streaming the diagnostic items listed within the Medicare Benefits Schedule. Item activity is compared with the available evidence and bundled into three streams. These are item bundles that are over-referred by general practitioners (Stream A), referred at appropriate levels (Stream B) or the under-referred, national health priority area items identified in Chapter Five (Stream C).

This baseline analysis establishes the aggregate mean unit values of diagnostic services in each stream delivered across geographic locations using Rural, Remote & Metropolitan Areas (RRMA) categories. Issues relating to equity of access for services are discussed (see Appendix 1 page 331 for a description of the RRMA classification system).

7.2 Streaming of general practice referral patterns for diagnostic testing relative to the available evidence

Drawing on the evidence presented in previous chapters, this study questions whether the current distribution of general practice referrals for diagnostic services produces an optimal effect. If not, it is important to understand what the scope and scale of any required redistribution may be to achieve improved social benefit.

This can be assessed by streaming diagnostic items listed within the Medicare Benefits Schedule according to the available evidence in the literature. The nominated criteria for streaming are simply whether the evidence indicates the items are:

- Over-referred (Stream A)
- Appropriately referred (Stream B)
- Or under-referred, with significance to national health priority areas (Stream C).

A limitation to this approach using existing data is that some pathology tests are grouped within the same Medicare Benefits Schedule item number (DoHA 2006 p.617). In cases where ideally tests within a grouped item number would be separated into different streams if more precise data were available, a conservative approach is to place the entire item within Stream B. This effectively reduces the sensitivity of the model to demonstrate change, where in reality redistribution may be warranted, but there is little choice due to current data limitations. However, this could be corrected over time.

The reliable determination of quantifiable thresholds, above or below which referrals can be considered appropriate to address necessary clinical care, is also problematic. This is not an issue unique to this study. Several authors flag that it is a problem confronting all models that seek to address inappropriate testing (Cummings & Mays 1999 p.16; Hammett & Harris 2002 p.124; Stuart, Crooks & Porton 2002 pp.134).

A pragmatic solution is adopted in this study. Presuming that the current evidence-base does not change, those items nominated in each stream will remain in that stream, regardless of any shifts in activity over time compared with the baseline. The implications of this approach, in terms of possible incentives and penalties, will become apparent in the modelling and results discussed in ensuing chapters.

7.2.1 Stream A

Stream A consists of those items identified in Chapter Four where the current levels of referral are higher than necessary based on the available evidence. It includes those tests that fail to demonstrate at least modest sensitivity and specificity for the targeted disease states. It also includes some areas of ambiguity for which the existing guidelines give little direction in general practice (Britt, Miller & Knox 2001 p.115).

Two important amendments are required however. In Chapter Four, full blood counts (FBC), erythrocyte sedimentation rates (ESR), electrolytes, urea and creatinine (EUC), plus liver function tests (LFT) were all indicated as possible target items. However, it is not possible with the available datasets to separately identify electrolytes, urea and creatinine (EUC) or liver function tests (LFT). This is because they are coded within the item range 66500-66515 which bundle together a broad group of chemical tests, including certain lipid studies for full cholesterol and triglycerides (DoHA 2006 p.617). Therefore, following the conservative approach outlined in Section 5.2, electrolytes, urea and creatinine (EUC) plus liver function tests (LFT) will be placed in Stream B.

7.2.2 Stream B

With the notable exception of those items categorised into Stream A, the majority of diagnostic referrals by general practice are consistent with available guidelines (Britt, Miller & Knox 2001 p.116). Stream B therefore constitutes a majority of the Medicare Benefits Schedule medical imaging and pathology items.

Stream B items include those tests that can be ordered by a general practitioner for which there is no indication to use it as population screening of asymptomatic patients. Current levels of utilisation are appropriate according to the available evidence in terms of addressing patients' symptoms and/or their clinical risk profiles. This includes follow up testing required for confirmation of diagnoses and monitoring of confirmed cases. For example, there is an absence of specific guidelines on screening for ovarian cancer. Until a better evidence-base is available, a conservative approach is recommended in the care of women at high risk, which includes at least annual measures of cancer marker CA 125 levels and transvaginal ultrasounds (Andreriesz & Quinn 2003 pp.655-656). Women are considered at high risk if they have strong family histories of breast, ovarian and/or colon cancer.

Stream B also includes those items where general practice has been encouraged by national health policy in certain areas to generate increased diagnostic activity. However the incentives only provide for opportunistic case detection, monitoring of high clinical risk or symptomatic assessments. Blood glucose, HbA1c and albumin excretion tests for the diagnosis and monitoring of diabetes mellitus are a case in point (Australian Centre for Diabetes Strategies 2001 p.128; Australian Institute of Health and Welfare & Department of Health and Ageing 1998 pp.54-55; Britt et.al. 2002 p.74; National Centre for Monitoring Diabetes 2002 pp.75, 84; National Preventive & Community Medicine Committee 2002 p.31; NSW Health 1996 p.14; NSW Health 1998 p.8; Senes & Britt 2001 p.26). Another example is dual-energy x-ray absorptiometry (DEXA) of the proximal hip and lumbar spine, which provides the most precise measures of bone mineral density. It is therefore the preferred diagnostic tool for osteoporosis (Sambrook et.al. 2002 S5-S6). Nonetheless, population screening using DEXA is not recommended, due to the cost of testing and the need only to intervene with therapy in patients at high risk (Sambrook et.al. 2002 p.S.6).

7.2.3 Stream C

Stream C is the very limited set of items highlighted in Chapter Five that are consistent with national health priorities and which the available evidence supports periodic screening of asymptomatic adults.

The first are those items that support the guidelines for Australia's current national cervical screening program (Australian Institute Of Health & Welfare 2002 p.325; Australian Institute of Health and Welfare & Dept of Health and Ageing 2000 p.7; Hilless & Healy 2001 p.50; National Health & Medical Research Council 1996 pp.99-100; National Preventive and Community Medicine Committee 2002 p.34).

The second are the items that support the recomendations for cholesterol screening of middle-aged men (National Health & Medical Research Council 1996 pp.10-11; National Preventive and Community Medicine Committee 2002 p.22). Lipid studies within the item range 66500-66515 however are excluded from Stream C because these same item numbers bundle together a broad group of chemical tests, such as electrolytes, urea and creatinine (EUC) plus liver function tests (LFT) (DoHA 2006 p.617).

Though the evidence also supports population screening for female breast cancer using mammography, it is not included in Stream C (Australian Institute of Health and Welfare 2006[a] p.334; Britt, Miller & Knox 2001 p.57; Hilless & Healy 2001 p.50; National Health & Medical Research Council 1996 p.106-107; Sayer et.al. 2000 p.35). This is because a medical practitioner's referral is not required to attend a BreastScreen Australia unit and none of the activity is recorded as claims through the Medicare Benefits Schedule (Australian Institute of Health and Welfare 2006[a] p.334; Britt, Miller & Knox 2001 pp. 57,110; Sayer et.al. 2000 p.35).

Once the population screening program for colorectal cancer using immunochemical faecal occult blood test is fully implemented it should also be carefully considered in relation to Stream C. Although the program activity will be recorded by Medicare Australia, it is not general practitioner-referred or generated (Australian Cancer

Network 2005 p.41; Nogrady 2006 pp.22-23). Therefore, in its current format, this program still lies outside the model's definition of Stream C activity.

7.2.4 A summary of the item streams

Table 2 classifies the medical imaging and pathology Medicare Benefits Schedule items into the nominated streams, based on the evidence presented in this chapter. Magnetic resonance imaging items are excluded from this process because they are beyond the scope of this study (Britt et.al. 2004 p.87).

Table 2: Medicare Benefits Schedule medical imaging and pathology items grouped according to the nominated Streams

Please see print copy for Table 2

Continued.........
See print copy for Table 2

** Males 45-64 yrs only* *** Females aged 20-70 yrs only*

Ref: AIHW & DoHA 1998 p.55; AIHW & DoHA 1999 p.14; AIHW 2000 p.85; Britt, Miller, Knox 2001 pp.106-107;115-117; Britt et.al. 2007 pp.28-29; Commonwealth of Australia 1998 p.12; DoHA 2006; NH&MRC 1996 p.107

7.3 Baseline data description

7.3.1 A description of general practitioner-referred diagnostic services with identification of key discretionary variables

The full dataset of Medicare Benefit Schedule medical imaging (Category 5 - excluding Group I5) and pathology (Category 6) items for the financial year 2002/03 are analysed in this study. There are two related data sets. One is the distribution of general practitioner-referred diagnostic services delivered Australia-wide in the financial year. The other is the benefits claimed for these referrals from Medicare Australia by diagnostic providers. Analysis of these data sets provides a baseline for comparison with results of modelling in the ensuing chapters.

There are a total of 372 items listed within the Medicare Benefit Schedule for medical imaging (Category 5 - excluding Group I5) and a further 312 items for pathology (Category 6).

An application was made to Medicare Australia seeking data at the level of postcodes and Divisions of General Practice for this analysis. Medicare Australia refused this request on the basis of concerns for the commercial confidence of individual diagnostic providers. Instead Medicare Australia provided de-identified data categorised according to the substantive Rural, Remote & Metropolitan Areas (RRMA) classification of the referring general practitioner's representative Division of General Practice.

The seven RRMA classes were chosen to describe the geographic breakdown of distribution because of their widespread application by numerous Australian Government programs. This includes the triennial outcomes-based funding contracts with the Division of General Practice network (Department of Health and Ageing 2005 pp.3-4). The use of the RRMA system is also consistent in part with the Bettering the Evaluation and Care Of Health (BEACH) studies ongoing analysis of Australian general practice (Britt, Miller, Knox and Valenti 2001 p.45).

Table 3 on page 145 summarises these data. It describes the volume of diagnostic services delivered on referral by a general practitioner in the financial year 2002/2003. It separates the data by stream and by RRMA classification of the referring general practitioner's Division of General Practice (Medicare Australia 2008 [a]; Medicare Australia 2008 [b]). Table 4 describes the benefits claimed from Medicare Australia for these services. Again the data are separated using the same variables as in Table 3.

It is worth noting that the geographic location of the referring general practitioner does not always correlate with that of the diagnostic provider who undertakes and reports on the diagnostic testing. In the case of pathology testing in particular, it is not always possible to even identify where the test has been performed. Services are attributed to the pathologist who reports on the test findings, who may be physically remote from the laboratory where it is performed. In turn, the laboratory may be remote from the collection centre, neither of which may be located with the service's offices where billings are typically centralised (Deeble & Lewis-Hughes 1991 pp.40-41).

The data sets produced by Medicare Australia reflect the date of processing, not the date of service. This is because Medicare Australia has a standard procedure of allowing a three to four month lag between when a service is delivered and when the item data are processed. This allows time for patients to claim reimbursement where the provider has not bulk-billed. This potentially creates an artefact in measured utilisation patterns (Wilkinson et.al. 2002 p.2).

However, the time horizon of data collection does not extend over more than one year. Accordingly, the benefit claims should not require discounting (Donaldson & Shackley 1997 pp.856-857; Drummond & Jefferson 1996 p.11). Residual claims from the previous year will be offset by unlodged claims in the next year.

Table 3: General practice-referred medical imaging and pathology 2002/03 activity by Stream, point of delivery and RRMA classification

Please see print copy for T

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Table 4: Benefits claimed for general practice-referred medical imaging and pathology 2002/03 activity by Stream, point of delivery and RRMA classification

Please see print copy for Table

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 1 shows services delivered and benefits claimed by the nominated streams. The predominance of items that are appropriately-referred (Stream B) is highlighted. Stream B item activity outnumbers over-referred items (Stream A) by a factor of four, and under-referred items (Stream C) by a factor of twenty-three. Total benefits claimed for Stream B items outstrip Stream A by a factor of three-and-half and Stream C by a factor of forty-four.

Figure 1: ***Distribution of total general practitioner-referred diagnostic services delivered and benefits claimed in 2002/03 by Stream***

Please see print copy for Figure 1

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 2 and Figure 3 on page 147 provide the percentage distribution of both the services delivered and the benefits claimed from Medicare Australia. Again the percentages represent distribution according to the model's streams. As already highlighted, Stream B items account for the majority of both services delivered (77.7%) and benefits claimed (74.6%). Stream A items account for 19.0% of services delivered and 23.7% of the benefits claimed. Stream C items account for 2.7% of the services delivered, but only 1.7% of the benefits claimed.

Figure 2: ***Percentage distribution total general practitioner-referred diagnostic services delivered in 2002/03 by Stream***

Please see print copy for Figure 2

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 3: ***Percentage distribution of total benefits claimed for general practitioner-referred diagnostic services delivered in 2002/03 by Stream***

Please see print copy for Figure 3

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 4 and Figure 5 present the same information, this time with medical imaging and pathology referrals separated as a percentage of the total volume and total cost.

Appropriately-referred pathology items (Stream B Category 6) constitute the majority of services delivered (69.7%). However, they only account for a relatively modest 46.1% of the benefits claimed. Appropriately-referred medical imaging items (Stream B Category 5) constitute only 8.0% of services delivered, yet they account for 28.5% of benefits claimed.

The disparity in the volume/cost relationship between medical imaging and pathology is repeated with Stream A items. This disparity is explained by the large differences between medical imaging and pathology weighted mean unit values outlined in Table 4 on page 145. The results for Stream C do not change from the previous figure however, because only pathology items have been classified as under-referred (Stream C Category 6).

Figure 4: Percentage distribution of total general practitioner-referred diagnostic services delivered in 2002/03 by Stream and MBS category

Please see print copy for Figure 4

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 5: ***Percentage distribution of total benefits claimed by Stream and MBS category***

Please see print copy for Figure 5

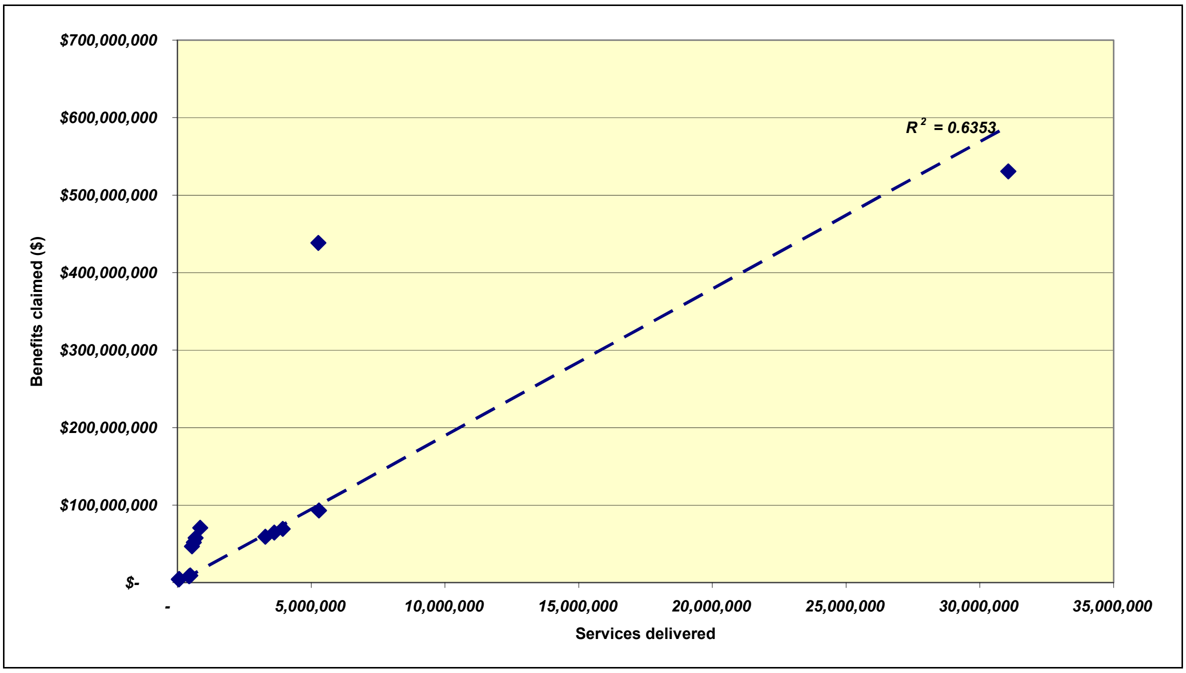
Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

7.3.2 The relationship between cost and volume

The description provided in Section 7.3.1 highlights several important relationships between the identified variables. The disparities in volume/cost relationships between the Medicare Benefit Schedule categories require further analysis.

There is not one standard price for all diagnostic items. This is reflected in the weighted mean unit values from Table 5 on page 152. The scattergram and trend-line in Figure 6 on page 150 demonstrates that pairings of subset totals for each category by RRMA totals are positive and linear as expected. However the coefficient of determination (R^2=0.64) indicates that, whilst important, variations in total cost are due to more than volume alone.

Figure 6: Scattergram and trend-line of services delivered and benefits claimed by Medicare Benefit Schedule Category and RRMA of referring general practitioner



The scattergram and trendlines in Figure 7 on page 151 examine the category pairings from Table 3 and Table 4 on page 145, separated by Stream and the RRMA location of the referring general practitioner.

The wide separation in trend lines also graphically demonstrates the effect created by the difference in the category weighted mean unit values highlighted in Table 4. This graph indicates that the weighted mean unit values of pathology items (Category 6) are markedly lower, whilst the volume of pathology services delivered is substantially higher than with medical imaging.

Using mean unit values as an indicator, it is clear that the total cost of general practitioner-referred diagnostic services is also influenced by variation in the item mix, independent of the volume of services delivered.

Figure 7: **_A scattergram with trend-lines of data pairings for each Medicare Benefit Schedule category by RRMA of referring general practitioner_**

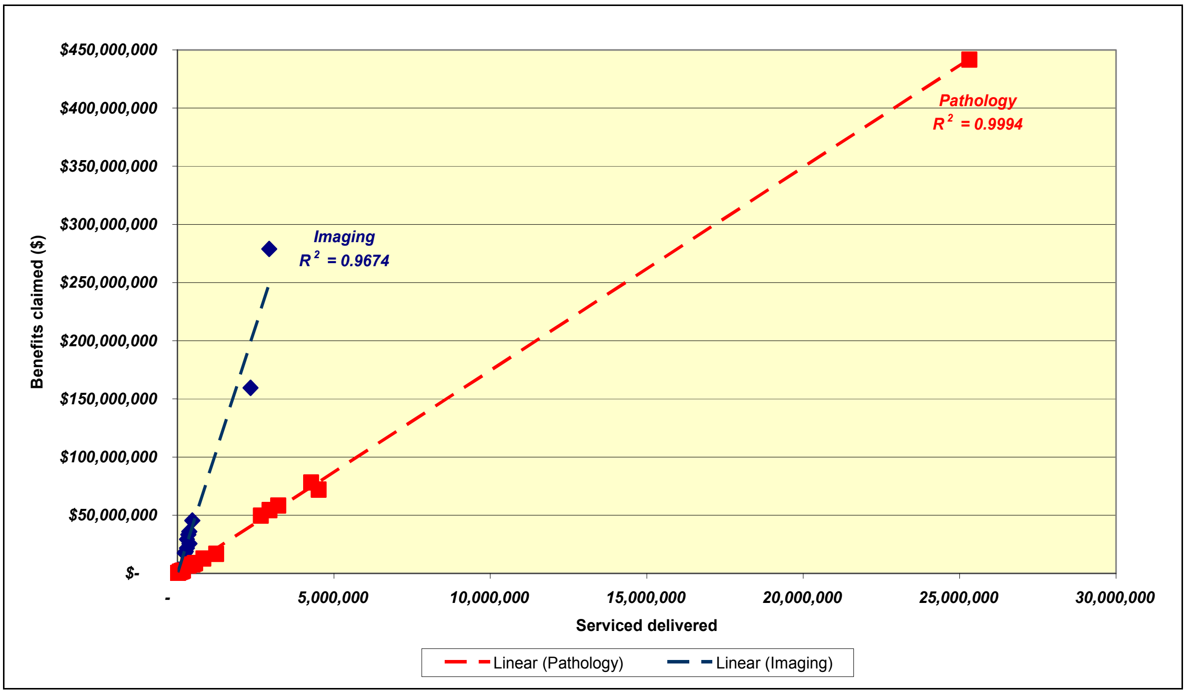


Table 5 on page 152 shows the mean unit values for the two categories, separated by Stream and the RRMA location of the referring general practitioner. The aggregate weighted mean unit value of all general practitioner-referred diagnostic items claimed in the financial year 2002/2003 was $26.88, with a large standard deviation (σ = $34.28).

A confounding factor that must be considered when calculating weighted mean values for pathology items is the 'coning' procedure introduced by Medicare Australia in 1999. The benefits paid for any bundle of claims by a pathologist for a given referral is limited to the three most expensive tests (Britt, Knox & Miller 2003 p.56). This artificially depresses the total of benefits claimed for pathology items reported by Medicare Australia compared with the total of services delivered. Invariably this must lower the mean unit values for pathology items (Category 6).

Table 6 again shows that the weighted mean unit value (μ) equals $26.88, whilst the median (*Mdn*) *of* the entire subset mean unit values is $47.49. The semi-interquartile range (SIQ 25-75%) is $17.72-$85.11. This indicates a negative skew in the overall distribution of subset mean unit values. In these conditions, it is more appropriate to compare the subsets' median values as indicators of central tendency, with the semi-interquartile range as a measure of dispersion (Polgar & Thomas 1995 p.213).

Table 5: Weighted mean unit values for general practice-referred diagnostic services delivered in 2002/03 by Stream, point of delivery and RRMA classification

Referring Provider		Weighted Mean Unit Value ($)								
		Stream A		Stream B		Stream C		RRMA weighted mean unit values ($)		
		Imaging	Pathology	Imaging	Pathology	Imaging	Pathology	Imaging	Pathology	Aggregate
RRMA 0		$ 157.45	$ 15.84	$ 142.66	$ 19.53		$ 11.06	$ 144.99	$ 18.75	$ 85.08
RRMA 1		$ 68.32	$ 15.96	$ 95.09	$ 17.45		$ 13.53	$ 83.23	$ 17.08	$ 26.67
RRMA 2		$ 71.65	$ 15.68	$ 95.64	$ 18.09		$ 13.89	$ 84.91	$ 17.59	$ 27.49
RRMA 3		$ 74.03	$ 15.72	$ 96.71	$ 18.62		$ 13.96	$ 86.76	$ 18.00	$ 27.69
RRMA 4		$ 70.65	$ 15.44	$ 96.59	$ 18.44		$ 13.73	$ 85.31	$ 17.82	$ 27.56
RRMA 5		$ 67.33	$ 15.30	$ 95.56	$ 18.24		$ 13.44	$ 83.02	$ 17.61	$ 26.70
RRMA 6		$ 60.65	$ 18.02	$ 87.65	$ 19.32		$ 14.18	$ 76.07	$ 18.91	$ 25.60
RRMA 7		$ 71.76	$ 17.42	$ 98.61	$ 18.91		$ 12.84	$ 87.32	$ 18.48	$ 25.26
Weigthed Mean Unit Values ($)	Category	$ 69.07	$ 15.84	$ 95.49	$ 17.78		$ 13.60	$ 83.81	$ 17.33	$ 26.88
	Stream		$ 33.66		$ 25.79		$ 13.60		$ 26.88	

Table 6 shows that the median unit values for Stream B is greater than that for the aggregate, whilst both Streams A and B have similarly broad semi-interquartile ranges. The median unit value for both over-referred (Stream A) and under-referred items (Stream C) are less than that for the aggregate. This is markedly so for Stream C and its semi-interquartile range is much narrower (Mdn = \$13.73; SIQ 25-75%$_{c}$ = \$13.49-\$14.07).

Table 6: Stream mean and median unit values

Please see print copy for Table 6

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

This elementary description is important because it highlights that the model in this study is focused on a marginal redistribution of publicly-funded diagnostic tests between the relatively larger volume of higher-priced, over-referred items (Stream A) and the small volume of lower-priced, under-referred items (Stream C).

Table 7 on page 153 demonstrates an aggregate median unit value of medical imaging items (Category 5) at \$84.91 (SIQ 25-75% = \$83.12-\$87.04). The median value for Stream A medical imaging items is below the aggregate median, and outside the category's aggregate's semi-interquartile range (Mdn = $70.65, SIQ 25-75% = $67.62-$72.90). Conversely, the median unit value for Stream B medical imaging items is above the aggregate median and also outside the category's aggregate's semi-interquartile range (Mdn = $95.64; SIQ 25-75% = $95.32-$97.66). This confirms that the median cost per item is substantially different between the two Streams.

By comparison, the aggregate median unit value of pathology items (Category 6) is only $17.82 (SIQ 25-75% = $17.60-$18.70). The median unit value for Stream A pathology items is outside the lower limit of the aggregate's semi-interquartile range (Mdn = $15.72; SIQ 25-75% = $15.56-$17.72). This suggests that the median cost per over-referred pathology items (Stream A Category 6) is substantially less than that of the pathology subset as a whole. By comparison, the median unit value for Stream B pathology items is above the aggregate median but within the aggregate's semi-interquartile range (Mdn = $18.44; SIQ 25-75% = $18.17-$19.11). The median unit value for Stream C pathology items is well below the aggregate median unit value and outside the semi-interquartile range (Mdn = $13.73; SIQ 25-75% = $13.49-$14.07).

Table 7: Stream subset and aggregate median unit values separated into medical imaging and pathology items

Stream	Imaging			Pathology		
	Median ($)	SIQ 25%	SIQ 75%	Median ($)	SIQ 25%	SIQ 75%
Stream A	*$ 70.65*	*$ 67.82*	*$ 72.90*	*$ 15.72*	*$ 15.56*	*$ 17.72*
Stream B	*$ 95.64*	*$ 95.32*	*$ 97.66*	*$ 18.44*	*$ 18.17*	*$ 19.11*
Stream C				*$ 13.73*	*$ 13.49*	*$ 14.07*
Aggregate	**$ 84.91**	*$ 83.12*	*$ 87.04*	**$ 17.82**	*$ 17.60*	*$ 18.70*

7.3.3 The relationship between the referring general practitioners' geographic location and the mean unit value of services delivered

Given the goal of this study, it is relevant to assess whether there are any differences in the mix of benefits claimed according to the geographic location of the referring general practitioner. De-identified general practice data were grouped according to the nominated RRMA classification of their representative Division of General Practice.

It is necessary first to describe the distribution of services and benefits claimed across RRMA within each stream. Table 8 provides the distribution of general practice-referred diagnostics, and cross-references the RRMA classifications of the referring general practitioner with that of the patients' residence (Medicare Australia 2008 [a]; Medicare Australia 2008 [b]).

Table 8: ***The distribution of general practice-referred diagnostic services by RRMA classifications of the referring general practitioner and patients' residence***

Please see print copy for Table 8

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 8 and Figure 9 on page 155 show services delivered and benefits claimed for over-referred items (Stream A) by RRMA classification of the referring general practitioner. Figure 10 and Figure 11 on page 156 reproduce the same for appropriately-referred items (Stream B). Figure 12 and Figure 13 on page 157 show the same information for under-referred (Stream C) items.

These graphs highlight the predominance of activity within each category for each Stream within RRMA 1 localities. Aggregated, referrals from RRMA 1-located general practitioners generate 64.7% of the all services delivered and 64.2% of the benefits claimed. Referring back to Table 3 and Table 4 on page 145, it is clear that RRMA 1 Stream B is overall the largest single sub-total for both services delivered and benefits claimed.

Figure 8: ***Distribution of over-referred items (Stream A) by RRMA classification***

Please see print copy for Figure 8

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 9: ***Distribution of benefits claimed for over-referred items (Stream A) by RRMA classification***

Please see print copy for Figure 9

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 10: Distribution of appropriately-referred items (Stream B) by RRMA classification

Please see print copy for Figure 10

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 11: Distribution of benefits claimed for appropriately-referred items (Stream B) by RRMA classification

Please see print copy for Figure 11

Imaging Pathology

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 12: ***Distribution of under-referred items (Stream C) by RRMA classification***

Please see print copy for Figure 12

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Figure 13: ***Distribution of benefits claimed for under-referred items (Stream C) RRMA classification***

Please see print copy for Figure 13

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

7.3.4 The relationship between patients' geographic location and mean services per capita

Sections 7.3.2 explored the relationship between volume and unit value to the total cost of general-practice referred diagnostic testing. Section 5.3.3 examined the distribution of this activity and subsequent cost. However measures of unit value and total volume do not provide any indication of equity in distribution.

Mean rate of services per capita per annum is a proxy indicator of normative distribution between cohorts. This is because it controls for the significant differences in total volumes due to population distribution.

Table 9 summarises the Australian Bureau of Statistic's June 2003 estimated resident population adjustments to the 2001 Census, separated by broad age-groups and the RRMA classification of residency. Both raw and weighted data are presented. The weighted data are based on 2002/2003 Medicare Benefits Schedule professional attendances (Category 1) for general practice (Australian Bureau of Statistics 2001; Australian Bureau of Statistics 2004; Australian Institute of Health and Welfare 2004 p.76).

Table 9: June 2003 estimated resident population adjustments weighted for general practice attendance by age and RRMA classification of residency

Please see print copy for Table 9

Ref: ABS 2001; ABS 2004; AIHW 2004 p.76

Applying age-weights to the population distribution by RRMA classification adjusts for any substantial age-profile variations between geographic regions. Table 10 shows the weightings used in Table 9. It shows that the overall mean for general practice attendances is 5.2 per capita per annum. The age group weightings are the ratios of utilisation relative with this national mean. This comparison is consistent with the Australian Government's analysis of Medicare demographic trends from 2001/2002 (Department of Health and Ageing 2002[a]).

Age-weighting creates marginal shifts in service catchments out of RRMAs 1, 5 and 6 and into RRMAs 2, 3, 4 and 7. The majority of the estimated age-weighted population (63.3%) resides within RRMA 1 locations, whilst further a 13.5% reside within other metropolitan and large regional centres (RRMAs 2 and 3). Approximately 22.9% of the estimated age-weighted population reside within rural and remote locations (RRMAs 4 through to 7), whilst a residual 0.3% is not defined.

Table 10: Estimated general practice consultations and mean attendances per capita by age with weightings relative to the national mean

Please see print copy for Table 10

Ref: ABS 2001; ABS 2004; DoHA 2002[a]; HIC 2003[b]; HIC 2005

The mean rate of age-weighted attendances per capita by RRMA classification is the best proxy indicator of regional general practice utilisation. Table 11 on page 160 confirms an aggregate mean rate of 5.2 general practice consultations per capita per annum. A downward trend in utilisation per capita is generally apparent with increasing rurality and remoteness. The annual consultation rate per capita in RRMA 1 and 2 locations is more than twice that of RRMA 7 locations.

These results approximate closely with that reported by Swerrisen (2004 p.17), who notes a utilisation rate of 5.3 general practice consultations per capita per annum, and 30% less consultations per capita in rural federal electorate areas compared with their metropolitan equivalents.

Table 11: Age-weighted mean rate of general practice consultations per capita per annum by RRMA classification

Please see print copy for Table 11

Ref: DoHA 2002[a]; DoHA 2002[b]; HIC 2005

It is possible that the result for the most remote communities is an under-estimation of residents' true utilisation of general practice, because of the increased use of providers such as Aboriginal community controlled services and State-sponsored clinics that rely on alternate means of funding other than the Medicare Benefits Schedule (Health Workforce Queensland & NSW Rural Doctors Network 2005 p.11; Pflaum 2001 p.33). However the BEACH studies data do not support this assumption (Britt, Miller and Valenti 2001 pp.17-18). No significant differences are found in the proportional distribution of services across RRMA classifications either provided at no charge to a funding source such as the Medicare Benefits Schedule, or covered by funding sources other than the Medicare Benefits Schedule.

Table 12 applies the age-weighted population figures from Table 9 on page 158 to the diagnostic referrals dataset in Table 8 on page 154. The aggregate mean rate is approximately 2.9 general practitioner-referred diagnostic services per capita per annum (σ = 0.66).

Table 12: Mean rates of general practice-referred diagnostic services per capita per annum for each Stream

Mean rates of GP diagnostic referrals per capita	Stream weighted means (μ)	Standard Deviation (σ)
Stream A	*0.55*	*0.12*
Stream B	*2.23*	*0.51*
Stream C	*0.10*	*0.03*
Aggregate	**2.87**	*0.66*

The mean rate of services per capita for appropriately-referred (Stream B) items is substantially higher than the two other Streams. This result is consistent with Figure 2 on page 147, in which Stream B accounts for 77.7% of the total diagnostic services delivered.

The mean rate of services per capita for under-referred (Stream C) items is substantially lower than the two other streams. Stream C consists of only four pathology items, all of which are specific to a gender and age range. This is also consistent with Figure 2 on page 147, in which Stream C accounts for only 3.3% of the total diagnostic services delivered.

Table 13 compares the mean rates for each Stream by the RRMA classification of the patients' residence. It shows an increase in referrals per capita from metropolitan to regional areas (RRMA 1-3), followed by a general downward trend with increasing rurality and remoteness (RRMAs 5-7).

At face value, these results appear to contradict results from the BEACH studies, which show that the rate of pathology ordering per one-hundred encounters increases progressively with measures of rurality (Britt, Miller and Valenti 2001 p.44). Rates from their metropolitan strata (RRMAs 1 to 3) differ significantly from both the large rural (RRMAs 4 & 5) and small rural strata (RRMAs 6 & 7). No significant difference is evident between the respective rural strata. No significant difference is evident with medical imaging by geographic strata (Britt, Miller and Valenti 2001 p.45).

Table 13: Mean rate of general practice-referred diagnostic services per capita by RRMA classification of the patient

Please see print copy for Table 13

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

Table 14 seeks to approximate the relationship reported by Britt, Miller and Valenti (2001 pp.44-45) by establishing rates with the combined results from Table 11 on page

160 and Table 13. In order to be consistent these are converted to a per-one-hundred encounters rate. This produces the rate of general practice-referred diagnostic services per one-hundred encounters at both aggregate and Stream levels, with each separated by the RRMA classification of the referring general practitioner.

Table 14: Mean rate of general practice-referred diagnostic services per one-hundred consultations by Stream and RRMA classification of patient

Please see print copy for Table 14

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

There is a general trend for higher rates of diagnostic services from general practice consultations occurring with increasing rurality, though it recedes once more in remote areas (RRMA 7). This trend is consistent across both Stream A and Stream B items. These findings confer with the results of Britt, Miller and Valenti (2001 p.44) in relation to pathology ordering.

The rates in Table 14 are 17.4% higher than the ordering rates reported in the BEACH studies, which establish a mean of 38.6 pathology test referrals (Britt et.al. 2007 p.62) and 8.8 imaging order referrals per one-hundred encounters (Britt et.al. 2007 p.64).

There are a range of possibilities as to why this may be the case. It is possible that the data from Table 11 on page 160 may under-estimate the denominator values, because it only represents identifiable general practice consultations claimed from within the Medicare Benefits Schedule professional attendances (Category 1). In addition, the BEACH studies use a sample, rather than the full Medicare Benefits Schedule dataset. The BEACH studies also only record a maximum of five pathology orders per consultation, though in many cases multiple orders by a general practitioner may include batteries of tests resulting in substantially greater than five analyses performed by a pathologist.

It is reasonable to deduce that the increased rates of diagnostic testing ordered by general practitioners from within small rural and remote communities is compensatory practice behaviour in reaction to their patients' relatively low rates of attendance. The variation in general practice consultations per capita by RRMA classification shown in Table 11 on page 160 is a dominant factor over the variation in ordering rates per one-hundred encounters shown in both Table 14 and in the BEACH studies' results (Britt, Miller and Valenti 2001 p.44).

7.4 Conclusion

Data sets of items within the Medicare Benefit Schedule medical imaging (Category 5 - excluding Group I5) and pathology (Category 6) for the financial year 2002/03 have been used to establish a baseline distribution of general practice-referred diagnostic services and the public cost that this generates. Drawing on Chapters Four and Five, the Medicare Benefit Schedule items are compared with the available evidence and bundled into activity that that is either over-referred (Stream A), referred at appropriate levels (Stream B), or under-referred (Stream C).

The discretionary variables which influence the volume, cost and distribution of activity includes the nominated streams and the referring general practitioners' geographic locality. Measurable outcome variables include the total volume of services delivered, total cost of the benefits claimed from Medicare Australia, the distribution of benefits between providers, and the distribution of service delivery amongst the population.

Several trends are identified in distribution. These include:

- With increases in volume there is a direct linear increase in expenditure. This reflects the fee-for-service structure of the Medicare Benefit Schedule.
- The bundle of items referred at an appropriate level (Stream B) account for the majority of both diagnostic services delivered and benefits claimed.
- Pathology items constitute the bulk of diagnostic services delivered. Pathology items referred at an appropriate level (Stream B Category 6) are by far the most prevalent in the total dataset.

There is a clear disparity in unit prices between diagnostic items in the Medicare Benefit Schedule items. Comparisons of subset weighted mean and median unit values are used in this study as the proxy indicator of variations in the referral mix.

There are marked differences demonstrated in median unit values between higher-cost, lower-volume medical imaging and lower-cost, higher-volume pathology items. This finding is consistent across Streams A and B (Stream C only consists of pathology items).

The median unit values for over-referred (Stream A) and under-referred items (Stream C) are less than the overall median, whilst that for appropriately-referred items (Stream B) is greater.

The blend of median unit values between subsets for each discretionary variable, according to the RRMA classifications of the referring general practitioners, indicates that there is a heterogeneous mix of diagnostic referrals. However no clear trend is evident in variation according to geographic dispersion.

Measures of unit value and total volume do not give any indication of equitable distribution. The mean rate of services per capita per annum and per-one-hundred-encounters are both used as proxy indicators, because they adjust for the significant differences in population distribution by RRMA classification. Analysis of the data demonstrates that despite the apparent compensatory higher rate of referrals by general practitioners, the 15.1% of the age-weighted Australian populace residing in RRMA 5 and 7 locations still access significantly less diagnostic services. Patients' relatively low rates of general practice attendance in these geographic regions are the dominant factor. This pattern is consistent across all the model's streams. This indicates an inequitable distribution of general practitioner-referred diagnostic services in smaller and more remote rural communities compared with metropolitan and larger rural centres.

The results in this baseline evaluation have implications for the modelling to follow in Chapter Eight. Different financial levers are applied within the model to each stream in order to drive a marginal redistribution in general practice referrals for diagnostic tests. This redistribution aims to achieve two concurrent outcomes. The first is increased rates of cervical and cholesterol screening by targeted subjects within vulnerable social groups. The second is reduced referral rates of diagnostic items that are over-utilised compared with clinical need.

CHAPTER EIGHT - Derivation of a supply-side incentive model designed to redistribute general practice-referred diagnostic services

8.1 Introduction

As a matter of conservative principle, systematic change in practice is only justified when a marginal benefit greater than the status quo is identified (Butcher 1998 p.285). The evidence already presented in Chapters Four and Five suggests that there is scope for redistribution of public expenditure on general practice-referred diagnostic services. Desired outcomes include improved adherence to available clinical practice guidelines and the attainment of national targets for cervical and cholesterol screening.

This chapter explores an original model which provides performance-based payments as an incentive to Divisions of General Practice to drive a marginal change in general practice referrals for diagnostic imaging and pathology tests. Whilst presuming a reference case that public expenditure is sustained at or near a constant level, this redistribution in service activity aims to achieve two concurrent outcomes. The first outcome is an increased utilisation by vulnerable social groups of particular population screening procedures (Australian Institute of Health and Welfare 2006[a] pp.333-334). The second outcome is a reduction in the referral of diagnostic items that are over-utilised compared with clinical need (Australian Institute of Health and Welfare & Department of Health and Ageing 1998 pp.55-56; Australian Institute of Health and Welfare 2006[a] p.350; National Health & Medical Research Council 1996 pp.14, 106-107).

8.2 Rationale

Few studies have examined the return on investment of practice modification (Clancy 2000 [a] p.4). Nor have there been many studies on the diffusion over time of modifying strategies to determine which organisational factors are most important in driving change. Scott (2007 p.33) outlines a range of criteria necessary to ensure that quality measures are reasonable and valid. This includes that measures should be clinically relevant, stable over a 2-3 year period (to allow comparative measures), attainable, accurate and have high impact. Of particular relevance to this study are calls for analyses that investigate the projected effect of redistribution in general practice diagnostic referrals on public expenditure for targeted levels of utilisation (Cohen 1994 p.781; Pollicino, Viney & Haas 2002 p.171).

This effect cannot be measured simply by using a costing study that looks only for broad fiscal rationalisation. Whilst these processes have an impact on global allocation, they do not address the issue of evidence-based redistribution.

The results of diagnostic testing typically require advanced levels of technical judgement to interpret. This is an archetypal example where patients' have significant information asymmetry and are rarely in the position to judge the worth (let alone cost effectiveness) of their providers' diagnostic referral practices (Deeble & Lewis-Hughes 1991 p.62; Richardson 1991 p.51). For this reason, demand-side controls may constrain expenditure, but will be indiscriminate and not have any positive impact on clinical effectiveness (Richardson 1991 p.51). Given the demand-side response to price signals is also muted by insurance, supply-side funding mechanisms are more effective in levering changes in organisation and service delivery capable of improving efficiency, equity and health gain (Naccarella et.al. 2007 p.41; Population Health Division 1998 p.43).

However, the medical profession has long-resisted the imposition of clinical protocols and productivity targets set by third parties. This is particularly the case where interventions are perceived to either decrease their autonomy, constrain income, challenge professional judgement or compromise patient care (Greco & Eisenberg 1993 p.1272; Komesaroff 1999 p.267; Robinson 2001 p.168). Methods are likely to receive less resistance when strategies are non-punitive and cost control is not a primary objective (Conyers 1998 p.9; Greco & Eisenberg 1993 p.1273). It is also more tenable to providers when the intervention seeks to reinforce either current practice or make its delivery less complex, rather than trying to change it altogether (Greco & Eisenberg 1993 p.1273).

8.3 A framework of key concepts that underpin the model

Informed by the literature, the derived model is built on a range of key concepts.

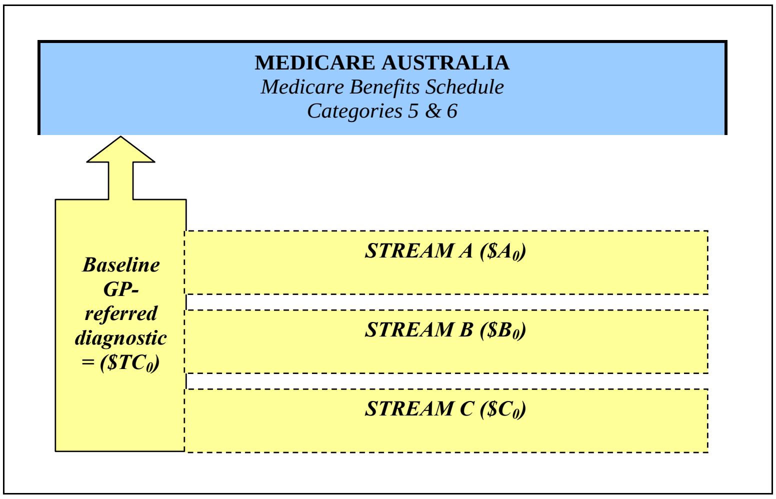
8.3.1 A streaming of referral activity according to evidence-based guidelines

From the outset, the model bundles items into the three streams described in Chapter Seven. Bundles of items are streamed according to whether they are over-referred (Stream A), appropriately referred (Stream B), or under-referred (Stream C) (Health

Insurance Commission 2003 [b]). Stream C activity will be further separated into sub-sets according to whether or not patients are categorised as socially vulnerable (C_V & C_N respectively).

Figure 14 demonstrates this simple concept. The current total cost of benefits claimed through the Medicare Benefits Schedule for general practice-referred diagnostic services is taken as the initial baseline (denoted as $\$TC_0$). This current total cost equals the combined outlay of the three streams ($\$TC_0 = \$A_0 + \$B_0 + \$C_0$).

Figure 14: Current total cost of benefits claimed for general practice-referred diagnostic services by Stream



8.3.2 Activity pooling

The results from the United Kingdom's Quality and Outcomes Framework (QOF) initiative support evidence that paying individual providers or small clinician groups directly will drive the largest absolute increases in quality measures. However, this approach creates numerous technical difficulties (Fisher 2006 pp.1845-1846; Scott 2007 p.33).

The first is attribution, given that patients often receive care from a multitude of physicians within the same year (Fisher 2006 p.1845; Pham et.al. 2007 p.1134; Scott 2007 pp.33-34). The second is that few general practitioners will generate sufficient activity within a given timeframe to allow statistically reliable measures (Fisher 2006 pp.1845; Scott 2007 p.34). In most cases, the performance measure will only relate to a small percentage of their caseload and the incentive payments a small portion of their income (Pham et.al. 2007 p.1134; Rosenthal et.al. 2005 pp.1792-1793). Third, the challenging nature of some particular practice demographics is such that the general benchmarks and targets are implausible and so there is only a weak incentive to invest and improve access for those patients who would otherwise benefit (Fisher 2006 p.1846; Pham et.al. 2007 p.1134; Rosenthal et.al. 2005 p.1788; Scott 2007 p.34). Fourth, a focus on individual providers or practices negates any value-adding effects that can be garnered from a coordinated approach to peer support and review (Fisher 2006 pp.1846-1847; Scott 2007 p.33).

Each individual general practice in Australia is a small business entity. In most cases each alone lacks sufficient scale to generate predictable ranges of benefit-claiming activity for reliable costing and allocating prospective budgets using public funds (Deeble & Lewis-Hughes 1991 p.64). Consistent with the United States Institute of Medicine Committee recommendations on pay-for-performance measures for Medicare (US) beneficiaries, it is proposed that activity is pooled with Divisions of General Practice, which represent groupings of general practices. This will mitigate the risk of having to administer large variations in expenditure between practices (Fisher 2006 p.1847; Scott 2007 p.33). It will also help rationalise the level of funding negotiations and contracting required by the purchaser (i.e. the Australian Government) (FitzGerald 2006 p.125; Podger 2006 p.137).

8.3.3 Cost neutrality

The United Kingdom's Quality and Outcomes Framework (QOF) is funded with additional investment, rather restructuring existing payment systems (Doran et.al. 2006 p.382). It is not yet clear that the subsequent outlay justifies the quality improvements to date. Given that this initiative has created costly budget over-runs, future governments will be less likely to source substantial additional public funds to drive pay-for-performance in health care (Doran et.al. 2006 p.379; Fisher 2006 p.1846; Scott 2007 p.32). Although the creation of fund pools using margins from existing payments are more likely to face resistance from the medical fraternity, this will be a more acceptable option for government (Doran et.al. 2006 p.382; Fisher 2006 p.1846).

In this study, modelling assumes that public expenditure from benefits claimed after applying the redistribution model will ideally not exceed the equivalent point with these baseline measurements of actual costs ($\$TC' = \$TC_0$). In this case, the baseline equals the total of benefits claimed for general practice-referred medical imaging (Category 5 [excluding Group I5]) and pathology tests (Category 6) in the financial year 2002/03 (as described in Chapter Seven) (Medicare Australia 2008 [a]; Medicare Australia 2008

[b]). Hereafter this assumption is referred to as the reference case (Gold et.al. 1996 p.99).

8.3.4 Nominal risk

The model includes an element of accountability explicit to both purchasers and providers. This is achieved by the Australian Government mapping expenditure on general practice-referred diagnostics. Because the model is focussed on manipulation of supply rather than demand, the dataset will map the benefits claimed against the source of the referral, regardless of the patients' residence. The Australian Government then applies incentives for increased Stream C activity and penalties for excessive Stream A activity to the Divisions' network, depending on the results for each stream compared with their health and fiscal objectives.

However, it is not proposed to commit general practices fully through a fund-holding cash-out. Instead the risk can be nominal. General practice diagnostic referral activity is mapped by stream against a prospective budget allocation maintained by the Australian Government. General practice performance is subsequently monitored and rewarded where appropriate. If however, at the end of a financial year, there is not a net positive balance remaining in a Division's allocation, then neither a reward nor a penalty applies.

8.3.5 Defined program budgeting

The potential risk to both the Australian Government and the Divisions' network is limited by the constraints on the level of delegation. In this case, this is achieved by limiting the model specifically to the Medicare Benefits Schedule funding of general practice-referred medical imaging (Category 5 [excluding Group I5]) and pathology tests (Category 6).

Providers continue to interact with their client on a predominantly fee-for-service basis, and their entitlement to charge above the scheduled fee remains. The patient continues to bear the out-of-pocket expense representing the gap between the Medicare Benefits Schedule rebate and the fee charged. In each case, respective benefit claims for the general practice and diagnostic services are forwarded to Medicare Australia for rebate, as is current practice.

8.3.6 *Defined catchment populations*

The model is focused on driving redistribution through supply incentives, rather than demand controls. However, it does not require a New Zealand or United Kingdom-style system of patient enrolment with general practice to define service populations (McDonald et.al. 2007 p.52; Powell Davies et.al. 2006 p.7). Patients will retain their current entitlement to seek care from the general practice of their choice (McDonald et.al. 2007 p.52).

This strategy aims to avoid the perverse incentives that arise when combining prospective allocation with enrolment. For example, in an environment of prospective budget allocation using weighted per-capita funding, the provider has considerable incentive to restrict services or referrals for its registered clientele (Eagar, Garrett & Lin 2001 pp.76-77; Mullen 1998 p.20). Providers also have a strong perverse incentive to ration by postcode. This refers to the practice of creating artificial barriers to access for persons outside their register as a means of controlling cross-boundary flows (Marriott & Mable 1998 p.635).

Therein lays the challenge to develop a population needs-based funding allocation unimpeded by issues of cross-boundary flows and barriers to access. In lieu of enrolment, the Standardised Whole Patient Equivalents (SWPE) calculations used by Medicare Australia for its Practice Incentive Payments (PIP) program could be applied more broadly as the solution for funding allocations (Swerissen 2004 p.37). These calculations estimate what a general practice's catchment patient population is, based on recent levels of activity (Health Insurance Commission 2003[a]). A practice's Standardised Whole Patient Equivalent (SWPE) equals the sum of the fractions of care it has provided to each of its patients, with weightings that reflect both Medicare Australia's and the Department of Veteran Affairs historic records of general practice utilisation. The weightings are an attempt to recognise potential utilisation according to measured needs. The weightings are also consistent with Eddy's (1994[b] p.820) call to ration using explicit eligibility criteria.

SWPE weightings increase notably for both genders from the age of sixty-five years onwards. They also demonstrate consistently higher weightings for females in all age bands after the age of 15 years (Health Insurance Commission 2003[a]). This is compatible with evidence that persons aged over 65 years utilise twice the volume of general practice consultations than the general population, whilst females utilise up to 50% more consultations than males (Swerrisen 2004 p.15; Woods 2001 p.334).

Medicare Australia determines SWPE over a twelve-month reference period that ends four months prior to the start of each PIP payment period. This method can be adapted to determine a Division's aggregate SWPE of its enrolled practices (Health Insurance Commission 2003[a]). The aggregate SWPE will represent a reliable estimate of a Division's nominated catchment patient population weighted for age and gender.

8.3.7 Measure and share the savings

There is some evidence to support the call for supply-side incentives as an efficient means to manipulate reforms (Podger 2006 p.135; Rodwin 2004 p. 1328; Van Weel & Del Mar 2004 p.99). The rationale is that general practice will be motivated to decrease any down-stream costs that their referrals generate if they are rewarded by sharing some of the savings to the funding body (Beilby & Pekarsky 2002 pp.324; General Practice Strategy Review Group 1998 p.245; Podger 2006 p.150).

There is some precedent for this approach with Australian general practice. Building on the quality use of medicine strategies from the Australian Government's National Medicines Policy, in 2002/2003 the Enhanced Divisions Quality Use of Medicine (EDQUM) project was piloted with thirteen Divisions of General Practice, and subsequently expanded in 2004/2005 to include a further eight Divisions. Rather than receiving up-front funding, this project instead shared savings with participating Divisions where evidence of additional quality use of medicine activity had changed local prescribing volumes and costs (Hordacre et.al. 2006 p.10). This approach is consistent with the 'measure and share' arrangements first discussed by the GP Strategy Review Group (1998 p.252).

It is administratively cumbersome and costly to implement a pay-for-performance model on a national scale using data extraction reports and clinical file audits at a practice level. As with the Medicare (US) experience, it is more feasible to utilise existing claims data to attribute patients' interventions to providers (Pham et.al. 2007 1130). Medicare Australia has the capacity to measure the benefits claimed for diagnostic items listed in its Medicare Benefits Schedule according to the general practitioner who made the referral, the patient who received the service, and the date of the claim. The model proposes that general practice is rewarded with performance payments for achieving certain objectives, which in part includes generating savings in public expenditure on over-referred diagnostic items ($A).

8.3.8 Targeted investment

In order for the Australian Government's health objectives to be addressed, it is reasonable to expect that the financial incentives for key stakeholders, such as the Divisions' network, reflects the results of redistribution, rather than merely the total cost of inputs or the total volume of outputs. The model will project what initial investment is required from the Australian Government in order to redistribute cost and activity up to the target levels away from Stream A and towards the select Stream C items.

8.4 Derivation of the key components within the model

The model consists of several components. These include:

- A reference case, where the total cost of the model is set at or near the equivalent point with current total public cost for general practice-referred diagnostics.
- A prospective nominal budget allocation that applies a benchmarked cap for Stream A expenditure.
- A credit reserve ledger mechanism that incorporates the prospective nominal budget allocation.
- Weighted-bonus payments for increased access by vulnerable social groups to Stream C items.
- A performance-based key to the credit reserve ledger.

8.4.1 Defining the reference case

If the model is able to operate in a perfect state, the total public cost for general practice-referred diagnostics ($TC′) after a nominated period (e.g. a full financial year) will consist of expenditure at target levels for Streams A ($A′), B ($B′) and C ($C′) plus the total performance payments for the Divisions' network ($PP′). This assumes that the model introduces no extra transaction or administrative costs than that which already exist.

The model's reference case is that expenditure is constrained within a global budget, set at or near current levels of expenditure ($\$TC' = \$TC_0$). This relationship is outlined in Derivation 1 and is graphically demonstrated in Figure 15. In each case total cost ($TC′) also includes total performance payments for Divisions ($PP′).

Derivation 1:

$\$(A' + B' + C' + \$PP') - TC_0 = 0$

Or:

$\$(A' + B' + C') - \$(A_0 + B_0 + C_0) + \$PP' = 0$

Or:

$\$(A' - A_0) + \$(B' - B_0) + \$(C' - C_0) + \$PP' = 0$

Where:

$\$A'$ = Stream A benchmark cost

$\$B'$ = Stream B benchmark cost

$\$A_0$ = Stream A baseline cost

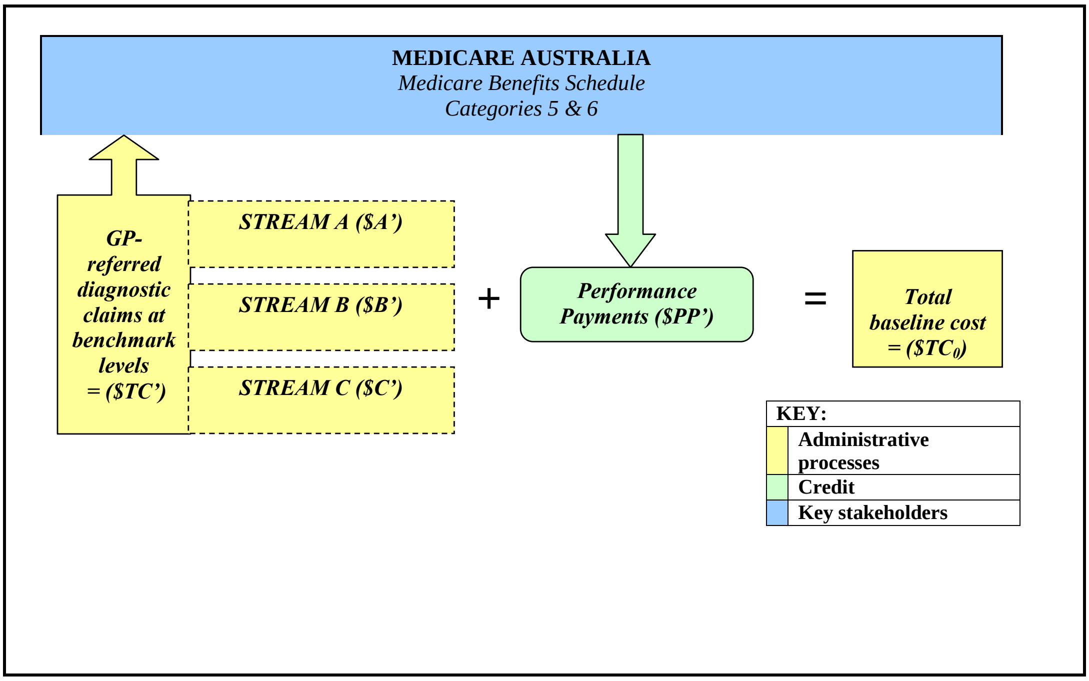
$\$B_0$ = Stream B baseline cost

$\$C'$ = Stream C target cost

$\$C_0$ = Stream C baseline cost

$\$PP'$ = Total performance payments

Figure 15: Projected total cost of benefits claimed for general practice-referred diagnostic services, including total performance payments for Divisions



8.4.2 Allocating a prospective nominal budget allocation using a cap for Stream A expenditure

Each gazetted Division of General Practice is nominally allocated a prospective budget as an opening line of credit by the Australian Government at the beginning of each financial year. The prospective budget for each Division equals the Australian Government's notional cap on public expenditure for over-referred diagnostic items (Stream A) for its aggregate SWPE.

Given the reference case ($\$TC' = \$TC_0$), projected increases in Stream B and C expenditure must be offset by a deduction in either the Stream A benchmark allocation ($\$A'$) or the Divisions' performance payments ($\$PP'$) in order to continue satisfying Derivation 1.

To detract from the performance payments ($\$PP'$) is contrary to the intent of the model, which is seeking to stimulate profit-maximising behaviour by the Divisions' network. The prospective nominal budget allocation for Stream A benchmark expenditure therefore is capped at less than baseline levels ($\$A' < \$A_0$). This benchmark cap should reflect the projected increases in expenditure on under-referred target items ($\$C' - \$C_0$) plus the annual growth factor for appropriately-referred items (denoted hereafter as α). Stream B items will remain within an uncapped fee-for-service environment. Cost projections need therefore to adjust for a realistic growth of Stream B expenditure ($\alpha\$B_0$).

Finally, the reduction in Stream A expenditure to the benchmark cap ($\$A' < \$A_0$) must also reflect the projected outlay on total performance payments ($\$PP'$) for Divisions of General Practice. Derivation 2 describes how the Stream A benchmark cap ($\$A'$) is determined. Accepting that the derivation of total performance payments ($\$PP'$) is not defined at this point, Derivation 3 on page 181 subsequently outlines how this is determined.

Derivation 2:

$$\$A' = \$A_0 - \$(B' - B_0) - \$(C' - C_0) - \$PP'$$

Or:

$$\$A' = \$A_0 - (\alpha\$B_0) - \$(C' - C_0) - \$PP'$$

Where:

$\$A'$ = Stream A benchmark cost

$\$A_0$ = Stream A baseline cost

$\$B_0$ = Stream B baseline cost

$\alpha\$B_0 = \$(B' - B_0)$

$\$C'$ = Stream C target cost

$\$C_0$ = Stream C baseline cost

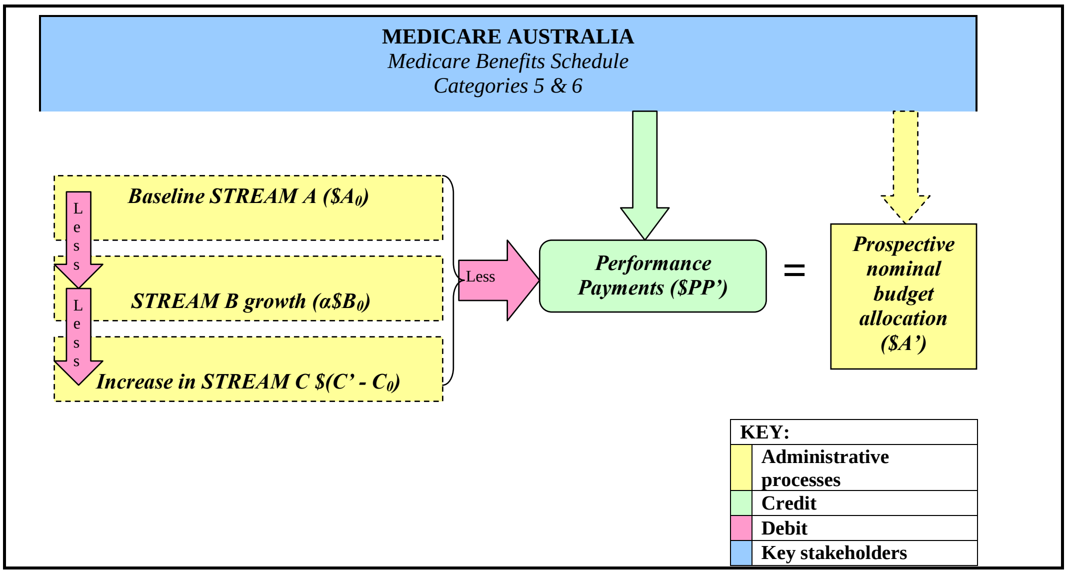
α = Projected Stream B growth factor

$\$PP'$ = Total performance payments

Figure 16 outlines how the prospective nominal budget allocation using the Stream A benchmark cap ($\$A'$) is derived.

The calculation of the Stream A benchmark cap ($A′) does not presume what should be an appropriate level of referral for Stream A items in order to address necessary clinical care. This issue is beyond the scope of this study, though it is flagged by several authors as a concern with all models that seek to constrain inappropriate testing (Hammett & Harris 2002 p.124; Stuart, Crooks & Porton 2002 pp.134). Establishing reliable, quantifiable measures of either necessary care or appropriate utilisation in models of resource allocation and distribution remains problematic (Cummings & Mays 1999 p.16). This is an area that warrants further research.

Figure 16: Derivation of the Stream A benchmark cap as the prospective nominal budget allocation



8.4.3 Incorporating the prospective nominal budget allocation within a credit reserve ledger

The mechanism for determining the potential limits for Divisions' performance payments ($PP′) is the use of a credit reserve ledger. The first two steps in the ledger measure marginal changes in expenditure over time (e.g. a full financial year) for both over-referred Stream A items and under-referred Stream C items.

The first step establishes an opening line of credit within the ledger for each Division by using the Stream A benchmark cap ($A′) as a prospective nominal budget allocation. Over a full financial year in the future (n) the expenditure that is above the predetermined cap on over-referred items is offset as debits against this ledger (i.e. where: $\$A' - \$A_n < \$0$).

The second step is to accrue expenditure above baseline on under-referred items ($\$C_n - \$C_0$) up to an evidence-based target (at $\$C_n \leq \$C'$) as credit. This mechanism begins to establish the first two line items in the credit reserve ledger (i.e. where, after a full financial year, the credit reserve balance includes: $\$(A' - A_n) + \$(C_n - C_0)$).

However a problem will begin to arise at the end of a financial year in the future (n) if there has been increased Stream C item uptake in the preceding year (n – 1) and the baseline is taken simply as that preceding year's value ($\$C_{n-1}$). This is because, assuming profit-maximising behaviour by the Divisions, the capacity to accumulate a credit reserve balance at the optimal limit will progressively diminish the closer each year approaches target activity ($\$(C_{n-1} - C_{n-2}) \ldots < \$(C_n - C_{n-1}) < \$(C_1 - C_0)$).

Determination of real growth requires a comparison of costs across financial years, with indexing to constant value terms so as to eliminate inflationary distortions. For this exercise the Australian Bureau of Statistic's Total (non-defence) final consumption expenditure (FSE) by governments' index is used. This index requires adjustments to constant value estimates as at the financial year 1999/2000 (Australian Institute of Health and Welfare 2002 pp.64-65). The last available deflation rate is 3.6% for 2000/01, and so this is adopted and held constant for the ensuing periods up to 2002/2003 (at FSE = 1.036), though clearly this may warrant further adjustment.

Review of the constant values for all diagnostic tests (not limited to general practice referrals) presented in Table 15 demonstrates a mean 2.5% real growth per annum in Stream C expenditure over the period 1999/2000 to 2002/2003. This trend, if it remains consistent, would undermine the intent of the model, which is to create and sustain a financial incentive for the Divisions to pursue Stream C activity. The alternative built into the model is that, each year after the baseline ($\$C_0$), the newly calculated value of the Stream C opening balance will represent a mean which is progressively adjusted to constant values ($\$C_p$). Only marginal adjustments are then required to the Stream C opening balance each year thereafter ($\$C_n - \$C_p$). Though this alone will not eliminate the decline over time in supply-side incentives for Stream C items, it will help to ameliorate this weakness in the model.

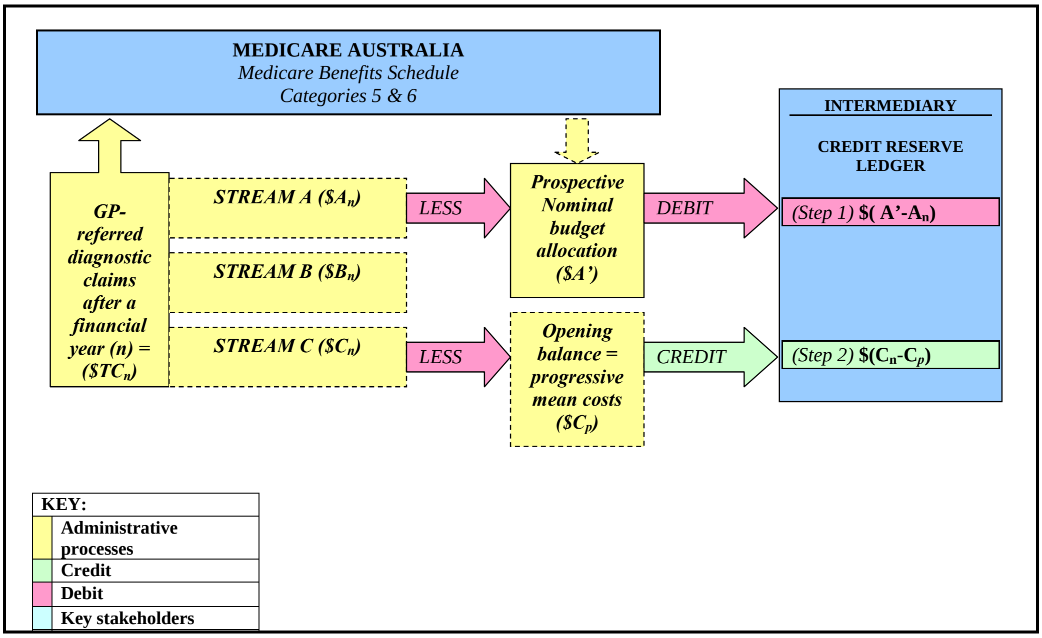
Table 15: Mean growth rates for constant value-adjusted benefits paid by Stream in the 4-year period 1999/2000 to 2002/2003

Please see print copy for Table 15

Ref: AIHW 2002; HIC 2003[b]

With this adjustment in place, the derivation of the first two line items in the credit reserve ledger is established (i.e. where, after a full financial year, the credit reserve balance includes: $(A′ - A_n) + $(C_n – C_p)). Figure 17 provides a diagrammatic representation of how the first two line items in the credit reserve ledger are derived.

Figure 17: Derivation of the first two line items in the credit reserve ledger mechanism



8.4.4 Identifying weighted-performance payments for increased access by vulnerable social groups to Stream C items

In the absence of further market manipulation there remains a risk within the model. There is little evidence that inequity and social disadvantage is explicitly acknowledged as a moderating variable within clinical practice guidelines (National Health & Medical Research Council 2002 p.11; Oxman, Schunemann & Fretheim 2006 p.2). Most clinical practice guidelines are built on evidence from randomised controlled trials, which typically analyse the effects of a single intervention, in isolation, on a homogenised population sample. Therefore it cannot be readily assumed that socially vulnerable groups will benefit equally with the general population from the adherence to clinical practice guidelines by general practice (National Health & Medical Research Council 2002 p.13).

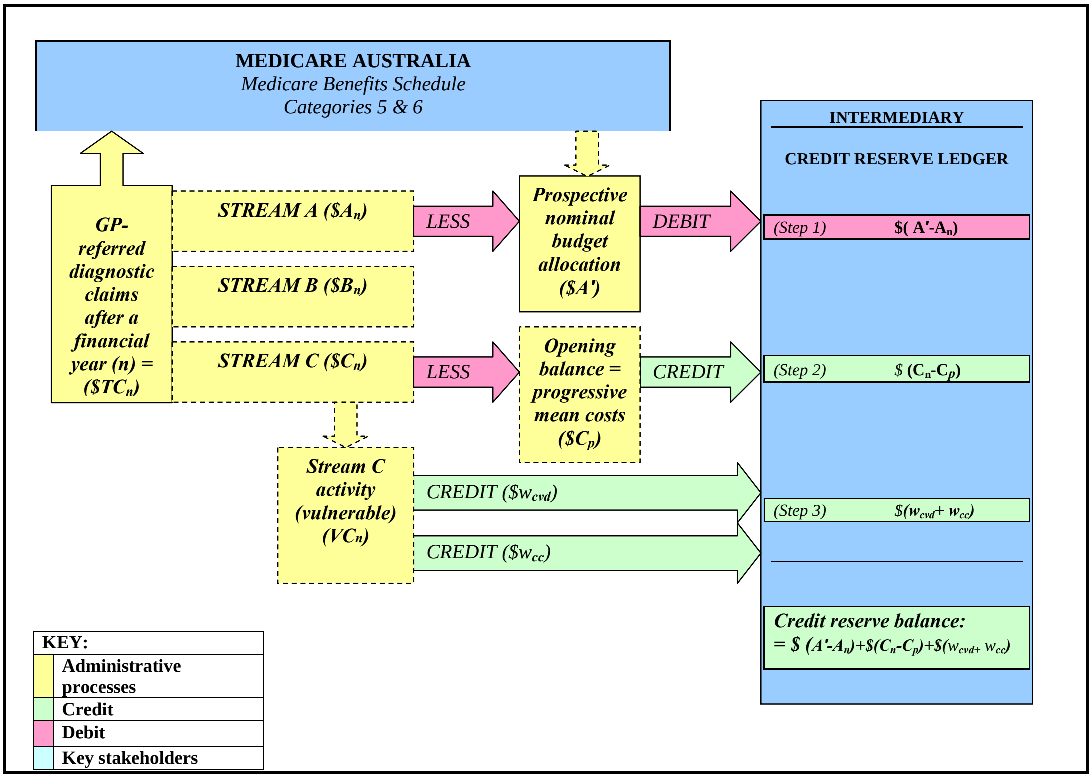
Insufficient risk weightings create a perverse incentive to cream-skim less challenging patients and game how certain patients are classified (Fisher 2006 p.1846; Nicholson et.al. 2008 pp.440-441; Scott 2007 p.34). This will then over-reward for a narrow practice profile and under-compensate for a broad scope of practice (Robinson 2001 p.158; Ross et.al. 1999 pp.32-33).

Evidence confirms that vulnerable social groups characteristically under-utilize general practice (Australian Institute of Health and Welfare 2006[a] p. 224; McDermott 1995 pp.73-74). This means that any increase in the supply of historically under-referred services (Stream C) may be directed to those social groups whose access to general practice is unconstrained by cultural, geographic or socioeconomic barriers (Macinko, Starfield & Shi 2007 p.122). It follows that, if those most at risk under-utilise the evidence-based services compared with the educated and wealthy, the cost-effectiveness of the program will decline (Banta 1990 p.458).

Hence, there is a need within the model to identify specific weightings within the performance payments ($\$PP_n$) for access by vulnerable social groups to Stream C items. The first step in achieving this is to apportion the total Stream C activity (denoted hereafter as StC) over a given financial year (n) into that provided for the non-vulnerable (NVC_n) and socially vulnerable groups (VC_n) respectively (i.e. $StC_n = NVC_n + VC_n$).

The majority of Stream C items are delivered to patients who have no clear indication of social vulnerability (NVC). The remaining portion (VC) are the 26.4% of the estimated resident population who are categorised as socially vulnerable according to one or more of the indicators first highlighted in Table 1 from Chapter Three (see page 79). Therefore the targeted age and gender subsets within the vulnerable social groups constitute approximately 11.6% of Australia's estimated resident population who ideally should access Stream C items each year.

Figure 18: Derivation of the third line item in the credit reserve ledger mechanism



The next step is to give some level of proportionate weighting to the credit accumulated for targeted screening within the vulnerable social groups. This is achieved by weighting the mean value of each referred item of service delivered by the age-adjusted disease-specific standardised mortality ratio (SMR).

Stream C consists of items for cholesterol screening and cervical cytology screening respectively. The weighted bonus for cholesterol screening ($\$w_{cvd}$) is the product of the mean unit value for the relevant items by the accumulated cardiovascular disease-specific standardised mortality ratios for each target group, less the value of the items' current mean unit value. Similarly, the weighted bonus for cytology screening ($\$w_{cc}$) uses the accumulated cervical cancer disease-specific standardised mortality ratios for each target group less the value of the current mean unit value of the items concerned. Figure 18 outlines the derivation of what constitutes the third line item in the credit reserve ledger.

8.4.5 *Establishing a performance-based key to the credit reserve ledger*

Divisions of General Practice will only realise the positive balance accumulated within their credit reserve ledger as income in proportion to their performance delivering the Stream C items to vulnerable social groups in a given year (VC_n). The performance-based key to the credit reserve ledger is thus the ratio of Stream C activity for vulnerable social groups to the target Stream C activity for these groups ($\beta = VC_n/VC'$).

In the first instance the model requires some means of identifying what proportion of each Division's catchment population can be defined as vulnerable social groups. Unfortunately the SWPE calculations do not offer a solution because they do not include any identification of the vulnerable social categories (Health Insurance Commission 2003[a]). With due consideration to privacy legislation, and the commitment within the model to avoid fixed patient registrations with particular practices, a less prescriptive alternative is desirable.

This is achieved by estimating the proportion of patients in each Division's enrolled general practices that are socially vulnerable using the demographic profiles of its statistical local area from the most recently-adjusted Census estimates. In some cases there will be general practices within the same statistical local area that are enrolled with different Divisions. In this scenario, the local estimate of social vulnerable groups can be apportioned according to the relative size of each practice's SWPE.

Accepting this, it is possible to project what each Division's Stream C target activity for vulnerable social groups (VC') should be. The Stream C activity for vulnerable social groups (VC_n) equals the level of actual utilisation by vulnerable social groups of Stream C items up to the designated targets ($VC_n \leq VC'$).

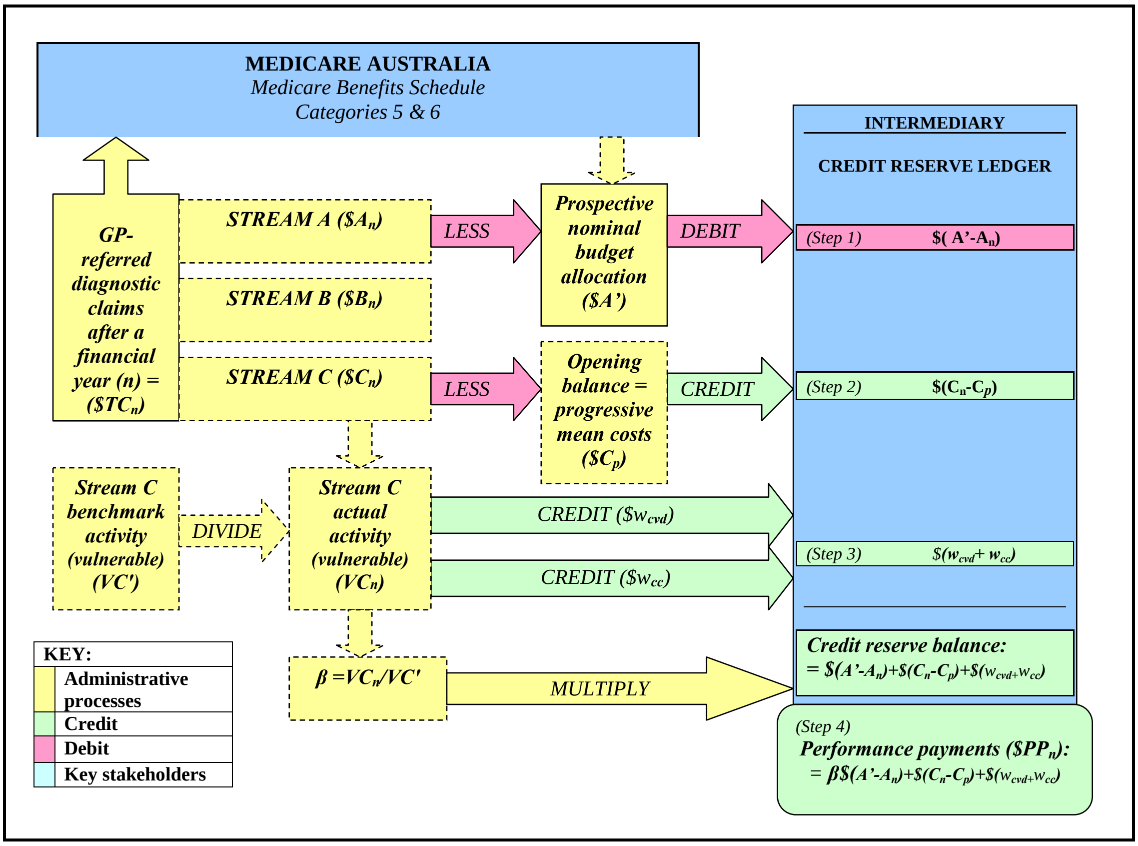
If a Division is able to realise its target Stream C activity for vulnerable social groups ($VC_n = VC'$), it will attain a maximum performance ratio ($\beta = 1.0$). Indeed, because the target is an estimate based on Census data, there is the possibility that a Division's actual activity may even exceed the target. In any case, once the target is attained, the Division will have the capacity to draw down the entire available balance in the credit reserve ledger as a maximum performance payment at the end of that financial year. Derivation 3 outlines how the maximum performance payment ($PP') is determined.

Derivation 3:

$\$PP' = \beta.\$(A'-A_n) + \$(C'-C_p) + \$(w_{cvd} + w_{cc})$	Where:
	$\$PP'$ = Maximum total performance payment
	$\$A'$ = Stream A benchmark cost
	$\$A_n$ = Stream A actual cost @ end of a financial year
	$\$C'$ = Stream C target cost
	$\$C_p$ = Stream C progressive mean cost
	β = VC_n/ VC'
	VC' = Stream C socially vulnerable target activity
	VC_n = Stream C socially vulnerable actual activity
	$\$w_{cvd}$ = weighted bonus for cholesterol screening
	$\$w_{cc}$ = weighted bonus for cytology screening

With the inclusion of the ratio as a performance-based key to the credit reserve ledger ($\beta = VC_n/VC'$), Figure 19 illustrates the full model derivation including the activity and associated expenditure streaming, prospective nominal budget allocation, credit reserve ledger, and Division performance payments. The net effect rewards Divisions for influencing their enrolled general practice members in driving Stream C activity more towards evidence-based targets ($StC_n \leq StC'$) each financial year, with particular attention paid to vulnerable social groups ($VC_n \leq VC'$).

Figure 19: The full model derivation



8.5 Essential calculations of costs, values and activity projections in the model

Application of the model in practice requires that certain costs and levels of activity are calculated as reference points. These calculations include:

Determination of a realistic growth factor for Stream B cost.

- Projections for Stream C target activity.
- Projections of costs and benefits claimed at Stream C target levels of activity.
- Determination of the weighted-bonus values for increased access by vulnerable social groups to Stream C items.
- Calculation of the maximum total performance payments possible at a national level.
- With the above values determined, calculation of the total benchmark cap for Stream A expenditure as the prospective nominal budget allocation at a national level.

8.5.1 *Growth factor for Stream B cost*

The benchmark cap for the prospective nominal budget allocation ($A') is required to absorb the projected increases in expenditure from the annual activity growth in appropriately-referred items ($\alpha\$B_0$), which remain within an uncapped fee-for-service environment. Based on the history of general practice-referred diagnostics since the introduction of Medicare, it is realistic to expect that this activity will continue to grow over time.

Table 15 on page 177 demonstrates an average 0.8% real growth per annum ($\$B' = 1.008 \times \$B_0$) in all Stream B expenditure (not limited to general practice referrals). The model assumes that this 0.8% growth will continue into the future.

An example of why there is continuing marginal growth in this stream of items is the Australian Government's 2002 introduction of Service Incentive Program (SIP) items to the Medicare Benefits Schedule Category 1. SIP items are designed to encourage general practice consultations in accredited practices specifically targeting problems such as asthma, diabetes, cervical screening and mental health (Health Insurance Commission 2003[a]). Clinical guidelines for the management of diabetes in particular promote a higher-than-average level of diagnostic testing compared with the typical intervention seen in general practice, and fall within the model's Stream B of items (Britt et.al. 2007 p.62; NSW Health 1998).

8.5.2 *Stream C target activity projections*

The total target Stream C activity (StC′) consists of the portions delivered to the non-vulnerable and socially vulnerable groups respectively (i.e. StC′ = NVC′ + VC′). To determine these values in the first instance requires a population estimate, followed by a projection of target levels of uptake.

In this instance, no age-weighting of the target population groups is required because the age ranges and target levels of utilisation are specified by the relevant guidelines for the management of both hypercholesterolaemia (National Health & Medical Research Council 1996 pp.10-11; National Preventive and Community Medicine Committee 2002 p.22), and cervical cytology (Australian Institute Of Health & Welfare 2002 p.325; Australian Institute of Health and Welfare & Dept of Health and Ageing 2000 p.7; Hilless & Healy 2001 p.50; National Health & Medical Research Council 1996 pp.99-100; National Preventive and Community Medicine Committee 2002 p.34).

Table 16 and Table 17 each adopt the target group percentages of the unweighted Australian Census 2003 estimate of residential population and broadly apply the guidelines to project target percentages of activity per annum. As seen in Table 16, the target Stream C activity (StC′) is 3,441,849 services per annum nation-wide, at an estimated total cost of $49.2 million.

Calculation 1 demonstrates that the target data in Table 16 produce a new weighted mean unit value for Stream C items of $14.28. This is higher than the $13.60 at baseline levels of activity because of the proportional increase of higher-priced cervical screening items in the mix.

Table 16: Estimated activity and cost of Medicare Benefits Schedule claims for Stream C items up to evidence-based targets

Please see print copy for Table 16

Ref: ABS 2004; AIHW 2002[a] p.325; HIC 2003[b]; NH&MRC 1996

Calculation 1

$X_{\$C'/StC'}$ = \$C′/StC′

$X_{\$C'/StC'}$ = \$49,155,859/3,441,849

$X_{\$C'/StC'}$ = \$14.28

Where:

$X_{\$C'/StC'}$ = Variable for the calculation of a new Stream C weighted mean unit value

\$C′ = Cost of Stream C target activity

StC′ = Stream C target activity

VC′ = Stream C socially vulnerable target activity

Table 17 in turn projects what percentage of the estimated residential population is within vulnerable social groups. This then allows the portion of target Stream C activity delivered to vulnerable social groups (NVC′) to be estimated.

Table 17: ***Annual estimated Medicare Benefits Schedule activity and cost for Stream C items delivered to socially vulnerable groups up to evidence-based targets***

Please see print copy for Table 17

Ref: ABS 2001; ABS 2004; AIHW 2002[a] p.325; HIC 2003 [b]; NH&MRC 1996

Using the activity data provided in Table 16 and Table 17, Calculation 2 determines the portion of target Stream C activity delivered to non-vulnerable social groups (using the variable $x_{NVC'}$).

Calculation 2

$x_{NVC'}$ = StC′ - VC′

$x_{NVC'}$ = (3,441,849) – (908,961)

$x_{NVC'}$ = 2,532,888 services delivered

Where:

$x_{NVC'}$ = Variable for the calculation of Stream C non-vulnerable target activity

StC′ = Stream C target activity

NVC′ = Stream C non-vulnerable target activity

VC′ = Stream C socially vulnerable target activity

8.5.3 Projected costs of benefits claimed at Stream C target activity

Table 16 projects the costs of benefits claimed at the proposed evidence-based target activity ($C′). Cost projections are calculated as the target number of tests per annum by the mean unit values for each item. In turn, the target number of tests per annum is determined using target group population percentages and the annual target level of activity for each group.

In the case of cholesterol testing, repeat tests are accepted as the norm for each screening procedure, with each person in the target group screened every five years (National Preventive and Community Medicine Committee 2002 p.22). In the case of cervical screening, each person in the target group is screened every two years (Australian Institute of Health and Welfare & Department of Health and Ageing 2000 p.7; National Health & Medical Research Council 1996 p.100; National Preventive and Community Medicine Committee 2002 p.34). The target level of activity for cervical screening is adjusted by a factor of 0.8, because this represents the estimated level of

Pap smears currently provided through general practice (Australian Institute of Health and Welfare 2006[a] p.336; National Health & Medical Research Council 1996 p.99).

The difference between the initial 2002/2003 Stream C outlay and target projections (\$C′ - \$$C_0$) represents a substantial 94.2% increase in public expenditure on these items (see Table 25 on page 201). It is projected that this margin will decline gradually over time with pursuit of the model's financial incentives. However, this will be partly offset because of the proposed use of a progressive mean cost (\$$C_p$) as the baseline, rather than the Stream C costs from the previous period.

8.5.4 The weighted bonus values for Stream C items delivered to vulnerable social groups

The model creates weighted bonus payments for targeted screening within the vulnerable social groups (\$$w_{cvd}$ + \$$w_{cc}$) by applying the relevant disease-specific standardised mortality ratios (SMR). This approach is consistent with the aim of the model to increase the social welfare function.

Table 18 on page 187 (replicating Table 1 on page 79) provides a matrix of the identified vulnerable social groups' representation within Australia's 2003 estimated residential population. The matrix recognises that certain sub-groups demonstrate co-identifiers of vulnerability. The percentage figures in each cell are mutually exclusive, representing only the cross-referenced variables that constitute the cell.

The model presumes that indicators of social vulnerability are multiplicative. Table 19 outlines the age-adjusted disease-specific standardised mortality ratios that are used for each of the identified vulnerable social groups.

Table 18: Population estimates of designated vulnerable social groupings

Please see print copy for Table 18

Ref: ABS 2003; ABS 2004; AIHW 2002[a]; AIHW 2005; Dunn, Sadkowsky & Jeffs 2002

Table 19: Age-adjusted disease specific standardised mortality ratios (SMR) for vulnerable social groups

Please see print copy for Table 19

Ref: AIHW 2005 pp.102-103; AIHW & AACR 2003 pp.31-32; DoHA & AIHW 1998 p.127; Population Health Division 2004 p.162

*** Estimated from comparative 5-year survival rate data*

Table 20 is a matrix for the cardiovascular disease-risk target group. Each red-bordered cell represents a weighted bonus ($\$w_{cvd}$) depending on the interaction between the indicators of social disadvantage in the respective row and column. The value in each cell is the product of the mean unit value for cholesterol screening items outlined in Table 18 by the accumulated standardised mortality ratios for each indicator of social disadvantage highlighted in Table 19, less the original mean unit value of the item (see Table 16 on page 184).

Table 20: SMR-weighted item bonuses for the cardiovascular disease-risk target group by designated vulnerable social grouping

Please see print copy for Table 20

Ref: ABS 2003; ABS 2004; AIHW 2002[a]; AIHW 2005; Dunn, Sadkowsky & Jeffs 2002

Table 21 repeats the same calculation to produce weighted bonus values for the cervical cancer-risk target group (\$$w_{cc}$).

Table 21: SMR-weighted item bonuses for the cervical cancer-risk target group by designated vulnerable social grouping

Please see print copy for Table 21

Ref: ABS 2003; ABS 2004; AIHW 2002[a]; AIHW 2005; Dunn, Sadkowsky & Jeffs 2002

Table 22 and Table 23 summarise the cost of the weighted bonuses for achieving the target levels of activity for the cholesterol ($\$w_{cvd}$) and cervical screening ($\$w_{cc}$) items by the vulnerable social groups (VC′). Again, each red-bordered cell represents the total cost of the weighted bonuses depending on the interaction between the indicators of social disadvantage in the respective row and column. The value in each cell this time is the product of the weighted bonus values for screening items outlined in Table 20 and Table 21, by the portion of the estimated resident population that the sub-group represents in the corresponding cell in Table 18 on page 187.

Table 22: ***Estimated cost of cholesterol screening weighted bonuses for targeted vulnerable social groups up to evidence-based targets***

Please see print copy for Table 22

Ref: ABS 2004; HIC 2003[b]; NH&MRC 1996

Table 23: ***Estimated cost of cervical screening weighted bonuses for targeted vulnerable social groups up to evidence-based targets***

Please see print copy for Table 23

Ref: ABS 2004; HIC 2003[b]; NH&MRC 1996

Calculation 3 on page 191 shows that the sum of the two weighted bonuses ($\$w_{cvd}$ + $\$w_{cc}$) inflates the estimated cost of attaining the Stream C target activity (described in Table 16 on page 184), by 19.43% up to $58,704,483 in constant value terms (using the variable $x_{\$C''}$).

Calculation 3

	Where:
$X_{\$C''} = \$C' + \$(w_{cvd} + w_{cc})$	$x_{\$C''}$ = Variable for the calculation of the cost of Stream C target activity plus weighted bonuses
$x_{\$C''}$=\$49,155,859 + 951,869 + 8,596,755	\$C′ = Cost of Stream C target activity
$x_{\$C''}$=\$58,704,483	$\$w_{cvd}$ = weighted bonus for cholesterol screening
	$\$w_{cc}$ = weighted bonus for cervical screening

8.5.5 The maximum total performance payment at a national level

The calculation of the total performance payment ($\$PP_n$) for a financial year in the future (n) relies on the capacity for the Divisions to accumulate Stream C activity delivered to vulnerable social groups (VC_n). This is because the ratio between the actual activity delivered to vulnerable social groups and target level represents their key to draw on the credit reserve ledger ($\beta = VC_n/VC'$).

In turn, the credit reserve balance that is available in the ledger depends upon several steps. These include the cost for the uptake of over-referred items compared with the benchmark cap, the proportional adjustment to any increased in benefits claimed for under-referred target items up to a target level (Stream C) and the weighted bonuses for uptake of Stream C by vulnerable social groups ($\$(A' - A_n) + \$(C_n - C_p) + \$(w_{cvd} + w_{cc})$).

The final total performance payment within a given year (n) will equal the product of the performance ratio and the available credit reserve ($\$PP_n = \beta.\$(A'-A_n) + \$(C_n - C_p) + \$(w_{cvd} + w_{cc})$). If the Divisions are able to operate at optimal efficiency then the product of the maximum performance ratio ($\beta = 1.0$) and the credit reserve balance will equal the entire credit reserve limit (if $\beta = 1.0$; $\$PP' = \$(A'- A') + \$(C' - C_p) + \$(w_{cvd} + w_{cc})$).

Calculation 4 on page 192 determines the maximum total performance payment (\$PP’) in the first financial year (using the variable $x_{\$PP}$). With the model operating in a perfect state this will equate to approximately \$33.4 million (2002/03 constant values).

However this cost will decline if the Divisions’ members prove sub-optimal in referring for Stream C items and/or controlling referrals for Stream A items. In this case the outcome will still be sub-optimal even with a maximum performance ratio held constant (i.e. $\beta' = 1.0$).

Calculation 4

$x_{\$PP} = \beta.\$(A' - A') + \$(C' - C_p) + \$(w_{cvd} + w_{cc})$

$x_{\$PP} = 1.0 \times [(0) + (49{,}155{,}859 - 25{,}309{,}351) + 951{,}869 + 8{,}596{,}755$

$x_{\$PP} = \$33{,}395{,}131$

Credit Reserve:

$\$C' = \$49,155,859$

Less

$\$C_p = \$25,309,351$

\$23,846,508

Less offsets

$\$(A' - A') = \$\ 0$

\$23,846,508

Plus Weightings

$+\$w_{cvd} = \quad \$951,869$

$+\ \$w_{cc} = \$8,596,755$

\$33,395,131

Where:

$x_{\$PP}$ = Variable for the calculation of the total performance payment

\$PP = Total performance payment

$\$A_n = \$A'$

$\$C_n = \$C' = \$49,155,859$

$\$C_p = \$C_0 = \$25,309,351$

$\beta = VC_n / VC' = 1.0$

$VC_n = VC' = 908,961$ items

$\$w_{cvd}$ = weighted bonus for cholesterol screening

$\$w_{cc}$ = weighted bonus for cervical screening

8.5.6 *The total benchmark cap for Stream A expenditure as the prospective nominal budget allocation at a national level*

At its maximal limit, the total credit reserve balance can be calculated without needing to determine the actual value of the Stream A benchmark cap (\$A′). However where the model operates with non-optimal Stream A activity (StA_n) the benchmark value (\$A′) does become an essential prerequisite in calculating the actual total credit reserve balance.

Calculation 5 on page 193 draws on the formula first used in Derivation 2 on page 174, to determine the value of the benchmark cap (using the variable x_A). The resultant value of \$A′ = \$292,462,770 represents a 18.5% reduction in expenditure on over-referred (Stream A) items compared with the 2002/03 baseline outlined in Table 4 on page 145.

Calculation 5

	Where:
$X_{\$A'}$ = \$A$_0$ - (0.008 x \$B$_0$) - \$(C′ - C$_0$) - \$ PP’	$x_{\$A'}$ = Variable for the calculation of the Stream A benchmark cap
$X_{\$A'}$ = (358,715,946) – (0.008 x 1,126,442,159) – (49,155,859 – 25,309,351) – (33,395,131)	\$A′ = Stream A benchmark cost
$X_{\$A'}$ = 358,715,946 – 9,011,537 – 23,846,508 – 33,395,131	\$A$_0$ = \$358,715,946
	\$B$_0$ = \$1,126,442,159
$x_{\$A'}$ = \$292,462,770	\$C′ = \$49,155,859
	\$C$_0$ = \$25,309,351
	\$PP’ = \$33,395,131

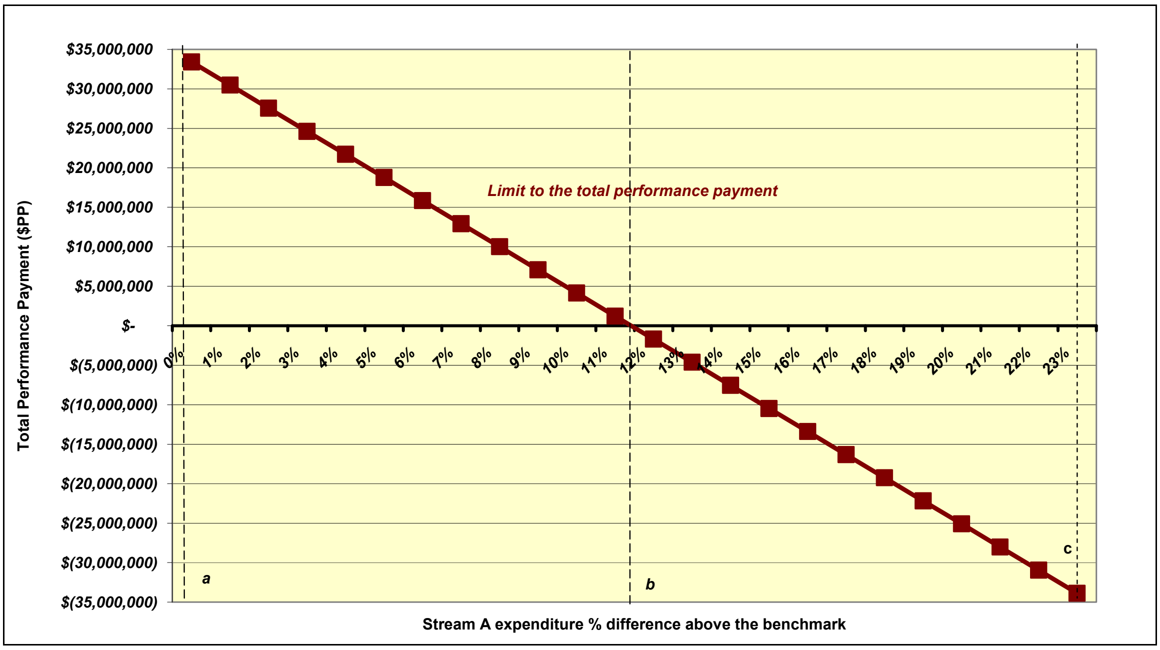
8.6 Determination of the frontiers for optimal performance payments

8.6.1 Decline in the total performance payment as benefits claimed for Stream A items exceeds the benchmark

Figure 20 on page 194 demonstrates a negative slope from point ‘a’ that reflects the decline in total performance payment (\$PP$_n$) in a given year (n) as benefits claimed for Stream A items exceeds the benchmark (\$A$_n$ > \$A′). At point ‘b’ (between 11-12% above the benchmark) the total performance payment will be nil (\$PP$_n$ = 0) because the credit reserve balance (\$(A′ - A$_n$) + \$(C′ - C$_p$) + \$(w_{cvd} + w_{cc})) expires. Point ‘c’ approximately 23% above the benchmark represents the baseline level of expenditure on benefits claimed for Stream A (\$A$_0$).

This relationship assumes that uptake of Stream C items is optimised at target levels and that the performance ratio is ideal (e.g. β = 1.0). This highlights one frontier of optimal credit possibilities within the model. If the performance ratio is sub-optimal (β < 1.0) for any difference in Stream A expenditure above the benchmark cap, then the total performance payment (\$PP$_n$) payable will lie on some point below and to the left of the optimal frontier in Figure 20.

Figure 20: The limit of the total performance payment with a constant performance ratio and increasing Stream A claims above the benchmark

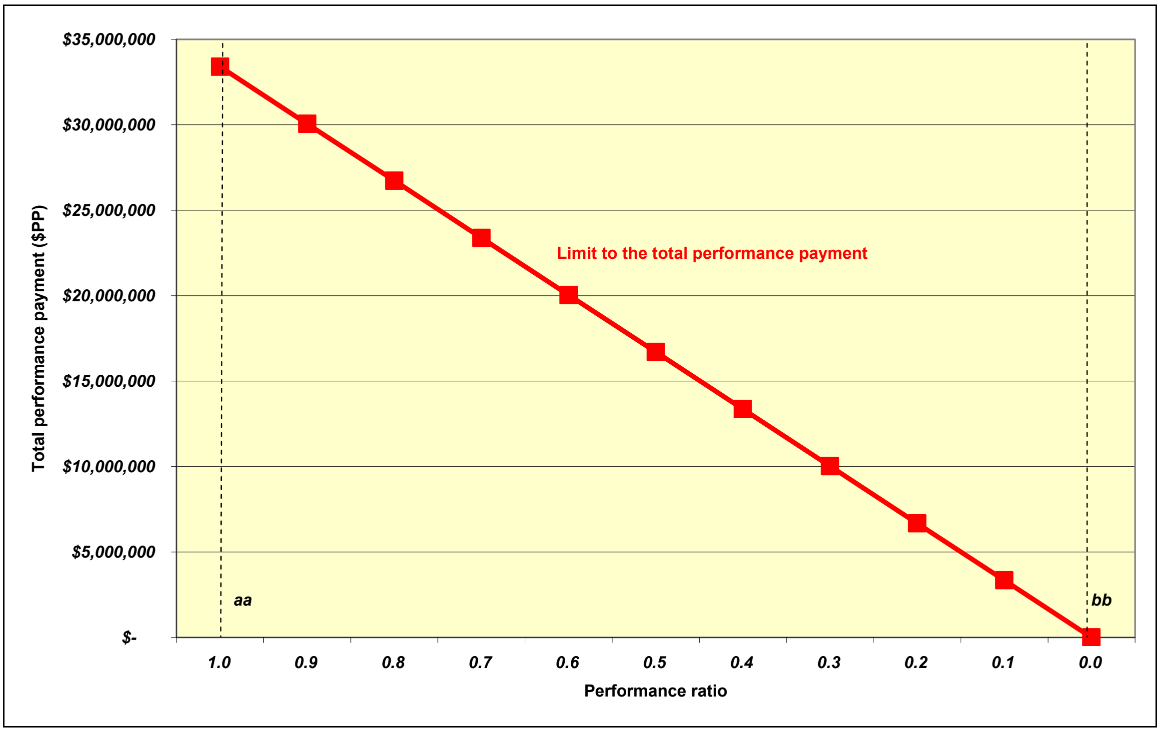


8.6.2 Decline in the total performance payment as the performance ratio declines

Assuming that there is optimal efficiency in achieving the credit reserve limit ($(A′ - A′) + $(C′ - C_p) + $($w_{cvd}$ + w_{cc})), the total performance payment ($$PP_n$) payable in a given year (n) will only be maximal when the performance ratio obtains unity (β = 1.0). Figure 21 demonstrates a negative slope from point ‘aa’ that reflects the decline in Divisions’ credit ($$PP_n$) as the performance ratio declines (β < 1.0). At point ‘bb’ the total performance payment will again be nil ($$PP_n$ = 0) because the performance ratio is zero (β = 0.0).

Figure 21 thus highlights another frontier of optimal performance payment possibilities within the model. If the credit reserve balance is sub-maximal for any given performance ratio (β) then the total performance payment ($$PP_n$) will lie on some point below and to the left of the optimal frontier in Figure 21.

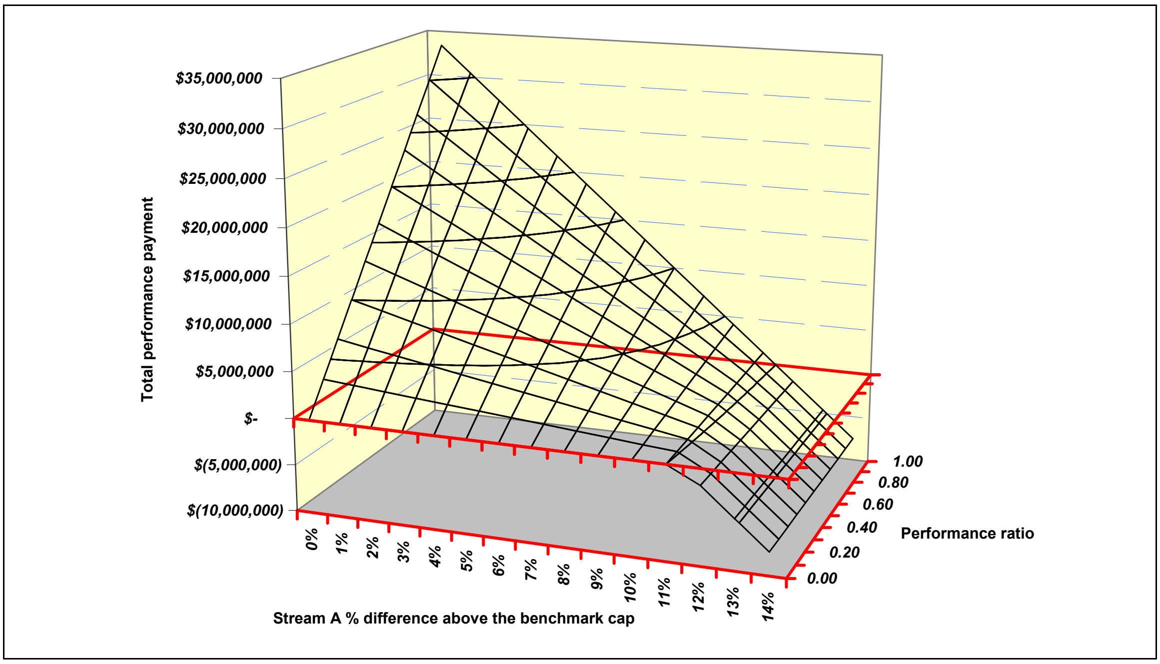
Figure 21: ***The limit of the total performance payment assuming a maximal credit reserve balance and a variable performance ratio***



8.6.3 The total performance payment as both the performance ratio and the credit reserve balance decline

Figure 22 on page 196 uses three axes to combine the results from Figure 20 and Figure 21 respectively. The graph demonstrates the range of Division credit possible on the vertical axis. This depends on varying Stream A above the benchmark cap ($\$A_n \geq \$A'$) on one horizontal axis and a varying performance ratio ($\beta \leq 1.0$) on the other. Only at the apex where the both the maximum credit reserve limit is attained ($\$(A'-A') + \$(C' - C_p) + \$(w_{cvd} + w_{cc})$) and the performance ratio is optimal ($\beta = 1.0$) will the Divisions' network achieve their total performance payment in full.

Figure 22: Projected total performance payment combining a variable credit reserve balance with a variable performance ratio



8.7 Conclusion

The original redistribution model derived in this chapter seeks to establish an environment of nominal risk sharing for Divisions of General Practice. The risk is limited specifically to the public funding through the Medicare Benefits Schedule of general practice-referred medical imaging (Category 5 [excluding Group I5]) and pathology tests (Category 6).

The incentive for the Divisions' network to act as intermediaries arises from an original mechanism labelled a credit reserve ledger. The ledger is a tool for the Australian Government to map the balance of benefits claimed for general practice-referred diagnostic services against the Divisions with which the respective general practitioners are enrolled. Where priority targets are addressed within a global budget constraint, the Divisions are then able to realise any positive balance of credit accrued in their particular ledger and draw on it as income. The key to being able to draw on payments from the credit reserve ledger is the proportionate uptake of the evidence-based target items by vulnerable social groups within each Division's catchment. Referred to as the performance ratio, this key equals the proportion of the actual uptake of target items by vulnerable social groups compared with an evidence-based target level of activity.

A Division of General Practice must achieve several concurrent objectives in order to fully realise its credit reserve limit as a performance payment. It must contain uptake of over-referred items within the benchmark cap. It also must optimise uptake of specific under-referred items up to an evidence-based target. In so doing, it must focus the uptake of these target items by social vulnerable groups to the point where the maximum performance ratio is attained.

The next chapter tests the derived model for sensitivity. This is done at macro-, meso- and micro-levels using scenario testing, with results compared against the reference case.

CHAPTER NINE - Results

9.1 Introduction

The original redistribution model derived in Chapter Seven should be tested for sensitivity. This will be done by manipulating a range of data and to compare the subsequent results against the reference case using possible scenarios (Briggs 1996 pp. 177-178; Kuntz & Weinstein 2001 p.143).

This chapter does this in three parts. In the first part, a macro-level analysis considers the net implications of the redistribution for the Australian Government, the Divisions of General Practice network and diagnostic providers. In the second part, a meso-level analysis examines the normative impact of scenarios on the Divisions network grouped by measures of geographic dispersion. Finally, a micro-level analysis tests the same scenario against a range of Division sizes with a variety of demographic profiles. The implications of this analysis are then discussed.

9.2 A consistent approach to the modelling of activity and cost at each level of analysis

It is important that the projected estimates in modelled data are congruent across the macro-, meso- and micro-levels of analysis. For example, it is logical that the aggregate total of activity and costs from the micro-analysis should closely approximate that estimated at the macro-level.

One means of modelling activity and cost at a macro-level is to draw on the measures of central tendency and dispersion. Table 24 summarises these measures.

Table 24: Stream mean and median unit values of the total benefits claimed per unit of diagnostic services

Please see print copy for Table 24

Ref: Medicare Australia 2008 [a]; Medicare Australia 2008 [b]

In each case, it is evident that the datasets are negatively skewed. In the case of Streams A and B there is large dispersion of values. Normally this should indicate that median values are the most appropriate measure of central tendency for use in modelling. A problem is evident in this case however when using these median unit values as point estimates. This is because it creates a downward distortion on the estimates of projected Stream activity at the macro-level, assuming the current item mix for each remains consistent. Therefore, because of this incongruence, weighted mean unit values are preferred.

9.3 A macro-level analysis of the implications for redistribution

Compared with the baseline evaluation in Chapter Seven, the derivations and calculations in Chapter Eight identify that increasing efficiency to targeted levels only requires a marginal redistribution. It is necessary to consider the macro-level impact of this redistribution on the funder (i.e. the Australian Government), Divisions' network and diagnostic providers within the conditions of the reference case.

The reference case requires that the adjusted Stream A expenditure (A_n) remains within the limits set out in Definition 1.

Definition 1

$\$A_0 > \$A_n \geq \$A'$

Where:

$\$A' = \$A_0 - \alpha\$B_0 - \$\,(C' - C_0) - \$PP'$

$\$A'$ = Stream A benchmark expenditure

$\$A_0$ = Stream A baseline cost

α = Stream B growth factor

$\$B_0$ = Stream B baseline cost

$\$C'$ = Stream C target expenditure

$\$C_0$ = Stream C baseline cost

$\$PP'$ = Total performance payment

9.3.1 Scenario testing

This macro-analysis evaluates the impact of the model by comparing four scenarios. One scenario examines the model's ideal national distribution. The other three scenarios examine possible sub-optimal distributions by manipulating key variables. A constant in each scenario is the projected 0.8% growth in Stream B expenditure (α).

Scenario 1: The ideal national distribution requires that the adjusted Stream A expenditure ($A') is at the minimum point of the range nominated in Definition 1. In addition Stream C activity is at target cost ($C') and the maximum performance ratio ($\beta' = VC_n/VC' = 1.0$) is necessary.

Scenario 2: This scenario keeps all the variables the same as in Scenario 1, except that the adjusted Stream A expenditure ($\$A_n$) is at the upper end of the range nominated in Definition 1 (i.e. at a level approaching the baseline $\$A_0$).

Scenario 3: This scenario considers the adjusted Stream A expenditure ($\$A_n$) across the range nominated in Definition 1. As in the first two scenarios, Stream C is at target cost ($C'). However the performance ratio is nil ($\beta_n = VC_n/VC' = 0.0$).

Scenario 4: This scenario also considers the adjusted Stream A expenditure ($\$A_n$) across the range nominated in Definition 1. However in this scenario there is no increase of Stream C activity above baseline levels ($\$C_0$) despite attainment of the maximum performance ratio ($\beta' = VC_n/VC' = 1.0$).

9.3.1.1 Scenario 1 - The ideal national distribution

Scenario 1 considers the model's ideal national distribution of general practice-referred diagnostic services. The model's projection for minimum Stream A expenditure at the benchmark cap is already known ($A' = $292,462,770). This is the outcome of Calculation 5 on page 193.

Based on these projections, Table 25 provides a macro-level summary of the redistribution that will occur in this scenario, assuming that the weighted mean unit values in Table 24 for each Stream apply. The second column shows the percentage redistribution within each Stream compared with current levels of activity and benefits claimed described originally in Chapter Seven. The third column describes the expected change for each Stream from current to projected levels of activity and benefits claimed as a percentage of the total.

The results for total activity and benefits claimed in Table 25 confirm the conclusion from Chapter Eight that only a marginal redistribution is required for an optimal outcome with the model. This scenario will produce approximately an 0.02% increase in activity yet a 2.2% reduction in the total cost of benefits claimed by diagnostic providers for general practice-referred diagnostic services. It is this marginal reduction that creates the total credit balance of approximately $33.4 million potentially payable to Divisions.

Table 25: Gross and percentage changes in the distribution of services delivered and benefits claimed by Stream

STREAM	Change in distribution	Change in distribution as a % of the Stream	Change in distribution as a % of the Total
Services Delivered			
A	- 1,956,650	-18.36%	-3.49%
B	388,179	0.89%	0.67%
C	1,580,365	84.90%	2.81%
Total	11,893	0.02%	
Benefits Claimed			
A	-$ 66,253,176	-18.47%	-3.95%
B	$ 9,011,537	0.80%	2.30%
C	$ 23,846,507	94.22%	1.65%
Total	-$ 33,395,131	-2.21%	

Over-referred items (Stream A) will reduce by approximately 3.5% of the total services delivered and 4.0% benefits claimed. Items referred at an appropriate level (Stream B) will increase by 0.7% of the total activity and 2.3% of the benefits claimed. Finally, under-referred items (Stream C) will increase by approximately 2.8% of the total services delivered and 1.7% of the total benefits claimed.

The reduced contribution from Stream A equates to a 18.4% decline in these items compared with their current levels of activity and benefits claimed. As modelled, Stream B items show a growth of 0.9% in services delivered and 0.8% benefits claimed compared with current levels. Most dramatically, Stream C activity needs to grow by 84.9% and benefits claimed by 94.2% to satisfy the conditions of Scenario 1.

Assuming that the combined performance ratio for all Divisions is optimal ($\beta_n = \beta' = 1.0$), Calculation 6 (replicating Calculation 4 on page 192) determines the maximum total performance payment in the first financial year (using the discretionary variable $x_{\$PP}$). With the model operating in a perfect state, this will equate to a total of approximately $33.4 million in performance payments (2002/03 constant values).

Calculation 7 confirms that there is no difference in the total cost to the Australian Government ($\$TC_0 - \$TC' = 0$) in Scenario 1.

Calculation 6

$x_{\$PP}$ = β.$(A′ - A′) + $(C′ - C_p) + $($w_{cvd}$ + w_{cc})

$x_{\$PP}$ = 1.0 x [(0) + (49,155,859 – 25,309,351)+ 951,869 + 8,596,755

$x_{\$PP}$ = $33,395,132

Credit balance:

$C′= $49,155,859
Less

C_p= $25,309,351

$23,846,508

Less offsets
$(A′ - A′) = $ 0
$23,846,508
Plus Weightings
+w_{cvd} = $951,869
+ w_{cc} = $8,596,755

$33,395,132

Where:

$x_{\$PP}$ = Variable for the calculation of the performance payment

$PP = Total performance payment

$A_n = $A′

$C_n = $C′ = $49,155,859
$C_p = $C_0 = $25,309,351

β = VC_n/ VC′ = 1.0

VC_n = VC′ = 908,961 items

w_{cvd} = weighted bonus for cholesterol screening

w_{cc} = weighted bonus for cervical screening

Calculation 7

$x_{TC'}$ = $A′+ $B′ + $C′ + $PP′

$x_{TC'}$ = $292,462,770 + 1,135,453,696 + 49,155,859 + 33,395,131

$x_{TC'}$ = $2,403,511,434

Therefore:

Variance = $($TC_0$ – TC′)

= $1,510,467,456 – $1,510,467,456

= $0

Where:

$x_{TC'}$ = Variable for the calculation of the total cost to the Australian Government

$A′ = $292,462,770

$B′ = $1,135,453,696

$C′ = $49,155,859

$PP′ = $33,395,131

$$TC_0$ = $1,510,467,456

Figure 23 and Figure 24 on pages 204 to 205 summarise the marginal shifts in services delivered and benefit claims between current levels and that projected in Scenario 1. As expected, Stream B continues to provide the majority of services delivered (78.4%) and benefits claimed (76.9%). Stream A items will decline to 15.5%

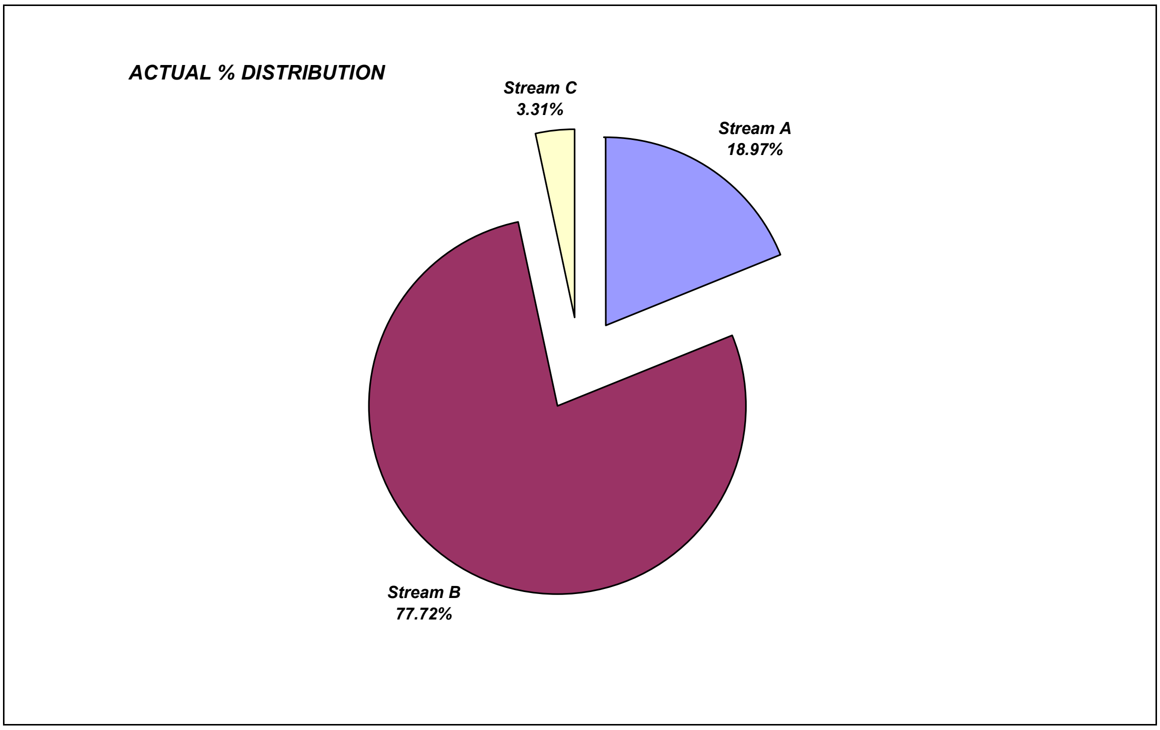
of activity and 19.8% of benefits claimed. Stream C items will grow to 6.1% of services delivered and 3.3% of the benefits claimed.

Using the discretionary variable $x_{\$R'}$, Calculation 8 demonstrates the reduction in aggregate revenue available to diagnostic providers. The impost of this reduction in revenue is borne predominantly by medical imaging providers. This is because there is a disproportionate level of benefits claimed for over-referred medical imaging items, whilst all the under-referred items are pathology services (Medicare Australia 2008 [a]; Medicare Australia [b]).

Calculation 8

	Where:
$x_{\$R'} = \$(A' + B' + C')$	$x_{\$R'}$ = discretionary variable for the calculation of the total revenue for diagnostic providers
$x_{\$R'} = 292{,}462{,}770+1{,}135{,}453{,}696+49{,}155{,}859$	$\$A' = \$292{,}462{,}770$
$x_{\$R'} = \$1{,}477{,}072{,}324$	$\$B' = \$1{,}135{,}453{,}696$
Therefore:	$\$C' = \$49{,}155{,}859$
Variance = $\$(R' - R_0)$	$\$R_0 = TC_0 = \$1{,}510{,}467{,}456$
= \$1,477,072,324 - 1,510,467,456	
= (\$33,395,131) UNFAV	

Figure 23: ***Comparisons of actual % activity by Stream with the ideal modelled distribution of the total general practice-referred diagnostic services***



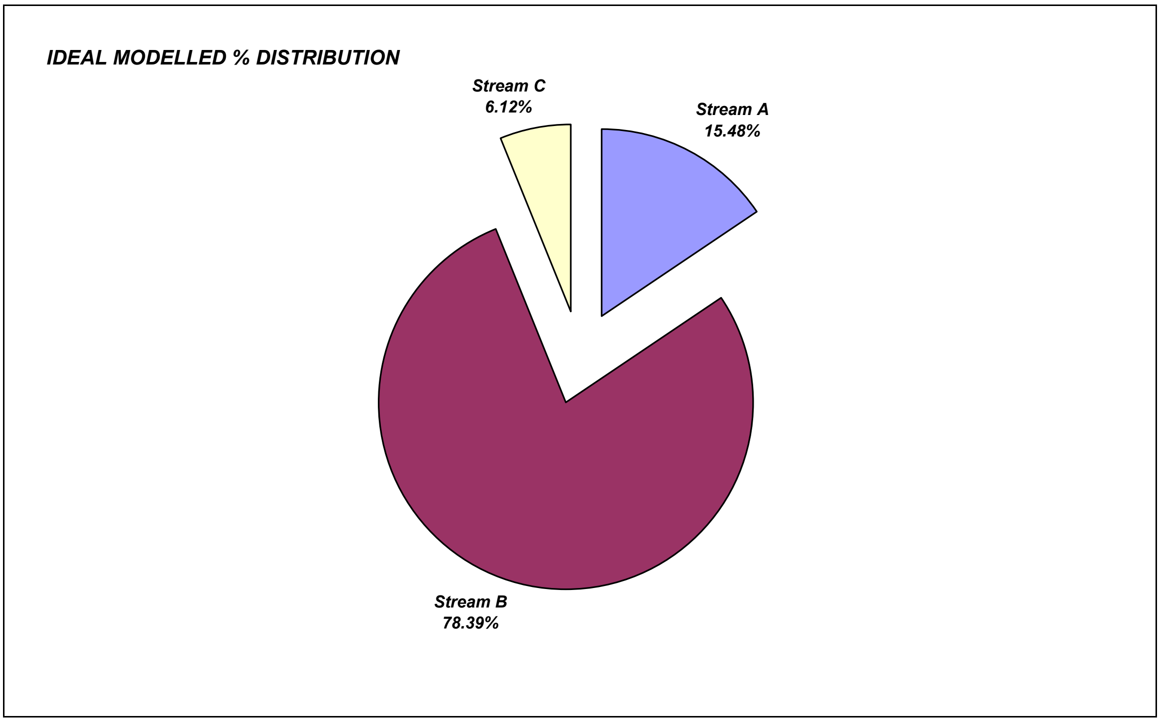
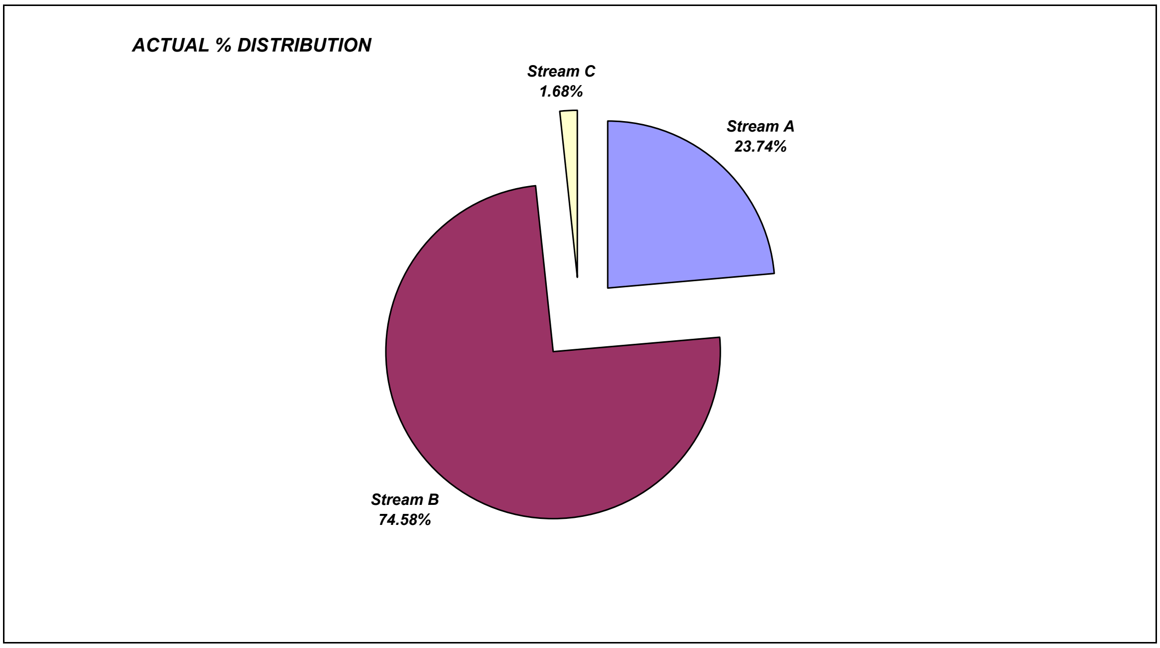
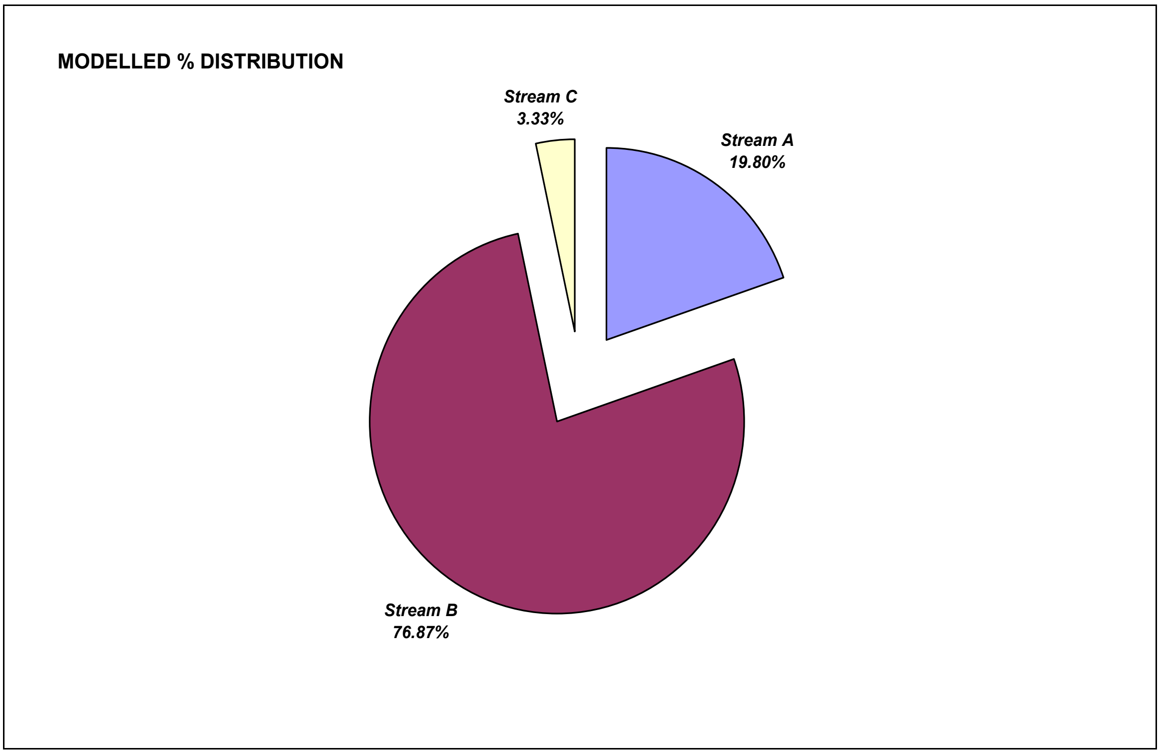


Figure 24: Comparisons of actual % benefits claimed by Stream with the ideal modelled distribution of the total general practice-referred diagnostic services





9.3.1.2 Scenario 2 - Operating at the upper end of the range for Stream A cost with Stream C activity at target levels

Scenario 2 keeps all variables the same as in Scenario 1, except that calculations turn to the upper end of the range identified in Definition 1 on 199 for Stream A expenditure

($\$A_n$). Using the discretionary variable $x_{\$An}$, Calculation 9 determines the value of Stream A expenditure ($\$A_n$ = \$325,857,901) at which the credit balance expires and there is nil performance payment ($\$PP_n$) in this scenario.

Calculation 9

$x_{\$An}$ = $\$A_0$ - (0.008 x $\$B_0$) - \$(C′ - C_p) - \$ PP_n

$x_{\$An}$ = \$(358,715,946) – (0.008 x 1,126,442,159) – (49,155,859 – 25,309,351) – (0)

$x_{\$An}$ = \$358,715,946 – 9,011,537 – 23,846,508 – 0

$x_{\$An}$ = \$325,857,901

Credit balance:

\$C′= \$49,155,859

Less

$\$C_p$= \$25,309,351

\$23,846,508

Less offsets

\$(A′ - A_n)=(-\$33,395,132)

(-\$9,548,624)

Plus Weightings

+$\$w_{cvd}$ = \$951,869

+ $\$w_{cc}$ = \$8,596,755

$\$PP_n$ = \$0

Where:

$x_{\$An}$ = Variable for the calculation of Stream A cost

$\$PP_n$ = Total Performance payment

$\$A_0$ = \$358,715,946

$\$C_n$ = \$C′ = \$49,155,859

$\$C_p$ = $\$C_0$ = \$25,309,351

β = VC_n/ VC′ = 1.0

VC_n = VC′ = 908,961 items

$\$w_{cvd}$ = weighted bonus for cholesterol screening

$\$w_{cc}$ = weighted bonus for cervical screening

Calculation 10 highlights that again there is no difference in the total cost to the Australian Government ($\$TC_0$ – $\$TC_n$ = 0). This is consistent with the horizontal total cost line (\$TC′) in Figure 25 on page 207 for the Australian Government which demonstrates that their outlay remains in steady-state in Scenario 2 (represented at point ***‘b’***).

Calculation 10

x_{TCn}= \$(A_n+ B′ + C′ + PP_n)

x_{TCn} = \$325,857,901 + 1,135,453,696 + 49,155,859 + 0

x_{TCn} = \$1,510,467,456

Where:

x_{TCn} = Variable for the calculation of the total cost to the Australian Government

$\$A_n$ = \$325,857,901

\$B′ = \$1,135,453,696

Therefore:

Variance = $(TC_0 – TC′)

= $1,510,467,456 – 1,510,467,456

= $0

$C′ = $49,155,859

$PP_n = $0

$TC_0 = $1,510,467,456

Calculation 11 demonstrates that in Scenario 2 there is no material reduction in the total of benefits claimed by diagnostic providers for general practice-referred diagnostic services compared with current levels.

Calculation 11

$x_{\$Rn}$ = $(A_n + B′ + C′)

$x_{\$Rn}$ = $325,857,901 + 1,135,453,696 + 49,155,859

$x_{\$Rn}$ = $1,510,467,456

Therefore:

Variance = $(R_n - R_0)

= $1,510,467,456 – 1,510,467,456

= $0

Where:

$x_{\$Rn}$ = discretionary variable for the calculation of the total revenue for diagnostic providers

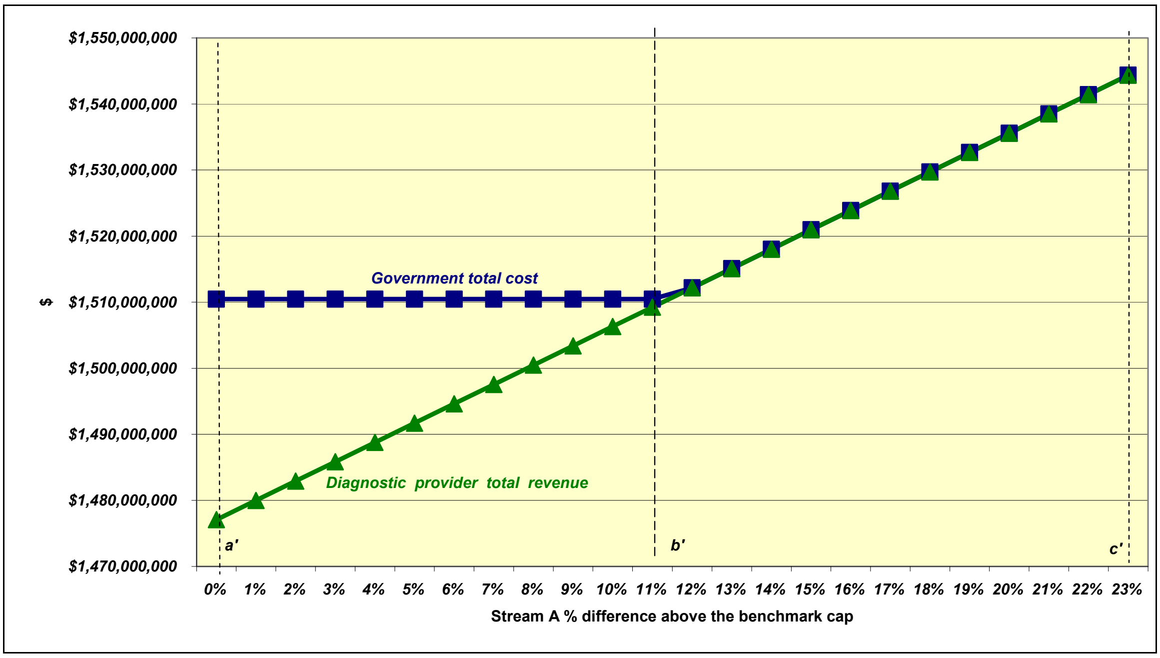
$A_n = $325,857,901

$B′ = $1,135,453,696

$C′ = $49,155,859

$R_0 = TC_0 = $1,510,467,456

Figure 25: Scenarios 1 & 2: Projected distribution of total funds for diagnostic services



The difference between Scenarios 1 and 2 is represented in Figure 25 as the range between points ***'a'*** and ***'b'***. The horizontal total cost line ($\$TC'$) for the Australian Government demonstrates that their outlay remains in steady-state for both Scenario 1 (represented at point ***'a'***) and Scenario 2 (represented at point ***'b'***). The distance between the government cost and diagnostic provider revenue lines at point ***a'*** approximates closely with the maximum credit pool that is potentially payable to the Divisions in the model. Subsequently, the vertical difference in values between lines from point ***'a'*** to point ***'b'*** represents the degree of possible redistribution from diagnostic providers' total revenue to the total Divisions' credit balance. At point ***'b'*** in Figure 25, the total diagnostic providers' revenue line approaches the Australian Government's total cost line. At this point there are no savings that can accumulate as potential performance payments to Divisions. There is no redistribution. At this point, this relationship still assumes that the performance ratio is optimal ($\beta' = 1.0$).

Both Scenarios 1 and 2 so far represent the range of redistribution possibilities at the maximum limit, which assumes benchmark expenditure in Streams B ($\$B'$) and C ($\$C'$) and maximisation of the performance ratio ($\beta' = 1.0$). Alternative scenarios below the optimal limit for the model need to also be considered, assuming that Stream A expenditure remains within the range nominated in Definition 1 on page 199.

9.3.1.3 Scenario 3 - Nil utilisation by targeted vulnerable social groups of Stream C items in combination with a range of Stream A costs

The model requires that Divisions can only realise the total performance payment ($\$PP_n$) as income with a positive ledger balance proportionate to the value of their performance ratio ($\beta_n = VC_n/VC'$). In this extreme scenario there is no utilisation of the targeted services by vulnerable social groups ($VC_n = 0$), despite the increased expenditure on the under-referred Stream C items ($\$C' – \$C_p$) up to target levels.

The lack of uptake of Stream C items by vulnerable social groups negates the performance ratio ($\beta_n = VC_n/VC' = 0$). Irrespective of what balance is accumulated in credit balance across the range of Stream A expenditure ($\$A_0 > \$A_n \geq \$A'$), the Divisions have no key with which to unlock performance payments.

In this scenario the trajectory of the Australian Government total cost line ($\$TC_n$) in a given year (n) will mimic exactly that of diagnostic providers' total revenue line represented in Figure 25 on page 207. There is no obvious incentive for the Divisions to either continue the pursuit of targets for Stream C or contain Stream A referrals. In the short run the total cost to the Australian Government is lowered compared with current outlays if referrals for Stream A items are contained at the benchmark cap ($\$A_n = \$A'$). However the likelihood that this position will be maintained is improbable. It is likely that over the long run the upward creep in Stream A activity will continue unabated, and may eventually cause total cost ($\$TC_n$) to exceed the indifference point at ***'b'***. At point ***'c'*** in Figure 25 for example, total cost ($\$TC_n$) equals the sum of the current baseline expenditure on Stream A items combined with the projected growth in expenditure on Stream B plus target levels of expenditure on Stream C ($\$TC_n = \$A_0 + \$B' + \$C' = \$1,543,325,500$). This represents a 2.2% increase in total cost compared with the baseline, adjusted to 2002/2003 constant values.

9.3.1.4 Scenario 4 - Nil change in the net utilisation of Stream C items despite utilisation by targeted vulnerable social groups at target levels in combination with a range of Stream A costs

In this scenario, the Divisions achieve the target level of under-referred Stream C services for vulnerable social groups (VC′). This results in an optimal performance ratio ($\beta' = 1.0$). However, if there is no net increase in actual Stream C activity ($C_n = C_p$) the Divisions' capacity to accumulate a positive credit balance is limited. The Divisions' total credit balance will only reflect any savings achieved in Stream A ($\$A' - \$A_n$) plus the weighted bonuses for cholesterol and cervical screening ($\$w_{cvd} + \$w_{cc}$) within vulnerable social groups.

Calculation 12 shows a saving of approximately $47.7 million (or 3.2%) in this scenario compared with current baseline costs ($\$TC_0$), when Stream A expenditure is maintained at the benchmark cap ($A'). This is represented as the vertical distance between the two slopes at point ***a'*** in Figure 26 on page 210.

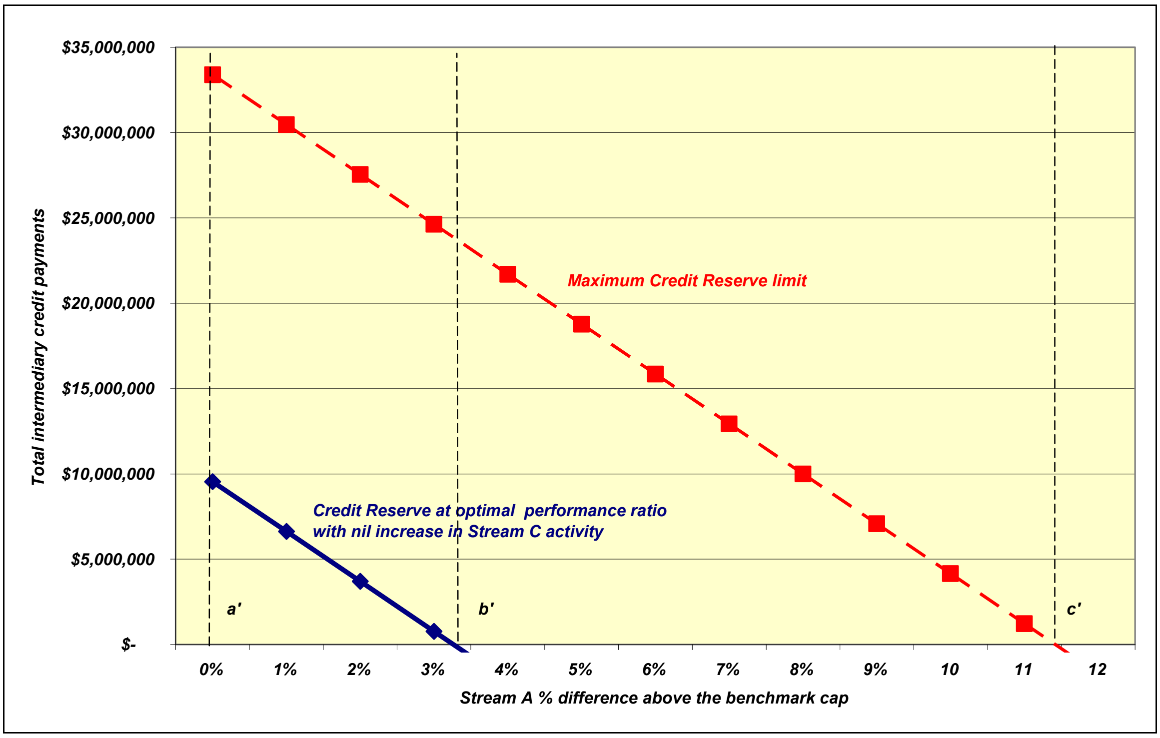
Calculation 12

	Where:
$x_{TCn} = \$(A' + B' + C_n + PP_n)$	x_{TCn} = Variable for the calculation of the total cost to the Australian Government
$x_{TCn} = \$292,462,770 + 1,135,453,696 + 25,309,351 + 9,548,624$	$\$A'$ = $292,462,770
$x_{TCn} = \$1,462,774,441$	$\$B'$ = $1,135,453,696
Therefore:	$\$C_n$ = $25,309,351

Variance = $(TC_0 – TC_n)$	PP_n = $9,548,624
= $1,510,467,456 – 1,462,774,441	TC_0 = $1,510,467,456
= $47,693,015 FAV	

Figure 26 demonstrates that the aggregate credit balance in this scenario is sub-optimal. When Stream A expenditure is maintained at the benchmark ($A'), the maximum value is approximately $9.5 million (represented at point ***a'***). The negative sloping line reflects the decline in the total performance payment as benefits claimed for Stream A items exceeds the target cap (A_n > $A'). The total credit balance ($(A'-$A_n$) + $($C_n – C_p$) + $$w_{cvd}$ + $$w_{cc}$) expires at between 3-4% variance above the Stream benchmark cap ($A') (represented at point ***b'***).

Figure 26: Projected performance payment compared with the optimal limit assuming a constant performance ratio despite no increase in Stream C expenditure and progressive percentage increases in Stream A expenditure above the benchmark



This is the result of two sub-optimal outcomes in this scenario. The first is that no net increase in Stream C activity (C_n = C_p) represents an approximate $23.8 million underspend for the Australian Government compared with target levels ($C′). The other is that the total performance payment is sub-optimal by this same amount, compared with the ideal distribution in Scenario 1.

Calculation 13 demonstrates that this same level of underspend is sustained up to the point where Stream A expenditure ($\$A_n$) exceeds the benchmark cap ($\$A'$) by approximately \$9.5 million (or 3.3%) (represented as the range between points ***a'*** to ***b'*** in Figure 26). Beyond point ***b'*** any further variation in Stream A expenditure above the benchmark ($\$A_n > \$A'$) will reflect a direct increase in total cost to the Australian Government ($\$TC_n$).

However Calculation 14 highlights that the savings in this scenario by the Australian Government are not exhausted until the indifference point is reached with current baseline cost ($\$TC_0$). This point is reached at approximately \$57.2 million (or 19.6%) in Stream A expenditure ($\$A_n$) above the benchmark ($\$A'$) (represented as point ***c'*** in Figure 27 on page 212). This figure represents the combination of the Australian Government underspend (\$47.7 million) plus the potential total credit forsaken by the Divisions (\$9.5 million).

Calculation 13

$x_{\$An} = \$TC_n - \$(B' + C_n + PP_n)$

$x_{\$An} = \$1,462,774,441 - (1,135,453,696 + 25,309,351 + 0)$

$x_{\$An} = \$302,011,394$

Therefore:

Variance = $A' - A_n$

= \$292,462,770 – 302,011,394

= (\$9,548,624) UNFAV

Where:

$x_{\$An}$ = Variable for the calculation of stream A expenditure

$\$TC_n$ = \$1,462,774,441

$\$A'$ = \$292,462,770

$\$B'$ = \$1,135,453,696

$\$C_n$ = $\$C_n$ = \$25,309,351

$\$PP_n$ = \$0

Figure 27 shows that revenue for diagnostic providers has a direct positive linear relationship with the difference in Stream A expenditure ($\$A_n$) above the benchmark ($\$A'$). Between point's ***a'*** and ***b'*** the slope on the diagnostic providers' revenue line is a reflection of the Divisions' declining capacity to accumulate credit. Between points ***b'*** and ***c'***, the diagnostic providers' revenue line exactly mimics total cost to the Australian Government ($\$TC_n$) in a given year (n). Diagnostic provider revenue will also not attain an indifference point with their current status until point ***c'***, at approximately 19.6% difference in Stream A expenditure ($\$A_n$) above the benchmark ($\$A'$). The vertical difference at any point on the graph between the actual baseline total cost to the

Australian Government line and the diagnostic providers' revenue line represents this reduction.

Calculation 14

$x_{\$An}$ = $\$TC_0 - \$(B' + C_n + PP_n)$

$x_{\$An}$ = \$1,510,467,456 – (1,135,453,696 + 25,309,351 + 0)

$x_{\$An}$ = \$349,704,409

Therefore:

Variance = $A' - A_n$

= \$292,462,770 – 349,704,409

= (\$57,241,639) UNFAV

Where:

$x_{\$An}$ = Variable for the calculation of stream A expenditure

$\$TC_0$ = \$1,510,467,456

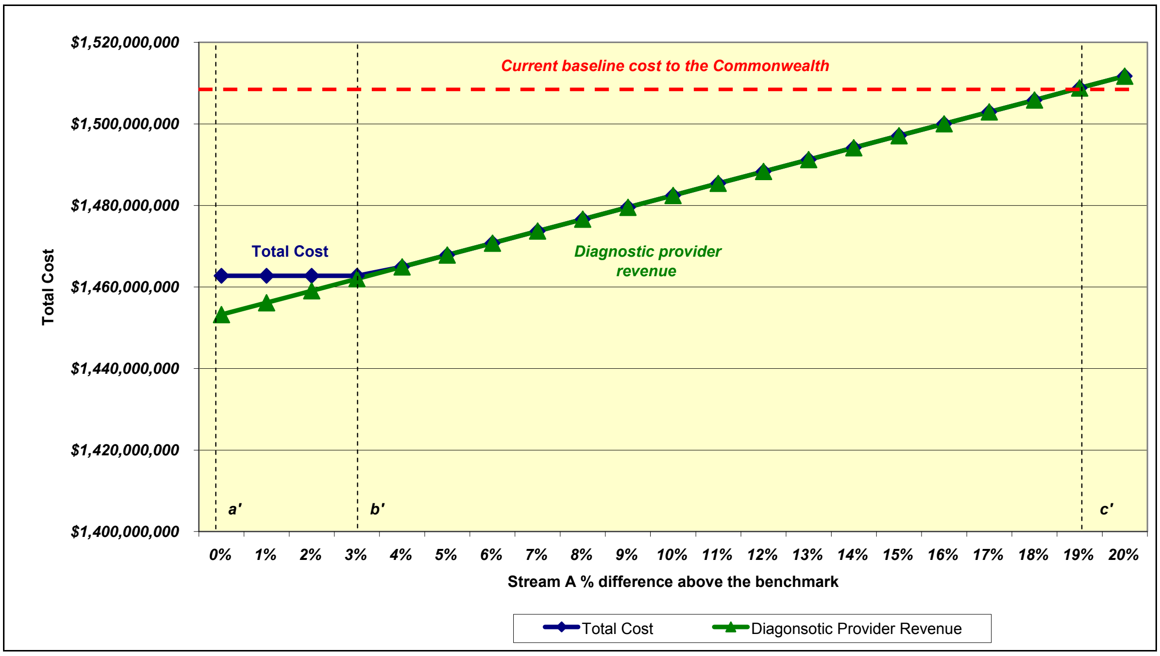
\$A′ = \$292,462,770

\$B′ = \$1,135,453,696

$\$C_n$ = $\$C_n$ = \$25,309,351

$\$PP_n$ = \$0

Figure 27: Projected distribution of total funds for diagnostic services in scenario 4



As shown in Calculation 15, at point ***a′*** this reduction in revenue for diagnostic providers is the full \$57.2 million variation described above (or 3.8% of current revenue).

Calculation 15

$x_{\$Rn} = \$(A' + B' + C_n)$

$x_{\$Rn} = \$292,462,770 + 1,135,453,696 + 25,309,351$

$x_{\$Rn} = \$1,453,225,817$

Therefore:

Variance = $\$(R_n - R_0)$

= \$1,453,225,817 - 1,510,467,456

= (\$57,241,639) UNFAV

Where:

$x_{\$Rn}$ = discretionary variable for the calculation of the total revenue for diagnostic providers

$\$A'$ = \$292,462,770

$\$B'$ = \$1,135,453,696

$\$C_n$ = $\$C_n$ = \$25,309,351

$\$R_0$ = $\$TC_0$ = \$1,510,467,456

In this scenario the Divisions have accrued only a marginal total credit ($\$(A' - A_n) + \$(C_n - C_p) + \$(w_{cvd} + w_{cc})$), which is well below the optimal limit. This produces only a token incentive to contain increased Stream A expenditure above the benchmark cap (\$A'). This will deter further pursuit of the performance ratio ($\beta_n = VC_n/VC'$) through increased uptake of Stream C items by vulnerable social groups. The net result over time with this scenario will be for total costs to the Australian Government (TC_n) to exceed point **b'**. An upwards creep will continue unabated and eventually exceed the indifference point at ***c'*** in Figure 27.

9.3.1.5 A summary of the macro-level scenarios

Table 26 summarises the implications of each macro-level scenario on the Australian Government, Divisions of General Practice, diagnostic providers and vulnerable social groups respectively.

The model is built on realising financial incentives for Divisions as the key instrument in driving redistribution. Though the goal of increasing access for vulnerable social groups to Stream C items up to target levels is possible in all but Scenario 3, improvements will probably only be sustained in Scenario 1.

In terms of financial redistribution, Scenario 2 offers no change to the status quo. It presents a situation where the model's population health goals are achievable without the need for Division incentives. The rate and mix of referrals by general practice to diagnostic providers attains equilibrium, and the cost to the Australian Government remains in a steady state.

Table 26: Summaries of the implications for stakeholders in the macro-level scenarios

Macro-level scenarios	Australian Government	Divisions' network	Diagnostic Providers	Vulnerable social groups
Scenario 1	*Total cost is in status quo*	*Optimal gains in the aggregate credit balance*	*Total revenue is reduced compared with current levels*	*Access to target services at target levels*
Scenario 2	*Total cost is in status quo*	*Nil aggregate credit balance*	*Total revenue is in status quo*	*Access to target services at target levels*
Scenario 3	*Total cost ranging from underspent to status quo*	*Nil aggregate credit balance*	*Total revenue ranging from a reduction to status quo*	*No increase in access to target services*
Scenario 4	*Total cost ranging from underspent to status quo*	*Aggregate credit balance ranging from sub-optimal to nil gain*	*Total revenue ranging from a reduction to status quo*	*Access to target services at target levels*

However this scenario runs against the grain of recent history. The very stimulus for deriving the redistribution model is the substantial open-ended growth in general practice-referred diagnostics that has occurred without clear reference to evidence-based practice.

It is difficult to envisage that Scenario 2 will be sustained for any length of time. It is more likely that Divisions will either actively pursue a reduction in Stream A item referrals in order to accrue credit reserve, or become disenfranchised if the task proves too difficult. In the latter case Stream A item referrals will continue to creep up unabated.

Scenario 3 describes a situation where the model fails to stimulate the supply of targeted items to vulnerable social groups. Any increase in Stream C activity reflects consumption by groups who have no particular barriers to access. In the short term there are possible savings for the Australian Government with an improvement in the total uptake of the targeted screening tests. However in the long run Scenario 3 will prove to be at the expense of the social welfare function because there is no improvement in access by those most in need.

Scenario 4 describes a situation where the model fails to stimulate any net increase in the supply of targeted items to the populace overall. Concurrently the model acts as a blunt instrument in broadly containing general practice referral rates to diagnostic services. In this case the possible savings for the Australian Government are substantial even when the population health goals for vulnerable social groups are realised. Some of the financial incentive for Divisions is realised, and there is some benefit to the social welfare function. However in each case the result is sub-optimal.

Again it is difficult to envisage that this scenario will be sustainable for any length of time. It is more likely that Divisions will try and improve on their position by actively pursuing a broad increase in Stream C item referrals and reduce the Australian Government underspend (i.e. move towards a position more like Scenario 1). Additionally Divisions may find it difficult to contain Stream A item referrals indefinitely. The Australian Government underspend will also shrink over time but with no further gain in the social welfare function (i.e. move towards a position more like Scenario 2).

9.4 A meso-level normative analysis of redistribution adjusted for geographic dispersion

9.4.1 Defining the mix of Division catchment populations using categories of geographic dispersion

Chapter Seven provided an analysis of the current utilisation of general practice-referred diagnostic testing by the Rural, Remote & Metropolitan Areas (RRMA) classification system (see Appendix 1 page 331 for a description of the RRMA classification system). It provided a breakdown of the mean levels of utilisation per 10,000 standardised whole patient equivalents for over-referred (Stream A) appropriately referred (Stream B) and under-referred (Stream C) items by each RRMA classification. Chapter Seven also provided calculations of the mean unit values for each stream.

This analysis confirmed findings noted in the literature that there are significant differences in access and utilisation of both general practice and general practice-referred diagnostic testing according to geographic dispersion. The literature also notes a disproportionate shift in demographic profiles according to geographic dispersion. In particular, the relative portions of vulnerable social groups increase with increasing rurality and remoteness (Australian Bureau of Statistics 2003; Australian Institute of Health and Welfare 2005 p.156).

However, the nominal use of broad geographically-defined strata or zones is insensitive to the demographic mix within Division catchment populations. Recognising this, the Primary Health Care Research and Information Service (2006) produced a geographic benchmarking tool which groups Divisions of General Practice by five categories according to their relative mix of RRMA classes. The nominated categories in the benchmarking tool are:

- Metropolitan (>95% of population in RRMA 1,2)
- Metropolitan/Rural (<95% of population in RRMA 1,2 & <95% in RRMA 3,4,5)
- Rural (>95% of population in RRMA 3,4,5)
- Rural/Remote (<95% of population in RRMA 3,4,5 & <95% in RRMA 6,7)
- Remote (>95% of population in RRMA 6,7)

The Primary Health Care Research and Information Service (2006) benchmarking tool provides a reasonable typology of demographics and geographic dispersion across the Divisions of General Practice network. It lists one-hundred and nineteen of the Divisions as at 2004-2005, including the service catchment sizes and the estimated number of Aboriginal persons within each Division. Nonetheless, the definitions of the three middle categories (i.e. Metropolitan/Rural, Rural, and Rural/Remote) are too imprecise to allow reasonable application of the model’s weightings. It also gives no indication of the degrees of variation within each category according to geographic dispersion.

A better definition of the geographic mix would require populations within small, discrete areas to be reliably defined at a sub-Divisional level. The problem is that Division boundaries have historically been defined using postcodes. Whilst there are often similarities, postcodes do not correspond with Census collection districts (CD) and their aggregate statistical local areas (SLA). In many cases Division boundaries cross statistical local areas. Postcodes are too imprecise to measure either resident population or geographic dispersion (Preston 2006 pp.1-2).

This problem was addressed by the University of Adelaide's Public Health Information Development Unit, which sought to estimate age-adjusted mortality, morbidity and hospitalisation rates at a Divisional level (Preston 2006 pp.1-2). The Unit has established a reliable concordance for the one-hundred and nineteen Divisions of General Practice with Census statistical local areas. In the cases where boundaries are crossed, statistical local area population counts are apportioned between Divisions.

It is now possible to cross-reference with work by the Australian Institute of Health and Welfare (2004 p.76) which categorises each statistical local area according to a RRMA class. Applying the Public Health Information Development Unit (2006[a]; 2006[b]) datasets based on estimated residential populations at the SLA level as at June 2001, Appendix 2 summarises the percentage mix by RRMA class for the one-hundred and nineteen Divisions of General Practice using the geographic categories in the Primary Health Care Research and Information Service (2006) benchmarking tool.

Appendix 2 contains a geographic categorisation of Divisions very similar to that provided in the Primary Health Care Research and Information Service (2006) benchmarking tool, though it is not identical. Three Divisions denoted by the Primary Health Care Research and Information Service (2006) as Metropolitan are categorised in Appendix 2 as Metropolitan/Rural instead because marginally less than 95% of their estimated resident populations are identified as RRMA 1 and 2 (Australian Institute of Health and Welfare 2004 p.76; Public Health Information Development Unit (2006[a]; 2006[b]). One reason for this variation is that the Primary Health Care Research and Information Service (2006) use the estimated residential population adjustments to the 2001 Census as at June 2004, whilst the Public Health Information Development Unit (2006[a]; 2006[b]) datasets are based on June 2001 figures.

Appendix 2 also provides the RRMA breakdown of the one Division listed but not categorised by the Primary Health Care Research and Information Service (2006) benchmarking tool. This Division is placed within the Rural grouping according to the benchmarking tool's definitions.

9.4.2 Scenario testing

The original intent of this study was to test the model against actual data matched to specific Divisions of General Practice (Australian Divisions of General Practice 2005; Primary Health Care Research and Information Service 2006). However Medicare

Australia (formerly known as the Health Insurance Commission) denied access to data that could potentially identify diagnostic or general practice providers by their links to a particular Division's service catchment area. In the absence of actual utilisation data, it is necessary to model assumptions using a variety of data to project how Divisions can reasonably expect to respond to the model.

Accepting this, it is possible to project what the model distribution will be for each Division of General Practice given a particular set of conditions. The first step is to develop normative estimates for each of the geographic categories. This is achieved by applying category means and standardising the catchment to a nominal size (e.g. 10,000 SWPE) so as to control for variations in Division scale.

Appendix 3 projects potential performance payments using mean values per 10,000 SWPE for each of the categories. In so doing, it assesses the impact of the model by introducing three more meso-level scenarios. They are the potential credit balances at:

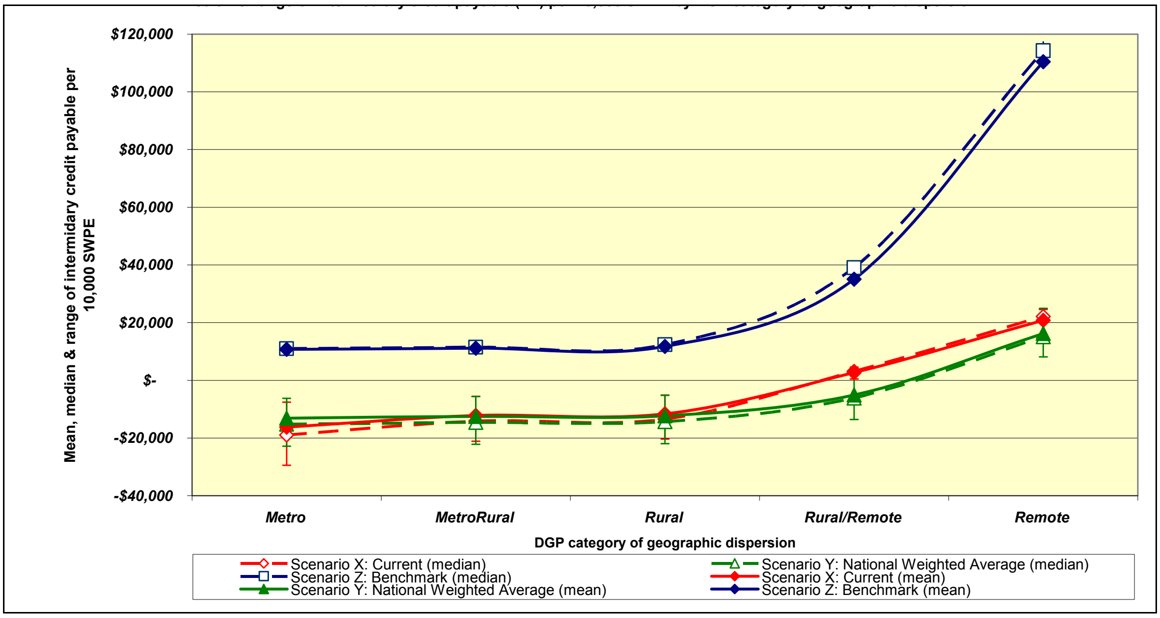
Scenario X: Current levels of general practice-referred diagnostic activity for each category.
Scenario Y: The current national weighted average levels of activity for each category.
Scenario Z: The projected target levels of activity (as discussed in Chapter Eight) for each category.

Calculations include the projected changes in the levels of activity per capita in Streams A and C, plus the performance ratio ($\beta = VC_n / VC'$). In addition, the calculations include the products of the weighted bonuses for targeted items by the estimated uptake per capita within vulnerable social groups ($\$w_{cvd} + \$w_{cc}$) (Australian Bureau of Statistics 2001; Australian Bureau of Statistics 2003; Australian Bureau of Statistics 2004; Australian Institute of Health and Welfare 2005 p.156; Health Insurance Commission 2003[b]; National Health & Medical Research Council 1996).

Figure 28 on page 219 summarises the results from Appendix 3. It demonstrates credit payable per 10,000 SWPE for each geographic category according to each scenario, applying both the weighted mean and median unit values for Stream A and C items. All else being equal, the high-point of the range above each median represents modelling where the 25% quartile Stream A unit values from Table 24 on page 198 are applied in combination with the 75% quartile Stream C unit values. The low-point of the range below each mean in turn represents the reverse for Stream A and Stream C unit values respectively.

Using this method, the range either side of each median at benchmark levels is immaterial. This is because any variations in Stream A unit values are negated at benchmark levels ($\$A_n$ - $\$A'$= 0), whilst the semi-interquartile range for Stream C median unit values is very narrow (Refer to Table 24 on page 198).

Figure 28: ***Mean projected performance payments ($PP) by category of geographic dispersion per 10,000 SWPE***



9.4.2.1 Scenario X - Current levels of general practice-referred diagnostic activity for each category of geographic dispersion

At current levels of activity, Figure 28 demonstrates that the model projects a negative credit balance per 10,000 SWPE using mean values for Metropolitan, Metropolitan/Rural or Rural categories. On the other hand the results for Rural/Remote and Remote categories are positive, with Appendix 3 projecting mean credit balances in excess of $2,000/10,000 SWPE and $20,000/10,000 SWPE respectively. This difference in results between categories of geographic dispersion gives some indication of the wide discrepancies in practice between regions.

9.4.2.2 Scenario Y - The current national weighted average levels of activity for each category of geographic dispersion

Figure 28 demonstrates that the application of the current national weighted average levels of activity produces a negative mean credit balance per 10,000 SWPE for all except the Remote category of geographic dispersion. Appendix 3 shows that the Remote category produces a favourable median credit balance of approximately $16,000/10,000 SWPE. These results are because the weighted average reflects the predominance of population from the Metropolitan and Metropolitan/Rural areas.

9.4.2.3 Scenario Z - The projected benchmark levels of activity for each category of geographic dispersion

By contrast, Figure 28 demonstrates that if the Divisions of General Practice collectively pursue the incentives in the model up to the nominated target levels, there is a capacity in all categories of geographic dispersion to accrue favourable credit balances. As the detail in Appendix 3 specifies, this ranges from a relative low of approximately $11,000/10,000 SWPE in the Metropolitan and Metropolitan/Rural categories to a high of approximately $110,000/10,000 SWPE in the Remote category.

9.4.2.4 Assessment of the potential gains and effort required by Divisions of General Practice to benefit from the model, according to categories of geographic dispersion and the need for potential correction

The variations identified between the three scenarios are so far only indicative. Further scrutiny is required in order to determine which categories of geographic dispersion require the most correction to attain at least a minimum positive balance, and which potentially have the most to gain above the minimum positive balance up to target levels. In turn the combination of these two effects gives some indication of the net effort required to attain optimal returns from the model. Table 27 describes the range per 10,000 SWPE in projected credit balances between mean values at target and current activity levels respectively.

Table 27: Indicators of correction, potential gain and relative effort by geographic category for the Divisions of General Practice to achieve the model targets per 10,000 SWPE

PHCRIS category	Variance current to minimum balance	Ratio of Correction compared with the mean	Variance minimum balance to benchmark	Ratio of Potential Gain compared with the mean	Variance current to benchmark	Ratio of net effort compared with the mean
Metro	*-$ 29,431*	**4.28**	*$ 10,700*	**0.29**	*$ 40,130*	**0.92**
Metro/Rural	*-$ 21,156*	**3.08**	*$ 11,200*	**0.30**	*$ 32,356*	**0.74**
Rural	*-$ 20,285*	**2.95**	*$ 12,045*	**0.33**	*$ 32,330*	**0.74**
Rural/Remote	*$ 5,762*	**0.00**	*$ 38,155*	**1.04**	*$ 32,393*	**0.74**
Remote	*$ 30,710*	**0.00**	*$ 111,655*	**3.04**	*$ 80,945*	**1.86**
Mean	*-$ 6,880*	**1.00**	*$ 36,751*	**1.00**	*$ 43,631*	**1.00**

The left-hand pair of columns in Table 27 describes the range between current levels and the minimum positive balance noted in the ledger within the model (i.e. zero dollars). Using this indicator, it is the Metropolitan category on average that requires the greatest degree of relative correction (-$29,431/10,000 SWPE), followed by the Metropolitan/Rural category (-$21,156/10,000 SWPE). On the other hand the Rural/Remote and Remote categories require no level of correction, as both obtain positive credit balances at current levels of activity.

Figure 28 on page 219 demonstrates this as the vertical distance at any point between the current activity line and the zero horizontal axis. The ratio of this range for each geographic category with the mean range across all categories is then used as an indicator of the correction required should Divisions change from their current level and mix of activity to achieve at least a zero balance. A ratio higher than unity (≥ 1.0) indicates a greater than average correction is required, whilst the reverse is true for ratios less than unity (≤ 1.0).

The middle pair of columns in Table 27 describes the potential gains per 10,000 SWPE within each geographic category by moving from the minimum positive balance to mean values at target levels of activity. Using this indicator, the Remote category has the greatest potential gain from the model ($111,655/10,000 SWPE). Conversely the Metropolitan category has the least potential to gain ($10,700/10,000 SWPE). Figure 28 demonstrates this as the vertical distance at any point from the zero horizontal axis to the target activity line. A ratio higher than unity (≥ 1.0) indicates a greater than average gain is possible, whilst the reverse is true for ratios less than unity (≤ 1.0).

The right-hand pair of columns looks at the total range from current activity to target levels for each geographic category. This is then compared with the mean range across all categories to provide an indicator of the relative effort required by Divisions in order change from their current level and mix of activity to achieve the model targets. A ratio higher than unity (≥ 1.0) indicates a greater than average effort is required, whilst the reverse is true for ratios less than unity (≤ 1.0). Using this indicator, the greatest effort is required from within the Remote category ($80,945/10,000 SWPE), followed by the Metropolitan category ($40,130/10,000 SWPE). However there are didactic rationales underpinning this result. For the Remote category, Divisions will typically start from the most favourable values at current levels of activity but still have the largest gains per 10,000 SWPE to pursue. With a large margin to pursue, all progress will register as a gain, because they do not need to correct for any unfavourable balance at current levels of activity. Conversely, for the Metropolitan category there is only a relatively modest gain per 10,000 SWPE to pursue. However Metropolitan Divisions are starting from the most unfavourable values at current levels of activity. These Divisions require the greatest degree of correction to even attain a zero balance. Figure 28 on page 219 demonstrates this as the vertical distance at any point between the current activity and target lines.

Almost identical effort is required from within the Metropolitan/Rural, Rural and Rural/Remote categories. Figure 28 graphically demonstrates this, with a relatively modest vertical distance between the current and target activity lines in each case ($32,330-32,393/10,000 SWPE).

9.4.2.5 A summary of the meso-level scenarios

Table 28 summarises in broad terms the normative implications of each meso-level scenario on the credit balance for Divisions of General Practice within each of the categories. This summary assumes that median unit values for Stream A and Stream C items apply.

It demonstrates that, regardless of the scenario, the model has a defining bias that favours increasing rurality and remoteness increases. This is consistent with the model's aim to provide supply incentives for servicing vulnerable social groups.

*Table 28: **Summaries of the implications for the credit balances per 10,000 SWPE for Divisions of General Practice within each of the categories when applying the meso-level scenarios***

Meso-level scenarios	Metro	Metro/ Rural	Rural	Rural/ Remote	Remote
Scenario X: Current activity	*Nil gains*	*Nil gains*	*Nil gains*	*Moderate gains*	*Major gains*
Scenario Y: National weighted average activity	*Nil gains*	*Nil gains*	*Nil gains*	*Nil gains*	*Moderate gains*
Scenario Z: Target activity	*Moderate gains with major effort required*	*Moderate gains with moderate effort required*	*Moderate gains with least effort required*	*Major gains with moderate effort required*	*Maximum gains with maximum effort required*

For Divisions of General Practice in the Metropolitan, Metropolitan/Rural and Rural categories no gain is likely in their credit balances when operating at either current (Scenario X) or national weighted average (Scenario Y) levels of activity. When operating at targeting levels of activity (Scenario Z) moderate gains per 10,000 SWPE are attainable in each case, with the effort required to achieve this declining as rurality increases.

For Divisions of General Practice in the Rural/Remote and Remote categories reasonable gains are likely in their credit balances when operating at current levels (Scenario X), with these gains amplified as remoteness increases. At national weighted average (Scenario Y) only in the Remote category are reasonable gains possible. Operating at targeting levels of activity (Scenario Z) major gains per 10,000 SWPE are attainable in each case, though this is dependent on a substantial level of effort. This is particularly the case for Divisions in the Remote category, where the maximum gains in the model per 10,000 SWPE are possible. However, the maximum gains are concomitant with the maximum degree of effort required.

9.5 An interim refinement to the model during its implementation phase

The results so far suggest that a refinement is required for the practical implementation of the model. Using the Primary Health Care Research and Information Service (2006) dataset, it is estimated that 64.3% of Australia's population live within the Metropolitan category alone. It is Divisions within this category that requires major effort for moderate gains, and potentially may be the least compliant. The same predicament applies to a lesser extent for both the Metropolitan/Rural and Rural categories. These categories account for a further 11.9% and 18.8% of the population respectively.

The implication is that, during the model's implementation phase, some sort of pragmatic transition strategy needs to be applied in order to assist Metropolitan, Metropolitan/Rural and Rural Divisions of General Practice to address their levels of correction and realise some gain as an incentive to actively participate. This in turn will have cost implications. It may require that the model operates for an interim period outside the terms of the reference case presented in Chapter Eight.

One way forward is to waive the corrective portion of the variation between any negative values of credit balance at current levels of activity and a minimum positive balance. With the overriding caveat that over-referred activity (Stream A) does not deteriorate further, all Divisions of General Practice will then be acknowledged for any improvement in the pursuit of under-referred target items (Stream C). In particular they will be rewarded where there is any uptake by vulnerable social groups (VC_n). The interim performance payments (denoted hereafter as $\$PP_i$) by a Division in this phase will equal:

IF ($\$A_n \leq \$A_0$): $\$PP_i = \beta.\$(C_n - C_p) + \$(w_{cvd} + w_{cc})$

At a macro-level the maximum total credit payable to Divisions of General Practice ($\$PP_i'$) will not change. As already outlined in Calculation 6 on page 202, Divisions will continue to accrue a credit balance according uptake of Stream C items ($\$C_n$ – $\$C_p$) plus the weighted bonuses ($\$w_{cvd}$ + $\$w_{cc}$), and will be able to realise this credit in proportion to their performance ratio ($\beta_n = VC_n/VC'$). The only substantial difference is that the likelihood of Divisions' attaining this maximum capacity will be much higher.

The outcome of this strategy is to motivate all Divisions to participate, and provide them sufficient incentive to use the time in addressing their levels of correction. The assumption is that Metropolitan, Metropolitan/Rural and Rural Divisions will eventually be in a better starting position for when the full model is applied according to the terms of the reference case.

Applying this pragmatic strategy for a time-limited period does have cost implications for the funder (i.e. the Australian Government) at the macro-level. Importantly, the terms of the reference case are not maintained during the implementation phase. Calculation 16 on page 225 demonstrates that, assuming optimal participation by Divisions, the transition strategy will cost the Australian Government up to an extra \$66.3 million per annum in 2003 values. This represents an increase on current cost of approximately 4.4%. However, referring back to Table 15 on page 177, diagnostic services already has an average growth of approximately 1.8% per annum. In constant value terms, this interim strategy represents a real growth of 2.6% compared with what the projected cost would be after one financial year without the intervention of the model.

Calculation 16

x_{TCn} = \$ A_n + \$B′ + \$C′ + \$PP′

x_{TCn} = \$358,715,946 + 1,135,453,696 + 49,155,859 + 33,395,131

x_{TCn} = \$2,464,699,815

Therefore:

Variance = \$(TC_0 – TC_n)

= \$2,403,511,434 – 2,464,699,815

= (\$66,253,176) UNFAV

Where:

x_{TCn} = Variable for the calculation of the total cost to the Australian Government

\$$A_n$ = \$$A_0$ = \$358,715,946

\$B′ = \$1,135,453,696

\$C′ = \$49,155,859

\$PP′ = \$33,395,131

\$$TC_0$ = \$1,510,467,456

Assuming that this transition strategy is effective, the model will then progress to its full application. The remainder of the results in this chapter are premised on the model operating in full, and apply to the reference case only.

9.6 A micro-level analysis of redistribution by applying scale and adjusting for geographic dispersion

9.6.1 Applying scale to give absolute measures of redistribution

It is now possible to project what the absolute response to the model will be at the level of an individual Division of General Practice. Applying a series of mean unit values will give the most likely response across the same three scenarios outlined in Section 7.4 (Scenarios X, Y and Z). Varying these values across a predictable range will provide a sensitivity analysis for the model projections.

Appendix 4 provides a summary of the projected absolute credit balances that are calculated in more itemised detail in Appendix 5 for each Division grouped according to geographic category (Australian Bureau of Statistics 2001; Australian Bureau of Statistics 2003; Australian Bureau of Statistics 2004; Australian Institute of Health and Welfare 2005 p.156; Health Insurance Commission 2003[b]; National Health & Medical Research Council 1996).

9.6.2 Degrees of error in the micro-level scenario testing

A 2.5% under-estimate is noteworthy in the calculations of the total redistribution for each scenario in Appendix 4 compared with that projected at a macro-level in Calculation 6 on page 202. This error is largely because the total estimate resident population used in the Primary Health Care Research and Information Service (2006) dataset is 1.7% higher than that used in Calculation 6. This creates an overestimating effect on calculated positive and negative values in the scenario testing. The residual can be attributed to rounding to the nearest cent of mean unit values for Stream A and Stream C items.

9.6.3 The scale of the Divisions of General Practice network

The Australia-wide network of one-hundred and nineteen Divisions of General Practice has a mean catchment size of 167,200 SWPE and a median of 154,545 SWPE. This indicates a positive skew in the population distribution. Figure 29 shows the distribution in catchment sizes, with the semi-interquartile range (SIQ 25-75%) either side of the median. In total twenty-nine Divisions are in the first quartile (lowest 25%), and a further twenty-nine are in the fourth quartile (highest 25%).

Optimal performance payments for Divisions of General Practice are indicated by examining the projected credit balances at target levels (Scenario Z). This produces a mean value of $273,744 and a median of $216,757, indicating a positive skew in distribution. Figure 30 highlights the distribution in projected performance payments at target levels, with the semi-interquartile range (SIQ 25-75%) either side of the median.

Figure 29: The national distribution of the Divisions of General Practice network catchment sizes

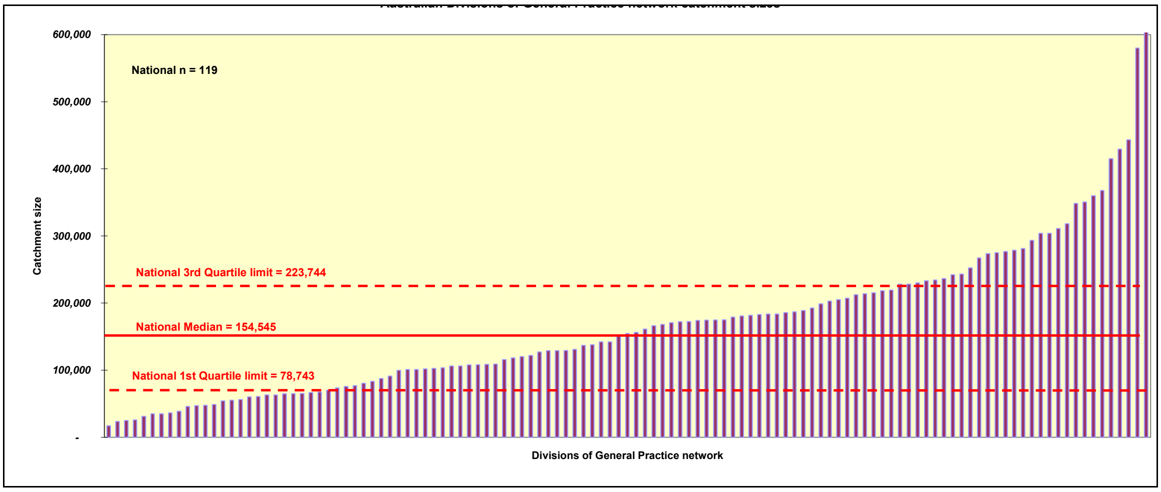
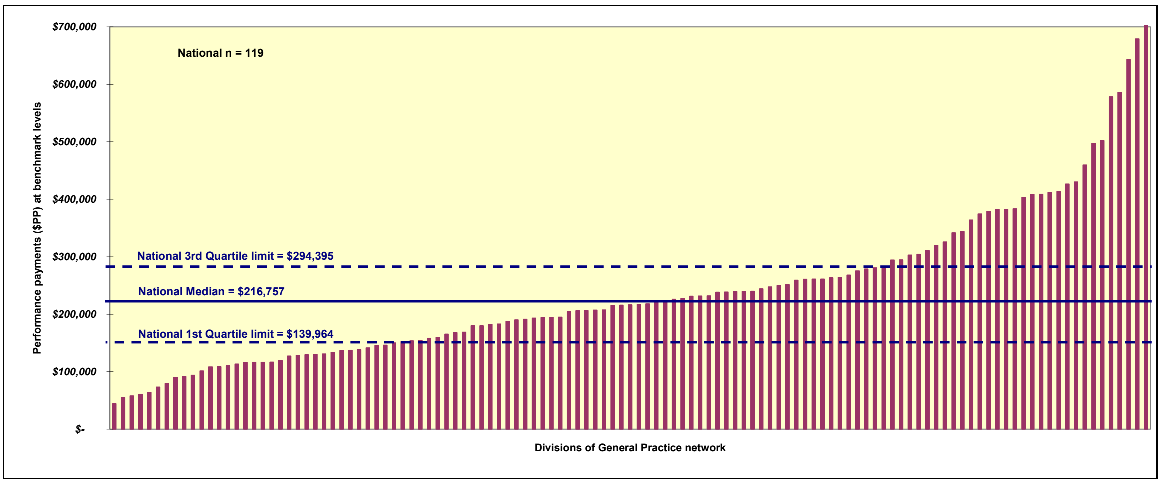


Figure 30: The national distribution of the Divisions of General Practice network optimal performance payments at target levels



9.6.4 Scenario testing

Figure 31 on page 228 is a scattergram with trend-lines of the correlation between catchment size and projected credit balances in each scenario for the total network of Divisions. In turn, Figure 32 shows both the mean and median credit balances for each geographic category according to each scenario. The range either side of each median represents the semi-interquartile range (SIQ 25-75%) of values for each category.

Sections 9.6.4.1 to 9.6.4.3 describe the relationship between projected credit balances in each scenario with catchment size and categories of geographic dispersion.

Figure 31: The correlation of projected credit balances for each scenario with catchment size for the Divisions of General Practice network

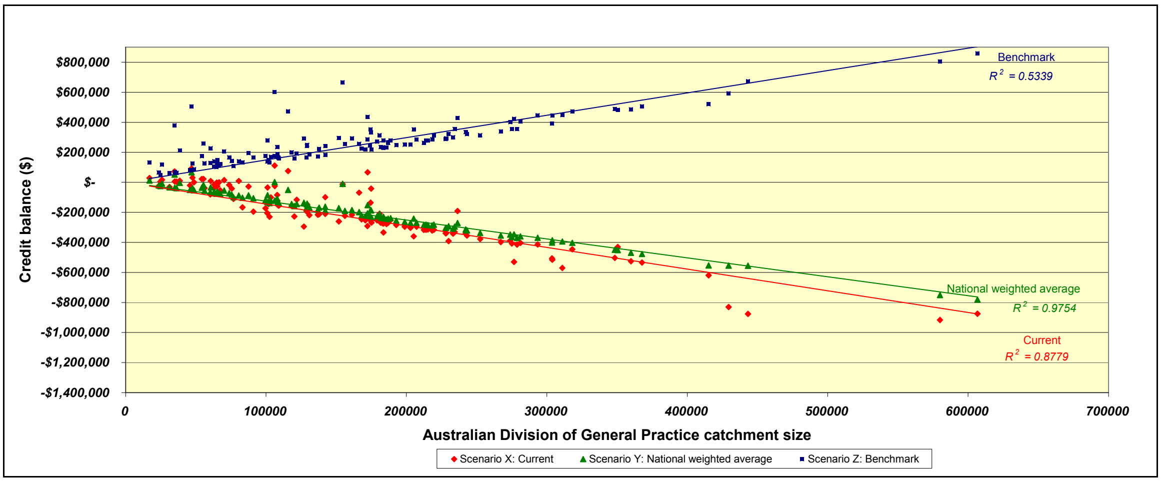
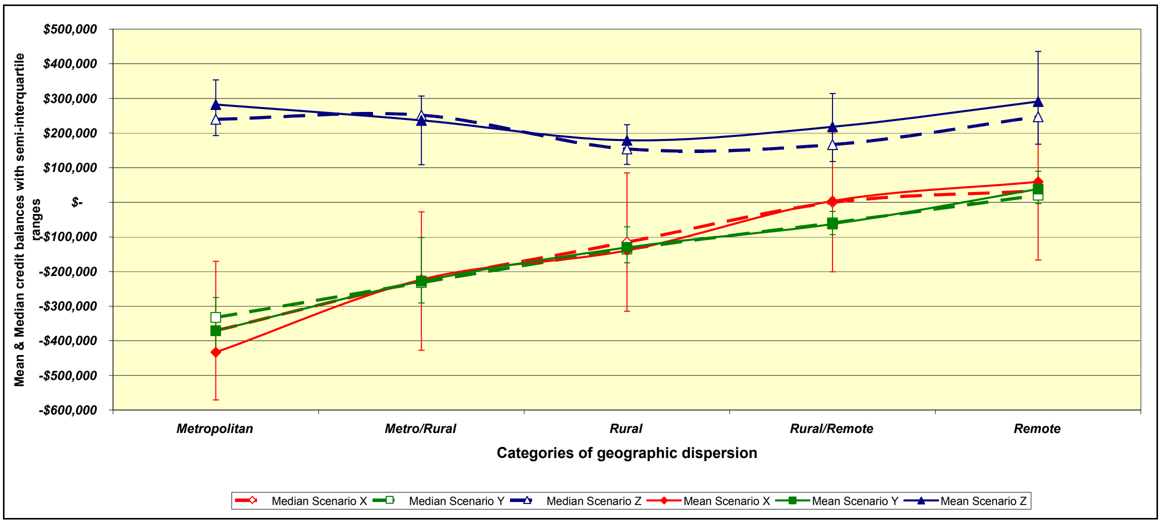


Figure 32: Mean and median projected credit balances by categories of geographic dispersion



9.6.4.1 Scenario X - Current levels of general practice-referred diagnostic activity for each category of geographic dispersion

Scenario X demonstrates negative sloping trend line in Figure 31, with a high coefficient of determination (R^2 = 0.88). This indicates the predominant effect of catchment size on the projected credit balances.

At current levels of activity, Figure 32 demonstrates that the model projects a negative credit balance (using both mean and median values) for Metropolitan, Metropolitan/Rural or Rural categories. Both the Rural/Remote and Remote categories demonstrate favourable median and mean values at current levels of activity. However the broad semi-interquartile ranges indicate that some Divisions who project a credit balance below their category medians may still have a negative result and therefore will not accrue any performance payments at current levels of activity.

9.6.4.2 Scenario Y - The current national weighted average levels of activity for each category of geographic dispersion

Scenario Y also has a negative sloping trend line in Figure 31, with an even stronger coefficient of determination (R^2 = 0.98). This trend line crosses the Scenario X line in the lower range of catchment sizes.

As can be seen in Figure 32, the application of the current national weighted average levels of activity produces negative credit balances for all but the Remote Divisions of General Practice at median and mean values. In the Remote category both values are marginally favourable. Again these results reflect the predominance of Metropolitan and Metropolitan/Rural populations in determining the national weighted average.

9.6.4.3 Scenario Z - The projected target levels of activity for each category of geographic dispersion

Scenario Z demonstrates a positive trend line in Figure 31 and it has a relatively weaker coefficient of determination (R^2 = 0.53) compared with the other scenarios. This effect is explained in Figure 32, which highlights all categories accrue positive credit balances at target levels of activity. This is evident using both the median and mean values. It is apparent that the larger absolute size of Divisions within the Metropolitan and Metropolitan/Rural categories is countered by the model's normative bias in favour of increasing rurality and remoteness.

9.6.4.4 *Metropolitan Divisions of General Practice*

There are fifty-one Divisions of General Practice within the Metropolitan category. Figure 33 illustrates that the estimated median catchment size is 219,509 SWPE (SIQ 25-75%: 183,691-284,289 SWPE) and that there is wide range.

The Metropolitan category median is higher than the national median, though it remains within the national semi-interquartile range. Only one Division of General Practice in this category has a catchment size lower than the national first quartile limit (lowest 25%). Conversely, twenty-five Divisions in this category have a catchment size above the national third quartile limit.

Figure 33: The distribution of Metropolitan Divisions of General Practice catchment sizes

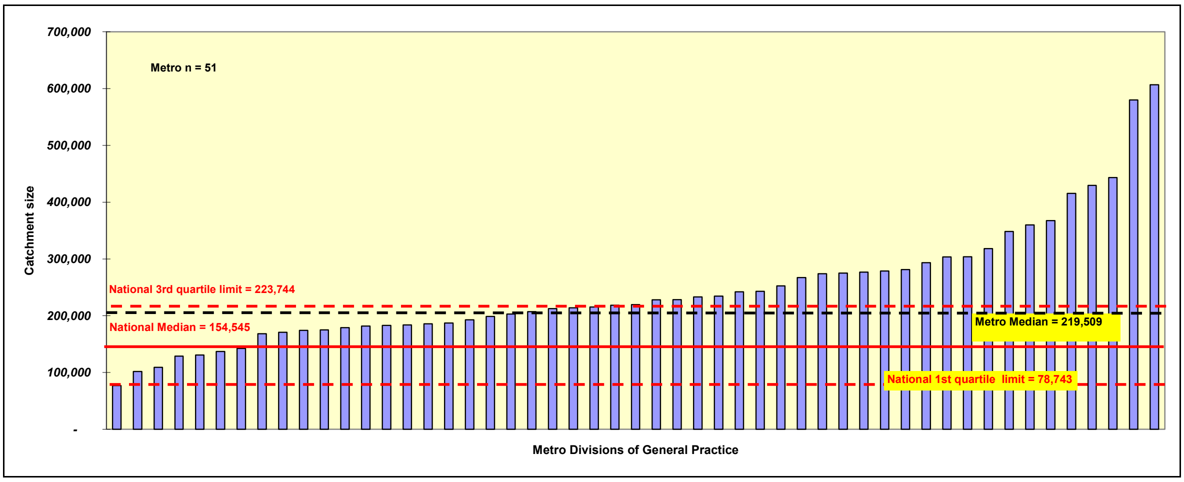
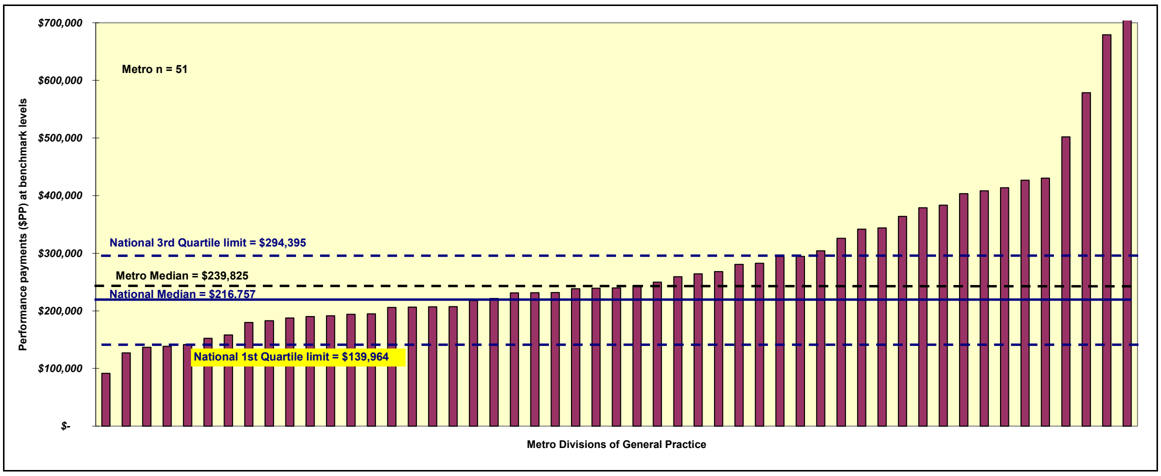


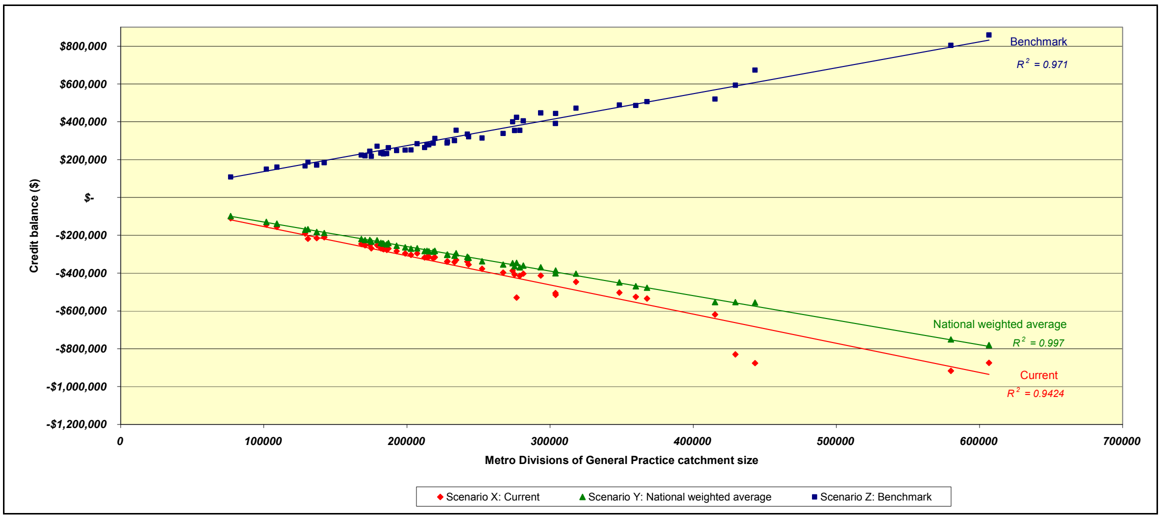
Figure 34 shows the median performance payment possible at target levels of activity is $239,825 (SIQ 25-75%: $192,748 - $353,870). Again this is higher than the national median, though it also remains within the national semi-interquartile range. Four Divisions of General Practice have optimal performance payments at target levels of activity lower than the national first quartile. Sixteen have optimal performance payments above the national third quartile limit.

Figure 34: The distribution of Metropolitan Divisions of General Practice optimal performance payments at target levels



The high number of projected credit balances within or above the national semi-interquartile range supports the importance of the catchment size as a factor in determining the optimal value of the performance payments at target levels of activity. This relationship is highlighted in Figure 35.

Figure 35: The correlation of projected credit balances for each scenario with catchment size in the Metropolitan Divisions of General Practice



The scattergram includes trend-lines of the correlation between catchment size and projected credit balances in each scenario for the Metropolitan Divisions of General Practice. This category demonstrates even closer correlations than the national dataset. At current (Scenario X) and the national weighted average levels of activity (Scenario Y) there are negative sloping trend lines with extremely high coefficients of determination (R^2 = 0.94 and $R^2 \approx 1.00$ respectively). In the case of Scenario Z, an equally strong coefficient of determination is produced with a positive sloping trend line for optimal performance payments at target levels of activity (R^2 = 0.97).

9.6.4.5 Metropolitan/Rural Divisions of General Practice

There are fourteen Divisions of General Practice within the Metropolitan/Rural category. It is a small, negatively skewed group with an estimated median catchment size of 177,846 SWPE (SIQ 25-75%: 74,915 – 217,622 SWPE). Figure 36 again demonstrates that the category median is higher than the national median, though lower than that for the Metropolitan category. The Metropolitan/Rural category median remains within the national semi-interquartile range. Three Divisions of General Practice in this category have a catchment size lower than the national first quartile limit.

Figure 36: The distribution of Metropolitan/Rural Divisions of General Practice catchment sizes

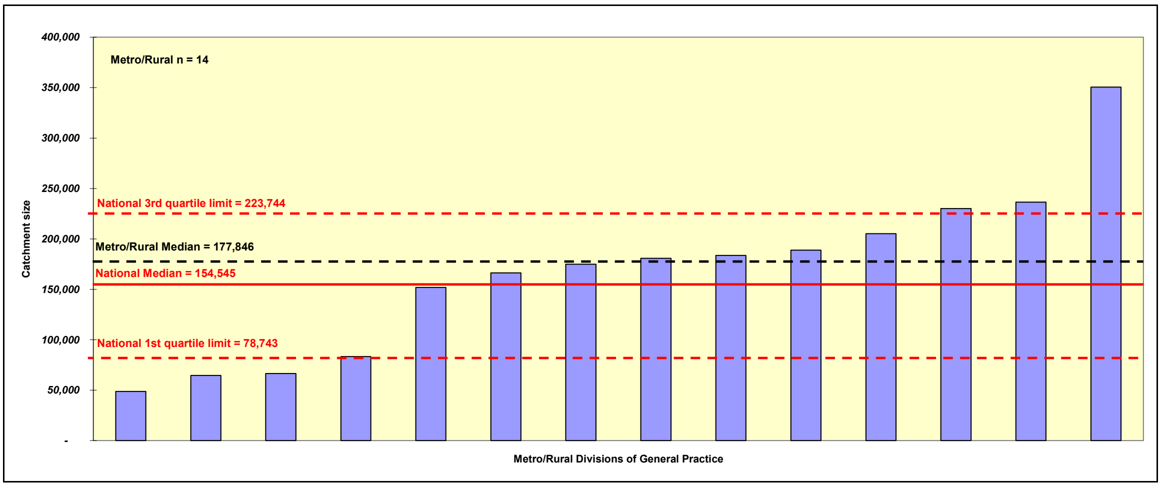


Figure 37 shows the median performance payment possible at target levels of activity within this group is $251,717 (SIQ 25-75%: $108,587 - $306,980). Again the category median is higher than both the national median and that for the Metropolitan category, but remains within the national semi-interquartile range. Four Divisions of General Practice in this category have optimal performance payments at target levels of activity lower than the national first quartile. Four Divisions also have optimal performance payments above the third quartile limit.

Figure 37: The distribution of Metropolitan/Rural Divisions of General Practice optimal performance payments at target levels

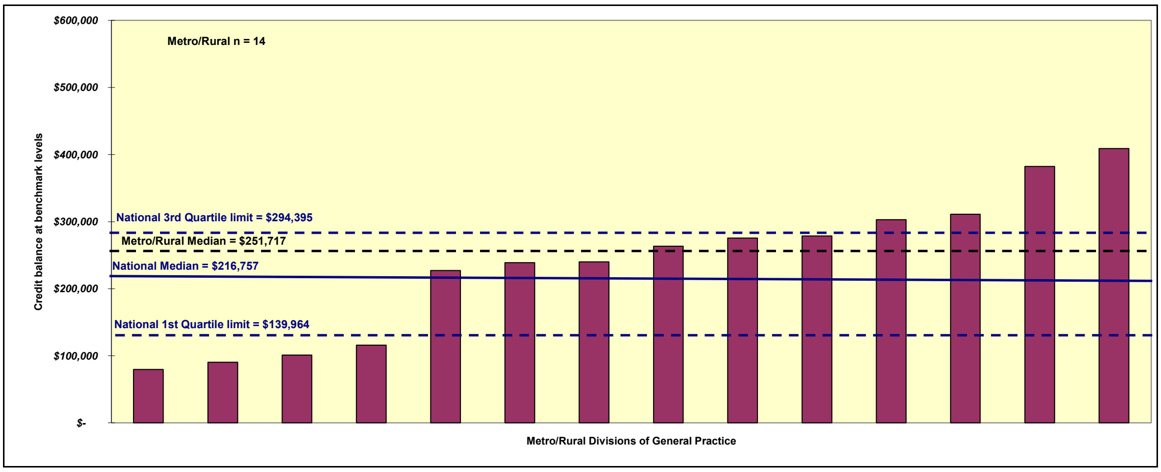
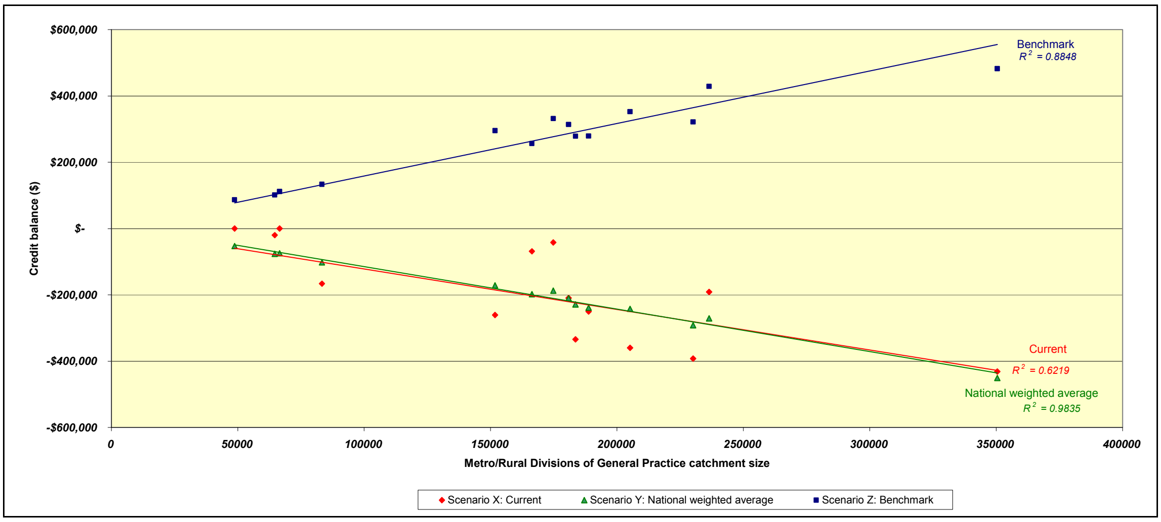


Figure 38 on page 234 provides the trend-lines for correlations between catchment size and projected credit balances in each scenario within the Metropolitan/Rural category. At both current (Scenario X) and national weighted average (Scenario Y) levels of activity there are negative sloping trend lines that virtually mimic each other. The trend-lines actually marginally cross-over. Scenario X has a more modest coefficient of determination (R^2 = 0.62) than with either the national dataset or the Metropolitan category. This indicates greater diversity in current activity between Divisions in the Metropolitan/Rural category, no doubt reflecting the broad range of demographic and geographic profiles.

The Scenario Y trend-line has a very high coefficient of determination (R^2 = 0.98). Scenario Z demonstrates a positive trend line with a strong coefficient of determination for optimal performance payments at target levels of activity (R^2 = 0.88).

Figure 38: ***The correlation of projected credit balances for each scenario with catchment size in the Metropolitan/Rural Divisions of General Practice***



9.6.4.6 *Rural Divisions of General Practice*

There are thirty-five Divisions of General Practice within the Rural category. This group has a marginally positive skew from a normal distribution with an estimated median catchment size of 103,486 SWPE (SIQ 25-75%: 64,402 – 131,422 SWPE). Figure 39 on page 235 shows that the category median is below the national median. However it still remains within the national semi-interquartile range. Eleven of the twelve Divisions of General Practice in this category have a catchment size lower than the national first quartile limit. While one Division has a catchment size above the national third quartile limits.

Figure 40 shows that the median performance payment possible at target levels of activity at $154,170 (SIQ 25-75%: $109,593 - $224,081). The category median is below the national median, though it still remains within the national semi-interquartile range. Fourteen Divisions of General Practice in this category have a optimal performance payment at target levels of activity lower than the national first quartile. Three Divisions have optimal performance payments above the third quartile limit.

Figure 39: The distribution of Rural Divisions of General Practice catchment sizes

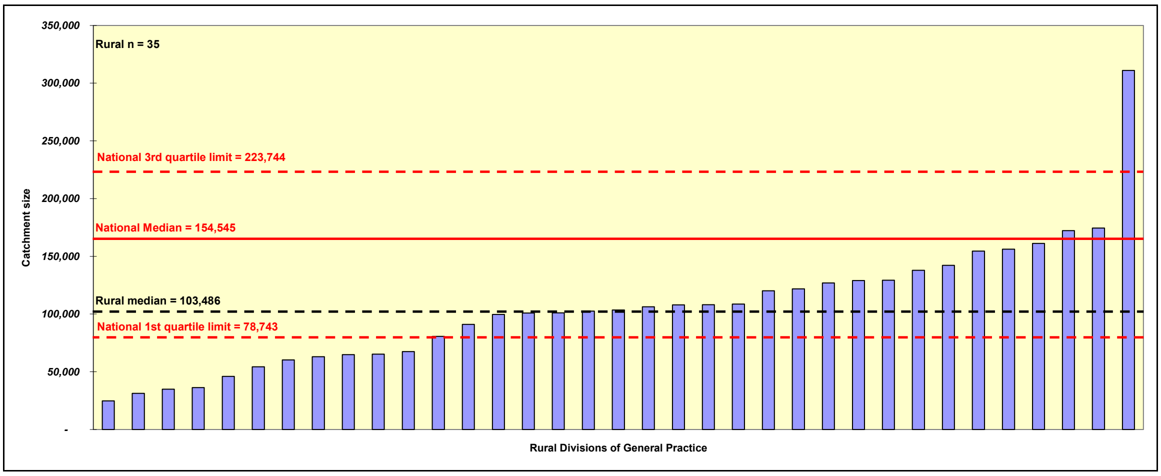


Figure 40: The distribution of Rural Divisions of General Practice optimal performance payments at target levels

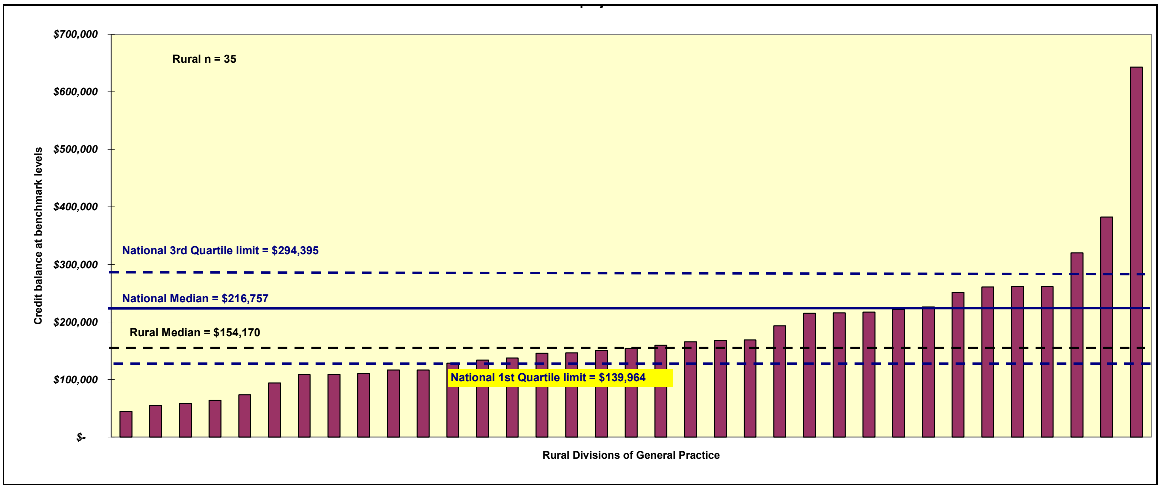
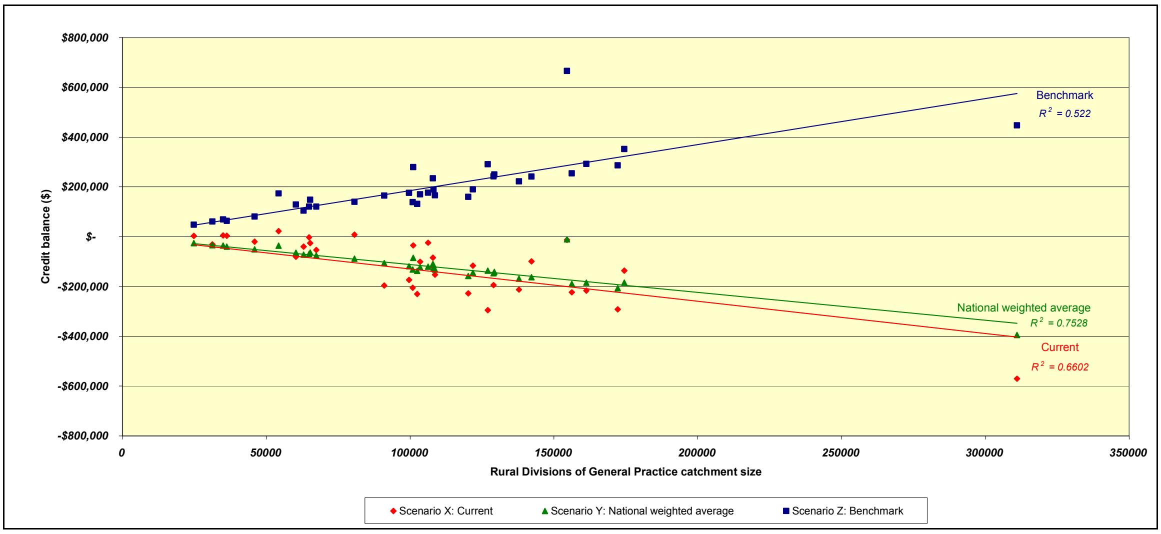


Figure 41 on page 236 provides the trend-lines for correlations between catchment size and projected credit balances in each scenario within the Rural category. At both current (Scenario X) and national weighted average (Scenario Y) levels of activity there are once more negative sloping trend lines. There is a weaker coefficient of determination (R^2 = 0.66) evident with Scenario X than with the national dataset or the more metropolitan categories. This once more indicates greater diversity in current activity between Divisions in the Rural category.

The Scenario Y trend-line has a higher coefficient of determination (R^2 = 0.75), though it too is weaker than its equivalent with the national dataset or the more metropolitan categories. Consistent with the other categories, Scenario Z demonstrates a positive trend line, with a modest coefficient of determination (R^2 = 0.52) compared with more metropolitan categories, and one that approximates its equivalent with the national dataset. This indicates that the absolute size of a Division's catchment population is less important in this category as a variable for determining optimal performance payments at target levels of activity. It also probably indicates that meeting the Stream C target levels and attaining full benefit of the weighted bonuses has a growing importance in the model as rurality increases.

Figure 41: The correlation of projected credit balances with catchment size in each scenario for Rural Divisions of General Practice



9.6.4.7 Rural/Remote Divisions of General Practice

There are fourteen Divisions of General Practice within the Rural/Remote category. They have an estimated median catchment size of 71,968 SWPE (SIQ 25-75%: 51,909 – 110,880 SWPE).

Figure 42 shows that the median falls marginally below the national first quartile limit. Nine Divisions of General Practice in this category have a catchment size lower than the national first quartile limit. None has a catchment size above the national third quartile limit.

Figure 42: The distribution of Rural/Remote Divisions of General Practice catchment sizes

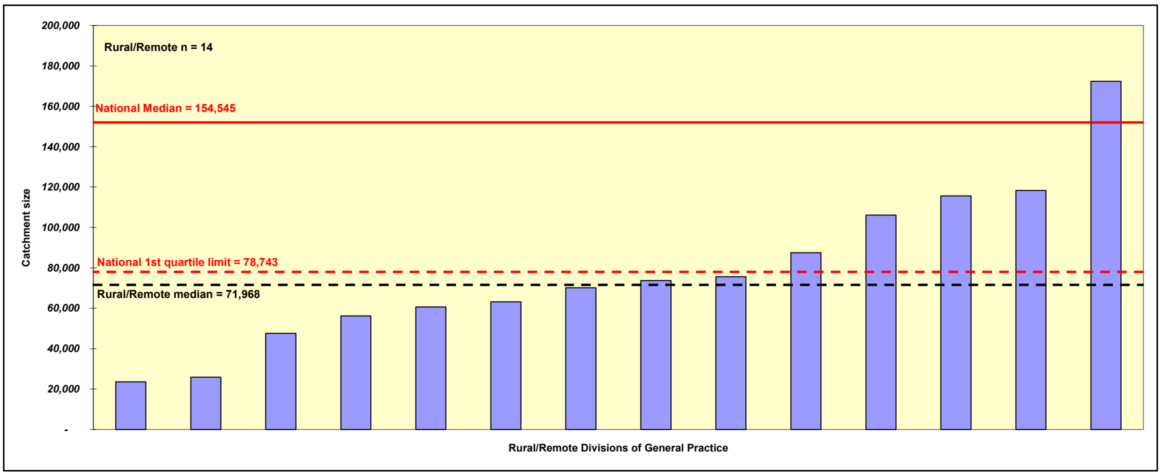


Figure 43 demonstrates that the median optimal performance payment at target levels of activity is $166,831 (SIQ 25-75%: $117,995 - $314,197). Six Divisions have optimal performance payments at target levels of activity lower than the national first quartile. Conversely, three Divisions have optimal performance payments above the third quartile limit.

Figure 43: The distribution of Rural/Remote Divisions of General Practice optimal performance payments at target levels

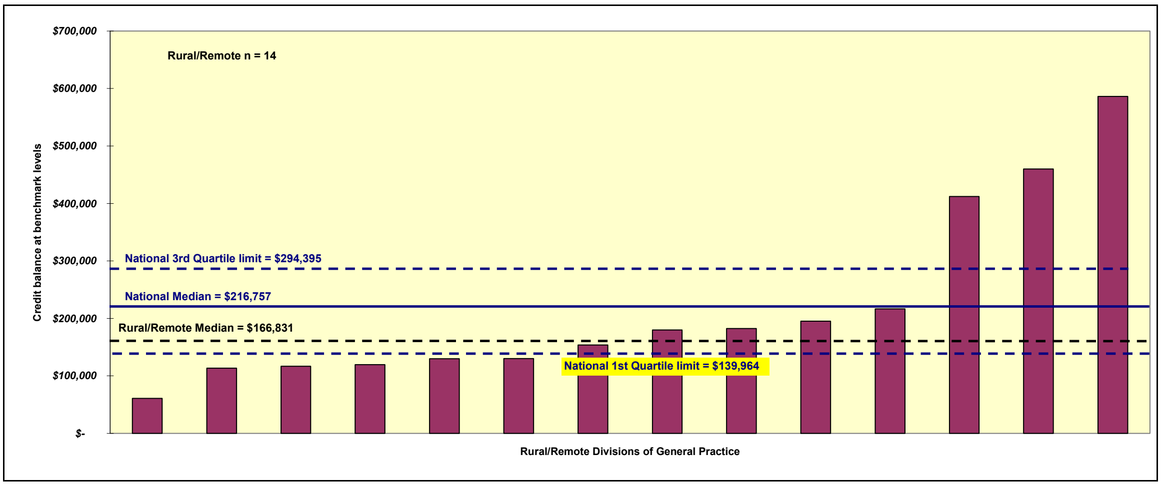


Figure 44: The correlation of projected credit balances with catchment size in each scenario for Rural/Remote Divisions of General Practice

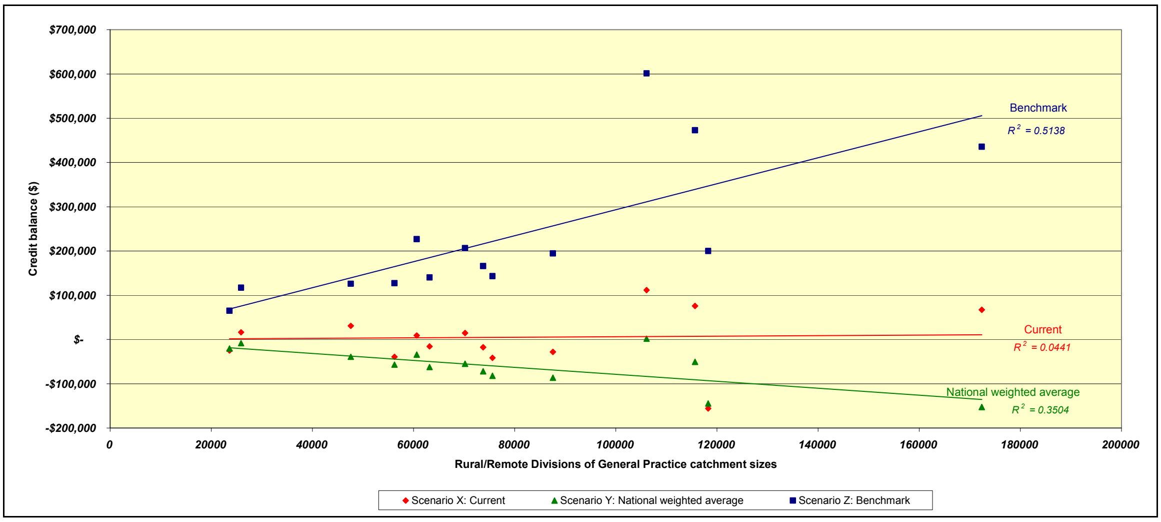


Figure 44 provides the trend-lines for correlations between catchment size and projected credit balances in each scenario within the Rural/Remote category. For the first time a positive trend line is found at current levels of activity (Scenario X), though the coefficient of determination is negligible (R^2 = 0.04). Conversely, the trend-line for the national weighted average level of activity (Scenario Y) remains negative, with a weak coefficient of determination (R^2 = 0.35).

As expected, Scenario Z produces a positive trend line for optimal performance payments at target levels of activity. The moderate coefficient of determination (R^2 = 0.51) is comparable with both the national dataset and that for the Rural category. Again this indicates that the absolute size of a Division's catchment population is less important as a variable for determining optimal performance payments at target levels of activity in the Rural/Remote category. Similarly, it also indicates that meeting the Stream C target levels and attaining the full benefit of the weighted bonuses has a growing importance.

9.6.4.8 Remote Divisions of General Practice

There are only five Divisions of General Practice within the Remote category. This small group has a normal distribution with a mean catchment size of 38,577 SWPE. To maintain consistency with description of the other categories, Figure 45 demonstrates a median of 38,608 SWPE (SIQ 25-75%: 21,477 – 53,274 SWPE). All five Divisions in this category have a smaller catchment size than the national first quartile limit.

Figure 45: The distribution of Remote Divisions of General Practice catchment sizes

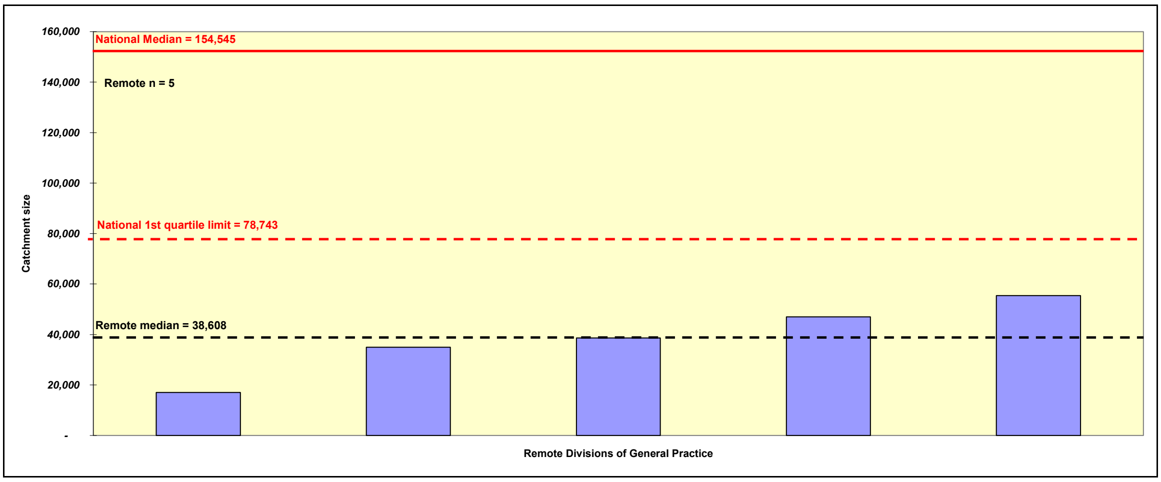


Figure 46: The distribution of Remote Divisions of General Practice optimal performance payments at target levels

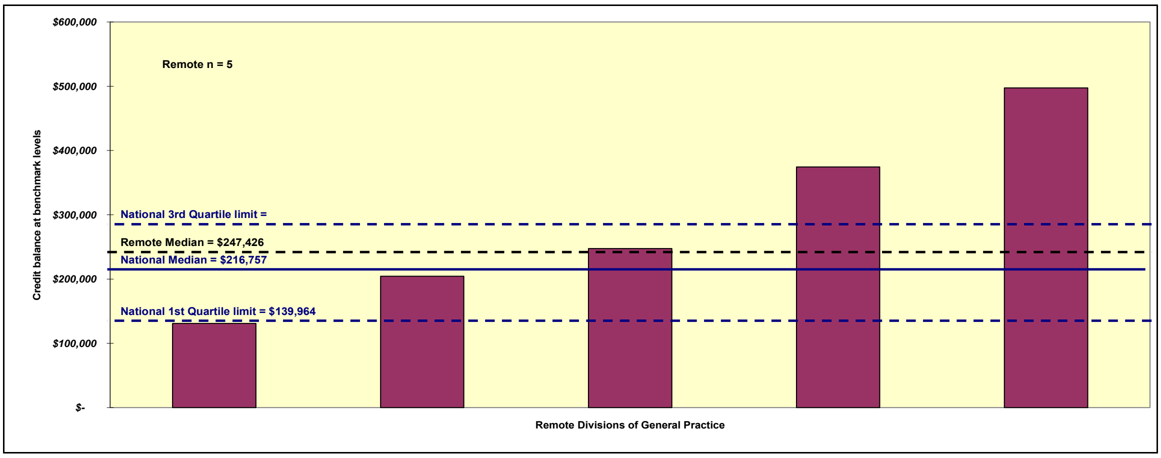
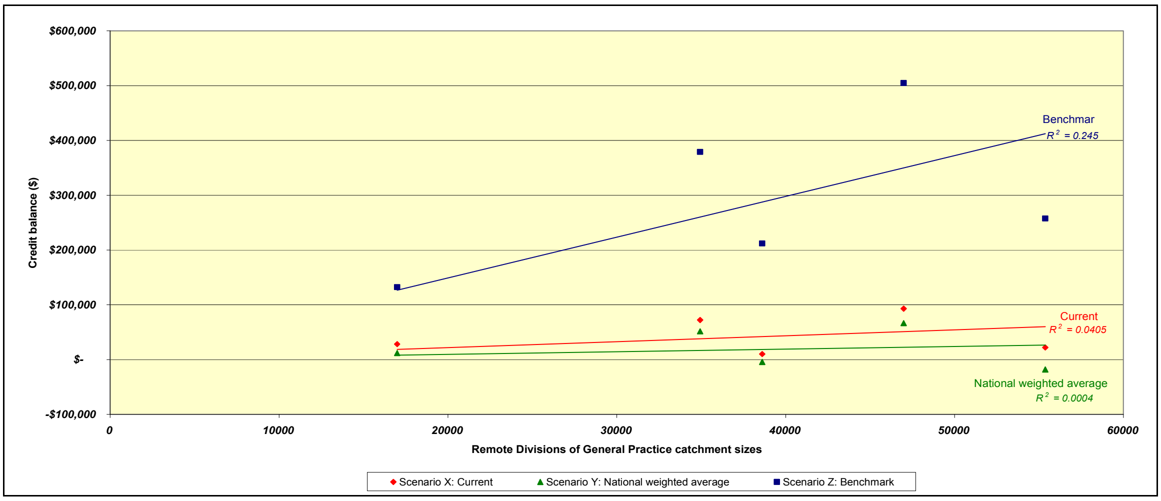


Figure 46 demonstrates that the optimal performance payments possible at target levels of activity have a near-normal distribution. The median is $247,426 (SIQ 25-75%: $167,671 - $435,907), which is above the national median and that for most of the other categories (with the exception of Metropolitan/Rural). Only one Division has an optimal performance payment below the national first quartile limit. Two Divisions have an optimal performance payment above the national third quartile.

Figure 47 on page 240 provides the trend-lines for correlations between catchment size and optimal performance payments in each scenario within the Remote category. As with the Rural/Remote category, the Scenario X trend line for current levels of activity is positive, but again it is negligible (R^2 = 0.04). The trend-line for the national weighted average level of activity (Scenario Y) is virtually horizontal, with effectively no coefficient of determination between the variables ($R^2 = 0.00$).

The Scenario Z trend line for optimal performance payments at target levels of activity is positive as expected. However the coefficient of determination ($R^2 = 0.24$) is substantially weaker than the national dataset and all other categories. This is a clear indication that the absolute size of a Division's catchment population is no longer a dominant variable for determining optimal performance payments at target levels of activity. More so than any other category, this emphasises the importance of meeting the Stream C target levels and fully attaining the benefit of the weighted bonuses.

Figure 47: The correlation of projected credit balances with catchment size in each scenario for Remote Divisions of General Practice



9.6.4.9 A summary of the micro-level scenarios

Table 29 summarises the absolute implications of each micro-level scenario on the credit balance for Divisions of General Practice within each of the categories. This summary assumes that calculated median values and semi-interquartile ranges for each category apply.

It is evident that no performance payments are possible for Divisions of General Practice within the Metropolitan and Metropolitan/Rural categories from their credit balances when operating at either current (Scenario X) or national weighted average (Scenario Y) levels of activity. In the Rural and Rural/Remote categories, the number of Divisions with the potential to gain at current levels of activity increases, though again no performance payment is possible operating at the national weighted average activity. Only Divisions within the Remote category are assured some material gain from the model at current levels of activity. However, at the national weighted average level of activity only some Divisions within the Remote category achieve minor to moderate gains.

Table 29: Summaries of the absolute implications for the credit balances for Divisions of General Practice within each of the categories when applying the micro-level scenarios

Meso-level scenarios	Metro	Metro/ Rural	Rural	Rural/ Remote	Remote
Scenario X: Current activity	*Nil gains*	*Nil gains*	*Nil to minor gains*	*Nil to major gains*	*Minor to moderate gains*
Scenario Y: National weighted average activity	*Nil gains*	*Nil gains*	*Nil gains*	*Nil gains*	*Nil to moderate gains*
Scenario Z: Target activity	*Moderate to major gains*	*Moderate to major gains*	*Minor to major gains*	*Moderate to major gains*	*Moderate to major gains*

Operating at target levels of activity (Scenario Z) all Divisions of General Practice have potential to accumulate substantial credit balances. In the Metropolitan and Metropolitan/Rural categories the gain is closely correlated with the Division catchment size, whilst the importance of this relationship declines in the Rural and Rural/Remote categories. In the Remote category, catchment size is clearly no longer the dominant factor in determining the credit balance at target levels of activity. Meeting the Stream C target levels and attaining the weighted bonuses is more important as rurality and remoteness increases. The implication of these findings is that all the Divisions of General Practice within the existing network have sufficient critical mass to accumulate a material benefit from participation.

9.7 Conclusion

The original redistribution model first derived in Chapter Eight is tested and analysed in this chapter. The results are considered in three parts.

In the first part a macro-level analysis examines the net implications of the redistribution for the Australian Government, Divisions' network and diagnostic providers as a whole. The results confirm that only a marginal redistribution is required for an optimal outcome. Ideally, the model will produce a 0.02% increase in activity with a 2.2% reduction in the total of benefits claimed by diagnostic providers for general practice-referred diagnostic services. Within this ideal redistribution the reduced contribution from over-referred items (Stream A) equates to an 18.4% decline in both activity and benefits claimed compared with their current levels. Appropriately referred items (Stream B) show the modelled growth of 0.8% in both services delivered and benefits claimed. Under-referred activity (Stream C) needs to grow by 84.9% and benefits claimed by 94.2%.

In the second part, a meso-level analysis applies the Primary Health Care Research and Information Service (2006) benchmarking tool that groups the existing Divisions of General Practice network into categories of geographic dispersion. To give a more specific description of Division's geographic dispersion within each category, datasets from the Public Health Information Development Unit (2006[a]; 2006[b]) are first applied to establish the concordance with Census statistical local areas (SLA). Each statistical local area is then cross-referenced and categorised according to a RRMA class (Australian Institute of Health and Welfare 2004 p.76).

Normative projections are developed for each of the geographic categories for given scenarios. This is achieved by applying category means and standardising the catchment to a nominal size (that is, 10,000 SWPE).

For the Metropolitan, Metropolitan/Rural and Rural categories no gain is likely when operating at either current (Scenario X) or national weighted average (Scenario Y) levels of activity. Operating at target levels of activity (Scenario Z) moderate gains per 10,000 SWPE are attainable in each case, with the effort required to achieve this declining as rurality increases.

In the Rural/Remote and Remote categories reasonable gains are likely when operating at current levels (Scenario X), with these gains amplified as remoteness increases. At national weighted average (Scenario Y) levels of activity there will be no gain in the Rural/Remote category, whilst reasonable gains are possible for those in the Remote category. Operating at targeting levels of activity (Scenario Z) major gains per 10,000 SWPE are attainable in each case, though this is dependent on a substantial level of effort. This is particularly the case for the Remote category, where the maximum gains possible are matched with the maximum degree of effort required.

The model has a defining bias in favour increasing rurality and remoteness. This is consistent with the model's aim to deliver supply-side incentives for servicing vulnerable social groups.

The meso-level results indicate that an initial refinement is required for the practical implementation of the model. The majority of Australia's population live in the Metropolitan category. Combined with the Metropolitan/Rural and Rural categories, these Divisions encompass an approximate 95% of the unweighted estimate resident population. It is these Divisions that require the greatest effort to glean benefit from the model, and potentially may be the least compliant.

A solution is to waive for an interim period of time the corrective portion of the variation between any negative values of credit balance at current levels of activity and a minimum positive balance. With the overriding caveat that over-referred activity (Stream A) does not deteriorate further, all Divisions of General Practice will be acknowledged for any improvement in the pursuit of under-referred target items (Stream C), particularly where there is uptake in any given year (n) by vulnerable social groups (VC_n).

A micro-level analysis examines the absolute values of projected credit balances within the same scenarios for each of the Divisions. The one-hundred and nineteen Divisions of General Practice network have positive skews in the distributions of both catchment size and optimal performance payments at target levels. It is also evident that the median catchment size declines progressively with increasing rurality. In terms of optimal performance payments, this effect is countered to varying degrees within each scenario as rurality and remoteness increases.

At the micro-level no absolute gain is possible within the Metropolitan and Metropolitan/Rural categories when operating at either current (Scenario X) or national weighted average (Scenario Y) levels of activity. In the Rural and Rural/Remote categories the number of Divisions with the potential to gain operating at current levels of activity increases, though again no gain is possible operating at the national weighted average activity. Only Divisions within the Remote category are assured some gain from the model at current levels of activity. However at the national weighted average level of activity only some Divisions within the Remote category achieve minor to moderate gains.

Operating at target levels of activity (Scenario Z), all have potential to accumulate substantial credit balances. In the Metropolitan and Metropolitan/Rural categories the gain is closely correlated with the Division catchment size. The importance of this relationship declines in the Rural and Rural/Remote categories. In the Remote category catchment size is no longer the dominant factor in determining the credit balance at target levels of activity. Meeting the Stream C target levels and attaining the weighted bonuses becomes more important. The implication of these findings is that all the Divisions of General Practice within the existing network have sufficient critical mass to accumulate a material benefit from participation.

Chapter Ten discusses the results of the scenario testing from this chapter. Limitations to the research design and results are highlighted. The implications for a redistribution of general practice-referred diagnostic services are considered. Conclusions are drawn on the major findings of this study. Particular consideration is given to the feasibility of applying the model within the field.

CHAPTER TEN - Discussion of the modelling results and implications for the redistribution of general practice-referred diagnostic services

10.1 Significance of the research

10.1.1 Significance of the literature review

The provision of health care cannot be left solely to the interplay of the open market. The state should intervene and apply economic leverage so that planning and priority setting are adequately addressed (Haas, Mooney, Viney & Cooper 1997 p.81; Haas 2001 p.228).

The pursuit of an optimum service mix is a worthwhile public goal. It follows then that planning should explicitly consider marginal opportunities for changes in the balance of costs and benefits (Haas et.al. 1997 p.81). It is also essential that an account be taken of relevant socioeconomic and demographic variables (Haas 2001 p.228).

The literature reports a variety of primary care service models that seek to contain cost, pursue quality, and reward the attainment of policy targets. In each case the distributive objectives must address the tensions inherent between the principles of equity and efficiency (Duckett 2000 p.228; Eagar, Garrett & Lin 2001 pp.188-189; Le Grand 1996 p.151; Mooney & Newberry 1999 p.42).

Accepting that it has narrow boundaries, the disease-state paradigm continues to have intuitive appeal in health planning. The paradigm is consistent with epidemiological indicators that recognize the relative burdens of both mortality and morbidity.

Australian epidemiological data are consistent with that emanating from across the Organisation of Economic Cooperation and Development (OECD) states. The prominence afforded cancer and cardiovascular disease targeted within the national health priority area (NHPA) portfolio is therefore unremarkable (Duckett 2000 pp.9-11).

General practice-referred diagnostic testing plays a pivotal role in the screening and monitoring of both cancer and cardiovascular disease. However other over-referred test items simultaneously produces a dead-weight loss in public expenditure that has the potential for redistribution.

It is in the public interest to study mechanisms that contain the expenditure growth in diagnostic testing referred from general practice, whilst sustaining clinical quality and rewarding discretionary increases for certain cancer and cardiovascular screenings. To truly enhance the social welfare function, general practice-referred diagnostics should also be explicit in how it counters barriers to access for vulnerable social groups.

10.1.2 Significance of the study findings

This study demonstrates the financial feasibility of an original model that uses supply-side incentives to drive marginal redistribution of general practice-referred diagnostic testing. This modelling approach is distinctive because it seeks to maximise a net benefit within a cost-neutral state. More commonly, service modelling investigates the least costly theoretical alternative for a given benefit (Donaldson & Shackley 1997 p.861).

To derive valid results from the decision-analytical model in a practical trial would require considerable administrative and transactional costs. Meaningful findings would necessitate large sample sizes and an extensive follow-up period to measure activity and costs. The alternative approach adopted in this study was to test the model against a comprehensive set of secondary data (Kuntz & Weinstein 2001 p.143). It remains to be tested whether this approach will translate into acceptability for the key protagonists within the model. These include general practitioners, diagnostic providers, and the Australian government.

The model projects that a 2.2% redistribution of public funding will achieve a net benefit in the social welfare function whilst maintaining a cost-neutral state for the Australian Government. The beneficiaries of this redistribution are Divisions of General Practice, as a reward for driving the change in referral patterns. The redistribution is at the expense of diagnostic providers' current profit margins.

The derived model recognises the Australian community's over-arching socio-political imperatives yet still challenges the status quo. It actively favours access to evidence-based population screenings by vulnerable social groups yet avoids the inadvertent stigmatisation that comes with isolated strategies that target the disadvantaged.

On a per-capita basis, the modelling demonstrates a defining bias in favour of Divisions as rurality and remoteness increases. This is because of the weightings for social vulnerability target socioeconomic disadvantage, Aboriginality and geographic remoteness. These indicators are increasingly over-represented as rurality and remoteness increase.

However in absolute terms the results demonstrate that the per-capita bias is dominated by the scale of a Division's catchment size. Using the current Divisions' network as an example, catchment sizes tend to be larger in metropolitan areas. Metropolitan Divisions have the potential for material gains if target levels of activity are achieved, though it requires substantially more effort. The implication is that all Divisions of General Practice within the existing network have sufficient critical mass to accumulate a material benefit, provided they are able to leverage optimal participation from their general practice membership base.

10.2 Critical issues

10.2.1 Critical mass of general practice participation

A key issue implicit within the model is the participation by general practice. Given its population-health intent, the model assumes an environment of universal coverage for the Medicare-eligible population. Taken to its logical conclusion this approach requires the Australian Government to mandate general practice participation.

However it is necessary to consider voluntary participation as an alternative scenario and the problems this will create downstream. At the macro-level, the incentives in the model are designed to stimulate interested parties in vying for participation to service regions of relative under-utilisation. This is particularly the case where there is over-representation of vulnerable social groups.

The risk with voluntary participation is that the opportunity-cost for increased utilisation in regions of high participation may not be countered by constraint in regions with historically higher-than-average activity. High-activity regions have little incentive to voluntarily participate. Whilst this scenario may satisfy the public health objectives of the model, it is unlikely that it would be palatable to the Australian Government. This is because total cost for diagnostic services would escalate. Hence the model, if applied on a voluntary basis, would fail to achieve its redistribution objective.

At the micro-level voluntary participation by only some general practices would undermine the principle of universal coverage, with subsequent ramifications for agency and equity. As Harris & Furler (2002 p.36), argue, equitable access and de-stigmatisation for disadvantaged groups is best addressed when mechanisms are put in place that ensure the redistribution of mainstream services according to reliable measures of need. The model should not rely solely on providers' motivations to supply.

10.2.2 Critical mass of service catchments

The median catchment size of Divisions declines progressively across the categories of geographic dispersion with increasing rurality. Generally there is a reasonable correlation between catchment size and the projected credit balances, though this relationship declines at target activity (Scenario Z) with increasing rurality. This reflects the normative bias in the model incentives towards rural and remote practice. The net effect is that the all Divisions are capable of a material benefit from the model at target levels of activity, regardless of their catchment size and geographic category of dispersion.

10.2.3 Patient flows

Wherever there is prospective allocation using a population funding formula, some mechanism is required to adjust for patient flows across the administrative boundaries. Patient enrolment with particular providers is now a common international response to this issue (FitzGerald 2006 p.126; McDonald et.al. 2007 p.52; Starfield 1998 p.339). Patient enrolment entails an initial prospective allocation from a funder to a provider group based on the size of their patient registry. This then requires adjustments for actual patient flow after a set period (Marriott & Mable 1998 p.657).

This model offers a less-restrictive alternative to patient enrolment. It adapts the standardised whole patient equivalent (SWPE) calculations from the Australian Government's practice incentive program (PIP) (Health Insurance Commission 2003[a]). This method does not restrict the current freedom enjoyed by Australian patients to choose between providers. Adaptation of the standardised whole patient equivalents methodology also recognises the need to consider potential accessibility within models of distribution (Blumenthal et.al. 1995 p.253). This is because it already uses weightings by age and gender which allows each benchmark some sensitivity to service those whose needs are genuinely more resource intensive.

A benchmark for over-referred items (Stream A) is determined by using an aggregate standardised whole patient equivalents figure that reflects past-rounds of actual utilisation. At the beginning of each financial year this figure is re-calculated, and then factored into the next benchmark cap.

10.2.4 *Using the Divisions of General Practice network as intermediaries*

The meso and micro-level results presented in Chapter Nine model data use the existing network of Divisions of General Practice (Australian Divisions of General Practice 2005; Primary Health Care Research and Information Service 2006). This network represents the nearest approximation of organised general practice to date in Australia, though it currently has limitations in its capacity to act as the intermediaries in this model (McDonald et.al. 2007 p.52).

The current geographic grouping of general practices in the Divisions' network also may create perverse incentives and aberrations in the model. This is because of the potential to manipulate the performance ratio (β).

For example, large Divisions in more affluent metropolitan areas have the capacity to gross substantial credit reserves from the balance between Streams A and C, with little need to consider the weighted bonuses within vulnerable social groups. Because their target Stream C activity for vulnerable social groups may be miniscule, it is possible to then draw down the full balance of the credit reserve by realising a maximal performance ratio with relatively little effort. The reverse is the case for those Divisions with fewer general practices representing smaller populations in more disadvantaged and remote catchments.

One way forward is through government regulation that apportions the burden of geographic dispersion amongst many. This regulation would require consortia of Divisions to demonstrate within their standardised whole patient equivalents enrolment a minimum distribution of socially disadvantaged groups and general practices from rural and remote areas. Whilst this is feasible, it will necessitate the network moving beyond the traditional administrative paradigm of defining membership only by geographic boundaries.

10.2.5 *Incentives*

The model seeks marginal redistribution of activity using fiscal incentives. Incentives are weighted in terms of the available evidence from practice guidelines. However it does not attempt to be prescriptive in terms of clinical practice. The distinction is that the model does not constrain clinical judgment with any particular patient presentation.

There has been increasing adoption of process-based pay-for-performance programs within OECD health systems in recent years (Kindig 2006 p.2611; Nicholson et.al. 2008 p.437; Scott 2007 p.34). However, there little published evidence to date on the effect this has had on quality improvement or cost reductions (Nicholson et.al. 2008 pp.436-437; Scott et.al. 2008 p.1).

Nicholson et.al (2008 p.448) argues that pay-for-performance models are only justified because current fee-for-service systems are premised on sub-optimal evidence. In reality, the evidence-base to determine what care is effective and what is not remains imperfect. Therefore, it is not possible to simply pay an agreed fee only for those services that are proven to be worthwhile and ignore those that are not. Instead, an interim compromise is to increase fees for services where there is reasonable evidence of effectiveness, compared with the compensation for those services where the evidence is lacking.

10.2.6 *Phased implementation using an interim stop-loss provision*

A refinement is required for the practical implementation of the model. Approximately 95.0% of Australia's unweighted estimate resident population live within catchments that will initially require major effort for moderate per capita gains. This presents a risk to compliance.

An interim implementation period is proposed. During this period the corrective portions created by any negative values within Divisions' credit reserves at current levels of activity are waived. This draws on the experience of stop-loss provisions common to monthly capitation payments in United States managed care models (Robinson 2001 p.159). With a caveat that over-referred activity (Stream A) does not deteriorate further, all Divisions of General Practice will be acknowledged for any improvement in the pursuit of under-referred target items (Stream C). This is particularly the case where there is uptake by a vulnerable social group

It requires the model to operate for an interim period outside the terms of the reference case. The cost implication for the Australian Government is a time-limited increase in outlay of approximately 2.6% (an extra $61.2 million per annum in 2003 values). In real terms, this represents only a 0.8% increase, because public expenditure on general-practice referred diagnostics is growing at an average rate of 1.8% per annum in any case (Australian Institute of Health and Welfare 2002; Health Insurance Commission 2003[b]). It remains to be tested whether this extra outlay will be acceptable to the Australian Government.

Assuming that this transition strategy is effective, the model will then move to full implementation. This will return the model to the conditions of the reference case, and stabilise the outlay for the Australian Government.

10.2.7 Weightings

The weightings applied to Stream C activity for vulnerable social groups are fixed regardless of how close actual uptake approaches the desired target levels. An alternative is to grade the weights progressively according to threshold levels up to the respective targets. This will increase the incentives for profit-maximising Divisions.

This will help satisfy the public health and equity objectives of the model. General practices will be encouraged to pursue the margin in the population that tend to otherwise under-utilise the targeted services.

However this may detract from the model's efficiency if the benefits only accrue to the individual screened, because the principle of diminishing returns holds (see Appendix 1 page 301 for a description of diminishing returns). Whether positive externalities outweigh the higher cost to produce a net gain in the social welfare function warrants further investigation.

10.2.8 Penalties

It is necessary to consider the ramifications for Divisions that return an unfavourable balance in their credit reserve ledger. The intent of the model is to only track the referral behaviour of general practice groupings. In principle the risk to the Divisions is nominal and no true penalty is meant to apply.

The model implicitly assumes that the Australian Government will continue to write off any net deficits in credit reserve ledgers at the end of each financial year. However, the removal of penalties from the model using short run write offs reduces general practice accountability and lessens the motive to adjust referral practises.

In the long run excessive activity growth in general practice-referred diagnostics will drive negative adjustments to the relevant Medicare Benefits Schedule (MBS) items, though this is a penalty for diagnostic providers. It is unclear what deterrent it provides to satisfy the model's objective in influencing general practice referral patterns.

It is in the Australian Government's interest to consider more punitive alternatives. Drawing on options discussed by Deeble & Lewis-Hughes (1991 p.65), one option is for any net unfavourable variance at the end of a financial year to carry as a penalty deduction from the next year's benchmark cap for over-referred items (Stream A). This would at least encourage Divisions to maintain an equivalent position as a minimum. However such an approach could negatively impact on general practitioners' willingness to participate.

A less punitive option is to also allow Divisions the capacity to accrue favourable credit reserve balances across financial years, with the discretion to draw down as required. Where Divisions choose not to draw down on any accrued balance, this will offset their risk of any future unfavourable results and hence avoid penalty deductions.

10.2.9 Cost-shifting and free riding

The model focuses on general practice referrals for diagnostic tests. Some diagnostic tests can only be performed on referral from a specialist and are consequently beyond the scope of this study. Nevertheless there remains a perverse incentive for general practitioners to avoid a debit against their Division's Stream A benchmark cap for tests they are capable of ordering by referring patients unnecessarily to a specialist with a request for the test.

In part, the reality of the market will corral this behaviour. On the demand-side, patients with limited justification in the absence of some preliminary test results will be less willing to pay the extra for specialist consultation fees and compliance should decline. On the supply-side, profit-maximising specialists will view most unscreened consultations as a lost opportunity to produce a return on further investigations or procedures (Starfield 1998 p.123). Such referrals would therefore be unattractive.

The model can further inhibit this perverse incentive by continuing to debit each Division for uptake of all over-referred items (Stream A) that can be ordered by their member general practitioners. This is regardless of whether they in fact were referred by a specialist or a general practitioner.

The reality of tracking this process on a patient-by-patient basis would be administratively burdensome. This is because it would require an identification of the patient's nominated general practitioner (if they have one) or the general practitioner that actually referred the patient to the specialist. An alternative is for the Australian Government to collect a summary report at the completion of each financial period which totals the cost of benefits claimed for specialist-referred diagnostic services belonging to Stream A that can be referred by a general practitioner. This sum could then be apportioned as a penalty against each of the Divisions' credit reserve balances according to an equitable indicator, such as their aggregate standardised whole patient equivalent size.

This alternative is similar in concept to how the punitive provisions of the 1999 General Practice Agreement deals with excess utilisation. The draw-back of this approach is that general practitioners who comply with the incentives of the model will still be penalised should the free-riding behaviour of less-diligent peers exceed a certain threshold (Nicholson et.al. 2008 p. 446; Robinson 2001 p. 154). Deeble & Lewis-Hughes (1991 p.66) argues that this problem can be minimised by ensuring activity pooling remains localised and applying peer group pressure through publication of results against benchmarked norms.

10.3 Limitations of the study

10.3.1 Theoretical perspective

The modelling strategy adopted in this study reflects a determinist perspective (Mandelblatt et.al. 1996 p.151). Relying strongly on data averages, the modelling assumes that the number of interactions and the response of general practice will be consistent and predictable, all else being equal (Mandelblatt et.al. 1996 p.154).

As Drummond & Jefferson (1996 p.11) warn, care must be taken with this assumption. Individual preferences and behaviours in relation even to the same objects, persons or events are not always consistent or stable over time. A challenge to the application of this model in the field will be to isolate the effects of the intervention from secular trends (Clancy 2000 [a] p.6).

Deterministic calculations are also prone to errors of omission where modelling addresses a complex series of events and decisions premised on those events. This is because the probability of each possible combination may not be adequately addressed in the results (Mandelblatt et.al. 1996 p.155).

10.3.2 Parameter constraints

This study seeks to project the proposed model's effectiveness in the current health care environment, rather than its theoretical efficacy. It is thus important to recognise the constraints that are beyond the model's control to change.

The first constraint is that the model assumes that the existing legislative and policy framework pertaining to primary medical care in Australia will remain in status quo. The second issue is that it makes no presumptions about the need to change the unit value or application of pubic subsidies for primary medical care through the Medicare Benefits Schedule. Finally, the fee-for-service payment interface between both general practice or diagnostic service providers and their patients does not change.

10.3.3 Use of secondary data

The research design in this study relies entirely on the analysis of secondary data sets. In particular, it uses a full financial year's data of all benefit claims and serviced delivered within Australia for the Medicare Benefit Schedule's medical imaging (Category 5 [excluding Group I5]) and pathology (Category 6) items.

There are several justifications for taking this approach. First, there is an ethical imperative when manipulating information which affects the distribution of health care to high-risk groups. This is achieved by ensuring internal validity through the use of data sets that are verifiable and standardised (Clancy 2000 [b] p.2). Second, centralised government sources routinely collect comprehensive, standardised public expenditure data in large volumes on medical providers' benefit claims for patient groupings within particular timeframes. This allows for the categorisation of mutually exclusive cost centres that directly reflect activity (i.e. itemised clinical services to clients). The clear advantage is that this optimises both the construct and external validity of the study calculations (Pollicino, Viney & Haas 2002 p.173).

However there are research limitations when using secondary data sets (Pollicino, Viney & Haas 2002 p.173). The first is that the research is limited to the measurement parameters of the administrative entity. The second is that the study must accept the lag times in administrative processing, and may not be aware of any programming or coding errors that have occurred in the process. The latter may then create artefacts within the testing protocol that cannot be expected in practice (Drummond & Jefferson 1996 p.6; Kuntz & Weinstein 2001 p.167; Polgar & Thomas 1995 p.41).

Reliance on data from historic service patterns also risks perpetuating a naturalistic fallacy. This occurs when it is erroneously assumed that what is necessarily equates with what ought to be (Baines & Parry 2000 p.290). However establishing reliable, quantifiable measures of either necessary care or appropriate utilisation remains problematic (Cummings & Mays 1999 p.16; Hammett & Harris 2002 p.124; Stuart, Crooks & Porton 2002 p.134). This remains an area for further research.

10.3.4 Model assumptions regarding the existing Divisions of General Practice network

The original intent of this study was to test the model against actual data matched to specific Divisions of General Practice. Medicare Australia (formerly known as the Health Insurance Commission) denied access to data that could potentially identify diagnostic or general practice providers by their links to a particular Division's catchment area.

It was necessary to make assumptions about how the Divisions of General Practice network would reasonably respond to the model. Since 2003 several Divisions of General Practice have undergone either mergers or a boundary revision. Caution is required in interpreting the findings because the results cannot necessarily be matched against any particular Division.

10.4 Limitations of the model

10.4.1 Model complexity

The derived model relies on the complex interplay of several concepts and processes in order to achieve the desired redistribution. Unless these steps (and the assumptions that underpin them), are well understood, the model will lack transparency (Kuntz & Weinstein 2001 p.143). Some key issues that must be considered include:

- A prerequisite condition is that the Australian Government accepts an element of financial risk in delegating responsibility to Divisions of General Practice. This is a major policy commitment for the Australian Government. The significance of this risk needs to be weighed against the potential gains that the model offers in the social welfare function.

- The model introduces a credit reserve ledger as an original mechanism to track and reward Division performance. This will be a significant administrative undertaking for the Australian Government which must be reviewed and adjusted each financial year.

- There is currently no systematic streaming of Category 5 and 6 Medicare Benefits Schedule items according to whether they are over-, appropriately- or under-referred compared with available evidence. This process will need to be adopted and will require regular updating against new evidence to ensure validity.

- A target level of evidence-based item activity by identified vulnerable social groups must be set each financial year for these groups to establish a specific performance ratio.

- Each Division must achieve several concurrent objectives in order to fully realise its credit reserve limit as a performance payment. These gains will not be achieved without effort or cost. It will require efficient systems of data retrieval and reporting, provider education, targeted public promotion plus consistent lines of communication with both member practices and government agencies.

10.4.2 Non-compliance with the model

As noted in Chapter Six, the Australian Medical Association (AMA) does not support the concept of fund holding at the individual general practice level (AMA Federal Council 2004 pp.1-2). Strictly speaking, the model presented in this paper does not directly advocate fund holding. Nevertheless, many of the elements within the original credit reserve ledger model do draw on the rationales behind the fund holding approach.

The model does exhibit a number of features that should satisfy many of the conditions which the Association stipulates before it is willing to consider a general practice fund holding-type initiative (AMA Federal Council 2004 pp.2-3). For example, the Association insists that:

- *The initiative should be built around a local fund holder, rather than either a national/international organisation or individual practices*.
  Using Divisions of General Practice as the model's intermediaries satisfies this condition.
- *The local fund holder should be able to demonstrate support from local general practitioners*.
  Again, using the well-established Divisions of General Practice network has a reasonable prospect for satisfying this condition.
- *The initiative creates additional funding for investment into general practice, and does not rely solely on existing funding*.
  The model projects that it will redistribute approximately $33.4 million per annum (2002/2003 constant values) of public funds for investment into general practice.
- *General practitioner input is recognised and remunerated*.
  This is addressed in the model. The shared savings and incentives that create the original credit reserve ledger mechanism in the model are premised on general practitioner referral practices for diagnostics. The credit payable at the conclusion of each financial year is directly reliant on how general practitioners' referrals for diagnostics compares with the evidence base.
- *The funding pool is separated from general practitioners' income, does not require cashing out of MBS items they are otherwise entitled to claim, and does not compromise their fee-for-service mode of business*.
  The credit reserve mechanism upon which the model is built satisfies all these related conditions.

- *The initiative does not impede patient access through explicit rationing, does not reduce patient choice of general practitioner, does not compromise clinical care, and does not dilute the independence of the doctor/patient relationship*.

  Once again, the model addresses these issues. It only attempts to map general practice referral practices for diagnostics after the event, and provides incentives the closer it matches both normative need and the evidence-based benchmarks. It has no penalty provisions if referral patterns do not match the model, and makes no attempt to intervene or direct how a general practitioner conducts a consultation with an individual patient. The model also explicitly avoids trying to implement patient enrolment.
- *The initiative does not shift government risk to the fund holder*.

  The model satisfies this condition by only making the risk nominal to the Divisions. There are not punitive outcomes for any apparent failure to achieve the targets and benchmarks.

10.4.3 Weightings using standardised mortality ratios (SMR)

Standardised mortality ratios are used as the weightings. Mortality measures assume an inverse relationship with indices of health, rating death as a health status equivalent to zero. By proxy, they are assumed to indicate degrees of social vulnerability and relative need for targeted services. This is because mortality measures possess objectivity, universality and often ready accessibility (Connelly & Doessel 2000 p.36). Mortality measures correlate well with self-reports of chronic and disabling illness (though not acute illness), which are the morbidities associated with high and sustained needs (McDermott 1995 p.76).

However standardised mortality ratios have limitations. They are neither a direct nor a complete indicator of normative need for health care and do not reflect the multidimensional nature of morbidity. Depending on the context, alternate indices of morbidity are arguably more sensitive to certain characteristics. Unfortunately, difficulties arise with inter-rater definitions, diagnostic codes and the dearth of comprehensive morbidity data sets. This makes their comparability and application more difficult (Connelly & Doessel 2000 p.45; Holland et.al. 1999 p.37).

Using disease-specific mortality ratios may overstate the impact of the particular diseases in question, given the frequency of co-morbidities (Kuntz & Weinstein 2001 p.159; Mandelblatt et.al. 1996 p.158). Compared with the comprehensiveness of all-cause mortality ratios, there are also problems of misclassification and under-reporting where the cause of death is indeterminate (Mandelblatt et.al. 1996 pp.158-159).

This study has assumed a multiplicative function where more than one of the variables affects the age-gender-disease-specific mortality ratios. The rationale is that disease-specific mortality is assumed to be monotonic within the specified age ranges for each of the socially vulnerable population sub-sets (Kuntz & Weinstein 2001 p.159). However it is not clear from the literature whether this is truly the case. If the assumption does not hold, then an additive function may need to apply instead (Kuntz & Weinstein 2001 pp.158-159; Mandelblatt et.al. 1996 pp.157-158).

10.4.4 Use of intermediaries

Introducing Divisions of General Practice in the model between the Australian government and the referring general practitioner creates another layer of administrative separation between the funder and provider. Ross et.al (1999 pp.23-24) argues that intermediate funders create several risks to efficiency. One risk is that the intent of government policy objectives may be diluted at the patient interface. Another is that the providers are less accountable to the original funder. Also the intermediaries invariably increase transaction costs, which detract from the allocation for service delivery and development.

10.4.5 Use of process measures as targets

The utilisation targets applied within the model are interim measures of process. This study does not offer definitive measures of outcome in terms of a change in health status. It is not possible using the available demographic and funding data sets to reliably predict changes in morbidity and mortality. The study also does not consider cost from the societal perspective (Garber 2000 pp.205-206). The calculation of costs is limited exclusively to the public price paid by government for the delivery of general practice-referred diagnostic services.

For these reasons this research is a study of marginal changes in public expenditure and activity. It is not an analysis of cost-benefit or cost-effect, because the study does not directly measure incremental health gains from increased activity, let alone try and give monetary values to the health gains that are assumed (Garber et.al. 1996 pp.27-28; Mandelblatt et.al. 1996 pp.138-139).

10.5 Issues requiring further research

The results of this study demonstrate that it is feasible to derive a model which marginally redistributes general practice-referred diagnostic tests in the pursuit of an enhanced social welfare function. Whilst a legitimate methodology, it must be acknowledged that modelling will only provide an abstract representation of the problem to be addressed (Mandelblatt et.al. 1996 p.156). To establish predictive validity, the model findings need to be tested for robustness in the field and generalised to other areas of primary care where similar issues apply (Mandelblatt et.al. 1996 p.162).

10.5.1 Field testing

The various limitations identified in this modelling study highlight the need for field testing in order to derive empirical results. A pilot study would ameliorate risk of unforseen, negative consequences and provide a true estimate of measurable effect in the field (Ashworth & Jones 2008 p.61; Fisher 2006 p.1847; Polgar & Thomas 1995 pp.47-48).

Such a pilot study would be a case-control design investigating two types of normal practice in health care funding (Mandelblatt et.al. 1996 p.147). This would require phased implementation over a 3-4 year period, using a quota sample of Divisions of General Practice from metropolitan, regional, rural and remote geographic areas. This time frame would a sufficient period for the model to be established, adopted by providers, and then mature in its application. The relative impact of the model's various design elements would be monitored over time. The data collected from these cases would be compared with concurrent data from a matched quota sample of controls with a similar range of demographic profiles (Scott 2007 p.35).

Because the pilot would be a quasi-experimental design, the interventions would not be double blind. Care would need to be taken firstly to ensure that there is no bias in the sample selection that may unduly affect the results (Mandelblatt et.al. 1996 p.147). It would also be important to ensure that the level of monitoring does not have a significant influence on the results measured (DePoy & Gitlin 1998 pp.116-117; Drummond & Jefferson 1996 p.6).

10.5.2 Generalisability

There is little evidence yet on the longer-term effects of pay-for-performance applications (Fisher 2006 p.1847). For example, the “dose-response” relationship of incentive size, frequency and duration with measured quality improvements remains unclear (Scott 2007 p.33).

The issues and concepts analysed in this study are relevant to other facets of general practice referral patterns. In particular, the model has potential application to pharmaceutical prescriptions and referrals to specialists for elective procedures.

It is recommended that future studies test the generalisability of the model. This would be achieved by researching the feasibility of adapting and applying it to general practice prescriptions and referrals to specialists for elective procedures. The consistent aim is to achieve marginal redistribution in the pursuit of an enhanced social welfare function.

10.6 Conclusions

Redistribution of public expenditure on diagnostic testing referred from general practice is in the public interest because of its potential benefit to the social welfare function. To realise this potential, interventions must reflect the evidence-base for enhancing clinical quality and promote discretionary increases in certain interventions. In addition, services must take into consideration any existing or potential access barriers for vulnerable social groups and demonstrate a positive commitment to addressing the imbalance.

This study presents an original model that uses supply-side incentives to drive marginal redistribution of general practice-referred diagnostic testing in the pursuit of defined population health targets. The model projects that a 2.2% redistribution of public funding will achieve a net benefit in the social welfare function whilst maintaining a cost-neutral state.

The research design of this study tests the model’s effectiveness in the current health care environment, rather than its theoretical efficacy. The model acknowledges Australia’s current legislative and policy framework and its communities’ over-arching socio-political imperatives. No presumptions are made about changing either the

Medicare Benefits Schedule or medical practitioners' predominant fee-for-service mode of delivery.

There are limitations to the study design which give cause for further investigation and testing in the field. The analysis' reliance on secondary data risks artefacts within the results, because of lag times in administrative processing, and possible programming or coding errors. The utilisation targets used in testing the proposed model are interim measures of process, and not definitive measures of change in health status. For this reason, this is a study of marginal costs and activity, rather than a cost-effectiveness analysis.

This study is also limited by its inability to test the model against the parameters from identified Divisions of General Practice. It was necessary to make assumptions about how the Divisions of General Practice network can reasonably expect to respond to the model.

Accepting these limitations, this study's methodology still demonstrates sufficient rigour. The datasets are reliable and the testing protocols are appropriate. On this basis, there is confidence that the results possess adequate levels of face validity.

There are also limitations in the model design which will require the protection of a regulatory framework to ensure its proper application in the field. For example, a perverse incentive exists in the model for general practitioners to avoid a debit against their Division's benchmark cap on over-referred items by forwarding patients unnecessarily to a specialist for particular tests. This could be avoided by making Divisions accountable for the outlay on diagnostic tests that could be ordered by general practice but that were ordered instead by a specialist.

The reliance on geographic grouping of general practices such as the Divisions' network potentially exposes the model to perverse incentives and aberrations. It is recommended that further studies explore options that do not rely on the traditional administrative paradigm of defining membership only by geographic boundaries, so that the burdens and benefits of geographic dispersion are more equitably apportioned.

In lieu of patient enrolment, this model adapts the standardised whole patient equivalent (SWPE) calculations from the Australian Government's practice incentive payments (PIP) program for determining catchment sizes. This mechanism does not impede the existing entitlement of Australian residents to choose their own general practitioner. It is also an established methodology currently in practice which effectively adjusts for patient flows between practices. Finally, it already incorporates weightings for age and gender to reflect patients' relative need for access to general practice.

The absolute scale of credit reserve balances correlates closely with the Division catchment size, though the importance of this relationship declines as rurality and remoteness increases. In the Remote category, catchment size is no longer the dominant factor in determining the potential credit reserve balance. Meeting the Stream C target levels and attaining the weighted bonuses becomes more important. This reflects the normative bias in the model towards rurality and remoteness. The implication of these findings is that all the Divisions of General Practice within the existing network have sufficient critical mass to accumulate a material benefit from participation.

It stands to be tested whether the incentives within the model are sufficient to engage general practice as a whole. Given its combined objectives to pursue population-health gains whilst containing the net cost to the state, the model is only sustainable in an environment of universal coverage for the Medicare-eligible population.

Approximately 95% of Australia's population live within the catchments of Divisions of General Practice that will initially require major effort to correct current activity and make moderate per capita gains at target levels. This presents a risk to compliance. An interim implementation period outside the terms of the reference case is necessary. The model would then move to full implementation. This will return the model to the conditions of the reference case, and stabilise the outlay for the Australian Government after this transition period.

The model requires further investigation and field testing in order to derive empirical results and assess predictive validity. It is also recommended that future studies test the generalisability of the model. The most relevant areas where this can be achieved will be through research into the redistribution modelling of general practice prescriptions and referrals to specialists for elective procedures. The consistent aim is to achieve marginal redistribution in the pursuit of an enhanced social welfare function.

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APPENDIX 1 - Descriptions of key terms

Access:

Potential access refers to physical or structural capacity. Realised access refers to actual utilisation (Blumenthal et.al, 1995 p.253; Starfield 1998 p.127). Social and organisational variables that impact on rates of access include out-of-pocket expense at the point of care, plus the age, culture and social status of patients relative to the providers. Spatial variables include geographic distance and time delays in obtaining a service (Starfield 1998 p.127).

Adverse selection:

See description of *market failure* (ref. page 316).

Agency:

The principal-agent theory centres on the use of suitable incentives by a principal to engage an agent, who then acts on their behalf. The agent subsequently performs certain functions or delivers certain services. Wherever there is an agency relationship, a contract is either implicitly or explicitly established. A perfect relationship assumes that there is information symmetry between parties, and that their interests are in harmony. A perfect agent will act solely in the interests of their principal (i.e. aim to optimise the principal's net benefit) and the principal will be the exclusive claimant to the outcome of the agent's actions (Hurley 2000 p.75; McPake et.al. 2002 p.167; Scott 2000 p.1179).

Altruism:

Altruism refers to the benefit people derive from others receiving care or services that are deemed necessary. This implies that there is a level of recognised interdependence associated with utilisation of particular services where a need is identified (Hurley 2000 p.72).

Ambulatory care:

Ambulatory care is non-institutional service delivery, including clinic-based or domiciliary settings (Dewdney 1989 p.83). This description encompasses primary care but in many systems specialists and tertiary centres also deliver ambulatory care on referral. The vast majority of patient consultations with medical practitioners across the

OECD occur in an ambulatory care setting. Predominantly this occurs in either primary care clinics or hospital outpatient departments (OECD 2001 p.30).

Asset specificity:

See description of *market failure* (ref. page 316).

Autonomy:

The ethical principle of autonomy articulates a person's right to self-control both at an individual and collective level. In health care a range of individual rights are commonly recognised. For the patient, these include opportunities for informed consent and choice. For the provider it includes the right to pursue appropriate standards of practice unrestrained. At a collective level the community has the right to determine health policy. This is achieved through inputs to the settings of care plus evaluation of targets and goals (National Health & Medical Research Council 1999 p.3-4).

Benefit:

A benefit is an evaluation of outcome, expressed in terms of gain, service or production. It may be an intermediate marker, provided it can be justified as a reasonable surrogate for the final outcome (Donaldson & Shackley 1997 p.851; Drummond & Jefferson 1996 p.7).

Burden of disease (or illness):

Burden of disease is measured by indicators of mortality and morbidity, and adjusted according to age, gender, location, and degrees of disability. Typically such measures are used to assess the impact of a given disease on a community in terms of quality of life, income and/or cost (Holland et.al. 1999 pp.30-31).

Cancer:

Cancer is a broad title for disease groupings characterised by abnormal cell proliferation (neoplasms or malignant tumours), which invade and impede other surrounding tissues within organs and body parts. It may include the development of secondary tumours (metastases) in other disparate organs and body parts (Australian Institute of Health and Welfare 2006[a] p.74).

Identified risk factors vary with cancer types, though some environmental associations are prevalent in many cases. They include smoking (30% of cases), diet (30%), radiation exposure (2%) and/or infectious agents (5-15%). Some distinguishing genetic traits are also associated with certain types of cancers (Australian Institute of Health and Welfare 2000 pp.63-64; Condon et.al. 2004 pp.506-507).

There is a general decline in survival for most cancers with ageing. Over the past two decades, there have been marked improvements in survival for several cancer types. This reflects in part improvements in diagnostic and therapeutic interventions, plus possible variations in exposure to relevant risk factors (Australian Institute of Health and Welfare 2006[a] pp.78-79). Malignancies discussed in this study include the following:

Breast cancer: Consistent with evidence from across the OECD, breast cancer is the most common malignancy detected with Australian females (98.4 new cases per 100,000). Its incidence increases with age (Australian Institute of Health and Welfare 2000 p.68; Jacobzone, Jee-Hughes & Moise 1999 p.33; O'Malley, Fletcher & Morrison 1990 p.251).

Breast cancer accounts for 17% of cancer deaths in females, which equates to approximately 3% of total mortality (Gough 2002 p.333; Jacobzone, Jee-Hughes & Moise 1999 p.33). This reflects more the prevalence of the disease than its relative voracity. It has a more favourable survival rate than other common cancers in women (e.g. lung, colorectal and ovarian cancers). However survival rates for breast cancer decline progressively after the age of 50 years (Jacobzone, Jee-Hughes & Moise 1999 pp.32-33).

Malignancies of the mammary gland most commonly arise from cells within the lactiferous ducts (Jacobzone, Jee-Hughes & Moise 1999 p.28). In 15% to 20% of cases the pathology is diagnosed early as a localised ductal carcinoma in-situ (DCIS or stage 0). More typically early breast cancer is diagnosed in stages I or II, where the malignancy is confined to the breast tissue with or without spreading to the ipsilateral lymph nodes. More advanced breast cancer is categorised as stages III and IV, where the malignancy is more locally advanced plus metastases are present in other organs (Jacobzone, Jee-Hughes & Moise 1999 p.28).

There is evidence of a genetic predisposition linked to the BRCA1 and BRCA2 genes. Studies also identify many other related factors. Physiological factors include increasing age, early onset menarche, and late onset menopause. Lifestyles factors include a first full-term pregnancy at age 35 years or older, null parity by age 40 years, smoking in excess of twenty cigarettes a day, smoking within the first five years of menarche, excessive alcohol intake, and a high fat, low fibre diet (Australian Institute of Health and Welfare 2000 p.68; Jacobzone, Jee-Hughes & Moise 1999 p.28; Mayor 2002 p.793).

There are also associations with other pathologies, such as previous histories of cancer to the breast, ovaries or endometrium, or evidence of benign proliferative disease with atypia. Breast cancer is also a possible adverse side effect of either commencing oral contraceptives at an early age, hormone replacement therapy or ionising radiation to the breast (Australian Institute of Health and Welfare 2000 p.68; Jacobzone, Jee-Hughes & Moise 1999 p.28; National Health & Medical Research Council 1996 p.105).

- *Cervical cancer:* Cervical cancer usually occurs in the presence of extensive, persistent high-grade squamous intraepithelial lesions affecting both surface tissue plus the deep endocervical crypts (National Cervical Cancer Screening Program 2005 p.16). The cells of the transformation zone of the cervix are the most prone to lesions (National Cervical Screening Program 2005 p.13).

  The known natural history is a prolonged pre-malignant phase over 10-15 years following a persistent human papilloma virus (HPV) infection, which is typically acquired during 15-25 years of age (Cruickshank 2001 p.351; Herbert 2000 [a] p.201; National Cervical Screening Program 2005 p.14). In particular, studies have identified oncogenic associations with viral serotypes HPV-16 and HPV-18 (National Health & Medical Research Council 1996 p.99).

  The cumulative lifetime incidence of a cytological abnormality for a given cohort of women may reach 30-40%, with the peak rate occurring in the third and fourth decades of life (Cruickshank 2001 p.351; Herbert [b] 2000 p.77; Raffle et.al. 2003 p.4). The life-time rate of diagnosed higher-grade cytological abnormalities progressing to invasive cancer is estimated between 12.0-14.4% (National Cervical Screening Program 2005 p.53; Raffle et.al 2003 p.4). The prevalence of invasive cervical cancer increases progressively with age (National Health & Medical Research Council 1996 p.100; Woolf 1990[b] p.321).

Cervical cancer is a rare outcome even from high-risk human papilloma virus infections (National Cervical Screening Program 2005 p.9). In most cases the infection will clear spontaneously and infection rates decline with age (Cruickshank 2001 p.351; Herbert 2000 [a] p.201).

However, where high-risk infections persist for more than three years, there is a significant risk of progressing to high-grade squamous intraepithelial lesions. Progression is also more common in smokers, the immuno-compromised and women who use oral contraceptives (National Cervical Screening Program 2005 p.12). Progression is more aggressive in older women and the larger the size of the initial lesion (Fahs & Mandelblatt 1990 p.442; National Cervical Screening Program 2005 p.17). Women are also more likely to progress to adenocarcinomas from atypical glandular cells of undetermined significance than to squamous cell carcinomas from low-grade squamous intraepithelial lesions (National Cervical Screening Program 2005 p.64).

The risk of cervical cancer is increased for those women who first had sexual intercourse at less than sixteen years of age, who have had multiple sexual partners, who have confirmed human papilloma virus infection or other sexually-transmitted diseases, or who have had a prior incidence of cervical intraepithelial neoplasia (CIN) (National Preventive and Community Medicine Committee 2002 p.34).

- *Colorectal cancer:* Cancer of the colorectum is the most commonly reported malignancy in Australia. It is second only to lung cancer for malignancy-related mortality and cause of lost life-years (Australian Cancer Network 2005 p.3; Bolin & Korman 1999 p.244; Nogrady 2006 p.21). Nevertheless, case survival rates in Australia exceed reported rates in most European states, and are equivalent to that found in the Netherlands and the United States (Australian Cancer Network 2005 p.4).

  Colorectal cancers develop slowly over an average of 10-15 years. Typically they arise from the presence and transformation of premalignant adenomatous polyps in the bowel wall (Australian Cancer Network 2005 pp.3-4; Fludger, Turner, Harvey &

Haslam 2002 p.1444; Knight, Fielding & Battista 1990 p.296; Winawer 2003 p.126). Most polyps are found distal to the splenic flexure of the colon. However the ratio of adenomas to benign hyperplastic polyps increases the more proximal the location within the colon. Proximal adenomas are more frequent in women and certain high risk groups, such as first-order relatives of colorectal cancer patients (Knight, Fielding & Battista 1990 p.296).

Three histological types of dysplasia can be identified, from the more common tubular, through tubulovillous to the less frequent and more aggressive villous adenomas. Ultimately adenoma size is considered more predictive of neoplastic transformation than histology (Knight, Fielding & Battista 1990 p.296). In a minority of cases de-novo malignancies also arise directly from the mucosa rather than an adenoma, suggesting an alternate pathogenesis in these cases (Australian Cancer Network 2005 p.3).

Less than 1% of cases are diagnosed before the age of 35 years. Risk increases with age from 40 years, and rises markedly from the age of 50 years (Australian Cancer Network 2005 p.3; Knight, Fielding & Battista 1990 p.295). The aetiology involves a complex interaction of inherited susceptibility and environmental factors (Australian Cancer Network 2005 p.3). There is a clear association between the incidence of colorectal cancer and industrialised societies' diet and lifestyle (Nogrady 2006 p.21; Rozen, Winawer & Waye 2002 p.755). The risk of colorectal cancer is also strongly associated with family history (National Preventive and Community Medicine Committee 2002 p.37).

- *Lung cancer:* Lung cancer accounts for 5.3% of all deaths in Australia. It is the leading cause of cancer-related mortality (20.1%), with 22.8% of cancer deaths in males and 14.8% in females respectively (Australian Cancer Network 2004 p.3). It accounts for a disproportionate 26% of all cancer deaths in Aboriginal Australians (Condon et.al. 2004 p.506). The estimated five-year relative survival ratio is only 11% for males and 14% for females. Survival declines with increasing age and extent of the disease at diagnosis (Australian Cancer Network 2004 pp.12-13). The Incidence rate increases with age, peaking in the 75-79 years age group. Similarly mortality rates increase with age, peaking in the 80-84 year's age group. Both age-adjusted rates are lower than that found in either North America or Europe (Australian Cancer Network 2004 p.4).

Lung cancer has four main histological classifications, divided into two groups. The first group is non-small cell lung cancers (NSCLC) (Australian Cancer Network 2004 pp.5-6). This group includes adenocarcinomas, squamous cell carcinomas and large cell carcinomas (Australian Cancer Network 2004 p.13). The second group, and the fourth distinct histological classification, are small cell lung cancers (Australian Cancer Network 2004 pp.5-6). Small cell lung cancers have the poorest five-year relative survival ratio of all the histological sub-types (Australian Cancer Network 2004 p.13).

The pathogenesis is in the repeated stimuli, inflammation and irritation of the bronchi by carcinogens (e.g. tobacco smoke). Repeated exposure to carcinogens disrupts cell development of the mucosal lining and then progresses into the basal membrane. Established tumours then spread to other lung tissues and eventually metastasise to the lymph nodes (Australian Cancer Network 2004 p.5-6).

Tobacco smoke has a direct association in approximately 95% of diagnosed cases in males, and 65% of cases in females. Exposure to tobacco smoke has a lead-time of at least 20 years. The excess risk of lung cancer rises in proportion to the square of the number of cigarettes smoked per day, and to the fourth or fifth power of the duration of smoking (Australian Cancer Network 2004 pp.6-7). Non-smokers exposed to environmental tobacco smoke have 1% of the excess risk for lung cancer of smokers (Australian Cancer Network 2004 p.8).

- *Prostate cancer:* Cancer of the prostate is the most common malignancy in Australian males (115 cases per 100,000), accounting for 23.5% of all reported cases (Australian Institute of Health and Welfare 2000 p.64; Population Health Division 2004 p.223). This is consistent with evidence from the United States and western European states (Nelson, De Marzo & Isaacs 2003 p.366). It is second only to lung cancer as the most common cause of cancer-related mortality in men (Australian Institute of Health and Welfare 2006[a] p.77; Population Health Division 2004 p.223; Scher 2007).. Five year survival rates decline with increasing rurality and remoteness (Australian Institute of Health and Welfare 2006[a] p.77; Population Health Division 2004 p.224).

  The pathogenesis is a process of accumulative, multi-focal alterations in cell structure and function over several decades (Nelson, De Marzo & Isaacs 2003 p.371; Scher 2007). There is marked heterogeneity in cellular abnormalities detected between diagnosed cases, as well as between lesions within cases. Additional alterations are also noted as prostate cancers progress (Nelson, De Marzo & Isaacs 2003 p.371).

Chronic or recurrent inflammation of the prostate creates proliferative inflammatory atrophy in the epithelial cells. This is most commonly in the periphery of the prostate. Repeated injury to focal atrophic lesions by inflammatory oxidants causes a regeneration of epithelial cells which fail to differentiate into columnar secretory cells. This leads to prostatic intraepithelial neoplasia, and ultimately, cancer (Nelson, De Marzo & Isaacs 2003 pp.375-376).

Though some studies identify an association with a history of sexually-transmitted infections, in many cases the pathogen of symptomatic prostatitis is unknown. Regardless, the presence of inflammation, rather than a specified infection, is considered the root cause of cellular or genomic damage to the prostate. The presence of certain genes also increases susceptibility (RNASEL and MSR1 have been identified to date) (Nelson, De Marzo & Isaacs 2003 p.372).

Approximately 40% of early onset and 5-10% of all prostate cancers are attributable to family history (Nelson, De Marzo & Isaacs 2003 pp.368-369; Scher 2007). Some ethnic groups (e.g. African-Americans) have a higher prevalence of the disease. This is possibly associated with higher levels of androgens, such as testosterone (Scher 2007). Frequency of both benign and malignant changes increases with age. Autopsy series identify an incidence of 29% in men aged 30-40 years, increasing to 64% in men aged 60-70 years, and exceeding 70% in men aged 7-80 years (Nelson, De Marzo & Isaacs 2003 p.366; Scher 2007).

The incidence of autopsy-detected prostate cancer is similar around the world, yet its clinical incidence is higher in western societies. This indicates that environmental factors also play an important role. Evidence points to increased risk with diets high in oxidants from saturated fat and carcinogens from char-grilled red meat (Nelson, De Marzo & Isaacs 2003 p.373; Scher 2007).

Capitation:

Capitation refers to prospective funding for a catchment or service population, which is negotiated and then fixed between the funding entity and provider groups. In return, the providers guarantee to deliver a range of services within a prescribed time frame for a nominated individual or client group (Gosden et.al. 2000 p.1).

The implication for the provider is that their marginal revenue for additional services will be zero, and their real marginal net income becomes negative with the cost of each additional output. Providers have a perverse incentive to deliver the lowest cost service permissible within the prevailing regulatory conditions. In turn, the funding entity has an imperative to set contractual terms that guarantee at least a minimal level and standard of service in return for prospective remuneration (Pauly 2000 p.550; Scott 2000 p.1188).

Determination of a catchment or service population is pivotal to a capitated funding allocation. Patient registration or nominal allotment to a provider group is becoming increasingly common (Scott 2000 p.1188). In other cases historic measures of utilisation have been used as a crude proxy for the service's estimated catchment population. Alternatively, needs-based formulae attempt to adjust for demographic characteristics and regional epidemiological variations to weight allocations for defined catchments (Marriott & Mable 1998 pp.646-647).

Cardiovascular disease (CVD):

There is a variety of primary risk factors for cardiovascular disease. They include smoking, hypertension, hypercholesterolaemia (high serum cholesterol), diabetes mellitus, obesity, a sedentary lifestyle, depressed levels of serum high density lipoprotein (HDL) cholesterol, and a family history of premature ischaemic heart disease in a first degree relative. The risk is higher in men, and increases with age (Jacobzone, Jee-Hughes & Moise 1999 p.5; JBS 2 Working Party 2005 pp.v1-2; Senes & Britt 2001 p.8; Taylor et.al. 1990 p.437; Woolf 1990[c] 408).

Cardiovascular disease incorporates a spectrum of disorders, which are often inter-related. They include:

- *Atrial fibrillation:* Atrial fibrillation (heart flutter) affects approximately 0.5% of the adult population. Prevalence rises with age up to 10% in the over-75 year's age group (Senes & Britt 2001 p.14). It occurs when the upper chambers of the heart lose rhythm and commence a rapid, chaotic sequence that inhibits the pumping of sufficient blood volumes to meet the body's physiological demands. It is typically sequelae to other forms of cardiovascular disease, and less commonly to thyroid disease. It commonly presents as co-morbidity with hypertension, heart failure, diabetes mellitus, ischaemic heart disease, angina, and lipid disorders (Senes & Britt 2001 p.14).

- *Carotid artery stenosis:* Up to 2.7% of males and 1.5% of females without symptoms aged 18-69 years will have evidence of carotid artery stenosis on Doppler ultrasound (Britt, Miller & Knox 2001 p.73; National Health & Medical Research Council 1996 p.29). Disease of the carotid artery increases the risk of an embolic stroke. Nevertheless the absolute risk is relatively small at 1.3% per annum (Britt, Miller & Knox 2001 p.73; National Health & Medical Research Council 1996 p.29). It has a higher prevalence in persons with diagnosed peripheral vascular disease and ischaemic heart disease. High serum-lipid levels are a common risk factor to all three pathologies (National Health & Medical Research Council 1996 pp.29-30).

- *Cerebrovascular disease:* Though Australia has amongst the lowest rates of deaths in the OECD due to cerebrovascular accidents (CVA or stroke), and it is declining, it still accounts for 10% of all-cause mortality (Jacobzone, Jee-Hughes & Moise 1999 p.14; Senes & Britt 2001 p.20). In addition stroke is associated with 25% of all chronic disability in Australia (Senes & Britt 2001 p.20). Men constitute a higher proportion of persons with frank cerebrovascular disease, and prevalence increasing with age.

  In approximately 80% of cases a stroke occurs when the arterial supply to a part of the brain is occluded (ischaemic stroke) by the localized formation of a clot (thrombosis). Alternatively a clot may travel to the brain in an artery from elsewhere in the body (embolism). Less commonly it may occur as a result of a blood vessel rupture and bleed (haemorrhagic stroke) (Jacobzone, Jee-Hughes & Moise 1999 p.11; Senes & Britt 2001 p.20). In either case a stroke results in the impairment of cognitive, motor and/or sensory functions to varying degrees depending on the scale of the infarct (Senes & Britt 2001 p.20).

  Where the signs and symptoms of an ischaemic episode resolve completely within a twenty-four hour period, they are labelled a transient ischaemic attack (TIA). Nevertheless the aetiology is identical to that of a stroke (Jacobzone, Jee-Hughes & Moise 1999 p.11; Senes & Britt 2001 p.23).

Causal risk factors for cerebrovascular disease include smoking, hypertension, high serum cholesterol, lipid disorders, diabetes mellitus, narrowing of the carotid arteries and a history of cardiovascular disease, in particular ischaemic heart disease (Jacobzone, Jee-Hughes & Moise 1999 pp.11-12; Senes & Britt 2001 pp.20-23). In addition to the common co-morbidities it also associated with dementia, depression and atrial fibrillation (Senes & Britt 2001 pp.20-23).

- *Chronic heart failure:* An estimated 8% of the population over the age of 80 years suffer from chronic heart failure. More chronic heart failure patients are female, and prevalence increases with age 75 years or older. In addition to the common co-morbidities it is also associated with ischaemic heart disease and chronic obstructive pulmonary disease (COPD) (Senes & Britt 2001 pp.11-12).

  Chronic heart failure occurs when the heart is incapable of pumping a sufficient volume of blood to meet the body's physiological demands. The main risk factors include a history of ischaemic heart disease and/or hypertension. It can also result from idiopathic cardiomyopathy, thyroid disease, damaged heart valves, alcohol abuse and the side effects of certain medications (Senes & Britt 2001 p.11).

- *Ischaemic heart disease (IHD):* Ischaemic (or coronary) heart disease is the most prevalent form of cardiovascular disease (Senes & Britt 2001 pp.8-9). It alone accounts for between 20 to 30% of cardiovascular disease-related mortality worldwide (Jacobzone, Jee-Hughes & Moise 1999 p.8). It is more common in males and increases with age 65 years or over (Senes & Britt 2001 pp.8-9).

  Ischaemic heart disease involves atherosclerosis of the coronary arteries. This restricts the supply of oxygenated blood to the myocardium (cardiac muscle) (Jacobzone, Jee-Hughes & Moise 1999 p.8). The principal risk factors are hypercholesterolaemia, hypertension, and smoking (Kushi & Kottke 1990 pp.385-386). Atherogenesis has an extensive lead time. Frank ischaemic heart disease may not manifest clinical symptoms for several decades (Kushi & Kottke 1990 p.397).

  The disease is typically manifest as angina, characterised by exercise or stress-induced pain in the chest or arm that is relieved by rest and/or sublingual nitrate medications (Jacobzone, Jee-Hughes & Moise 1999 p.5; Senes & Britt 2001 p.8).

More seriously, an acute occlusion of blood supply to parts of the cardiac muscle is known as an acute myocardial infarct (AMI) (Jacobzone, Jee-Hughes & Moise 1999 p.5). At least 50% of ischaemic heart disease-related mortality is the result of an infarct (Jacobzone, Jee-Hughes & Moise 1999 p.8).

- *Peripheral vascular disease:* The majority of peripheral vascular disease patients are male, and most are aged 65 years and older. In addition to the common co-morbidities it also associated with ischaemic heart disease (Senes & Britt 2001 p.50).

  Peripheral vascular disease has the same risk factors and aetiology as ischaemic heart disease. It is caused by atherosclerosis (hardening or thickening) of blood vessels walls, impairing limb circulation. Peripheral vascular disease significantly increases the likelihood of lower-limb amputation, acute myocardial infarcts and stroke (Senes & Britt 2001 p.50).

Casemix:

Casemix systems reimburse contracted providers an average cost for case-weighted episodes of care (Altman & Wallack 1996 p.12). Casemix measures potentially provide a means of assessing the aggregate burden of illness within a population of patients, and therefore are a useful tool for costing service delivery (Starfield 1998 p.38). Commencing in September 1983, the first casemix system was diagnosis-related groups (DRG) in the United States. Diagnosis-related groups were designed specifically to target acute hospital admissions of Medicare (US) patients (Feldstein 1999 p.212; Maynard 1993 p.9).

Catastrophic insurance:

Catastrophic insurance is the cover provided for the relatively small percentage of health care cases characterised by major medical costs (Feldstein 1999 p.121).

Communitarianism:

The communitarian approach asserts, as a matter of justice, that people have a social obligation or contract to pursue the common good (however defined) for their particular community (McPake et.al. 2002 p.75; Rice 1998 p.164).

Competition:

Competition is a product of resource scarcity (McTaggart, Findlay & Parkin 1996 p.8). In order that a market provides perfect competition, certain conditions are necessary (Santerre & Neun 1996 pp.163-164). These are:

- Consumers pay the full price of the product.
- All firms are profit-maximising.
- No one buyer or seller is sufficiently large to manipulate the market price of a product.
- All firms produce products that are comparable.
- There are no barriers to market entry or exit.
- All economic agents possess perfect information.
- All firms face non-decreasing costs of production.

The delivery of health care does not satisfy many of the above conditions. Nevertheless, at least two models have been developed in an attempt to mix public and market competition components within a regulated framework (McPake et.al. 2002 pp.238-239). These include:

- *Managed competition:* Managed competition is administered in two tiers. At one tier, funding agencies (e.g. insurers) compete with each other for patient enrolment. At the second, providers compete for patients according to the contractual terms set with respective funders on behalf of their enrolees.

- *Regulated competition:* Supply-side competition between providers vying for patients according to contractual terms set by a single (typically public) financer.

Consumer Price Index (CPI):

The consumer price index was initially developed in the United States. It is a market-specific index for the household cost of living. The annual percentage change in the consumer price index is taken as that market's rate of inflation (Feldstein 1999 p.53).

The consumer price index is calculated using the sample pricing and average consumption patterns of 207 product strata, which represent a total of 364 market items. Each product strata belongs to one of 69 expenditure classes, with each expenditure class derived from one of 7 major product groupings (Feldstein 1999 p.56).

Aggregated, it is typically taken to represent a nation's annual inflation rate. This has particular significance in the development of economic policy and strategy (Feldstein 1999 p.54).

The application of the consumer price index within the health care sector has methodological limitations. The index has an underlying assumption over time of both constant value and quality in the market items that it prices (Feldstein 1999 p.69). This fails to take into account the effects of substitution over time (Feldstein 1999 pp.57-58). In addition, a medical consumer price index measures the increase over time of a fixed set of inputs (e.g. average cost of a hospital bed day, average cost of a physician's consultation and pharmaceutical costs etc.). It does not attempt to measure the average cost of treatment for a diagnosis-specific episode of care. It is insensitive to changes in practice standards and case mix over time, which is both influenced by input substitution and quality improvements (Feldstein 1999 pp.71-72). Finally, because the consumer price index is a market index of private consumption, it does not include those items that are subsidised or directly delivered by government agencies. This is a significant limitation, because of the substantial levels of public subsidisation in health care (Feldstein 1999 pp.61-62).

Co-payment and co-insurance:

A co-payment is the patient's liability to pay the balance of a provider's fee after a third party (e.g. insurer) has subsidised or paid a fixed amount. Co-insurance refers to the third party subsidisation of providers' fees, usually as a set proportion (e.g. a fixed percentage), with the balance paid by the patient (EOHCS 2000 p.23; Feldstein 1999 p.120; McPake et.al. 2002 p.211).

Cost:

In economic terms, cost refers to all inputs in production. An economic analysis must consider both explicit costs plus the implicit or opportunity costs of using time and assets for the production in question, rather than for an alternate purpose (McTaggart et.al. 1996 p.222; Santerre & Neun 1996 p.91).

Costs may be categorised according to which aspect of the production function is being analysed (Eagar, Garrett & Lin 2001 p.192; McTaggart et.al. 1996 pp.222-223; Rice 1998 p.104). Some key descriptions include:

- *Average cost:* The mean cost per unit of output.

- *Fixed cost:* A cost that is independent of the output level. It does not change as output increases.

- *Marginal cost:* The change in total cost resulting from a unit increase in output.

- *Opportunity cost:* The cost of opportunities foregone because limited resources are committed to one purpose in favour of another.

- *Total cost:* Total costs are the sum of all costs or inputs used in production. They are subdivided into fixed and variable costs.

- *Variable cost:* A cost that varies with the output level.

Cream skimming (preferred risk selection):

See description of *market failure* (ref. page 316).

Deductible:

Deductibles are a common price-rationing mechanism used in insurance plans. A deductible is where a fixed out-of-pocket threshold is set for expenses, which the enrolee is required to pay first before they are eligible to lodge a claim (Feldstein 1999 p.118; McPake et.al. 2002 p.211).

The argument for using a deductible is to lower the administrative cost of handling many small claims. However the mechanism is criticised as a blunt and regressive instrument that discriminates against low income households and may well present a deterrent to accessing necessary care. Also, once the deductible threshold is surpassed, it offers no constraint to the moral hazard of consumption up to the point of zero utility (Feldstein 1999 p.118).

Demand:

Demand is a demonstration of a market's preference for a given good or service (Eagar, Garrett & Lin 2001 p.139; Hurley 2000 p.70; Rice 1998 p.60). Classic demand theory assumes that consumers are utility maximising. It follows that consumers will show preference for those goods and services that are perceived to optimise their utility within the resources available to them (Rice 1998 p.55).

In a competitive market there is an inverse relationship between the quantities of any goods and services demanded and their price of consumption (Rice 1998 p.55; Santerre & Neun 1996 p.48). The ratio of the percentage change in volumes demanded compared with percentage change in a good's price is known as the price elasticity of demand. The degree to which a shift in price along this curve produces a change in the volume demanded by one unit represents the derived marginal utility of the product (Rice 1998 pp.60-61).

For any change in other non-price determinants of demand (e.g. availability of substitutes, levels of consumer income, taste etc.), the relationship will adjust to match the new market dynamics. (Rice 1998 p.60; Santerre & Neun 1996 p.49).

Demand for health care is derived. This means that goods and services are consumed as one input to ultimately produce the desired commodity (i.e. a beneficial health status), rather than being the desired good per se' (Feldstein 1999 p.53). In some cases the actual delivery of health care interventions can be a distressing, embarrassing and/or inconvenient experience, which most would choose to avoid if they did not consider it necessary (Hurley 2000 p.68; Santerre & Neun 1996 pp.48-49).

Diabetes mellitus:

Diabetes mellitus is a series of related diseases all characterised by chronically elevated plasma glucose concentrations (hyperglycaemia) with disturbances of carbohydrate, fat and protein metabolism (Jacobzone, Jee-Hughes & Moise 1999 pp.16; Senes & Britt 2001 p.26; Singer et.al. 1990 p.349-350).

All types of diabetes mellitus increase the risk of microvascular complications, particularly the small blood vessels supplying the kidneys, eyes and peripheral nerves. Similarly, all types of the disease increase the risk of both obstetric and neonatal complications (Australian Institute of Health and Welfare 2006[a] p.72; Singer et.al. 1990 p.349).

- *Insulin-dependent (type 1) diabetes mellitus:* Insulin-dependent diabetes mellitus (type I) is an autoimmune disorder that destroys the insulin-producing islet beta cells of the pancreas (Australian Institute of Health and Welfare 2006[a] p.68; JBS 2 Working Party 2005 p.v40; Senes & Britt 2001 p.26; Singer et.al. 1990 p.349). Ketoacidosis is one life-threatening metabolic disorder more prevalent with type I diabetes mellitus than other types of the disease (Singer et.al. 1990 p.359). There is also a two-three fold increased risk of ischaemic heart and cerebrovascular disease in later life. This risk increases further in the presence of diabetic nephropathy (JBS 2 Working Party 2005 p.v40).

Type I diabetes mellitus is most common in races of European origin (Australian Institute of Health and Welfare 2000 p.86; Jarvelin 2002 p.10). Onset of diabetes mellitus in childhood is most commonly type I, with its peak prevalence before the age of 40 years (Australian Health Ministers Conference 1999 p.3; Australian Institute of Health and Welfare 2006[a] pp.68-69; Senes & Britt 2001 p.26). Children with diabetes mellitus have a 3% risk of developing coeliac disease and a 5% risk of developing autoimmune thyroid disease (NSW Health 1998 p.8).

- *Non-insulin dependent (type II) diabetes mellitus:* Type II diabetes mellitus is a result of insulin resistance and, eventually, insulin deficiency in the islet beta cells of the pancreas (JBS 2 Working Party 2005 p.v40; Singer et.al. 1990 p. 349). It is associated with severe complications including renal failure, retinopathy, and macro-vascular disease. Macro-vascular complications include coronary artery disease, congestive heart failure, cerebrovascular disease and peripheral vascular disease (Australian Institute of Health and Welfare 2006[a] p.72; Jacobzone, Jee-Hughes & Moise 1999 pp.16-17; Singer et.al. 1990 p.358).

  The onset of type II diabetes mellitus increases with age, most notably 40 years of age and over. Major contributing factors include familial history, low birth weight, central obesity, physical inactivity and poor diet (Australian Health Ministers Conference 1999 p.3; Australian Institute of Health and Welfare 2006[a] pp.70-71; JBS 2 Working Party 2005 p.v40; Senes & Britt 2001 p.29).

  A body mass index (BMI) greater than 25 in adults increases the risk of developing type II diabetes mellitus three-fold. A body mass index greater than 30 increases the same risk ten-fold. Co-morbid obesity and diabetes mellitus are also compounding risk factors for cardiovascular and cerebrovascular disease (JBS 2 Working Party 2005 p.v40; National Centre for Monitoring Diabetes 2002 p.23; Senes & Britt 2001 p.44).

Ethnic groups at higher risk for type II diabetes mellitus include indigenous and non-English speaking peoples (especially of Arab, Chinese, Indian, Pacific Islander and Vietnamese origin) over 35 years of age. However, most factors relate to individual clinical histories. This includes cases with impaired glucose tolerance (IGT) or impaired fasting glucose (IFG), people over the age of 45 years with a body mass index (BMI) > 30 and/or hypertension, all people with a history of cardiovascular disease, and women with a combined history of polycystic ovary syndrome and obesity (Australian Centre for Diabetes Strategies 2001 p.128; Australian Institute of Health and Welfare & Department of Health and Ageing 1998 pp.51-52; Australian Institute of Health and Welfare 2000 p.86; Senes & Britt 2001 p.29) (see page 310 for descriptions of Impaired glucose tolerance (IGT) & impaired fasting glucose (IFG):).

- *Gestational diabetes mellitus:* Gestational diabetes significantly increases the risk for the mother of a difficult labour and delivery, caesarean section, pre-eclampsia, and uterine bleeding. It also increases the risk to the child of a pre-term birth, macrosomia (excessive birth-weight), congenital abnormalities, foetal distress, neonatal hypocalcaemia, neonatal hypoglycaemia, respiratory distress, and jaundice (Senes & Britt 2001 p.32; Singer et.al. 1990 p.352). Macrosomia is subsequently associated with childhood obesity (Singer et.al. 1990 p.354). Gestational diabetes is also a marker of increased risk for developing type II diabetes mellitus later in life (Australian Health Ministers Conference 1999 p.3; Australian Institute of Health and Welfare 2006[a] p.68).

Diminishing returns:

The economic concept of diminishing returns dictates that, beyond a critical point, the marginal output will decrease for each extra unit of input of production. This relationship assumes that all else is kept constant (Connelly & Doessel 2000 pp.38-39).

Disease-state management:

The disease-state management approach focuses on a comprehensive integration of services through the continuum of care for an identified at-risk population grouping (Decter 2000 p.260). The model is most applicable to the management of chronic disease. This is because the benefits of a rationalised approach to care over an extended period of time should more than recoup the cost of engineering and administering the formal integration of services (Coote & Hunter 1996 p.35; Decter 2000 p.261).

For the concept to operate effectively, the care continuum must be systematically addressed. This requires specific funding agreements, multi-provider service guidelines, administration of data sets and maintenance of reliable communication systems (Coote & Hunter 1996 pp.35-36; Decter 2000 pp.265-266).

Dislipidaemia:

Lipids (triglycerides and cholesterol) are carried in the blood serum by macromolecules known as lipoproteins, which arise initially from the intestines and liver (Colquhoun 2006 p.28). Dislipidaemia refers to irregularities in serum lipid metabolism. Confirmed diagnosis includes hypercholesterolaemia (total cholesterol > 5.0 mmol/l), elevated triglycerides (> 1.7 mmol/l), elevated low-density lipoprotein (LDL > 2.5 mmol/l), plus depressed levels of high-density lipoprotein (HDL < 1.0 mmol/l) (Colquhoun 2006 p.27; JBS 2 Working Party 2005 p.v32). The Joint British Societies Working Party (2005 p.v32) add that a non-HDL cholesterol target (LDL and triglyceride-rich lipoproteins) of < 3.3 mmol/l is also desirable.

Dislipidaemia is a major risk factor for diabetes mellitus complications, atherosclerosis (thickening or hardening) of the coronary arteries, and ischaemic strokes. Frequent co-morbidities include hypertension and diabetes mellitus (JBS 2 Working Party 2005 p.v40; National Centre for Monitoring Diabetes 2002 pp.46-47; Senes & Britt 2001 p.38).

The odds of developing ischaemic heart disease are substantially increased in the presence of hypercholesterolaemia (National Preventive & Community Medicine Committee 2002 p.22). A genetic predisposition is suspected in some cases (Marks et.al. 2002 p.1304; National Centre for Monitoring Diabetes 2002 p.23). However a diet high in saturated fats is the primary cause of hypercholesterolaemia in most cases (Kushi & Kottke 1990 pp.394-396; National Centre for Monitoring Diabetes 2002 p.23).

Duty of care:

A duty of care is tested legally by establishing that a relationship of proximity existed between the concerned parties. Where such a relationship ends, so does the duty (MacFarlane 1995 pp.99-100; Trindade & Cane 1993 pp.329-330). The federal ruling of Deane.J in Sutherland Shire Council v Heyman [1985] 157 CLR 424 provides the legal precedent in Australia (Trindade & Cane 1993 pp.329-330). The three key legal tests for establishing proximity are:

- *Physical proximity:* An association of immediacy with regards space and time.

- *Circumstantial proximity:* Defined relationships established through identified roles, positions and premises (e.g. workplaces, contractual arrangements etc.).

- *Causal proximity:* An association between the defendant's act or course of conduct and the damages sustained.

Economic analysis:

Economic considerations in this study are deliberately limited in scope to normative analyses. Normative analysis seeks to rank resource allocation models and associated policies according to their relative efficiency (Hurley 2000 p.57). The common paradigms dominant in the OECD member states include:

- *Extra-welfare economics (or non-welfarism):* Rather than being one set of primary principles, extra-welfarism is a term encompassing most normative economic positions that reject the primacy given to individual utility by welfarism (Tsuchiya & Williams 2001 p.41). Extra-welfarism argues that the value or benefit of health care should not be linked to an individual's economic resource capacity. It rejects willingness-to-pay and interpretations of demand as a valid method in normative assessments of efficiency (Hurley 2000 p.63). Instead the concept of need is given primacy over demand. Access and/or health gain are also given primacy over utility as the outcomes of interest (Dolan 2001 p. 48; Garber 2000 p.184; Hurley 2000 p.64; Rice 1998 pp.160-161).

  Extra-welfarism does not reject a place for paternalism in health care, particularly where there are strong arguments for services as merit goods (Dolan 2000 p.1727; Dolan 2001 p.48; Garber et.al. 1996 pp.31-32; Garber 2000 pp.184-185; Hurley

2000 p.71). Extra-welfarist analysis insists that, in reality, issues of efficiency and distributional equity are not necessarily independent, and cannot be neatly separated when measuring a social welfare function (Hurley 2000 p.62).

- *Welfare economics:* Four key principles underpin welfare economics (Hurley 2000 pp.60-61). They are:

    1. Utility maximisation assumes that individuals choose rationally, and will rank their preferences consistently (Garber et.al. 1996 p.29).
    2. Individual sovereignty assumes that the individual is the best judge of their own welfare, and rejects paternalism.
    3. Consequentialism exclusively values outcomes, and thus judges all policies, directives and/or actions solely according to the effects they produce.
    4. Welfarism assumes that the social welfare function is individualistic and utility-based (Hurley 2000 p.61; Rice 1998 p.145).

Effectiveness:

Effectiveness is the degree of benefit achieved in actual practice (Mandelblatt et.al. 1996 p.137). It is the measure of an intervention under ordinary circumstances by the average provider for a typical recipient (Eagar, Garrett & Lin 2001 p.19; Woolf 1990[a] p.7).

Efficacy:

Efficacy is the degree of benefit expected from a standardised intervention applied under optimal conditions (Duckett 2000 p.227; Eagar, Garrett & Lin 2001 p.19; Woolf 1990[a] p.7). Most often this applies to academic or controlled research settings where interventions are initially developed and tested (Mandelblatt et.al. 1996 p.137).

Efficiency:

Efficiency is a normative construct requiring a reference point against which to evaluate a function's performance (Hurley 2000 p.59-61). The literature identifies a conceptual hierarchy that describes efficiency. It is:

- *Technical (or productive) efficiency:* Technical efficiency is supply-focused. It refers to the pursuit of a production function where the cost of inputs (materials, equipment and labour) required for a given output are minimised (or the output for a given quantity of inputs is maximised). Many combinations of inputs may be possible to produce the most technically efficient output (Eagar, Garrett & Lin 2001 p.18; Hurley 2000 p.60). It must satisfy the condition where no further substitution between inputs leads to a reduction in costs. The marginal rate of substitution for all pairing of inputs should equal the ratio of the input prices (McPake et.al. 2002 p.68).

- *Cost effectiveness efficiency:* Cost effectiveness efficiency is also supply-focused, though context specific, according to prevailing prices for inputs. As a prerequisite, cost effectiveness must meet the conditions of technical efficiency. However it also assumes that, under normal circumstances, only one mix of inputs is capable of achieving maximum production in any context (Hurley 2000 p.60).

- *Allocative efficiency:* Technical efficiency is a prerequisite condition of allocative efficiency. However, it also incorporates consideration of demand dynamics (Hurley 2000 p.60). It requires the optimal mix and distribution of goods and services according to the relative values that consumers place on them (Hurley 2000 p.60; McPake et.al. 2000 p.70). A key functional limitation is the degree to which it is possible to switch production between any given pairing of goods (the marginal rate of transformation). This is optimised when it equals the ratio of the goods' prices (McPake et.al. 2002 p.68).

- *Dynamic efficiency:* Dynamic efficiency describes a system's capacity to adapt its distribution of goods and services over time to ensure that an optimal mix is sustained (Eagar, Garrett & Lin 2001 p.18).

Egalitarianism:

The egalitarian philosophy gives primacy to solidarity. This dictates that where a community defines a resource (e.g. health care) to be a merit good, then its allocation should be according to relative need, rather than either free market distribution or economic assessments of efficiency (Decter 2000 p.19; Reinhardt 1996 p.87; Richardson, Nord & Scott 1996 p.60). Egalitarianism also judges some components of a health system as public goods. The argument follows that such components deserve government intervention to ensure a just distribution (Clancy 2000 [b] p.3; Duckett 2000 p.24; Maslove 1998 p.373).

Enrolment:

See description of *rostering* (ref. page 331).

Equity:

Equity is a concern for fairness and justice. This considers the means to balance legitimate, though competing claims to scarce resources in an impartial manner (Hurley 2000 p.87). Equity in health care is a normative construct, with at least four focal variables. They are:

- *Equal access to care for equal need:* Parity for persons with equivalent needs to consume appropriate services when required. This notion equates with the welfarist tradition that emphasises equal opportunity to access services for persons according to both need and preference (Dolan 2000 p.1727; Dolan 2001 p.48; Rice 1998 p.161). This assumes the unlikely condition that each person's relative budget constraint is identical (Hurley 2000 pp.89-90; Mullen 1998 p.13).

- *Equal utilisation according to equal need:* Equity judged through observed behaviours. Realised uptake of services is compared, and adjusted relative to measures of need (such as indicators of morbidity) (Mullen 1998 p.13). The difficulty with using 'use-per-need' as the sole variable is that it gives no indication whether or not the current utilisation rates are adequate, necessary or preferred (Mullen 1998 pp.13-14).

- *Equal quality of care for all:* Providers commit to delivering services of the same standard to all sections of the community. Implicit is sensitivity to patients' acceptance and preferences in how services are organised and administered (Mullen 1998 p.15).

- *Equity of outcome:* Resources are allocated so as to enable an equal distribution of health gains (Eagar, Garrett & Lin 2001 p. 17; Hurley 2000 p.92). This approach moves beyond individual utility maximisation as the key indicator of efficiency. Instead it gives primacy to normative measures of health gain (Rice 1998 p.162).

Equity also has at least two dimensions. They are:

- *Horizontal equity:* The equal treatment of equals (Hurley 2000 pp.88-89; Mullen 1998 p.12). This is the common understanding of equality, where equal shares are distributed to all (Rice 1998 p.152).

- *Vertical equity:* The unequal treatment of unequals, in accordance with their relative inequalities (Hurley 2000 pp.88-89; Mullen 1998 p.12; Rice 1998 p.152).

False negatives:

A screening test result that erroneously indicates the absence of a disease-state is labelled a false negative. False negatives engender a false sense of security, resulting in inadequate attention to modifying risks. This may also create unnecessary delays in seeking care, even when warning symptoms are apparent (Woolf 1990[a] 9).

False positives:

A screening test result that erroneously indicates the presence of the disease-state is labelled a false positive. False positives often create unnecessary anxiety and expose the subject to unnecessary treatments. This in turn creates undue behaviour changes, unnecessary costs, loss of productivity and an increased risk of iatrogenic consequences (Woolf 1990[a] 9).

Fee-for-service:

Fee-for-service refers to the paying of fees for each consultation delivered. The volume of consultations provided and the unit price are the key cost drivers for total cost in this system (Gosden et.al 2000 p.1; Scott 2000 p.1188). In fee-for-service environments, total revenue earned by physicians equates to the aggregate output cost for the purchasing entities.

Where fees are fixed according to a schedule, physicians' commitment to enhancing the marginal health production will exactly equal the marginal cost of their input factors (e.g. time). Consequently, the physician is unlikely to engage in time-consuming activities with other providers. Instead they have a clear motive to select treatments on a case-by-case basis that increase their income per unit of time worked (Burstrom & Gisin 1998 pp.96-97).

Fund holding (or budget holding):

General practitioner fund holding was first introduced in the United Kingdom following the *NHS and Community Care Act 1990 (UK)* (Coote & Hunter 1996 p.28). The National Health Service (NHS) used a weighted per capita formula to contract with district health authorities and participating general practitioners to accept responsibility for purchasing hospital admissions, some elective surgery, ambulatory care, ambulance services, diagnostic tests and pharmacy prescriptions on behalf of their registered clientele (Decter 2000 p.84; Marriott & Mable 1998 p.565).

Marriott & Mable (1998 p.558) identify six elements in the National Health Service application of general practice fund holding. The first four are structural elements. They are limited consumer choice of general practitioner, control of access to secondary care by general practice gate keepers, selective contracting by purchasers and the use of financial incentives tied to general practice. The final two are complementary functional elements. They are quality systems and utilisation management systems.

The New Zealand equivalent to fund holding is termed budget holding. In this model, accredited general practices are assigned nominal recurrent budgets from Regional Health Authorities to subsidise the cost of pharmaceuticals and diagnostic pathology tests for their enrolled patients. Some budget holding entities also negotiate funding for either secondary or mental health services (Marriott & Mable 1998 p.590).

Gate keeping:

In its broadest sense, gate keeping requires a certain entity or provider to be the first point of contact, which then controls access to subsequent services downstream (Starfield 1998 p.119). In health care, this means that patients must routinely consult with a gate keeper, who determines whether access to secondary care is required. Typically this function is delegated to general practitioners (OECD 2001 p.30). The general practitioner is used to provide a non-emergency screening function for referrals to diagnostic testing, ambulatory specialist clinics and hospitals (Marriott & Mable 1998 p.639; Scott 2000 p.1177).

General practice gate keeping is commonly applied as a non-price rationing mechanism by health insurance systems where consumers' out-of-pocket expense is at or near-zero. This has significant implications for practice behaviour, in terms of integration with other providers, clinical quality, patient equity and cost (Scott 2000 p.1177).

General practice:

General practice is a common (though not universal) term across the OECD member states for services provided by a primary care physician. Services are typically family-based, first contact care (Duckett 1997 p.20). Though definitions in the literature vary, Scott (2000 p.1177) identify common elements relate to continuity of care, ready access and the provision of medical services for an unspecified range of conditions.

Gross Domestic Product (GDP):

Gross Domestic Product (GDP) is defined as the total domestic expenditure plus exports, less import of goods and services (OECD 2001 p.62). Measures of gross domestic product allow analysis of changes in the size of a state's economy over time, and are often used as an indicator of national expenditure trends, after adjustment for inflation (Duckett 2000 p.31; OECD 2001 p.42).

To allow for international comparison, data requires conversion to nominal values, adjusting into a common unit using the current exchange rate. Typically the United States dollar (US$) is used (Deber & Swan 1998 p.311). To control for volume and mix of consumption, measures of real gross domestic product requires conversion of a state's nominal gross domestic product using the purchasing power parity (PPP) index (Arweiler 1998 p.225; OECD 2001 p.62) (see page 328 for a description of purchasing power parity).

Health expenditure as a percentage of gross domestic product is a measurement of the relative resources apportioned by a nation to address health issues for its population (Contandriopoulos 1998 p.181; Deber & Swan 1998 p.317). The proportion of gross domestic product spent on the sector will only show a substantial change when the rate of growth in the numerator (i.e. health care expenditure) is not synchronised with that in the denominator (i.e. gross domestic product). Even then it will give no indication as to which has predominantly created the change (Arweiler 1998 p.224).

Health gain:

Measures of health gain relate to improvement in the health status of groups and populations, not an individual's capacity to benefit from a particular treatment.

Measures primarily focus on health outcomes rather than on the inputs and/or outputs of health care delivery (Coote & Hunter 1996 p.11). Three common instruments discussed in the literature include:

- *Disability-Adjusted Life-Years (DALY)* (Dolan 2000; Homedes 1996; Le Grand 1996).

- *Healthy-Year Equivalents (HYE)* (Dolan 2000; Dolan 2001; Gold et.al. 1996; Hurley 2000).

- *Quality-Adjusted Life-Years (QALY)* (Dolan 2000; Dolan 2001; Garber et.al. 1996; Garber 2000; Hurley 2000; Gold et.al. 1996; Le Grand 1996; Luce et.al. 1996; Richardson, Nord & Scott 1996; Tsuchiya & Williams 2001).

Horizontal integration:

Horizontal integration refers to the formal association, consolidation or merging of like entities within one level of care into a single organisation. This may range from the relatively straightforward scenario of two or more general practitioners physically grouping into one co-located practice, to a bundle of independent practices establishing a cooperative association to negotiate contract terms with third parties as one entity on behalf of its constituents.

Iatrogenic consequences:

Iatrogenic consequences are complications or adverse effects that arise from the application of a clinical intervention. Screening tests not only expose subjects to iatrogenic risks with the procedure itself, but also with any subsequent interventions where there are positive findings (Woolf 1990[a] pp.8-9). The risk of an iatrogenic consequence must be weighed against the impact of the disease state being investigated or treated. A decision must be made as to whether intervention will decrease or increase the levels of morbidity and mortality in the population (Woolf 1990[a] p.8).

Impaired glucose tolerance (IGT) & impaired fasting glucose (IFG):

A plasma glucose concentration of < 7.0 mmol/l before fasting and between 7.8-11.1 mmol/l two hours after an oral glucose load indicates impaired glucose tolerance (IGT) (JBS 2 Working Party 2005 p.v3; National Centre for Monitoring Diabetes 2002 pp.29-

30; Singer 1990 p.351). A plasma glucose concentration between 6.1-7.0 mmol/l after fasting indicates impaired fasting glucose (IFG) (JBS 2 Working Party 2005 p.v3; National Centre for Monitoring Diabetes 2002 pp.29-30).

Some people have a genetic predisposition to impaired glucose tolerance. Its prevalence increases with age as the beta cells of the pancreas become less efficient at producing insulin. Impaired glucose tolerance increases a person's risk of macro vascular disease, and it is compounded further in the presence of co-morbidities such as obesity and hypertension. Both impaired glucose tolerance and impaired fasting glucose are predictive of type II diabetes mellitus and ischaemic heart disease (Jacobzone, Jee-Hughes & Moise 1999 pp.16; JBS 2 Working Party 2005 p.v42; National Centre for Monitoring Diabetes 2002 p.29).

Indemnity plans (or service benefit plans):

Strictly defined, indemnity refers to schemes where the insurer pays the policy holder a fixed dollar amount per event or intervention (e.g. a medical procedure) (Feldstein 1999 p.121). The policy holder accepts considerable risk with this type of scheme, particularly in domains such as health care given the inexorable rise in prices over time and its inherent uncertainty (Rice 1998 p.123).

In reality there is little demand in the health care market for such insurance. Instead, insurers offer service benefits plans, where policy holders are assured a proportional subsidy of any costs incurred (Pauly 2000 p.545). The open-ended subsidy of services in return for a regular premium or tax levy from enrolees is popularly labelled an indemnity plan in the literature. This is used to distinguish a fee-for-service approach from managed care and capitation models (Rice 1998 p.123). Service benefit plans also typically remunerate providers on a fee-for-service basis, with the use of patient deductibles and/or co-payment contributions as a common control strategy (Duckett 1997 p.30; Feldstein 1999 p.231; Marriott & Mable 1998 p.601).

Independent Practice Associations (IPA):

One trend evident in some OECD states is the formal networking or horizontal integration of providers' management and business support systems whilst maintaining their practice independence (Decter 2000 p.82; Marriott & Mable 1998 p.623). In New Zealand the Independent Practice Associations (IPA) are general practice networks. Initially they shared responsibility for fund holding prospective payments (Marriott &

Mable 1998 p.591). This role was largely subsumed with the 2002 introduction of the more-widely representative Primary Health Organisations (PHO). Some Independent Practice Associations subsequently re-constituted as Primary Health Organisations. Some formed partnerships with other entities in the corporate governance of the new structures, whilst some contracted to provide the management support services (McDonald et.al. 2007 p.49).

In the American context, it refers to a group of independent multi-speciality providers that share corporate support systems and negotiate contractual terms as a block with a range of insurers and health maintenance organisations (Marriott & Mable 1998 p.602). The American model evolved in order to give physicians shared risk and group bargaining when dealing with the third party interventions from insurers or government. This is achieved whilst maintaining practice autonomy (Bezzola & Martinsson 1998 p.23; Rice 1998 p.126; Starfield 1998 p.60).

Informed choice:

The medico-legal precedent for determining whether a patient has been fully informed arises from the High Court rulings in *Rogers v Whittaker [1992] 175 CLR 479* (Pinnock 2004 p.379). There are three tests:

- Information has been given that a reasonable person as a patient would think relevant.
- Extra information has been given, which a reasonable doctor would add, having regard to the particular circumstances of the patient.
- And additional information has been given, that that particular patient sought, having been given the opportunity to seek it.

Internal market:

The internal market model arose in response to the chronic difficulties with information asymmetry and perverse fiscal incentives undermining the agency role of health care providers. The model provides third party intervention on behalf of the consumer by gazetting agents as purchasers (e.g. regional health authorities or general practice fund holders*)* who engage the services of competing providers on behalf of their enrolees. Internal markets rely predominantly on long term contracting between purchasers and providers, and the contestability of providers (Hurley 2000 p.77).

Justice:

The ethical principle of justice is concerned with fairness or equity (Hurley 2000 p.88; National Health & Medical Research Council 1999 p.3; Starfield 1998 p.398). Determination of fairness includes equal access to basic resources for all sections of community, sensitivity to the needs of minority and marginalized groups, and regard for the impact of present decisions on future generations (National Health & Medical Research Council 1999 p.3).

Kaldor-Hicks criterion:

The Kaldor-Hicks criterion is also referred to as either the potential Pareto improvement or the compensation test (Garber et.al. 1996 p.33; Hurley 2000 p.61). Economic theorists Kaldor and Hicks sought to develop a criterion for assessing allocative efficiency that overcame the policy limitations encountered when strictly applying the Pareto criterion. The criterion describes allocation as optimally efficient when the benefits that accrue to those who gain are of a sufficient order that in theory they compensate those who lose up to the point of indifference, whilst they still retain some net benefit (Garber et.al. 1996 p.33; Hurley 2000 p.61; Rice 1998 p.21).

Lead-time bias:

Lead-time bias is also referred to as the zero point shift. It refers to the distorting effect that early detection may give when measuring length of survival. Subsequent interventions may have no greater impact on prolonging life, yet there is a perception of greater longevity because of the earlier detection (Australian Cancer Network 2004 p.33; Mandelblatt et.al. 1996 p. 160; Woolf 1990[a] p.6).

Length bias:

Length bias is the tendency to over-estimate patients' length of survival from a particular disease state using the results of screening tests. This is because screening programs readily detect the higher prevalence of chronic, slower progressing presentations whilst under-representing the more aggressive cases that have a shorter natural history (Australian Cancer Network 2004 p.33; Mandelblatt et.al. 1996 p. 161; Woolf 1990[a] pp.6-7).

Libertarianism:

Libertarianism is premised on the efficacy of open competitive markets. The philosophy does not challenge the distribution of wealth, provided that the original assignment was arrived at fairly, and its current distribution is a product of voluntary exchange (Rice 1998 p.146). It assumes health care should be treated as another private consumption good. Equality in health status for all is not a key priority. The position assumes that access and utilisation will be determined through the market by preference and willingness to pay (Hurley 2000 p.67; Reinhardt 1996 p.88; Starfield 1998 p.399).

Managed care:

Managed care plans were first introduced in the United States, following enactment of the *Health Maintenance Organization Act 1973 (US)* (Altman & Wallack 1996 p.15; Feldstein 1999 p.210). They have increasingly penetrated the United States employer-based market as a substitute to indemnity plans, competing on both price and level of benefits provided (Feldstein 1999 pp.230).

Managed care is a system of enrolling individuals into prepaid health care plans. The plan then assumes responsibility for brokering all necessary care for their enrolees. Utilisation management is a key function (Duckett 1997 p.30; Feldstein 1999 p.177; Starfield 1998 p.58). Typical processes include prior authorisation of hospital admissions and surgery, review of hospital lengths of stay, case management of catastrophic care, and benchmarking of physicians' performance (Duckett 1997 p.30; Feldstein 1999 p.177).

Common features include contracts with selected providers for comprehensive, vertically integrated sets of care, utilisation and quality control mechanisms imposed on contractors, predetermined premiums for enrolees and financial incentives for enrolees to exclusively utilise contracted providers (DeLaet, Shea & Carrasquillo 2002 pp.454-455; Marriott & Mable 1998 p.601; Rice 1998 p.49). Two pivotal elements include fixed, prospective payment by enrolees to the plan and the significant shift in risk from the funding entity to the plan's contracted provider network (Duckett 1997 p.31). In some cases, the roles of purchaser and provider have merged, with some services provided directly and others purchased on behalf of enrolees (Marriott & Mable 1998 p.601-602).

The various forms of managed care plans include:

- *Health maintenance organisation* (HMO)*:* Health maintenance organisations (HMO) are the most prevalent version of managed care plans in Switzerland and the United States (Bezzola & Martinsson 1998 p.23). Archetypal characteristics include binding terms with enrolees and contracted providers for a set period, exclusivity of service provision for their rostered population, and gate keeping to secondary and coordinated care through selected primary care physicians. In return for this vertical integration and controlled access, enrolees have minimal deductibles or co-payments (Feldstein 1999 pp.218-219; Marriott & Mable 1998 p.608; Rice 1998 p.123).

  Health maintenance organisations are almost always funded through a capped prospective allocation (Rice 1998 p.123). However subsequent remuneration to contracted providers may include salary, per diem rates, prospective capitation and fee-for-service (Marriott & Mable 1998 p.602). Similarly, governance comes in a variety of forms. This includes for-profit corporations, not-for-profit organisations and member cooperatives (Marriott & Mable 1998 p.608). Common to all is benefit sharing with contracted providers in return for constraints on the volumes of care provided. The trade off for the physicians is an acceptance of third party intervention and scrutiny of their clinical practice (Bezzola & Martinsson 1998 p.23; Starfield 1998 p.59).

- *Point-of-service plans (POS):* A point-of-service plan offers enrolees access to a network or panel of physicians at a discounted fee for service. However the panel of physicians are not entitled to exclusive patronage from the enrolee. Enrolees may forgo the plan's discount rates to seek services elsewhere, but a substantially higher co-payment applies (Feldstein 1999 p.176). Access to the nominated panel is only on referral from a primary care physician, who acts in a gate keeping capacity for the plan (Marriott & Mable 1998 p.603).

- *Preferred provider organisations (PPO):* Preferred provider organisations are a direct response by indemnity plans to health maintenance organisations' use of closed provider panels (Feldstein 1999 p.231). It is similar in concept to a point-of-service plan, except that it offers direct access to the panel of physicians on self-referral from enrolees. This eliminates the gate keeping function of a primary care physician (Marriott & Mable 1998 p.604). Typically, providers are paid fee-for-service and are not exclusive to one insurance plan (Feldstein 1999 p.218; Starfield 1998 p.60).

Marginal analysis:

Marginal analysis is an economic methodology that takes the existing pattern of resource expenditure as the baseline and examines the effect of small variations to utilisation patterns (Cohen 1994 pp.781-782). Implicit in any marginal analysis is consideration for the basic economic principles of *scarcity*, technical efficiency and opportunity cost (Cohen 1994 p.782).

The method can also be used to consider the concept of *diminishing marginal returns*, where the marginal cost-benefit ratio of a given activity deteriorates beyond a certain critical volume or scale (Cohen 1994 p.782). In so doing, marginal analysis is useful because it tries to tackle the concept of allocative efficiency. This requires analyse of the effects of changing the balance (though not the total) of expenditure by shifting resources between programs in the pursuit of increased net benefit. A key challenge in the application of the marginal analysis methodology at this level is to define and validly measure benefit (Cohen 1994 p.786).

Market failure:

A market is in a state of failure when inefficient resource allocation is evident within an environment free of regulation or government intervention (Hurley 2000 p.59). Hurley (2000 pp.73-74) identifies at least four key reasons why health care spirals into market failure in the absence of perfect competition. These include:

1. Information asymmetry.
2. The presence of externalities.
3. Absence of exclusiveness and rivalry in the distribution of goods and services.
4. The inherent uncertainty of demand.

Characteristics of market failure in health care include the following:

- *Adverse selection:* In an environment of information asymmetry between health care insurers and consumers, an insurer must accept a certain degree of risk in clientele selection. A competitive market triggers adverse selection when consumers have an information advantage over insurers regarding their risk status, and subsequently the insurance premiums fail to adjust accordingly (Hurley 2000 p.82). In the presence of a community-rated premium, the insurance policy is most attractive to individuals with high risk. Over time, their excess utilisation will drive up the average price of the premium, forcing low risk applicants from the market. This will further fuel the premium's inflationary spiral, ultimately to the point where the insurance market becomes unsustainable (Bezzola & Martinsson 1998 p.19; Feldstein 1999 pp.137-138; Hurley 2000 p.82). Where granted a market monopoly with compulsory enrolment, a sole insurer may overcome adverse selection and ensure that the accumulative risks are shared across the whole of society (Bezzola & Martinsson 1998 p.19).

- *Asset specificity:* Asset specificity arises over time as one provider or firm accumulates sufficient assets to monopolise a particular market, where that market lacks sufficient scale to warrant others making the necessary capital investment to create competition (McPake et.al. 2002 p.242).

- *Cream skimming:* The antithesis of adverse selection, cream skimming is the colloquialism for preferred risk selection. This is a process of deliberate selection bias when unconstrained insurers are better informed regarding an individual's risk status than the individuals themselves. The profit-maximising insurer has a perverse incentive to purposefully enrol only those consumers whose expected losses are below the premium charged (Feldstein 1999 p.139; Hurley 2000 p.83).

  Risk-adjusted premiums reduce the incentive for cream skimming. This assumes that a competitive insurance market exists, and that insurers are capable of efficiently managing risk (Feldstein 1999 p.185)

  Cream skimming is most likely when there is no mandate for universal population coverage by funding bodies and/or third party payers (Coote & Hunter 1996 p.31; Marriott & Mable 1998 pp.634-635). Cream skimming may occur in three ways (Bezzola & Martinsson 1998 pp.19-20):

  - Insurers discriminate against high risk applicants at enrolment.
  - Insurers push current enrolees with a high level of expected cost outlay from an insurance plan.
  - Insurers only target plans at services and physicians with optimal profit margins.

- *Monopoly:* A monopoly exists where there is a single supplier without effective substitutes, and barriers prevent entry of new firms to the market (Feldstein 1999 p.165; McTaggart et.al. 1996 p.270; Santerre & Neun 1996 pp.190-191). Violating the conditions of perfect competition, monopolists have considerable market power to lever both the level of production and price in order to maximise profit. The degree to which this is achieved depends upon their products' price elasticity of demand (Rice 1998 p.115; Santerre & Neun 1996 pp.193-194).

  Where only constant or decreasing returns to scale are demonstrated, the development of monopolies serves no advantage to the community. However when the average cost of production declines with the merger of firms, this produces an increasing return to scale, and it is in a market's interest. The proviso is that the monopolist's behaviour can be regulated to prevent perverse incentives for undersupply and inflated pricing (Rice 1998 pp.119-120).

  Monopolistic competition is a market characterised by a higher number of competing firms but with produce that is only slightly differentiated from each other. Either real or perceived differentiation is achieved with variations on the types of service, location, quality or reputation. Price differentiation is minimised between firms in a monopolistic competition because of the risk to market share (Feldstein 1999 p.166).

- *Monopsony:* A monopsony is a market structure where there is a dominant purchaser with the market power to set prices. Violating the conditions of perfect competition, monopsonists typically use their market power to leverage down the input price and quantities of service provided (McTaggart et.al. 1996 p.354; Santerre & Neun 1996 p.205).

- *Moral hazard*: This is commonly associated with the depressing impact of insurance on the price of consumption. Economic theory assumes an individual's demand for service will be up to the level where marginal utility equals marginal cost. The depressing effect of insurance on the price at the point of care increases the volume and range of services demanded. This is because the consumer is not required to account for the full cost of their decisions (Bezzola & Martinsson 1998 p.21; Hurley 2000 pp.83-84; Persson & Guzelgun 1998 p.264).

Providers have a perverse incentive to contrive increases in both the quantity and price of services supplied, without regard for the clinical needs of their patient. This ex-post moral hazard is unconstrained by insured patients because they are insulated from the full cost of service provision (Bezzola & Martinsson 1998 p.19; Hurley 2000 p.84; McPake et.al. 2002 p.223).

- *Opportunistic behaviour (or gaming)*: Gaming arises in the presence of imperfect contract conditions. This is where one party will use information asymmetry and seek to operate outside contract terms in order to gain a further market advantage (McPake et.al. 2002 pp.242-243). Alternatively, where rewards are linked to specific observable tasks, regulated firms may manage production to skew observed characteristics in order to meet targets, whilst neglecting other equally legitimate tasks and characteristics within their business obligations (McPake et.al. 2002 pp.176-177).

Medicaid (US):

Medicaid was enacted in 1965 by the United States federal government to provide health care services for those impoverished and vulnerable groups not covered by employment-based insurance systems, plus nursing home and home health care for the frail elderly (Duckett 1997 p.56; Frogner & Anderson 2006 p. 102; Marriott & Mable 1998 p.595). The program is jointly funded by state and federal governments, and administered by states according to broad national guidelines (Duckett 1997 p.56; Frogner & Anderson 2006 p.102; Marriott & Mable 1998 p.597).

Medicare (Aust.):

Medicare (Aust.) was enacted in 1984 by the Australian Government. In return for a compulsory 1.5% levy on taxable income, Australian residents (and foreign countries with whom Australia has a reciprocal health care agreement) have universal insurance cover for a range of services (Hilless & Healy 2001 p.15). This includes access free-of-charge to state administered hospitals and community health services plus heavily subsidised provision of pharmaceuticals, medical, optometric plus some dental and allied health services (Duckett 2000 p.195; Frogner & Anderson 2006 p.95). The Medicare scheme does not preclude Australians from also purchasing indemnity plans from private health insurance companies for private inpatient care and ancillary primary care (Duckett 2000 pp.38-39).

Medicare Benefits Schedule:

Medicare Australia (formerly known as the Health Insurance Commission) funds and administers the Medicare Benefits Schedule (MBS) (Hilless & Healy 2001 p.18). The schedule sets a series of itemised patient rebates for medical consultations and procedures, though provider fees are not obligated to adhere to them. The majority of expenditure is for general practice consultations, pathology and diagnostic imaging tests, plus specialist consultations (Hilless & Healy 2001 p.33).

Medicare (US):

Enacted in 1965, Medicare (US) is the United States federal government's two-part health insurance scheme for the elderly (over 65 years with a work record of at least 10 years), people with a disability pension and people with end-stage renal failure (Duckett 1997 p.38; Marriott & Mable 1998 p.598). Medicare (US) is funded from federal tax revenue. Part A provides hospital insurance, whilst for a premium the optional Part B provides medical insurance (Duckett 1997 pp.38-39; Marriott & Mable 1998 pp.596-597). Part B covers inpatient medical care, ambulatory care (medical and allied health), domiciliary care, ambulance transport, transfusions, vaccinations and pathology services (Duckett 1997 pp.47-48).

The government contracts private insurance companies (known as intermediaries or carriers) to administer the program and process claims (Duckett 1997 p.48; Marriott & Mable 1998 p.598). Set payments are made to medical providers according to a resource-based relative value schedule (Duckett 1997 p.49).

Merit goods:

Merit goods are characterised by benefits which society values, but are under-consumed if left solely to individuals' willingness to pay in the market. In such cases, the state will typically intervene with strategies to increase consumption (Duckett 2000 p.24; Ross et.al. 1999 p.4) Examples of merit goods in health care include childhood nutrition initiatives, smoking cessation strategies and safe sex programs (Maslove 1998 p.373; Ross et.al. 1999 p.4).

Monopoly:

See description of *market failure* (ref. page 316).

Monopsony:

See description of *market failure* (ref. page 316).

Moral hazard:

See description of *market failure* (ref. page 316).

Need:

The social concept of need is distinct from the market concept of demand. Need for a good or service (e.g. health care) is defined as a non-market assessment of a person's capacity to benefit from an intervention (Eagar, Garrett & Lin 2001 p.139; Hurley 2000 p.91). Need is quantified as equalling the level at which that person's marginal capacity to benefit is reduced to zero (Hurley 2000 p.91). This assessment is open to broad interpretation. Need is a normative construct, with its numerous interpretations reflecting the interests and values of whichever party chooses to measure it (Eagar, Garrett & Lin 2001 p.138). The literature commonly accepts the four versions of need first enunciated by Bradshaw (1972) (Eagar, Garrett & Lin 2001 pp.139-141). They are:

- *Normative need:* Equivalent to the measured variance from recognised standards of care. Normative need is determined on the basis of empirical research and contemporary expert opinion.

- *Expressed need:* Inferences drawn on the likely needs of a community by comparing morbidity data with service utilisation data. The greater the discrepancies in measures of supply, utilisation or health status of a given population grouping, the greater an expressed need may be inferred.

- *Comparative need:* Benchmarking of distribution between areas, typically using demographic and socio-economic criteria.

- *Felt need:* Community expression or demonstrations of want.

Opportunistic behaviour (or gaming):

See description of *market failure* (ref. page 316).

Opportunity costs:

See description of *cost* (ref. page 297).

Organisation of Economic Co-operation and Development (OECD):

The Organisation of Economic Co-operation and Development (OECD) is a collaborative entity first founded by a convention of initially twenty industrialised nations on December 14 1960 (OECD 2001 p.2). With its headquarters in Paris, France, the OECD seeks to develop consensus between member states on policies related to economic growth, trade, financial stability and standards of living (Decter 2000 p.45; OECD 2001 p.2).

Original member states included, in alphabetical order: Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom and the United States. Subsequent additions over the ensuing 40 years have included, in chronological order: Japan, Finland, Australia, New Zealand, Mexico, Czech Republic, Hungary, Poland, South Korea and the Slovak Republic (OECD 2001 p.2).

Pareto criterion:

19th century Italian economist Vilfredo Pareto defined a now fundamental, though contentious, criterion for allocative efficiency. Assuming that market supply and demand is in equilibrium, the criterion describes allocation as optimally efficient only if it is not possible to further increase one person's utility without decreasing that of another (McPake et.al. 2002 p.71; Reinhardt 1996 p.71).

Pareto optimality is achieved when consumers' rates of indifference are equal to the economy's ability to transform one good into others. However the concept does not presume that under these conditions there is necessarily a single best allocation (Hurley 2000 pp.60-61; Rice 1998 pp.18-19). If reallocation makes at least one person better off without disadvantaging any others, this is considered a *Pareto improvement* (Garber et.al. 1996 p.33).

Population screening:

Population screening is a systematic process of testing asymptomatic individuals at risk of a specific condition that warrants direct preventive action (Australian Cancer

Network 2005 p.32; National Cervical Screening Program 2005 p.113). It involves organised calls and recalls to a defined population for screening tests as an aid to early detection and follow-up of positive case findings. A clear distinction is made between this type of screening and either testing of symptomatic patients or opportunistic testing by providers of individuals whom they suspect may be at risk.

Organised screening is only warranted where it is able to demonstrate benefit at a population level with minimal risk of harm (McNeil & O'Brien 1999 p.344). It should be simple, affordable and acceptable to the public (Australian Cancer Network 2005 p.32; Singer et.al. 1990 p.352). It is also argued that unless treatment begun in the non-symptomatic phase of disease is more effective than treatment after the onset of symptoms, then population screening is irrational (Singer et.al. 1990 p.352).

The World Health Organisation (WHO) outline a series of nine principles which should be satisfied before a population screening program is implemented (Australian Cancer Network 2005 p.32; National Cervical Screening Program 2005 p.113). In summary, these principles are:

- The condition is an important health problem
- There is a recognisable latent or early symptomatic stage
- The natural history of the condition is adequately understood
- There is an accepted treatment for patients with recognised disease
- There is a suitable screening test or examination
- The test is acceptable to the population
- There is an agreed policy on who to treat as patients
- The cost of case finding should be economically balanced in relation to possible total expenditure on medical care
- Case finding is continuing, and not a once-and-for-all project

Positive predictive value:

The positive predictive value of a diagnostic test is a function of test specificity, disease prevalence in the screened population, and to a lesser extent the test sensitivity. Often presented as a percentage value, it refers to the proportion of positive results that ultimately have a confirmed diagnosis. In other words, it represents the ratio of true cases to false positives detected by the screening test (Knight, Fielding & Battista 1990 p.300; Woolfe 1990 p.9). The value is calculated as follows:

Positive predictive value = $\frac{\text{Number of diagnosed positives}}{\text{Number of screened positives}}$

Pragmatism:

Pragmatism is a philosophy that provides a means for ethical resolution in the process of complex decision making (Smith 1992 pp.59-60). Pragmatism is underpinned by three key themes:

- *Transciency:* Existence has no obvious goal or finale'. Each decision should be made on its own merit, without concern for future rounds of sanctions or rewards.

- *Pluralism:* No one ethos or set of cultural mores has primacy over another, even where they may contradict. Public office should avoid widespread prescription and take care that priorities are only set within specific contexts, with frequent opportunity for review.

- *Meliorism:* Progress with most tasks is incremental, without ever necessarily achieving any ultimate solutions. Similarly, harm from most adverse events cannot be totally avoided or eliminated. Instead harm is ameliorated through good care and management.

Preference:

There is little consensus in the literature on how to define an individuals' preference for the consumption of goods and services, given it is clearly a difficult concept to quantify. Welfare economic theory assumes that persons will rank their preferences rationally and consistently according to the utility that they will likely derive (Garber et.al. 1996 p.29). Rice (1998 p.57) argues however that there is not necessarily a reliable relationship between stated preferences and actual behaviour. Citing the clear successes of certain marketing and advertising campaigns, Rice (1998 p.40) instead that preference combinations in reality are likely to be both infinite, transient and readily manipulated (see page 330 for a description of rationality).

Assuming utility maximising behaviour, the combination of goods and services actually consumed are a reflection of the market's revealed preferences (Rice 1998 p.57). In turn, this will respond directly to measures of both price and the consumers' willingness to pay (Eagar, Garrett & Lin 2001 p.139; Hurley 2000 p.70; Rice 1998 p.57).

However individuals' actions in a market may be a result of commitment, and are not always a revelation of their personal preferences (Rice 1998 p.79). The realisation of consumption within a competitive market does not always equate with allocative efficiency or an optimal social welfare function.

Prevention:

Prevention is any activity that reduces the likelihood of an adverse event, or impedes the progress of an identified malady. The literature recognises three levels of prevention in health care. Primary prevention reduces the likelihood of an adverse event occurring. Secondary prevention interrupts or minimises the progress of a disease through early detection and effective treatment. Tertiary prevention slows progress and ameliorates any resultant disability through the treatment of an established disease process (Spitzer 1990 p.4).

Primary care:

Primary care is any health-related services that are first contact for the patient/consumer. Typically primary care deals with presentations that are both more common and less-differentiated. Generally this occurs in a community-based setting, such as practice rooms, community centres, schools and homes (Starfield 1998 p.20).

The Canadian Medical Association describes primary medical care to include diagnosis, treatment and management of health problems, prevention and health promotion, plus ongoing support with family and community intervention as required (Marriott & Mable 1998 p.623; Starfield 1998 pp.24-25). There is a general assumption that primary care providers aim to deliver a service that is longitudinal, comprehensive and coordinated (Blumenthal et.al 1995 p.254; Starfield 1998 pp.20-21). A greater proportion of a caseload are patients in continuing care, or re-presenting for new problems, rather than attending for the first, or only, time (Starfield 1998 p.20).

Primary care physician (PCP):

Primary care physicians (PCP) are medical practitioners capable of providing both first contact and longitudinal ambulatory care to patients regardless of their condition (Starfield 1998 p.9). The care is typically coordinated with other key health and welfare services (Blumenthal et.al, 1995 p.255; Gosden et.al, 2000 p.3). The American Medical Association defines primary care physicians as a group of providers that not only delivers family or general practice but also may provide internal medicine ("internists"), paediatrics, obstetrics and gynaecology (Duckett 1997 pp.19-20; Macinko, Starfield & Shi 2007 p.112).

Production function:

A production function is the process of measuring the use of inputs to generate outputs. The marginal productivity of each input, plus the relative prices of different substitutes, determines the least costly mix for producing a given level of output (Feldstein 1999 p.169). In the context of health care, factors other than the direct supply of labour and materials will influence the relationship between inputs and outputs. Analysis of the health production function must consider the impact of key social determinants on the population, notably income, age and place of residence (Haas 2001 p.227).

The production function is a key a factor in determining economies of scale. Positive economies of scale exist as long as the marginal cost of output is below the average cost, and the long run average cost curve subsequently declines (Feldstein 1999 pp.170-171). As demand grows for a certain output, more inputs will be required. Eventually scarcity of materials will inflate the input price and increasing the marginal cost of production. Assuming that the law of diminishing returns holds true, marginal productivity will decline, and the marginal cost of output will increase beyond the average cost (a diseconomy of scale) (Feldstein 1999 p.170). In the long run all inputs are variable. The marginal costs of production therefore should approach the long run average cost, and return the production function to scale (Feldstein 1999 pp.170-171).

Professionalism:

A body of skilled labour that lays claim to being a profession, and is accepted as such by society, typically demonstrates a series of elitist characteristics and commitments. These are summarised by Pennington (1990 p.243) as follows:

- Commitment to service applying an exclusive body of knowledge and skills.
- Commitment to explicitly maintaining a given set of ethics and standards of service through self-regulation (i.e. autonomy).

- Commitment to exclude any from the body of practice that do not satisfy set standards.
- Commitment to pass on the knowledge, skills and standards through teaching to select persons considered suitable.
- Commitment to expand the body of knowledge and skills through scholarship and research.
- Expectation that society will afford the practitioner and their dependents an adequate standard of living in return for meeting the above commitments.

Profit:

In economic terms, profit represents total revenues less the total explicit and implicit costs of production (Santerre & Neun 1996 p.165). Normal (or zero) profit is when price equals the average total cost, and costs include a normal rate of return on capital plus the opportunity cost of the producer's effort (Feldstein 1999 p.167). In a perfect competitive market, firms can expect a normal profit rate.

The ratio of price to total average cost indicates the extent to which price is determined by competition. Excess profits indicate a high price/cost ratio in imperfect market conditions where a firm has substantial power and lower price elasticities of demand for their services. Market power gives a firm more discretion to distort prices, manipulate output, plus vary both the quality and type of services it offers (Feldstein 1999 pp.167-168). Where total average costs exceed price, the firm incurs an economic loss (Rice 1998 p.105; Santerre & Neun 1996 p.165).

Profit maximisation:

Profit-maximising firms will produce output up to the indifference point where the marginal benefit of the last unit equals the market price of that unit (Feldstein 1999 p.163). This indifference point in turn also equals the point at which the marginal cost equals the total average cost (Feldstein 1999 p.167). Profit maximisation is achieved at the level of output where the gain is optimised for the given conditions. It does not always follow that profit maximisation will create excess profits. In some circumstances where total costs always exceed total revenue, profit maximisation equates to minimisation of an economic loss (Santerre & Neun 1996 p.167).

Public funding:

Public funding refers to the distribution of finances by a government. In health care, this relates to investment in the provision of facilities and/or services on behalf of a government's constituents. Typically, the funds are raised through either taxation or social security levies (OECD 2001 p.44).

Public goods:

In order to produce public (or generalised) effects, a good should demonstrate properties of non-rivalry and non-exclusivity. Non-rivalry is the accruement of benefits to members of the community beyond the individual recipient of the good or service. For example, a community is afforded herd immunity against certain infectious diseases once immunisation rates surpass threshold levels. Non-exclusivity is the inability to isolate a product for discrete exchange within a competitive market. Examples of this include pollution-free air and water, plus some aspects of public sanitation (Duckett 2000 p.24; Hurley 2000 p.71; Ross et.al. 1999 p.4).

Purchaser-provider split:

The key premise of managed competition is for health care systems to split the functions of purchasers and providers. The model entails a purchasing authority periodically brokering contracts with competing entities for the provision of specified functions in a quasi-market environment (Coote & Hunter 1996 p.27; Decter 2000 p.19; Marriott & Mable 1998 p.627). Purchasers act on the behalf of identified consumers to secure a set of services contracted in terms of volume, price and quality (Duckett 2000 p.235; Eagar, Garrett & Lin 2001 p.45).

Purchasing Power Parity (PPP):

Purchasing power parity (PPP) is an internationally accepted system for comparing the relative cost of purchasing an identical set of goods and services by indexing prices across countries to a standardised monetary unit. The standard currency nominated by the OECD is the United States dollar. Hence the index is often referred to in the literature as PPP ($US) (Arweiler 1998 p.217; Deber & Swan 1998 p.311; OECD 2001 p.42).

Analysts use purchasing power parity conversions of gross domestic product to compare standards of living and assess levels of productivity between economies

(Arweiler 1998 p.218). Calculations of purchasing power parity (health) provide an indication of relative cost for an equivalent mix and volume of goods and services within the health care sector, typically expressed as a per capita ratio (Arweiler 1998 p.218; Deber & Swan 1998 p.316). Purchasing power parity (health) per capita indicates the average resource commitment per person within a given economy (Contandriopoulos 1998 p.181). This is a more direct measure of health service accessibility than aggregate health care as a percentage of gross domestic product. It is less prone to distortion from measures of the country's relative wealth (Contandriopoulos 1998 p.186).

Quality-Adjusted Life Years (QALY):

Quality-adjusted life-years (QALY) are a normative construct that estimates both the quality and quantity of life-years gained as the result of an intervention (Garber 2000 p.190; Hurley 2000 p.101). It is a useful non-monetary measure of health status, which has been generally accepted by both welfarist and extra-welfarist economic paradigms (Dolan 2000 p.1735; Garber et.al. 1996 p.31; Hurley 2000 pp.102-104). By capturing standardised social values for both morbidity and mortality (albeit under strict conditions), the QALY allows for the comparison of outcomes across a wide range of interventions (Dolan 2000 p.1726; Hurley 2000 p.101; Tsuchiya & Williams 2001 pp.32-33). The results are typically then applied in a ratio with the costs of the intervention to provide a cost-utility analysis (Goldsmith, Hutchinson & Hurley 2006 p.4; Luce et.al. 1996 p.178; Tsuchiya & Williams 2001 pp.37-38).

A QALY is calculated by profiling of series of health states within a period of time. Each are weighted on a scale from 0.0 (normally taken to equal death) to 1.0 (full health), and multiplied by the probability of that state occurring (Garber 2000 p.212; Hurley 2000 p.101). The summation of these products is an estimate of the number of years in full health equivalent to the actual health profile that includes periods of less-than full health (Dolan 2000 p.1726; Garber et.al. 1996 p.29; Garber 2000 p. 212; Gold et.al. 1996 pp.92-93; Hurley 2000 p.101).

Various models are used to estimate the probabilities of survival with certain health states (e.g. life table data) (Garber 2000 p. 214). A variety of instruments have also been developed to try and reliably establish the weights. Some have been built on psychometric testing (e.g. SF-36 scales), whilst others have applied utility theory (e.g. standard gamble and time trade-off) to elicit preference measures using uncertainty exercises (Dolan 2000 pp.1733-1735; Dolan 2001 pp.32-53; Garber 2000 pp.202-203; Gold et.al. 1996 pp.97-98; Hurley 2000 p.102).

The conventional application of QALYs is criticised by both Le Grand (1996 pp.156-157) and Richardson, Nord & Scott (1996 pp.19-20) for its assumption of distributive neutrality. To satisfy such arguments for distributional equity, positive discriminatory weightings are applied in some cases to QALY measures according to derived indices of social deprivation, disability and age (Garber et.al. 1996 p.36; Hurley 2000 pp.106-107; Luce et.al. 1996 p.201; Smith 1992 pp.56-57; Tsuchiya & Williams 2001 pp.38-39).

Rationality:

Premised on an assumption that all persons seek utility maximisation, classic economic theory states that consumer choice is rational if it demonstrates both consistency and transitivity (Rice 1998 p.74). An alternate interpretation is that rationality requires demonstration of what the community would accept as reasonable behaviour. Depending on the context, this at least allows for adjustment in preferences over time (Rice 1998 p.75).

The theory of cognitive dissonance argues against the assumption that consumers will always behave with rationality. The theory describes the process of self-justification or rationalisation a person will undertake when their cognition conflicts with their behaviour, because they find the former easier to change (evidence of addictive behaviours are provided as a ready example) (Rice 1998 pp.76-77).

Rationing:

Popularly rationing is a term used synonymously with reductions and restrictions. However, technically the term refers to the processes involved in distributing finite resources (Lenaghan 1996 p.8). All means of distribution constitute rationing, and it occurs in one of four ways (Reinhardt 1996 p.69). The first is price rationing, which involves free market allocation according to willingness to pay. The other three means are termed non-price rationing. They include proximity, lottery, or administrative discretion. The latter criterion divides into multiple strategies, including setting the pattern of supply through service planning, and gate keeping mechanisms using referral systems (McPake et.al. 2002 p.201).

Rationing is constrained by three key considerations (Daniels 1993 p.224). They are:

- *Limited divisibility of goods:* Goods and services are not infinitely divisible. Inevitably some parties will experience a loss of benefit solely due to imperfect distribution.

- *Plausible claims by alternate users:* Because resources are finite, some parties will be denied some benefits, despite having legitimate claims.

- *Indeterminacy of distribution:* Even when there is consensus, all principles of distributive justice are schematic and do not address every possible contingency.

Rights:

Lenaghan (1996 p.27) identifies three levels of rights. The first are aspirational rights, which are non-enforceable, idealised statements (e.g. the United Nations citizens' charter). The second are a person's substantive rights. These are entitlements to specific goods or services enforced through legal statutes. The third are a person's procedural rights acquired through common law. Procedural rights do not guarantee access to specific services or materials. Instead they entitle the person to just and reasonable decision-making and conduct from public entities when exercising their authority.

Rostering (or enrolment):

Rostering is a funding process premised on the allocation of a prospective payment by purchasing authorities to providers according to the sum total of individuals registered on their practice rosters (Marriott & Mable 1998 p.635). Rostering is designed to overcome the administrative dilemmas of determined geographic boundaries for resource allocation. Instead, the patient's identifier for service eligibility links with the provider organisation of their choice, regardless of its physical proximity to their residence (Marriott & Mable 1998 p.621).

Rural, Remote and Metropolitan Areas (RRMA) classification system:

The Rural, Remote and Metropolitan (RRMA) classification system is a descriptive tool designed to group statistical local areas (SLAs) with like population density and distance-to-urban centre characteristics (Australian Institute of Health and Welfare 2004 p.2). Groupings consist of seven classes bundled into three broad zones. These are metropolitan (RRMAs 1 & 2), rural (RRMAs 3,4 & 5), and remote (RRMAs 6 & 7) (Australian Institute of Health and Welfare 2004 p.5; Department of Health and Ageing 2005 p.3).

Since its introduction in 1994, the RRMA system has been used by a range of Australian Government programs as one tool in describing eligibility and determining geographic distribution (Australian Institute of Health and Welfare 2004 p.2; Department of Health and Ageing 2005 p.3).

As the first national classification system for geographic dispersion developed in Australia, It has gained widespread acceptance because of its relative simplicity and intuitive logic. Nevertheless it is criticised on several counts. One is that it continues to rely on descriptions of statistical local areas from the 1991 Census, and has not been updated to reflect demographic changes since that time. Further, though its measures of rurality have often been used as a proxy indicator of access and relative socioeconomic disadvantage, its indices do not include direct measures of either workforce levels or social need (Department of Health and Ageing 2005 p.4).

Arguably the Australian Standard Geographical Classification (ASGC) system developed in 2001 provides a more precise and accurate definition of geographic dispersion than the RRMA system (Department of Health and Ageing 2005 pp.5-6). National datasets maintained by both the Australian Bureau of Statistics (2003; 2004) and the Australian Institute of Health and Welfare (2005) on the distribution of aboriginal populations, disease-specific mortality rates, and relative socioeconomic disadvantage are categorised using the ASGC system. The ASGC system offers five classes of geographic dispersion, which only broadly approximate groupings of RRMA categories. The five classes are: major cities, inner regional, outer regional, remote, and very remote (Australian Institute of Health and Welfare 2004 p.76; Department of Health and Ageing 2005 pp.5-6).

Salary:

A salary is a fixed term payment over an agreed time period (e.g. per hour, per session, per diem or per annum) to perform specified tasks. It is a comparatively simple remuneration system because it reduces the inherent transaction costs of itemised contracting. The method nevertheless has implications for productivity. Though payments may be risk-adjusted, they remain ex-ante. There is no variation in remuneration with the amount of service provided. In the absence of other motivating factors, there remains a perverse incentive to minimise effort (Scott 2000 pp.1187-1188; Starfield 1998 p.55).

Scarcity:

Society's total supply of resources is insufficient to satiate demand for all goods and services if they were freely distributed without cost to consumers (Reinhardt 1996 p.68). Scarcity also exists when supply is unable to meet demand, irrespective of consumers' willingness to pay.

Social welfare function:

A social welfare function is the quantification of the accumulative benefit that a society draws from its consumption of particular goods and services. It is measured in terms of social merit, rather than market return. Constituting social welfare depends upon value judgements and the criterion set to measure it (Garber et.al. 1996 p.31; Rice 1998 p.22). Most commonly, the social welfare function is measured ex ante, using subjective probabilities of future values for given health states (Dolan 2000 p.1738).

Premised on ordinal utility theory, the welfarist tradition takes the social welfare function as the aggregate ranking of individual members' preferences within the group (Garber et.al. 1996 p.34). It does not provide a capacity for qualitatively comparing relative utility gains between individuals (Hurley 2000 p.61; Rice 1998 p.57). The measures are individualistic and utilitarian, with values driven by demand and willingness to pay (McPake et.al. 2002 pp.73-75).

However Arrow's (1963) possibility theorem argues that the aggregation of individual preferences to determine a single measurable social welfare function is ethically dubious within a democratic society (Rice's 1998 p.22). For example, an individual's utility-maximising pursuit of status or rank over others does not necessarily contribute to a net gain in social welfare through civil rights, such as freedom (Rice 1998 p.81).

From the extra-welfarist perspective, it is fallacious to transpose any one individual's utility function for their welfare function, because they may be quite separate constructs (Rice 1998 p.80). Extra-welfarism measures the social welfare function as an aggregate gain, with criteria explicitly considering need and capacity to benefit (McPake et.al. 2002 p.75; Hurley 2000 pp.62-64).

Sensitivity:

The sensitivity of a diagnostic test refers to the proportion of subjects who do have the condition in question and return a positive result. The more false negative results a test produces, the lower is its sensitivity (Knight, Fielding & Battista 1990 p.299; Woolf 1990[a] p.6).

Specificity:

The specificity of a diagnostic test refers to the proportion of subjects who are truly free of the condition in question and return a negative result. The more false positive results a test produces, the lower is its specificity (Knight, Fielding & Battista 1990 p.300).

The percentage prevalence of the disease state within the screened population has a substantial impact on the frequency of false positive results for a given level of specificity (Woolfe 1990 p.9). The value is calculated as follows:

$$\text{Specificity} = 1 - \frac{\text{Number of false positives}}{\text{Number tested}}$$

Substitution:

Substitution refers to the market's capacity to search for alternate goods or services to replace that which is currently consumed in order to satisfy demand (Rice 1998 p.59). The degree of substitutability is a key element within a production function, and subsequently is a key determinant of that product's cost. Where constraints to substitutability exist that do not detract from the quality of the product (e.g. legal restrictions on the provision of certain health services), the cost of production will rise (Feldstein 1999 p.171).

Supplier-induced demand:

Supplier-induced demand is a perverse incentive that arises when provider remuneration is a product of utilisation. It describes exploitation of information asymmetry by providers (or agents) over passive consumers (or principals) to deliver services of marginal if any extra value (Burstrom & Gisin 1998 p.94; Hurley 2000 p.78). The practice violates the economic conditions for a perfect market, where the demand and supply functions are supposed to be independent (Hurley 2000 p.78; Rice 1998 p.108).

Open-ended fee for service schemes are most at risk of stimulating supplier induced demand (Bezzola & Martinsson 1998 p.21; Persson & Guzelgun 1998 p.267). The opportunity to induce demand is most prevalent when the provider has some level of monopoly power (Rice 1998 pp.116-117).

The concept is difficult to test for. It is most readily suspected when there is no downward shift in price with increased supply (Brittle & Perera 2000 pp.181-182; Persson & Guzelgun 1998 p.267; Rice 1998 p.108). It is also suspected when there is no reduction in supply despite regulatory changes imposing a reduction in payment schedules (Rice 1998 p.111). In either case, the net effect is an inflation of aggregate expenditure by the market on medical services.

The concept relies on the assumption that providers will demonstrate profit-maximising behaviour. However, in the case of medical services this motive does not go unconstrained, nor is it the sole stimulus driving practice. Empirical evidence demonstrates that medical practice is influenced by numerous other context-specific variables. These include a commitment to professional ethics, public reputation and a desire to establish a clinically interesting caseload. Additionally, the opportunity cost of increased activity is a decline in the practitioner's leisure time (Rice 1998 pp.112-113; Scott 2000 p.1184). Short of increasing the scale of production through engaging business partners and assistants, the argument follows that a rational provider will only increase supply with increases in price up to a point of zero marginal utility. Beyond this point, activity may plateau or even reduce despite increases in price.

The concept also relies on the assumption that patients are induced to consume more services than they value, or would derive a marginal benefit from. However to justify this, the welfarist paradigm requires a substantiation of consumers revealed preferences if their information base was symmetrical with that of the providers. The extra-welfarist paradigm requires a substantiation of genuine need and capacity to benefit. In either case, the benchmarks are difficult to determine with any level of certainty (Rice 1998 pp.114-115).

Supply:

The law of supply states that all firms will respond to a higher price by increasing the quantity supplied. A profit-maximising firm will produce at a level where the market price equals their marginal cost of production and cease production in the long run should the price fall below their average cost (Santerre & Neun 1996 pp.169-170). Provided there are no constraints on inputs to production, the supply of a given good or service should establish equilibrium with levels of demand in the long run (Rice 1998 p.55).

The ratio of the percentage change in the supply of goods or services with percentage change in their price is known as the price elasticity of supply (Rice 1998 p.106; Santerre & Neun 1996 p.172). A competitive market increases the price elasticity of supply, though the degree to which this is true depends on the particular industry's production function (Feldstein 1999 p.169). The less the price elasticity of supply, the larger the price increases necessary to produce increased output. Price inelasticity of supply benefits providers because higher prices enhance their income (Feldstein 1999 p.164).

The two major factors influencing the price elasticity of supply include the time frame of production and the substitutability of variable inputs. The greater the time frame, the greater the opportunity for suppliers to adjust resources to meet changes in the market. The greater the availability of input substitution, the more likely a supplier can dampen diminishing marginal productivity with increased production. In both cases the price elasticity of supply should increase (Feldstein 1999 p.169; Santerre & Neun 1996 pp.172-174).

Utilitarianism:

The utilitarianism assumes that social welfare is the summation of individual measures of utility. Historically, the utilitarian approach attempted to both quantify in cardinal terms the utility derived from one bundle of goods compared with another and aggregate the cardinal utilities across individuals into a functional measure. Contemporary welfare economics rejects this concept. Instead it focuses on the ordinal ranking of alternate goods and services according to individual preference (Rice 1998 pp.143-144). Subsequently the derived welfare function proves to be a weaker measure. It only provides an indicator of communal welfare as an aggregate ranking of individuals' preferences (Rice 1998 p.57). Ordinal ranking prevents qualitative distinctions between the levels of utility that are subsequently determined (Rice 1998 p.81).

From the utilitarian perspective, marginal net benefit is measured according to the value individuals derive from their consumption of particular goods and services. (e.g. levels of expenditure and rates of utilisation). Alternatively outcome measures (e.g. health gain) may be included in measures where the preference rankings of consumers have been determined (Connelly & Doessel 2000 pp.48-49; Mooney & Newberry 1999 p.42; Mullen 1998 p.17). This reflects a teleological morality. That is, the value of an action or decision lies with its consequences and outcomes (i.e. its utility) (Smith 1992 p.56).

Utility:

Utility refers to the benefit or satisfaction an individual derives from consumption of a good or service. It is dependent on that individual's particular preferences (McTaggart et.al. 1996 p.148). Normative measures of utility are more meaningful than absolute estimates. This is because people tend to value their gains or acquisitions according to what is considered the social norm (Hurley 2000 p.61; Rice 1998 p.31). Some key aspects of utility described in the literature include:

- *Total utility:* The total benefit or satisfaction derived from the consumption of a good or service. As consumption rises, so too should total utility (McTaggart et.al. 1996 pp.148).

- *Expected utility:* When comparing the relative value between choices of commodities, consumers must consider the expected utility of their choices. The expected utility of any particular choice is quantified by aggregating the product of each possible outcome by the probability of that outcome occurring (Feldstein 1999 p.125). Assuming that consumers will choose rationally, they will opt for the commodity expected to produce the greatest aggregate of probability-weighted outcomes. At a point of indifference in terms of value, a risk-adverse individual will opt for commodities where any losses are known rather than accept the uncertainty of potential losses. This concept is relevant to the market price of insurance (Feldstein 1999 pp.125-126).

- *Marginal utility:* Marginal utility is the change in total utility from a unit increase in the quantity of goods or services consumed. Typically increased consumption remains positive but at a progressively diminishing rate. This is referred to as the principle of diminishing marginal return (McTaggart et.al. 1996 pp.149).

Value:

Welfarist analysis equates consumer value with utility. Alternatively, an extra-welfarist perspective of health assesses consumer value according to measures of health gain (Garber 2000 pp.184-185; Hurley 2000 p.60).

Vertical integration:

Vertical integration is the consolidation of functions between entities along a supply chain. In health care this may include the establishment of formal business links between any combination of general practices, specialist ambulatory care clinics, hospitals, residential care facilities, laboratories and/or insurance companies (Marriott & Mable 1998 p.555). An important precursor is the integration of financial functions by participating entities. In this context, there is synergy with the motives that also drives the horizontal integration (Scott 2000 p.1193).

Scott (2000 p.1192) identifies three sets of economic determinants that stimulate vertical integration in the medical sector. The first are the identification of technological economies, where the integration of technical processes reduces production costs. The second are the identification of transactional economies, where the processes of contracting and exchange between entities are rationalised. The third are market imperfections such as price regulation, monopoly and information asymmetry. These conditions encourage firms to vertically integrate in order to better monitor the processes of production and assure supply (Marriott & Mable 1998 p.627).

APPENDIX 2 - Approximate percentage mix of RRMA classes for each Division

Category of geographic dispersion	DGP Code #	RRMA						
		1	2	3	4	5	6	7
Metro	***201***	100.00%						
	202	100.00%						
	203	100.00%						
	204	100.00%						
	205	100.00%						
	206	100.00%						
	208	100.00%						
	209	100.00%						
	210	100.00%						
	211	100.00%						
	212	100.00%						
	213	100.00%						
	214	100.00%						
	215	100.00%						
	216		100.00%					
	217		98.56%		1.09%	0.34%		
	219	53.24%	46.76%					
	222 (901)	92.63%	5.63%			1.74%		
	237	100.00%						
	238		100.00%					
	240	4.31%	95.69%					
	301	100.00%						
	302	99.30%				0.70%		
	303	100.00%						
	304	100.00%						
	305	99.57%				0.43%		
	306	100.00%						
	307	100.00%						
	308	99.39%				0.61%		
	310	100.00%						
	311	100.00%						
	312	86.49%	13.51%					
	313	93.22%	6.78%					
	314	100.00%						
	315	68.02%	31.98%					
	316	100.00%						
	320	98.84%				1.16%		
	401	60.01%	39.99%					
	402	100.00%						
	404	10.60%	89.24%			0.16%		
	405	76.90%	22.94%			0.16%		
	406		96.55%			3.45%		
	501	100.00%						
	503	98.56%				1.44%		
	504	100.00%						
	601	99.06%				0.94%		
	602	100.00%						
	603	100.00%						
	604	100.00%						
	605	99.18%						0.82%
	606	100.00%						

Category of geographic dispersion	DGP Code #	RRMA						
		1	2	3	4	5	6	7
Metro/Rural	***218***		32.44%	0.30%	54.62%	12.65%		
	221	0.18%	9.62%		12.11%	78.08%		
	226		64.96%		33.00%	2.04%		
	235	5.94%			2.46%	91.60%		
	317		71.39%		15.44%	13.16%		
	318	39.94%				60.06%		
	322	7.89%			0.75%	91.23%		0.14%
	407	0.12%	93.63%			6.25%		
	408	8.40%	62.14%			29.46%		
	412		94.60%			5.40%		
	502	94.92%				5.08%		
	505	90.79%				7.94%		1.28%
	514	32.64%				67.36%		
	701	70.42%				29.58%		

Category of geographic dispersion	DGP Code #	RRMA						
		1	2	3	4	5	6	7
Rural	***220***				99.42%	0.58%		
	223			68.74%	3.28%	27.63%		0.34%
	224			0.43%	62.03%	37.54%		
	225			26.76%	37.97%	35.27%		
	227				32.11%	67.89%		
	228			53.01%		46.13%		0.86%
	229	0.18%		21.50%	29.83%	43.88%		4.61%
	230			35.13%	0.19%	61.67%		3.01%
	231					96.46%		3.54%
	236			61.74%		38.26%		
	319			2.26%	15.39%	82.35%		
	323				69.35%	30.65%		
	324				51.29%	48.71%		
	325			71.42%		28.58%		
	326			80.83%		19.17%		
	327			45.12%		54.88%		
	329			75.86%		24.14%		
	330					100.00%		
	331		18.42%			77.33%		4.25%
	409			60.27%		39.73%		
	413			94.27%		3.93%	0.29%	1.51%
	418			37.14%	40.01%	22.84%		
	419			46.24%	22.14%	30.77%	0.51%	0.34%
	420			34.61%	41.55%	23.04%		0.80%
	506					100.00%		
	507					100.00%		
	508				30.39%	69.06%		0.55%
	509					99.61%		0.39%
	510				37.50%	62.50%		
	513				56.52%	43.48%		
	607				41.07%	58.93%		
	613				46.45%	53.55%		
	702			64.41%		34.95%		0.64%
	703				51.53%	46.96%		1.51%
	801	44.07%				25.95%	5.86%	24.12%

Category of geographic dispersion	DGP Code #	RRMA						
		1	2	3	4	5	6	7
Rural/Remote	***232***			0.26%	39.29%	49.60%		10.85%
	241				86.50%			13.50%
	328				52.25%	36.42%		11.34%
	332				53.66%	28.51%		17.83%
	410			0.16%		45.60%	40.34%	13.91%
	411			57.91%		36.92%	1.81%	3.37%
	414		6.50%		8.71%	63.69%	3.95%	17.15%
	416			0.05%	17.90%	44.82%	11.52%	25.71%
	417			0.74%		55.98%	17.17%	26.11%
	511			38.29%	25.59%	20.18%		15.94%
	512				52.36%	7.70%		39.94%
	609			42.86%	42.05%			15.09%
	612				53.15%	7.32%	10.46%	29.08%
	615					79.15%	0.99%	19.86%

Category of geographic dispersion	DGP Code #	RRMA						
		1	2	3	4	5	6	7
Remote	***233***							100.00%
	610						40.78%	59.22%
	611						77.04%	22.96%
	614						86.01%	13.99%
	802						55.86%	44.14%

APPENDIX 3 - Potential total credit limits for Divisions at current levels, the national weighted average, and target levels per 10,000 SWPE for the PHCRIS categories of geographic dispersion

Stream		Unit $	Metropolitan			Metro/Rural			Rural			Rural/Remote			Remote		
			Current	National Weighted Average	Benchmark	Current	National Weighted Average	Benchmark	Current	National Weighted Average	*Benchmark*	Current	National Weighted Average	*Benchmark*	Current	National Weighted Average	*Benchmark*
Stream A services/10,000 SWPE			5,564	5,448	4,712	5,414	5,448	4,712	5,430	5,448	4,712	4,841	5,448	4,712	4,416	5,448	4,712
Stream C services/10,000 SWPE			997	952	1,800	909	952	1,800	891	952	1,800	771	952	1,800	735	952	1,800
Stream C services to vulnerable groups (C_V)/10,000 SWPE			204	187	356	231	231	439	292	312	590	406	501	947	735	952	1800
Performance Ratio (β)			0.573	0.524	1.000	0.526	0.526	1.000	0.495	0.529	1.000	0.428	0.529	1.000	0.409	0.529	1.000
Stream A mean unit value ($) x services/10,000 SWPE		$ 33.66	$ 187,267	$ 183,358	$ 158,587	$ 182,214	$ 183,358	$ 158,587	$ 182,766	$ 183,358	$ 158,587	$ 162,929	$ 183,358	$ 158,587	$ 148,637	$ 183,358	$ 158,587
Stream C mean unit value ($) x services/10,000 SWPE		$ 13.60	$ 13,552	$ 12,940		$ 12,357	$ 12,940		$ 12,112	$ 12,940		$ 10,486	$ 12,940		$ 9,999	$ 12,940	
		$ 14.28			$ 25,704			$ 25,704			$ 25,704			$ 25,704			$ 25,704
ω_{cvd}	SES	$ 0.84	$ 46	$ 44	$ 82	$ 52	$ 54	$ 102	$ 65	$ 69	$ 131	$ 86	$ 107	$ 202	$ 168	$ 217	$ 411
	ATSI	$ 22.32	$ 26	$ 25	$ 47	$ 32	$ 34	$ 64	$ 48	$ 51	$ 97	$ 226	$ 278	$ 526	$ 205	$ 265	$ 501
	Remote	$ 1.02	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 2	$ 2	$ 4	$ 55	$ 68	$ 129	$ 162	$ 209	$ 396
	SES/ATSI	$ 25.17	$ 15	$ 14	$ 26	$ 27	$ 28	$ 53	$ 40	$ 43	$ 81	$ 212	$ 262	$ 495	$ 288	$ 373	$ 706
	SES/Rem	$ 1.95	$ 0	$ 0	$ 0	$ 0	$ 0	$ 1	$ 2	$ 2	$ 3	$ 106	$ 131	$ 247	$ 392	$ 507	$ 959
	ATSI/Rem	$ 25.80	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 1	$ 67	$ 83	$ 157	$ 237	$ 306	$ 579
	SES/A/R	$ 28.92	$ 0	$ 0	$ 0	$ 0	$ 0	$ 1	$ 2	$ 2	$ 3	$ 270	$ 333	$ 629	$ 1,657	$ 2,145	$ 4,056
ω_{cc}	SES	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	$ 22.32	$ 69	$ 66	$ 125	$ 86	$ 90	$ 170	$ 128	$ 137	$ 259	$ 601	$ 741	$ 1,402	$ 545	$ 705	$ 1,334
	Remote	$ 8.56	$ 1	$ 1	$ 2	$ 0	$ 0	$ 0	$ 42	$ 45	$ 85	$ 1,236	$ 1,525	$ 2,884	$ 4,576	$ 5,922	$ 11,201
	SES/ATSI	$ 88.34	$ 137	$ 131	$ 247	$ 252	$ 264	$ 499	$ 375	$ 401	$ 758	$ 1,981	$ 2,445	$ 4,624	$ 2,696	$ 3,489	$ 6,599
	SES/Rem	$ 8.56	$ 1	$ 1	$ 1	$ 5	$ 5	$ 10	$ 19	$ 20	$ 37	$ 1,236	$ 1,525	$ 2,884	$ 4,576	$ 5,922	$ 11,201
	ATSI/Rem	$ 143.72	$ 0	$ 0	$ 0	$ 1	$ 1	$ 2	$ 6	$ 7	$ 13	$ 996	$ 1,229	$ 2,325	$ 3,509	$ 4,541	$ 8,588
	SES/A/R	$ 143.72	$ 0	$ 0	$ 0	$ 4	$ 4	$ 7	$ 20	$ 21	$ 40	$ 3,569	$ 4,404	$ 8,330	$ 21,929	$ 28,381	$ 53,676
Performance Payments (PP)/10,000 SWPE :			**-$ 16,265**	**-$ 13,112**	**$ 10,740**	**-$ 12,187**	**-$ 12,515**	**$ 11,118**	**-$ 11,596**	**-$ 12,307**	**$ 11,721**	**$ 2,699**	**-$ 5,065**	**$ 35,042**	**$ 20,791**	**$ 16,224**	**$ 110,415**

APPENDIX 4 - Summary of potential total credit reserve balances at current levels, national weighted average and target levels by catchment size and geographic dispersion

Category of geographic dispersion	DGP	SWPE	Scenario Z: Credit payable at target activity
Metro	201	*359,887*	$ 486,290
	202	*170,751*	$ 219,813
	203	*187,021*	$ 262,076
	204	*142,189*	$ 183,159
	205	*168,112*	$ 223,920
	206	*606,654*	$ 858,606
	208	*212,366*	$ 263,848
	209	*228,302*	$ 293,500
	210	*174,051*	$ 244,170
	211	*218,316*	$ 287,055
	212	*415,192*	$ 520,063
	213	*227,979*	$ 287,704
	214	*213,914*	$ 277,903
	215	*234,344*	$ 354,987
	216	*273,870*	$ 400,089
	217	*443,232*	$ 673,038
	219	*303,850*	$ 444,276
	237	*179,134*	$ 270,192
	238	*76,863*	$ 108,028
	240	*101,790*	$ 149,071
	301	*183,001*	$ 233,642
	302	*233,232*	$ 300,281
	303	*202,861*	$ 250,919
	304	*183,656*	$ 229,816
	305	*192,758*	$ 247,589
	306	*267,217*	$ 338,573
	307	*278,823*	$ 354,548
	308	*243,088*	$ 320,624
	310	*252,536*	$ 313,816
	311	*185,836*	$ 231,647
	312	*136,924*	$ 171,040
	313	*175,103*	$ 217,678
	314	*198,765*	$ 250,446
	315	*303,737*	$ 391,199
	316	*275,143*	$ 354,085
	320	*215,316*	$ 278,256
	401	*130,846*	$ 186,301
	402	*281,238*	$ 404,698
	404	*276,623*	$ 423,029
	405	*580,039*	$ 804,107
	406	*429,480*	$ 592,799
	501	*219,509*	$ 311,737
	503	*207,153*	$ 284,051
	504	*181,738*	$ 234,169
	601	*318,132*	$ 472,048
	602	*128,873*	$ 166,340
	603	*367,737*	$ 506,288
	604	*293,442*	$ 446,733
	605	*242,210*	$ 334,765
	606	*109,135*	$ 160,358
	901	*348,437*	$ 488,495
Metro/Rural	218	*205,156*	$ 352,445
	221	*174,827*	$ 331,636
	226	*83,283*	$ 133,480
	235	*48,708*	$ 87,125
	317	*230,088*	$ 321,773
	318	*166,355*	$ 256,665
	322	*66,547*	$ 111,592
	407	*183,606*	$ 278,600
	408	*180,864*	$ 313,927
	412	*151,770*	$ 295,237
	502	*188,776*	$ 278,973
	505	*350,482*	$ 482,216
	514	*64,614*	$ 101,364
	701	*236,471*	$ 428,744

Category of geographic dispersion	DGP	SWPE	Scenario Z: Credit payable at target activity
Rural	220	*90,993*	$ 165,092
	223	*99,631*	$ 175,775
	224	*129,280*	$ 250,148
	225	*161,260*	$ 292,668
	227	*65,248*	$ 148,439
	228	*108,149*	$ 189,539
	229	*174,461*	$ 352,160
	230	*101,063*	$ 279,590
	231	*54,274*	$ 173,704
	236	*60,279*	$ 128,992
	319	*106,241*	$ 176,716
	323	*108,641*	$ 166,339
	324	*121,807*	$ 190,510
	325	*120,193*	$ 159,819
	326	*102,457*	$ 131,730
	327	*103,486*	$ 170,143
	329	*100,903*	$ 138,831
	330	*80,622*	$ 140,427
	331	*64,877*	$ 120,886
	409	*156,221*	$ 254,470
	413	*126,993*	$ 290,907
	418	*311,022*	$ 447,155
	419	*129,018*	$ 242,503
	420	*172,202*	$ 286,983
	506	*36,263*	$ 63,473
	507	*24,791*	$ 48,048
	508	*45,907*	$ 81,037
	509	*34,975*	$ 69,404
	510	*62,978*	$ 104,753
	513	*31,218*	$ 60,777
	607	*142,196*	$ 241,804
	613	*67,377*	$ 120,549
	702	*137,847*	$ 222,292
	703	*107,918*	$ 234,693
	801	*154,545*	$ 665,867
Rural/Remote	232	*63,177*	$ 140,112
	241	*23,594*	$ 65,215
	328	*75,600*	$ 143,145
	332	*87,561*	$ 194,645
	410	*70,185*	$ 206,584
	411	*118,282*	$ 199,974
	414	*172,374*	$ 435,426
	416	*115,669*	$ 472,793
	417	*106,091*	$ 601,389
	511	*56,218*	$ 127,305
	512	*25,901*	$ 117,384
	609	*73,751*	$ 166,015
	612	*60,634*	$ 226,541
	615	*47,599*	$ 125,884
Remote	233	*16,993*	$ 132,254
	610	*34,928*	$ 379,043
	611	*55,370*	$ 257,454
	614	*38,608*	$ 211,891
	802	*46,984*	$ 504,632
	Totals:	**19,896,807**	**$ 32,575,544**
	Variation:	*1.74%*	*-2.45%*

APPENDIX 5 - Potential total credit reserve balances at current levels, national weighted average and target levels by catchment size and geographic dispersion

Metro (NSW)			DGP Code #	201	202	203	204	205	206	208	209	210	211
			SWPE	**359,887**	**170,751**	**187,021**	**142,189**	**168,112**	**606,654**	**212,366**	**228,302**	**174,051**	**218,316**
			ATSI	*3,721*	*909*	*2,669*	*766*	*1,484*	*9,324*	*382*	*1,184*	*2,505*	*1,634*
			% RRMA 1-2	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*
			% RRMA 3	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
			% RRMA 4-5	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
			% RRMA 6-7	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
SCENARIO X (CURRENT ACTIVITY)	Stream A services per capita (A_n)			*0.552*	*0.552*	*0.552*	*0.552*	*0.552*	*0.552*	*0.552*	*0.552*	*0.552*	*0.552*
	Stream C services per capita (C_n)			*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*	*0.100*
	Stream C vulnerable social groups (VC_n)			*0.020*	*0.020*	*0.021*	*0.020*	*0.020*	*0.021*	*0.020*	*0.020*	*0.021*	*0.020*
	Performance Ratio ($\beta = VC_n/VC'$)			*0.555*	*0.555*	*0.555*	*0.555*	*0.555*	*0.555*	*0.555*	*0.555*	*0.555*	*0.555*
			Median unit values ($)										
Stream A mean unit value ($) x total services			$ 33.66	$ 6,682,431	$ 3,170,528	$ 3,472,631	$ 2,640,185	$ 3,121,526	$ 11,264,434	$ 3,943,241	$ 4,239,142	$ 3,231,803	$ 4,053,721
Stream C mean unit value ($) x total services			$ 13.60	$ 489,140	$ 232,076	$ 254,189	$ 193,256	$ 228,489	$ 824,533	$ 288,637	$ 310,296	$ 236,561	$ 296,724
ω_{cvd}	SES 1-2	*20%*	$ 0.84	$ 1,650	$ 783	$ 857	$ 652	$ 771	$ 2,781	$ 974	$ 1,047	$ 798	$ 1,001
	SES 3	*28%*	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	*33%*	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	*1.2%*											
	Non SES, Non rem	*40%*	$ 22.32	$ 904	$ 221	$ 649	$ 186	$ 361	$ 2,266	$ 93	$ 288	$ 609	$ 397
	SES 1-2	*60%*	$ 25.17	$ 1,536	$ 375	$ 1,102	$ 316	$ 613	$ 3,849	$ 158	$ 489	$ 1,034	$ 675
	SES 3	*72%*	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	*73%*	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ω_{cc}	SES 1-2	*20%*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	*28%*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	*33%*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	*1.2%*											
	Non SES, Non rem	*40%*	$ 88.34	$ 9,529	$ 2,328	$ 6,835	$ 1,962	$ 3,801	$ 23,879	$ 978	$ 3,032	$ 6,415	$ 4,185
	SES 1-2	*60%*	$ 88.34	$ 14,357	$ 3,507	$ 10,298	$ 2,956	$ 5,726	$ 35,976	$ 1,474	$ 4,568	$ 9,665	$ 6,305
	SES 3	*72%*	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	*73%*	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
			Credit Balance	**-$ 525,987**	**-$ 252,924**	**-$ 270,448**	**-$ 210,581**	**-$ 246,700**	**-$ 874,655**	**-$ 317,507**	**-$ 338,294**	**-$ 251,610**	**-$ 321,525**

				201	202	203	204	205	206	208	209	210	211
Metro (NSW)			**DGP Code #**	**201**	**202**	**203**	**204**	**205**	**206**	**208**	**209**	**210**	**211**
			SWPE	**359,887**	**170,751**	**187,021**	**142,189**	**168,112**	**606,654**	**212,366**	**228,302**	**174,051**	**218,316**
			ATSI	*3,721*	*909*	*2,669*	*766*	*1,484*	*9,324*	*382*	*1,184*	*2,505*	*1,634*
			% RRMA 1-2	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*
			% RRMA 3	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
			% RRMA 4-5	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
			% RRMA 6-7	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
SCENARIO Y (NATIONAL W'TED AVERAGE ACTIVITY)	**Stream A services per capita (A_n)**			*0.545*	*0.545*	*0.545*	*0.545*	*0.545*	*0.545*	*0.545*	*0.545*	*0.545*	*0.545*
	Stream C services per capita (C_n)			*0.095*	*0.095*	*0.095*	*0.095*	*0.095*	*0.095*	*0.095*	*0.095*	*0.095*	*0.095*
	Stream C vulnerable social groups (VC_n)			*0.019*	*0.019*	*0.020*	*0.019*	*0.019*	*0.020*	*0.019*	*0.019*	*0.020*	*0.019*
	Performance Ratio ($\beta = VC_n/VC'$)			*0.529*	*0.529*	*0.529*	*0.529*	*0.529*	*0.529*	*0.529*	*0.529*	*0.529*	*0.529*
			Median unit values ($)										
Stream A mean unit value ($) x total services			*$ 33.66*	$ 6,598,826	$ 3,130,861	$ 3,429,185	$ 2,607,153	$ 3,082,473	$ 11,123,503	$ 3,893,906	$ 4,186,106	$ 3,191,369	$ 4,003,005
Stream C mean unit value ($) x total services			*$ 13.60*	$ 465,703	$ 220,956	$ 242,010	$ 183,996	$ 217,541	$ 785,026	$ 274,807	$ 295,429	$ 225,226	$ 282,507
ω_{cvd}	**SES 1-2**	***20%***	*$ 0.84*	*$ 1,571*	*$ 745*	*$ 816*	*$ 621*	*$ 734*	*$ 2,648*	*$ 927*	*$ 997*	*$ 760*	*$ 953*
	SES 3	***28%***	*$ 0.84*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	SES 4-5	***33%***	*$ 0.84*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	ATSI	***1.2%***											
	Non SES, Non rem	*40%*	*$ 22.32*	*$ 861*	*$ 210*	*$ 617*	*$ 177*	*$ 343*	*$ 2,157*	*$ 88*	*$ 274*	*$ 580*	*$ 378*
	SES 1-2	*60%*	*$ 25.17*	*$ 1,463*	*$ 357*	*$ 1,049*	*$ 301*	*$ 583*	*$ 3,665*	*$ 150*	*$ 465*	*$ 985*	*$ 642*
	SES 3	*72%*	*$ 25.17*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	SES 4-5	*73%*	*$ 25.17*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
ω_{cc}	**SES 1-2**	***20%***	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	SES 3	***28%***	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	SES 4-5	***33%***	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	ATSI	***1.2%***											
	Non SES, Non rem	*40%*	*$ 88.34*	*$ 9,073*	*$ 2,216*	*$ 6,508*	*$ 1,868*	*$ 3,618*	*$ 22,735*	*$ 931*	*$ 2,887*	*$ 6,108*	*$ 3,984*
	SES 1-2	*60%*	*$ 88.34*	*$ 13,669*	*$ 3,339*	*$ 9,805*	*$ 2,814*	*$ 5,452*	*$ 34,252*	*$ 1,403*	*$ 4,349*	*$ 9,202*	*$ 6,003*
	SES 3	*72%*	*$ 88.34*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	SES 4-5	*73%*	*$ 88.34*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
			Credit Balance	**-$ 469,680**	**-$ 225,894**	**-$ 241,458**	**-$ 188,075**	**-$ 220,304**	**-$ 780,861**	**-$ 283,614**	**-$ 302,142**	**-$ 224,637**	**-$ 287,139**

Metro (NSW)			DGP Code #	201	202	203	204	205	206	208	209	210	211
			SWPE	359,887	170,751	187,021	142,189	168,112	606,654	212,366	228,302	174,051	218,316
			ATSI	3,721	909	2,669	766	1,484	9,324	382	1,184	2,505	1,634
			% RRMA 1-2	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
			% RRMA 3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 6-7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SCENARIO Z (BENCHMARK ACTIVITY)	Stream A services per capita (A')			0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471
	Stream C services per capita (C')			0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
	Stream C vulnerable social groups (VC')			0.037	0.036	0.037	0.036	0.037	0.037	0.036	0.036	0.037	0.037
	Performance Ratio ($\beta = VC_n/VC'$)			1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Median unit values ($)										
Stream A mean unit value ($) x total services			$ 33.66	$ 5,707,340	$ 2,707,889	$ 2,965,910	$ 2,254,933	$ 2,666,038	$ 9,620,743	$ 3,367,848	$ 3,620,573	$ 2,760,222	$ 3,462,208
Stream C mean unit value ($) x total services			$ 14.28	$ 925,054	$ 438,898	$ 480,719	$ 365,483	$ 432,115	$ 1,559,343	$ 545,866	$ 586,827	$ 447,381	$ 561,159
ω_{cvd}	SES 1-2	20%	$ 0.84	$ 2,971	$ 1,410	$ 1,544	$ 1,174	$ 1,388	$ 5,008	$ 1,753	$ 1,885	$ 1,437	$ 1,802
	SES 3	28%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	1.2%											
	Non SES, Non rem	40%	$ 22.32	$ 1,628	$ 398	$ 1,168	$ 335	$ 649	$ 4,079	$ 167	$ 518	$ 1,096	$ 715
	SES 1-2	60%	$ 25.17	$ 2,766	$ 676	$ 1,984	$ 569	$ 1,103	$ 6,931	$ 284	$ 880	$ 1,862	$ 1,215
	SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	1.2%											
	Non SES, Non rem	40%	$ 88.34	$ 17,159	$ 4,192	$ 12,308	$ 3,532	$ 6,843	$ 42,997	$ 1,762	$ 5,460	$ 11,552	$ 7,535
	SES 1-2	60%	$ 88.34	$ 25,852	$ 6,315	$ 18,543	$ 5,322	$ 10,310	$ 64,780	$ 2,654	$ 8,226	$ 17,404	$ 11,352
	SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
			Credit Balance	$ 486,290	$ 219,813	$ 262,076	$ 183,159	$ 223,920	$ 858,606	$ 263,848	$ 293,500	$ 244,170	$ 287,055

Metro (NSW)			DGP Code #	212	213	214	215	216	217	219	237	238	240
			SWPE	415,192	227,979	213,914	234,344	273,870	443,232	303,850	179,134	76,863	101,790
			ATSI	*1,078*	*760*	*1,337*	*5,432*	*4,822*	*9,725*	*5,597*	*4,061*	*1,019*	*1,827*
			% RRMA 1-2	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*98.56%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*
			% RRMA 3	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
			% RRMA 4-5	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*1.44%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
			% RRMA 6-7	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
SCENARIO X (CURRENT ACTIVITY)	Stream A services per capita (A_n)			*0.552*	*0.552*	*0.552*	*0.552*	*0.552*	*0.583*	*0.567*	*0.552*	*0.552*	*0.552*
	Stream C services per capita (C_n)			*0.100*	*0.100*	*0.100*	*0.100*	*0.099*	*0.099*	*0.099*	*0.100*	*0.099*	*0.099*
	Stream C vulnerable social groups (VC_n)			*0.020*	*0.020*	*0.020*	*0.021*	*0.020*	*0.021*	*0.021*	*0.021*	*0.020*	*0.020*
	Performance Ratio ($\beta = VC_n/VC'$)			*0.555*	*0.555*	*0.555*	*0.555*	*0.548*	*0.548*	*0.552*	*0.555*	*0.548*	*0.549*
			Median unit values ($)										
Stream A mean unit value ($) x total services			*$ 33.66*	$ 7,709,341	$ 4,233,145	$ 3,971,984	$ 4,351,331	$ 5,085,255	$ 8,698,955	$ 5,793,296	$ 3,326,184	$ 1,427,203	$ 1,890,050
Stream C mean unit value ($) x total services			*$ 13.60*	$ 564,308	$ 309,857	$ 290,741	$ 318,508	$ 367,560	$ 594,070	$ 410,554	$ 243,470	$ 103,157	$ 136,687
ω_{cvd}	SES 1-2	20%	*$ 0.84*	*$ 1,904*	*$ 1,045*	*$ 981*	*$ 1,074*	*$ 1,240*	*$ 1,975*	*$ 1,385*	*$ 821*	*$ 348*	*$ 461*
	SES 3	28%	*$ 0.84*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	*$ 0.84*	$ -	$ -	$ -	$ -	$ -	$ 48	$ -	$ -	$ -	$ -
	ATSI	1.2%											
	Non SES, Non rem	40%	*$ 22.32*	*$ 262*	*$ 185*	*$ 325*	*$ 1,320*	*$ 1,157*	*$ 2,330*	*$ 1,352*	*$ 987*	*$ 244*	*$ 439*
	SES 1-2	60%	*$ 25.17*	*$ 445*	*$ 314*	*$ 552*	*$ 2,242*	*$ 1,966*	*$ 3,902*	*$ 2,297*	*$ 1,676*	*$ 415*	*$ 745*
	SES 3	72%	*$ 25.17*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	*$ 25.17*	$ -	$ -	$ -	$ -	$ -	$ 69	$ -	$ -	$ -	$ -
ω_{cc}	SES 1-2	20%	*$ -*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	*$ -*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	*$ -*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	1.2%											
	Non SES, Non rem	40%	*$ 88.34*	*$ 2,761*	*$ 1,946*	*$ 3,424*	*$ 13,911*	*$ 12,194*	*$ 24,560*	*$ 14,250*	*$ 10,400*	*$ 2,577*	*$ 4,623*
	SES 1-2	60%	*$ 88.34*	*$ 4,159*	*$ 2,932*	*$ 5,159*	*$ 20,959*	*$ 18,372*	*$ 36,471*	*$ 21,469*	*$ 15,669*	*$ 3,882*	*$ 6,965*
	SES 3	72%	*$ 88.34*	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	*$ 88.34*	$ -	$ -	$ -	$ -	$ -	$ 648	$ -	$ -	$ -	$ -
			Credit Balance	-$ 619,449	-$ 339,475	-$ 316,080	-$ 330,678	-$ 387,769	-$ 876,186	-$ 515,593	-$ 253,131	-$ 110,110	-$ 144,065

Metro (NSW)			DGP Code #	212	213	214	215	216	217	219	237	238	240
			SWPE	**415,192**	**227,979**	**213,914**	**234,344**	**273,870**	**443,232**	**303,850**	**179,134**	**76,863**	**101,790**
			ATSI	1,078	760	1,337	5,432	4,822	9,725	5,597	4,061	1,019	1,827
			% RRMA 1-2	100.00%	100.00%	100.00%	100.00%	100.00%	98.56%	100.00%	100.00%	100.00%	100.00%
			% RRMA 3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	0.00%	0.00%	0.00%	0.00%	0.00%	1.44%	0.00%	0.00%	0.00%	0.00%
			% RRMA 6-7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SCENARIO Y (NATIONAL W'TED AVERAGE ACTIVITY)	Stream A services per capita (A_n)			0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545
	Stream C services per capita (C_n)			0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
	Stream C vulnerable social groups (VC_n)			0.019	0.019	0.019	0.020	0.020	0.020	0.020	0.020	0.020	0.020
	Performance Ratio ($\beta = VC_n/VC'$)			0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529
			Median unit values ($)										
Stream A mean unit value ($) x total services			$ 33.66	$ 7,612,889	$ 4,180,184	$ 3,922,290	$ 4,296,891	$ 5,021,633	$ 8,127,026	$ 5,571,341	$ 3,284,570	$ 1,409,347	$ 1,866,404
Stream C mean unit value ($) x total services			$ 13.60	$ 537,269	$ 295,011	$ 276,810	$ 303,247	$ 354,395	$ 573,554	$ 393,190	$ 231,804	$ 99,463	$ 131,719
ω_{cvd}	SES 1-2	20%	$ 0.84	$ 1,812	$ 995	$ 934	$ 1,023	$ 1,195	$ 1,907	$ 1,326	$ 782	$ 336	$ 444
	SES 3	28%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ 46	$ -	$ -	$ -	$ -
	ATSI	1.2%											
	Non SES, Non rem	40%	$ 22.32	$ 249	$ 176	$ 309	$ 1,257	$ 1,116	$ 2,250	$ 1,295	$ 939	$ 236	$ 423
	SES 1-2	60%	$ 25.17	$ 424	$ 299	$ 526	$ 2,135	$ 1,895	$ 3,767	$ 2,200	$ 1,596	$ 401	$ 718
	SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ 67	$ -	$ -	$ -	$ -
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	1.2%											
	Non SES, Non rem	40%	$ 88.34	$ 2,628	$ 1,853	$ 3,260	$ 13,245	$ 11,757	$ 23,712	$ 13,647	$ 9,902	$ 2,485	$ 4,455
	SES 1-2	60%	$ 88.34	$ 3,960	$ 2,792	$ 4,912	$ 19,955	$ 17,714	$ 35,212	$ 20,561	$ 14,918	$ 3,743	$ 6,712
	SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ 626	$ -	$ -	$ -	$ -
			Credit Balance	**-$ 553,308**	**-$ 303,219**	**-$ 282,290**	**-$ 295,119**	**-$ 347,863**	**-$ 555,647**	**-$ 386,521**	**-$ 225,916**	**-$ 98,820**	**-$ 129,207**

			DGP Code #	212	213	214	215	216	217	219	237	238	240
Metro (NSW)			SWPE	415,192	227,979	213,914	234,344	273,870	443,232	303,850	179,134	76,863	101,790
			ATSI	1,078	760	1,337	5,432	4,822	9,725	5,597	4,061	1,019	1,827
			% RRMA 1-2	100.00%	100.00%	100.00%	100.00%	100.00%	98.56%	100.00%	100.00%	100.00%	100.00%
			% RRMA 3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	0.00%	0.00%	0.00%	0.00%	0.00%	1.44%	0.00%	0.00%	0.00%	0.00%
			% RRMA 6-7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SCENARIO Z (BENCHMARK ACTIVITY)	Stream A services per capita (A')			0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471
	Stream C services per capita (C')			0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
	Stream C vulnerable social groups (VC')			0.036	0.036	0.036	0.038	0.037	0.038	0.037	0.038	0.037	0.037
	Performance Ratio ($\beta = VC_n/VC'$)			1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Median unit values ($)										
Stream A mean unit value ($) x total services			$ 33.66	$ 6,584,405	$ 3,615,450	$ 3,392,398	$ 3,716,391	$ 4,343,222	$ 7,029,083	$ 4,818,666	$ 2,840,832	$ 1,218,947	$ 1,614,257
Stream C mean unit value ($) x total services			$ 14.28	$ 1,067,210	$ 585,997	$ 549,845	$ 602,358	$ 703,955	$ 1,139,284	$ 781,016	$ 460,446	$ 197,569	$ 261,641
ω_{cvd}	SES 1-2	20%	$ 0.84	$ 3,428	$ 1,882	$ 1,766	$ 1,935	$ 2,261	$ 3,607	$ 2,508	$ 1,479	$ 635	$ 840
	SES 3	28%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ 87	$ -	$ -	$ -	$ -
	ATSI	1.2%											
	Non SES, Non rem	40%	$ 22.32	$ 472	$ 333	$ 585	$ 2,377	$ 2,110	$ 4,255	$ 2,449	$ 1,777	$ 446	$ 799
	SES 1-2	60%	$ 25.17	$ 801	$ 565	$ 994	$ 4,038	$ 3,584	$ 7,125	$ 4,161	$ 3,019	$ 757	$ 1,358
	SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ 127	$ -	$ -	$ -	$ -
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	1.2%											
	Non SES, Non rem	40%	$ 88.34	$ 4,971	$ 3,505	$ 6,165	$ 25,049	$ 22,236	$ 44,846	$ 25,810	$ 18,727	$ 4,699	$ 8,425
	SES 1-2	60%	$ 88.34	$ 7,490	$ 5,280	$ 9,289	$ 37,740	$ 33,502	$ 66,595	$ 38,886	$ 28,214	$ 7,080	$ 12,693
	SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ 1,183	$ -	$ -	$ -	$ -
			Credit Balance	**$ 520,063**	**$ 287,704**	**$ 277,903**	**$ 354,987**	**$ 400,089**	**$ 673,038**	**$ 444,276**	**$ 270,192**	**$ 108,028**	**$ 149,071**

Metro (VIC)		Median unit values ($)	301	302	303	304	305	306	307	308	310	311	312	313	314	315	316	320
DGP Code #			301	302	303	304	305	306	307	308	310	311	312	313	314	315	316	320
SWPE			183,001	233,232	202,861	183,656	192,758	267,217	278,823	243,088	252,536	185,836	136,924	175,103	198,765	303,737	275,143	215,316
ATSI			822	1,190	277	459	955	997	1,140	1,848	459	394	294	309	632	1,502	1,456	1,147
% RRMA 1-2			100.00%	99.30%	100.00%	100.00%	99.57%	100.00%	100.00%	99.39%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.84%
% RRMA 3			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
% RRMA 4-5			0.00%	0.70%	0.00%	0.00%	0.43%	0.00%	0.00%	0.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.16%
% RRMA 6-7			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SCENARIO X (CURRENT ACTIVITY) — Stream A services per capita (A_n)			0.552	0.551	0.552	0.552	0.551	0.552	0.552	0.551	0.552	0.552	0.556	0.554	0.552	0.562	0.552	0.551
Stream C services per capita (C_n)			0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
Stream C vulnerable social groups (VC_n)			0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Performance Ratio ($\beta = VC_n/VC'$)			0.555	0.554	0.555	0.555	0.555	0.555	0.555	0.554	0.555	0.555	0.554	0.555	0.555	0.553	0.555	0.553
Stream A mean unit value ($) x total services		$ 33.66	$ 3,397,987	$ 4,325,916	$ 3,766,751	$ 3,410,149	$ 3,576,725	$ 4,961,721	$ 5,177,223	$ 4,509,367	$ 4,689,123	$ 3,450,628	$ 2,562,129	$ 3,263,991	$ 3,690,695	$ 5,743,319	$ 5,108,892	$ 3,990,712
Stream C mean unit value ($) x total services		$ 13.60	$ 248,726	$ 316,325	$ 275,718	$ 249,616	$ 261,644	$ 363,188	$ 378,962	$ 329,783	$ 343,234	$ 252,579	$ 185,785	$ 237,789	$ 270,151	$ 411,167	$ 373,960	$ 291,616
ωcvd SES 1-2	20%	$ 0.84	$ 839	$ 1,060	$ 930	$ 842	$ 879	$ 1,225	$ 1,278	$ 1,106	$ 1,158	$ 852	$ 627	$ 802	$ 911	$ 1,387	$ 1,261	$ 972
ωcvd SES 3	28%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ωcvd SES 4-5	33%	$ 0.84	$ -	$ 12	$ -	$ -	$ 6	$ -	$ -	$ 11	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 19
ωcvd ATSI	0.4%																	
ωcvd ATSI Non SES, Non rem	40%	$ 22.32	$ 200	$ 288	$ 67	$ 111	$ 232	$ 242	$ 277	$ 448	$ 111	$ 96	$ 71	$ 75	$ 154	$ 363	$ 354	$ 278
ωcvd ATSI SES 1-2	60%	$ 25.17	$ 339	$ 487	$ 114	$ 189	$ 392	$ 412	$ 471	$ 757	$ 189	$ 163	$ 121	$ 127	$ 261	$ 618	$ 601	$ 466
ωcvd ATSI SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ωcvd ATSI SES 4-5	73%	$ 25.17	$ -	$ 4	$ -	$ -	$ 2	$ -	$ -	$ 6	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7
ωcc SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ωcc SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ωcc SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ωcc ATSI	0.4%																	
ωcc ATSI Non SES, Non rem	40%	$ 88.34	$ 2,104	$ 3,040	$ 709	$ 1,175	$ 2,442	$ 2,552	$ 2,918	$ 4,722	$ 1,175	$ 1,009	$ 751	$ 790	$ 1,618	$ 3,830	$ 3,727	$ 2,926
ωcc ATSI SES 1-2	60%	$ 88.34	$ 3,172	$ 4,550	$ 1,069	$ 1,771	$ 3,664	$ 3,847	$ 4,399	$ 7,074	$ 1,771	$ 1,520	$ 1,132	$ 1,191	$ 2,439	$ 5,772	$ 5,618	$ 4,359
ωcc ATSI SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ωcc ATSI SES 4-5	73%	$ 88.34	$ -	$ 39	$ -	$ -	$ 19	$ -	$ -	$ 53	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 62
Credit Balance			-$ 271,667	-$ 342,306	-$ 303,642	-$ 274,078	-$ 284,081	-$ 397,486	-$ 414,358	-$ 354,845	-$ 377,546	-$ 277,608	-$ 215,108	-$ 268,619	-$ 296,094	-$ 505,823	-$ 407,589	-$ 313,774

Metro (VIC)			DGP Code #	301	302	303	304	305	306	307	308	310	311	312	313	314	315	316	320
			SWPE	183,001	233,232	202,861	183,656	192,758	267,217	278,823	243,088	252,536	185,836	136,924	175,103	198,765	303,737	275,143	215,316
			ATSI	822	1,190	277	459	955	997	1,140	1,848	459	394	294	309	632	1,502	1,456	1,147
			% RRMA 1-2	100.00%	99.30%	100.00%	100.00%	99.57%	100.00%	100.00%	99.39%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.84%
			% RRMA 3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	0.00%	0.70%	0.00%	0.00%	0.43%	0.00%	0.00%	0.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.16%
			% RRMA 6-7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SCENARIO Y (NATIONAL W'TED AVERAGE ACTIVITY)	Stream A services per capita (A_n)			0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545
	Stream C services per capita (C_n)			0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
	Stream C vulnerable social groups (VC_n)			0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
	Performance Ratio ($\beta = VC_n/VC'$)			0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529
			Median unit values ($)																
Stream A mean unit value ($) x total services			$ 33.66	$ 3,355,475	$ 4,276,502	$ 3,719,624	$ 3,367,485	$ 3,534,377	$ 4,899,645	$ 5,112,450	$ 4,457,220	$ 4,630,457	$ 3,407,457	$ 2,510,615	$ 3,210,658	$ 3,644,521	$ 5,569,269	$ 5,044,975	$ 3,947,997
Stream C mean unit value ($) x total services			$ 13.60	$ 236,808	$ 301,808	$ 262,507	$ 237,656	$ 249,434	$ 345,786	$ 360,804	$ 314,562	$ 326,788	$ 240,477	$ 177,183	$ 226,588	$ 257,207	$ 393,043	$ 356,042	$ 278,624
ω_{cvd}	SES 1-2	20%	$ 0.84	$ 799	$ 1,011	$ 886	$ 802	$ 838	$ 1,166	$ 1,217	$ 1,055	$ 1,102	$ 811	$ 598	$ 764	$ 868	$ 1,326	$ 1,201	$ 929
	SES 3	28%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ -	$ 12	$ -	$ -	$ 6	$ -	$ -	$ 11	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 18
	ATSI	0.4%																	
	Non SES, Non rem	40%	$ 22.32	$ 190	$ 275	$ 64	$ 106	$ 221	$ 231	$ 264	$ 427	$ 106	$ 91	$ 68	$ 71	$ 146	$ 347	$ 337	$ 265
	SES 1-2	60%	$ 25.17	$ 323	$ 464	$ 109	$ 180	$ 374	$ 392	$ 448	$ 722	$ 180	$ 155	$ 116	$ 121	$ 248	$ 590	$ 572	$ 446
	SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ -	$ 4	$ -	$ -	$ 2	$ -	$ -	$ 5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	0.4%																	
	Non SES, Non rem	40%	$ 88.34	$ 2,004	$ 2,901	$ 675	$ 1,119	$ 2,328	$ 2,430	$ 2,779	$ 4,504	$ 1,119	$ 960	$ 717	$ 753	$ 1,540	$ 3,661	$ 3,549	$ 2,796
	SES 1-2	60%	$ 88.34	$ 3,020	$ 4,341	$ 1,018	$ 1,686	$ 3,493	$ 3,663	$ 4,188	$ 6,748	$ 1,686	$ 1,447	$ 1,080	$ 1,135	$ 2,322	$ 5,518	$ 5,349	$ 4,165
	SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ -	$ 37	$ -	$ -	$ 18	$ -	$ -	$ 50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 59
			Credit Balance	-$ 242,642	-$ 308,375	-$ 271,233	-$ 244,814	-$ 255,077	-$ 355,029	-$ 370,093	-$ 319,289	-$ 337,244	-$ 247,971	-$ 182,525	-$ 233,764	-$ 264,473	-$ 401,361	-$ 364,030	-$ 284,294

Metro (VIC)			DGP Code #	301	302	303	304	305	306	307	308	310	311	312	313	314	315	316	320
			SWPE	183,001	233,232	202,861	183,656	192,758	267,217	278,823	243,088	252,536	185,836	136,924	175,103	198,765	303,737	275,143	215,316
			ATSI	822	1,190	277	459	955	997	1,140	1,848	459	394	294	309	632	1,502	1,456	1,147
			% RRMA 1-2	100.00%	99.30%	100.00%	100.00%	99.57%	100.00%	100.00%	99.39%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.84%
			% RRMA 3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	0.00%	0.70%	0.00%	0.00%	0.43%	0.00%	0.00%	0.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.16%
			% RRMA 6-7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SCENARIO Z (BENCHMARK ACTIVITY)	Stream A services per capita (A′)			0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471
	Stream C services per capita (C′)			0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
	Stream C vulnerable social groups (VC′)			0.036	0.037	0.036	0.036	0.036	0.036	0.036	0.037	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.037
	Performance Ratio ($\beta = VC_n/VC'$)			1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Median unit values ($)																
Stream A mean unit value ($) x total services			$ 33.66	$ 2,902,158	$ 3,698,756	$ 3,217,112	$ 2,912,545	$ 3,056,891	$ 4,237,714	$ 4,421,770	$ 3,855,059	$ 4,004,892	$ 2,947,117	$ 2,171,436	$ 2,776,906	$ 3,152,154	$ 4,816,874	$ 4,363,410	$ 3,414,632
Stream C mean unit value ($) x total services			$ 14.28	$ 470,386	$ 599,500	$ 521,434	$ 472,069	$ 495,465	$ 686,855	$ 716,687	$ 624,833	$ 649,119	$ 477,673	$ 351,949	$ 450,085	$ 510,906	$ 780,726	$ 707,228	$ 553,448
ω_{cvd}	SES 1-2	20%	$ 0.84	$ 1,511	$ 1,912	$ 1,675	$ 1,516	$ 1,584	$ 2,206	$ 2,302	$ 1,995	$ 2,085	$ 1,534	$ 1,130	$ 1,446	$ 1,641	$ 2,508	$ 2,271	$ 1,757
	SES 3	28%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ -	$ 22	$ -	$ -	$ 11	$ -	$ -	$ 20	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 34
	ATSI	0.4%																	
	Non SES, Non rem	40%	$ 22.32	$ 360	$ 520	$ 121	$ 201	$ 418	$ 436	$ 499	$ 808	$ 201	$ 172	$ 129	$ 135	$ 276	$ 657	$ 637	$ 502
	SES 1-2	60%	$ 25.17	$ 611	$ 878	$ 206	$ 341	$ 707	$ 741	$ 847	$ 1,365	$ 341	$ 293	$ 219	$ 230	$ 470	$ 1,117	$ 1,082	$ 843
	SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ -	$ 8	$ -	$ -	$ 4	$ -	$ -	$ 10	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 12
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	0.4%																	
	Non SES, Non rem	40%	$ 88.34	$ 3,789	$ 5,486	$ 1,277	$ 2,116	$ 4,402	$ 4,596	$ 5,255	$ 8,519	$ 2,116	$ 1,816	$ 1,355	$ 1,424	$ 2,913	$ 6,924	$ 6,712	$ 5,287
	SES 1-2	60%	$ 88.34	$ 5,711	$ 8,210	$ 1,925	$ 3,189	$ 6,606	$ 6,927	$ 7,920	$ 12,761	$ 3,189	$ 2,737	$ 2,043	$ 2,147	$ 4,391	$ 10,435	$ 10,116	$ 7,877
	SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ -	$ 70	$ -	$ -	$ 35	$ -	$ -	$ 95	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 112
			Credit Balance	**$ 233,642**	**$ 300,281**	**$ 250,919**	**$ 229,816**	**$ 247,589**	**$ 338,573**	**$ 354,548**	**$ 320,624**	**$ 313,816**	**$ 231,647**	**$ 171,040**	**$ 217,678**	**$ 250,446**	**$ 391,199**	**$ 354,085**	**$ 278,256**

			DGP Code #	401	402	404	405	406	501	503	504	601	602	603	604	605	606	901
Metro (Qld, SA, WA & ACT)			SWPE	130,846	281,238	276,623	580,039	429,480	219,509	207,153	181,738	318,132	128,873	367,737	293,442	242,210	109,135	348,437
			ATSI	2,030	4,849	6,385	7,389	4,361	3,460	2,366	985	6,499	721	4,543	6,982	2,786	2,142	4,757
			% RRMA 1-2	100.00%	100.00%	99.84%	99.84%	96.55%	100.00%	98.56%	100.00%	99.06%	100.00%	100.00%	100.00%	99.18%	100.00%	98.26%
			% RRMA 3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	0.00%	0.00%	0.16%	0.16%	3.45%	0.00%	1.44%	0.00%	0.94%	0.00%	0.00%	0.00%	0.00%	0.00%	1.74%
			% RRMA 6-7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.82%	0.00%	0.00%
SCENARIO X (CURRENT ACTIVITY)	Stream A services per capita (A_n)			0.564	0.552	0.580	0.559	0.579	0.552	0.550	0.552	0.551	0.552	0.552	0.552	0.549	0.552	0.552
	Stream C services per capita (C_n)			0.099	0.100	0.099	0.100	0.098	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.099	0.100	0.099
	Stream C vulnerable social groups (VC_n)			0.021	0.021	0.021	0.020	0.020	0.021	0.021	0.020	0.021	0.020	0.020	0.021	0.021	0.021	0.021
	Performance Ratio ($\beta = VC_n/VC'$)			0.553	0.555	0.549	0.553	0.543	0.555	0.553	0.555	0.554	0.555	0.555	0.555	0.552	0.555	0.552
			Median unit values ($)															
Stream A mean unit value ($) x total services			$ 33.66	$ 2,485,317	$ 5,222,065	$ 5,398,107	$ 10,909,196	$ 8,372,942	$ 4,075,873	$ 3,837,687	$ 3,374,536	$ 5,898,359	$ 2,392,931	$ 6,828,190	$ 5,448,671	$ 4,478,201	$ 2,026,433	$ 6,472,906
Stream C mean unit value ($) x total services			$ 13.60	$ 176,947	$ 382,244	$ 371,584	$ 785,699	$ 570,527	$ 298,345	$ 280,317	$ 247,009	$ 431,153	$ 175,158	$ 499,809	$ 398,831	$ 327,488	$ 148,331	$ 470,731
ω_{cvd}	SES 1-2	20%	$ 0.84	$ 597	$ 1,289	$ 1,252	$ 2,646	$ 1,858	$ 1,006	$ 932	$ 833	$ 1,441	$ 591	$ 1,686	$ 1,345	$ 1,096	$ 500	$ 1,560
	SES 3	28%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ -	$ -	$ 3	$ 7	$ 110	$ -	$ 22	$ -	$ 23	$ -	$ -	$ -	$ -	$ -	$ 46
	Remote	0.05%																
	Non SES	56%	$ 1.02	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 31	$ -	$ -
	SES Remote	44%	$ 1.95	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 47	$ -	$ -
	ATSI	1.5%																
	Non SES, Non rem	40%	$ 22.32	$ 490	$ 1,176	$ 1,530	$ 1,786	$ 1,034	$ 839	$ 571	$ 239	$ 1,571	$ 175	$ 1,102	$ 1,693	$ 672	$ 519	$ 1,147
	SES 1-2	60%	$ 25.17	$ 834	$ 2,002	$ 2,601	$ 3,035	$ 1,699	$ 1,428	$ 958	$ 407	$ 2,650	$ 298	$ 1,875	$ 2,882	$ 1,135	$ 884	$ 1,918
	SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ -	$ -	$ 5	$ 6	$ 74	$ -	$ 17	$ -	$ 31	$ -	$ -	$ -	$ -	$ -	$ 41
	SES Remote	86%	$ 28.92	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 15	$ -	$ -
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	0.05%																
	Non SES	56%	$ 8.56	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 692	$ -	$ -
	SES Remote	44%	$ 8.56	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 544	$ -	$ -
	ATSI	1.5%																
	Non SES, Non rem	40%	$ 88.34	$ 5,162	$ 12,393	$ 16,128	$ 18,821	$ 10,894	$ 8,843	$ 6,020	$ 2,517	$ 16,562	$ 1,843	$ 11,611	$ 17,844	$ 7,083	$ 5,474	$ 12,085
	SES 1-2	60%	$ 88.34	$ 7,793	$ 18,710	$ 24,311	$ 28,367	$ 15,879	$ 13,350	$ 8,958	$ 3,801	$ 24,770	$ 2,782	$ 17,529	$ 26,940	$ 10,606	$ 8,265	$ 17,926
	SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ -	$ -	$ 46	$ 57	$ 691	$ -	$ 160	$ -	$ 286	$ -	$ -	$ -	$ -	$ -	$ 387
	SES Remote	86%	$ 143.72	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 204	$ -	$ -
			Credit Balance	**-$ 218,483**	**-$ 403,427**	**-$ 529,858**	**-$ 916,462**	**-$ 830,326**	**-$ 316,153**	**-$ 295,742**	**-$ 269,132**	**-$ 446,266**	**-$ 190,757**	**-$ 534,564**	**-$ 413,385**	**-$ 339,737**	**-$ 155,529**	**-$ 503,463**

Metro (Qld, SA, WA & ACT)			DGP Code #	401	402	404	405	406	501	503	504	601	602	603	604	605	606	901
			SWPE	130,846	281,238	276,623	580,039	429,480	219,509	207,153	181,738	318,132	128,873	367,737	293,442	242,210	109,135	348,437
			ATSI	2,030	4,849	6,385	7,389	4,361	3,460	2,366	985	6,499	721	4,543	6,982	2,786	2,142	4,757
			% RRMA 1-2	100.00%	100.00%	99.84%	99.84%	96.55%	100.00%	98.56%	100.00%	99.06%	100.00%	100.00%	100.00%	99.18%	100.00%	98.26%
			% RRMA 3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	0.00%	0.00%	0.16%	0.16%	3.45%	0.00%	1.44%	0.00%	0.94%	0.00%	0.00%	0.00%	0.00%	0.00%	1.74%
			% RRMA 6-7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.82%	0.00%	0.00%
SCENARIO Y (NATIONAL W'TED AVERAGE ACTIVITY)	Stream A services per capita (A_n)			0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545
	Stream C services per capita (C_n)			0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
	Stream C vulnerable social groups (VC_n)			0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.019	0.020	0.019	0.020	0.020	0.020	0.020	0.020
	Performance Ratio ($\beta = VC_n/VC'$)			0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529
			Median unit values ($)															
Stream A mean unit value ($) x total services			$ 33.66	$ 2,399,170	$ 5,156,731	$ 5,072,112	$ 10,635,495	$ 7,874,871	$ 4,024,879	$ 3,798,322	$ 3,332,317	$ 5,833,213	$ 2,362,993	$ 6,742,762	$ 5,380,502	$ 4,441,121	$ 2,001,081	$ 6,388,881
Stream C mean unit value ($) x total services			$ 13.60	$ 169,318	$ 363,929	$ 357,957	$ 750,585	$ 555,758	$ 284,050	$ 268,061	$ 235,174	$ 411,671	$ 166,765	$ 475,861	$ 379,722	$ 313,426	$ 141,223	$ 450,886
ω_{cvd}	SES 1-2	20%	$ 0.84	$ 571	$ 1,228	$ 1,206	$ 2,528	$ 1,810	$ 958	$ 891	$ 793	$ 1,376	$ 563	$ 1,605	$ 1,281	$ 1,049	$ 476	$ 1,494
	SES 3	28%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ -	$ -	$ 3	$ 7	$ 107	$ -	$ 22	$ -	$ 22	$ -	$ -	$ -	$ -	$ -	$ 44
	Remote	0.05%																
	Non SES	56%	$ 1.02	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 30	$ -	$ -
	SES Remote	44%	$ 1.95	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 45	$ -	$ -
	ATSI	1.5%																
	Non SES, Non rem	40%	$ 22.32	$ 469	$ 1,119	$ 1,474	$ 1,706	$ 1,007	$ 799	$ 546	$ 227	$ 1,500	$ 166	$ 1,049	$ 1,612	$ 643	$ 495	$ 1,098
	SES 1-2	60%	$ 25.17	$ 798	$ 1,906	$ 2,506	$ 2,899	$ 1,655	$ 1,360	$ 917	$ 387	$ 2,530	$ 283	$ 1,786	$ 2,744	$ 1,086	$ 842	$ 1,837
	SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ -	$ -	$ 5	$ 6	$ 72	$ -	$ 16	$ -	$ 29	$ -	$ -	$ -	$ -	$ -	$ 40
	SES Remote	86%	$ 28.92	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 15	$ -	$ -
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	0.05%																
	Non SES	56%	$ 8.56	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 662	$ -	$ -
	SES Remote	44%	$ 8.56	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 520	$ -	$ -
	ATSI	1.5%																
	Non SES, Non rem	40%	$ 88.34	$ 4,940	$ 11,799	$ 15,537	$ 17,980	$ 10,612	$ 8,419	$ 5,757	$ 2,397	$ 15,814	$ 1,754	$ 11,054	$ 16,989	$ 6,779	$ 5,212	$ 11,575
	SES 1-2	60%	$ 88.34	$ 7,457	$ 17,813	$ 23,419	$ 27,100	$ 15,468	$ 12,711	$ 8,566	$ 3,618	$ 23,650	$ 2,649	$ 16,689	$ 25,649	$ 10,150	$ 7,869	$ 17,170
	SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ -	$ -	$ 44	$ 54	$ 673	$ -	$ 153	$ -	$ 273	$ -	$ -	$ -	$ -	$ -	$ 371
	SES Remote	86%	$ 143.72	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 195	$ -	$ -
			Credit Balance	-$ 167,886	-$ 360,137	-$ 346,152	-$ 750,645	-$ 553,728	-$ 282,246	-$ 268,885	-$ 240,369	-$ 403,087	-$ 170,369	-$ 477,299	-$ 368,922	-$ 313,481	-$ 138,825	-$ 449,086

Metro (Qld, SA, WA & ACT)			DGP Code #	401	402	404	405	406	501	503	504	601	602	603	604	605	606	901
			SWPE	130,846	281,238	276,623	580,039	429,480	219,509	207,153	181,738	318,132	128,873	367,737	293,442	242,210	109,135	348,437
			ATSI	2,030	4,849	6,385	7,389	4,361	3,460	2,366	985	6,499	721	4,543	6,982	2,786	2,142	4,757
			% RRMA 1-2	100.00%	100.00%	99.84%	99.84%	96.55%	100.00%	98.56%	100.00%	99.06%	100.00%	100.00%	100.00%	99.18%	100.00%	98.26%
			% RRMA 3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	0.00%	0.00%	0.16%	0.16%	3.45%	0.00%	1.44%	0.00%	0.94%	0.00%	0.00%	0.00%	0.00%	0.00%	1.74%
			% RRMA 6-7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.82%	0.00%	0.00%
SCENARIO Z (BENCHMARK ACTIVITY)	Stream A services per capita (A')			0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471
	Stream C services per capita (C')			0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
	Stream C vulnerable social groups (VC')			0.037	0.037	0.038	0.037	0.038	0.037	0.037	0.036	0.038	0.036	0.037	0.038	0.038	0.037	0.037
	Performance Ratio ($\beta = VC_n / VC'$)			1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Median unit values ($)															
Stream A mean unit value ($) x total services			$ 33.66	$ 2,075,047	$ 4,460,069	$ 4,386,881	$ 9,198,664	$ 6,810,994	$ 3,481,127	$ 3,285,177	$ 2,882,128	$ 5,045,160	$ 2,043,758	$ 5,831,830	$ 4,653,608	$ 3,841,135	$ 1,730,739	$ 5,525,757
Stream C mean unit value ($) x total services			$ 14.28	$ 336,327	$ 722,894	$ 711,032	$ 1,490,932	$ 1,103,935	$ 564,226	$ 532,466	$ 467,139	$ 817,726	$ 331,255	$ 945,231	$ 754,263	$ 622,577	$ 280,521	$ 895,622
ω_{cvd}	SES 1-2	20%	$ 0.84	$ 1,080	$ 2,322	$ 2,280	$ 4,781	$ 3,423	$ 1,812	$ 1,685	$ 1,500	$ 2,602	$ 1,064	$ 3,036	$ 2,423	$ 1,983	$ 901	$ 2,826
	SES 3	28%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ -	$ -	$ 6	$ 13	$ 202	$ -	$ 41	$ -	$ 41	$ -	$ -	$ -	$ -	$ -	$ 83
	Remote	0.05%																
	Non SES	56%	$ 1.02	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 56	$ -	$ -
	SES Remote	44%	$ 1.95	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 84	$ -	$ -
	ATSI	1.5%																
	Non SES, Non rem	40%	$ 22.32	$ 886	$ 2,117	$ 2,788	$ 3,226	$ 1,904	$ 1,511	$ 1,033	$ 430	$ 2,838	$ 315	$ 1,984	$ 3,049	$ 1,216	$ 935	$ 2,077
	SES 1-2	60%	$ 25.17	$ 1,509	$ 3,604	$ 4,739	$ 5,484	$ 3,130	$ 2,572	$ 1,733	$ 732	$ 4,786	$ 536	$ 3,377	$ 5,190	$ 2,054	$ 1,592	$ 3,474
	SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ -	$ -	$ 9	$ 11	$ 136	$ -	$ 31	$ -	$ 55	$ -	$ -	$ -	$ -	$ -	$ 75
	SES Remote	86%	$ 28.92	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 28	$ -	$ -
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	0.05%																
	Non SES	56%	$ 8.56	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,252	$ -	$ -
	SES Remote	44%	$ 8.56	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 984	$ -	$ -
	ATSI	1.5%																
	Non SES, Non rem	40%	$ 88.34	$ 9,342	$ 22,315	$ 29,384	$ 34,004	$ 20,069	$ 15,923	$ 10,888	$ 4,533	$ 29,908	$ 3,318	$ 20,907	$ 32,131	$ 12,821	$ 9,857	$ 21,892
	SES 1-2	60%	$ 88.34	$ 14,104	$ 33,689	$ 44,292	$ 51,252	$ 29,253	$ 24,039	$ 16,201	$ 6,843	$ 44,729	$ 5,009	$ 31,563	$ 48,509	$ 19,197	$ 14,882	$ 32,474
	SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ -	$ -	$ 84	$ 102	$ 1,273	$ -	$ 289	$ -	$ 516	$ -	$ -	$ -	$ -	$ -	$ 702
	SES Remote	86%	$ 143.72	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 370	$ -	$ -
			Credit Balance	**$ 186,301**	**$ 404,698**	**$ 423,029**	**$ 804,107**	**$ 592,799**	**$ 311,737**	**$ 284,051**	**$ 234,169**	**$ 472,048**	**$ 166,340**	**$ 506,288**	**$ 446,733**	**$ 334,765**	**$ 160,358**	**$ 488,495**

Metro-Rural			**DGP Code #**	**218**	**221**	**226**	**235**	**317**	**318**	**322**	**407**	**408**	**412**	**502**	**505**	**514**	**701**
			SWPE	**205,156**	**174,827**	**83,283**	**48,708**	**230,088**	**166,355**	**66,547**	**183,606**	**180,864**	**151,770**	**188,776**	**350,482**	**64,614**	**236,471**
			ATSI	*6,358*	*4,415*	*2,272*	*660*	*1,570*	*918*	*354*	*3,878*	*5,531*	*8,622*	*3,701*	*2,823*	*330*	*8,886*
			% RRMA 1-2	*32.44%*	*9.80%*	*64.96%*	*5.94%*	*71.39%*	*39.94%*	*7.89%*	*93.75%*	*70.54%*	*94.60%*	*94.92%*	*90.79%*	*32.64%*	*70.42%*
			% RRMA 3	*0.30%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
			% RRMA 4-5	*67.27%*	*90.20%*	*35.04%*	*94.06%*	*28.61%*	*60.06%*	*91.97%*	*6.25%*	*29.46%*	*5.40%*	*5.08%*	*7.94%*	*67.36%*	*29.58%*
			% RRMA 6-7	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*0.14%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*	*1.28%*	*0.00%*	*0.00%*
SCENARIO X (CURRENT ACTIVITY)	**Stream A services per capita (A_n)**			*0.578*	*0.493*	*0.587*	*0.473*	*0.570*	*0.499*	*0.472*	*0.576*	*0.546*	*0.577*	*0.547*	*0.541*	*0.493*	*0.526*
	Stream C services per capita (C_n)			*0.094*	*0.076*	*0.097*	*0.072*	*0.093*	*0.082*	*0.072*	*0.097*	*0.090*	*0.097*	*0.098*	*0.097*	*0.079*	*0.091*
	Stream C vulnerable social groups (VC_n)			*0.028*	*0.025*	*0.025*	*0.024*	*0.022*	*0.023*	*0.023*	*0.021*	*0.022*	*0.022*	*0.021*	*0.022*	*0.023*	*0.023*
	Performance Ratio ($\beta = VC_n/VC'$)			*0.520*	*0.420*	*0.540*	*0.400*	*0.518*	*0.454*	*0.401*	*0.538*	*0.501*	*0.540*	*0.547*	*0.537*	*0.442*	*0.505*
			Median unit values ($)														
Stream A mean unit value ($) x total services			*$ 33.66*	$ 3,990,683	$ 2,898,897	$ 1,644,499	$ 775,592	$ 4,417,224	$ 2,795,973	$ 1,057,605	$ 3,558,738	$ 3,321,797	$ 2,947,041	$ 3,477,087	$ 6,383,260	$ 1,072,141	$ 4,185,765
Stream C mean unit value ($) x total services			*$ 13.60*	$ 260,842	$ 179,700	$ 110,041	$ 47,685	$ 291,497	$ 184,786	$ 65,237	$ 241,874	$ 221,868	$ 200,443	$ 252,607	$ 461,019	$ 69,820	$ 292,478
ω_{cvd}	**SES 1-2**	***20%***	*$ 0.84*	*$ 285*	*$ 59*	*$ 241*	*$ 10*	*$ 702*	*$ 249*	*$ 17*	*$ 765*	*$ 528*	*$ 640*	*$ 809*	*$ 1,412*	*$ 77*	*$ 695*
	SES 3	***28%***	*$ 0.84*	*$ 4*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	SES 4-5	***33%***	*$ 0.84*	*$ 977*	*$ 902*	*$ 215*	*$ 250*	*$ 464*	*$ 618*	*$ 334*	*$ 84*	*$ 364*	*$ 60*	*$ 71*	*$ 204*	*$ 262*	*$ 481*
	Remote	***0.2%***															
	Non SES	*56%*	*$ 1.02*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 1*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 67*	*$ -*	*$ -*
	SES Remote	*44%*	*$ 1.95*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 2*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 101*	*$ -*	*$ -*
	ATSI	***2.16%***															
	Non SES, Non rem	*34%*	*$ 22.32*	*$ 1,234*	*$ 693*	*$ 458*	*$ 99*	*$ 304*	*$ 156*	*$ 53*	*$ 780*	*$ 1,036*	*$ 1,739*	*$ 756*	*$ 567*	*$ 54*	*$ 1,678*
	SES 1-2	*60%*	*$ 25.17*	*$ 796*	*$ 135*	*$ 592*	*$ 12*	*$ 431*	*$ 124*	*$ 8*	*$ 1,455*	*$ 1,454*	*$ 3,272*	*$ 1,428*	*$ 1,024*	*$ 35*	*$ 2,351*
	SES 3	*72%*	*$ 25.17*	*$ 9*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	SES 4-5	*73%*	*$ 25.17*	*$ 2,012*	*$ 1,514*	*$ 389*	*$ 225*	*$ 211*	*$ 227*	*$ 118*	*$ 118*	*$ 740*	*$ 227*	*$ 93*	*$ 109*	*$ 89*	*$ 1,203*
	SES Remote	*86%*	*$ 28.92*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 0*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 24*	*$ -*	*$ -*
ω_{cc}	**SES 1-2**	***20%***	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	SES 3	***28%***	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	SES 4-5	***33%***	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	Remote	***0.2%***															
	Non SES	*56%*	*$ 8.56*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 23*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 1,508*	*$ -*	*$ -*
	SES Remote	*44%*	*$ 8.56*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 18*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 1,184*	*$ -*	*$ -*
	ATSI	***2.16%***															
	Non SES, Non rem	*34%*	*$ 88.34*	*$ 13,010*	*$ 7,304*	*$ 4,831*	*$ 1,040*	*$ 3,201*	*$ 1,641*	*$ 559*	*$ 8,222*	*$ 10,920*	*$ 18,327*	*$ 7,970*	*$ 5,976*	*$ 574*	*$ 17,688*
	SES 1-2	*60%*	*$ 88.34*	*$ 7,443*	*$ 1,263*	*$ 5,536*	*$ 109*	*$ 4,031*	*$ 1,156*	*$ 78*	*$ 13,597*	*$ 13,587*	*$ 30,582*	*$ 13,345*	*$ 9,570*	*$ 330*	*$ 21,973*
	SES 3	*72%*	*$ 88.34*	*$ 82*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
	SES 4-5	*73%*	*$ 88.34*	*$ 18,802*	*$ 14,153*	*$ 3,637*	*$ 2,101*	*$ 1,967*	*$ 2,118*	*$ 1,104*	*$ 1,103*	*$ 6,912*	*$ 2,124*	*$ 870*	*$ 1,019*	*$ 831*	*$ 11,239*
	SES Remote	*86%*	*$ 143.72*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 3*	*$ -*	*$ -*	*$ -*	*$ -*	*$ 312*	*$ -*	*$ -*
			Credit Balance	**-$ 359,776**	**-$ 42,144**	**-$ 166,198**	**$ 279**	**-$ 391,878**	**-$ 68,768**	**$ 25**	**-$ 334,197**	**-$ 209,515**	**-$ 260,756**	**-$ 250,422**	**-$ 431,053**	**-$ 19,955**	**-$ 191,203**

Metro-Rural			DGP Code #	218	221	226	235	317	318	322	407	408	412	502	505	514	701
			SWPE	205,156	174,827	83,283	48,708	230,088	166,355	66,547	183,606	180,864	151,770	188,776	350,482	64,614	236,471
			ATSI	6,358	4,415	2,272	660	1,570	918	354	3,878	5,531	8,622	3,701	2,823	330	8,886
			% RRMA 1-2	32.44%	9.80%	64.96%	5.94%	71.39%	39.94%	7.89%	93.75%	70.54%	94.60%	94.92%	90.79%	32.64%	70.42%
			% RRMA 3	0.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	67.27%	90.20%	35.04%	94.06%	28.61%	60.06%	91.97%	6.25%	29.46%	5.40%	5.08%	7.94%	67.36%	29.58%
			% RRMA 6-7	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	1.28%	0.00%	0.00%
SCENARIO Y (NATIONAL W'TED AVERAGE ACTIVITY)	Stream A services per capita (A_n)			0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545
	Stream C services per capita (C_n)			0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
	Stream C vulnerable social groups (VC_n)			0.028	0.031	0.024	0.031	0.023	0.027	0.031	0.020	0.024	0.022	0.020	0.021	0.028	0.024
	Performance Ratio ($\beta = VC_n/VC'$)			0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529
			Median unit values ($)														
Stream A mean unit value ($) x total services			$ 33.66	$ 3,761,705	$ 3,205,598	$ 1,527,063	$ 893,101	$ 4,218,854	$ 3,050,257	$ 1,220,194	$ 3,366,568	$ 3,316,291	$ 2,782,829	$ 3,461,364	$ 6,426,378	$ 1,184,751	$ 4,335,891
Stream C mean unit value ($) x total services			$ 13.60	$ 265,477	$ 226,231	$ 107,770	$ 63,029	$ 297,740	$ 215,268	$ 86,114	$ 237,591	$ 234,043	$ 196,394	$ 244,281	$ 453,533	$ 83,612	$ 306,000
ω_{cvd}	SES 1-2	20%	$ 0.84	$ 290	$ 75	$ 236	$ 13	$ 717	$ 290	$ 23	$ 751	$ 557	$ 627	$ 782	$ 1,389	$ 92	$ 727
	SES 3	28%	$ 0.84	$ 4	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ 994	$ 1,136	$ 210	$ 330	$ 474	$ 720	$ 441	$ 83	$ 384	$ 59	$ 69	$ 200	$ 313	$ 504
	Remote	0.2%															
	Non SES	56%	$ 1.02	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$ -	$ -	$ -	$ -	$ 66	$ -	$ -
	SES Remote	44%	$ 1.95	$ -	$ -	$ -	$ -	$ -	$ -	$ 2	$ -	$ -	$ -	$ -	$ 100	$ -	$ -
	ATSI	2.16%															
	Non SES, Non rem	34%	$ 22.32	$ 1,256	$ 872	$ 449	$ 130	$ 310	$ 181	$ 70	$ 766	$ 1,093	$ 1,704	$ 731	$ 558	$ 65	$ 1,756
	SES 1-2	60%	$ 25.17	$ 811	$ 170	$ 580	$ 15	$ 441	$ 144	$ 11	$ 1,429	$ 1,533	$ 3,206	$ 1,381	$ 1,007	$ 42	$ 2,460
	SES 3	72%	$ 25.17	$ 9	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ 2,047	$ 1,906	$ 381	$ 297	$ 215	$ 264	$ 156	$ 116	$ 780	$ 223	$ 90	$ 107	$ 106	$ 1,258
	SES Remote	86%	$ 28.92	$ -	$ -	$ -	$ -	$ -	$ -	$ 0	$ -	$ -	$ -	$ -	$ 23	$ -	$ -
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	0.2%															
	Non SES	56%	$ 8.56	$ -	$ -	$ -	$ -	$ -	$ -	$ 30	$ -	$ -	$ -	$ -	$ 1,483	$ -	$ -
	SES Remote	44%	$ 8.56	$ -	$ -	$ -	$ -	$ -	$ -	$ 24	$ -	$ -	$ -	$ -	$ 1,165	$ -	$ -
	ATSI	2.16%															
	Non SES, Non rem	34%	$ 88.34	$ 13,241	$ 9,195	$ 4,732	$ 1,375	$ 3,270	$ 1,912	$ 737	$ 8,076	$ 11,519	$ 17,956	$ 7,708	$ 5,879	$ 687	$ 18,506
	SES 1-2	60%	$ 88.34	$ 7,576	$ 1,590	$ 5,422	$ 144	$ 4,118	$ 1,347	$ 103	$ 13,356	$ 14,332	$ 29,965	$ 12,905	$ 9,415	$ 396	$ 22,989
	SES 3	72%	$ 88.34	$ 83	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ 19,137	$ 17,817	$ 3,562	$ 2,778	$ 2,010	$ 2,467	$ 1,457	$ 1,084	$ 7,291	$ 2,081	$ 842	$ 1,003	$ 995	$ 11,759
	SES Remote	86%	$ 143.72	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$ -	$ -	$ -	$ -	$ 306	$ -	$ -
			Credit Balance	-$ 242,227	-$ 187,059	-$ 102,049	-$ 52,997	-$ 291,954	-$ 197,898	-$ 74,506	-$ 229,179	-$ 210,632	-$ 171,411	-$ 238,699	-$ 451,008	-$ 75,912	-$ 270,872

Metro-Rural	DGP Code #			218	221	226	235	317	318	322	407	408	412	502	505	514	701
	SWPE			205,156	174,827	83,283	48,708	230,088	166,355	66,547	183,606	180,864	151,770	188,776	350,482	64,614	236,471
	ATSI			6,358	4,415	2,272	660	1,570	918	354	3,878	5,531	8,622	3,701	2,823	330	8,886
	% RRMA 1-2			32.44%	9.80%	64.96%	5.94%	71.39%	39.94%	7.89%	93.75%	70.54%	94.60%	94.92%	90.79%	32.64%	70.42%
	% RRMA 3			0.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	% RRMA 4-5			67.27%	90.20%	35.04%	94.06%	28.61%	60.06%	91.97%	6.25%	29.46%	5.40%	5.08%	7.94%	67.36%	29.58%
	% RRMA 6-7			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%	0.00%	0.00%	0.00%	0.00%	1.28%	0.00%	0.00%
SCENARIO Z (BENCHMARK ACTIVITY)	Stream A services per capita (A')			0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471
	Stream C services per capita (C')			0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
	Stream C vulnerable social groups (VC')			0.054	0.059	0.046	0.059	0.043	0.050	0.058	0.039	0.045	0.041	0.038	0.040	0.052	0.045
	Performance Ratio ($\beta = VC_n/VC'$)			1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Median unit values ($)														
Stream A mean unit value ($) x total services			$ 33.66	$ 3,253,507	$ 2,772,529	$ 1,320,760	$ 772,446	$ 3,648,896	$ 2,638,174	$ 1,055,349	$ 2,911,752	$ 2,868,268	$ 2,406,875	$ 2,993,742	$ 5,558,188	$ 1,024,694	$ 3,750,122
Stream C mean unit value ($) x total services			$ 14.28	$ 527,333	$ 449,375	$ 214,071	$ 125,199	$ 591,418	$ 427,599	$ 171,052	$ 471,941	$ 464,893	$ 390,110	$ 485,230	$ 900,879	$ 166,084	$ 607,825
ω_{cvd}	SES 1-2	20%	$ 0.84	$ 549	$ 141	$ 447	$ 24	$ 1,356	$ 549	$ 43	$ 1,421	$ 1,053	$ 1,185	$ 1,479	$ 2,627	$ 174	$ 1,375
	SES 3	28%	$ 0.84	$ 7	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ 1,880	$ 2,148	$ 397	$ 624	$ 897	$ 1,361	$ 834	$ 156	$ 726	$ 112	$ 131	$ 379	$ 593	$ 953
	Remote	0.2%															
	Non SES	56%	$ 1.02	$ -	$ -	$ -	$ -	$ -	$ -	$ 3	$ -	$ -	$ -	$ -	$ 126	$ -	$ -
	SES Remote	44%	$ 1.95	$ -	$ -	$ -	$ -	$ -	$ -	$ 4	$ -	$ -	$ -	$ -	$ 189	$ -	$ -
	ATSI	2.16%															
	Non SES, Non rem	34%	$ 22.32	$ 2,376	$ 1,650	$ 849	$ 247	$ 587	$ 343	$ 132	$ 1,449	$ 2,067	$ 3,222	$ 1,383	$ 1,055	$ 123	$ 3,321
	SES 1-2	60%	$ 25.17	$ 1,533	$ 322	$ 1,097	$ 29	$ 833	$ 273	$ 21	$ 2,703	$ 2,900	$ 6,063	$ 2,611	$ 1,905	$ 80	$ 4,652
	SES 3	72%	$ 25.17	$ 17	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ 3,872	$ 3,605	$ 721	$ 562	$ 407	$ 499	$ 295	$ 219	$ 1,475	$ 421	$ 170	$ 203	$ 201	$ 2,379
	SES Remote	86%	$ 28.92	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$ -	$ -	$ -	$ -	$ 44	$ -	$ -
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	0.2%															
	Non SES	56%	$ 8.56	$ -	$ -	$ -	$ -	$ -	$ -	$ 57	$ -	$ -	$ -	$ -	$ 2,805	$ -	$ -
	SES Remote	44%	$ 8.56	$ -	$ -	$ -	$ -	$ -	$ -	$ 45	$ -	$ -	$ -	$ -	$ 2,204	$ -	$ -
	ATSI	2.16%															
	Non SES, Non rem	34%	$ 88.34	$ 25,043	$ 17,390	$ 8,949	$ 2,600	$ 6,184	$ 3,616	$ 1,394	$ 15,275	$ 21,785	$ 33,960	$ 14,577	$ 11,119	$ 1,300	$ 35,000
	SES 1-2	60%	$ 88.34	$ 14,328	$ 3,007	$ 10,254	$ 272	$ 7,787	$ 2,548	$ 194	$ 25,260	$ 27,106	$ 56,671	$ 24,406	$ 17,806	$ 748	$ 43,477
	SES 3	72%	$ 88.34	$ 157	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ 36,192	$ 33,697	$ 6,736	$ 5,253	$ 3,801	$ 4,665	$ 2,755	$ 2,050	$ 13,790	$ 3,936	$ 1,592	$ 1,896	$ 1,881	$ 22,240
	SES Remote	86%	$ 143.72	$ -	$ -	$ -	$ -	$ -	$ -	$ 8	$ -	$ -	$ -	$ -	$ 580	$ -	$ -
			Credit Balance	$ 352,445	$ 331,636	$ 133,480	$ 87,125	$ 321,773	$ 256,665	$ 111,592	$ 278,600	$ 313,927	$ 295,237	$ 278,973	$ 482,216	$ 101,364	$ 428,744

				220	223	224	225	227	228	229	230	231	236	319	323	324	325	326	327
Rural	**DGP Code #**			**220**	**223**	**224**	**225**	**227**	**228**	**229**	**230**	**231**	**236**	**319**	**323**	**324**	**325**	**326**	**327**
	SWPE			**90,993**	**99,631**	**129,280**	**161,260**	**65,248**	**108,149**	**174,461**	**101,063**	**54,274**	**60,279**	**106,241**	**108,641**	**121,807**	**120,193**	**102,457**	**103,486**
	ATSI			3,790	4,250	5,277	5,966	3,841	3,551	7,627	10,434	6,545	4,121	778	1,199	1,042	1,091	1,027	2,226
	% RRMA 1-2			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.18%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	% RRMA 3			0.00%	68.74%	0.43%	26.76%	0.00%	53.01%	21.50%	35.13%	0.00%	61.74%	2.26%	0.00%	0.00%	71.42%	80.83%	45.12%
	% RRMA 4-5			100.00%	30.91%	99.57%	73.24%	100.00%	46.13%	73.71%	61.86%	96.46%	38.26%	97.74%	100.00%	100.00%	28.58%	19.17%	54.88%
	% RRMA 6-7			0.00%	0.34%	0.00%	0.00%	0.00%	0.86%	4.61%	3.01%	3.54%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SCENARIO X (CURRENT ACTIVITY)	**Stream A services per capita (A_n)**			0.600	0.574	0.550	0.557	0.508	0.544	0.529	0.513	0.458	0.559	0.489	0.559	0.534	0.574	0.588	0.534
	Stream C services per capita (C_n)			0.096	0.100	0.086	0.091	0.078	0.092	0.085	0.084	0.068	0.096	0.075	0.088	0.083	0.101	0.105	0.089
	Stream C vulnerable social groups (VC_n)			0.033	0.031	0.029	0.030	0.027	0.029	0.031	0.030	0.026	0.031	0.025	0.029	0.028	0.030	0.031	0.028
	Performance Ratio ($\beta = VC_n/VC'$)			0.532	0.557	0.478	0.507	0.433	0.513	0.474	0.466	0.380	0.536	0.414	0.488	0.461	0.559	0.582	0.495
			Median unit values ($)																
Stream A mean unit value ($) x total services			$ 33.66	$ 1,837,525	$ 1,923,163	$ 2,391,972	$ 3,024,355	$ 1,116,287	$ 1,979,998	$ 3,106,720	$ 1,743,633	$ 835,798	$ 1,134,129	$ 1,748,553	$ 2,044,174	$ 2,191,055	$ 2,321,301	$ 2,028,427	$ 1,858,519
Stream C mean unit value ($) x total services			$ 13.60	$ 118,420	$ 135,737	$ 151,278	$ 199,923	$ 69,198	$ 135,761	$ 202,333	$ 115,286	$ 50,469	$ 79,010	$ 107,738	$ 129,699	$ 137,545	$ 164,423	$ 145,866	$ 125,473
ω_{cvd}	**SES 1-2**	20%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ 0.84	$ -	$ 441	$ 3	$ 253	$ -	$ 340	$ 205	$ 191	$ -	$ 230	$ 12	$ -	$ -	$ 555	$ 557	$ 267
	SES 4-5	33%	$ 0.84	$ 659	$ 234	$ 838	$ 815	$ 385	$ 349	$ 830	$ 397	$ 271	$ 168	$ 586	$ 722	$ 766	$ 262	$ 156	$ 383
	Remote	1.9%																	
	Non SES	56%	$ 1.02	$ -	$ 5	$ -	$ -	$ -	$ 13	$ 107	$ 40	$ 21	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES Remote	44%	$ 1.95	$ -	$ 8	$ -	$ -	$ -	$ 20	$ 161	$ 60	$ 31	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	4.22%																	
	Non SES, Non rem	27%	$ 22.32	$ 594	$ 697	$ 743	$ 890	$ 490	$ 536	$ 1,065	$ 1,432	$ 732	$ 650	$ 95	$ 172	$ 142	$ 180	$ 176	$ 325
	SES 1-2	60%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ 5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	72%	$ 25.17	$ -	$ 1,454	$ 10	$ 723	$ -	$ 863	$ 695	$ 1,528	$ -	$ 1,218	$ 7	$ -	$ -	$ 389	$ 432	$ 445
	SES 4-5	73%	$ 25.17	$ 1,825	$ 662	$ 2,275	$ 2,004	$ 1,507	$ 761	$ 2,412	$ 2,724	$ 2,172	$ 765	$ 285	$ 530	$ 435	$ 158	$ 104	$ 548
	SES Remote	86%	$ 28.92	$ -	$ 10	$ -	$ -	$ -	$ 19	$ 203	$ 178	$ 107	$ -	$ -	$ -	$ -	$ -	$ -	$ -
0	**SES 1-2**	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	1.9%																	
	Non SES	56%	$ 8.56	$ -	$ 120	$ -	$ -	$ -	$ 298	$ 2,393	$ 888	$ 458	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES Remote	44%	$ 8.56	$ -	$ 94	$ -	$ -	$ -	$ 234	$ 1,880	$ 698	$ 360	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	4.22%																	
	Non SES, Non rem	27%	$ 88.34	$ 6,257	$ 7,345	$ 7,833	$ 9,382	$ 5,167	$ 5,654	$ 11,220	$ 15,098	$ 7,720	$ 6,852	$ 1,001	$ 1,816	$ 1,493	$ 1,893	$ 1,855	$ 3,424
	SES 1-2	60%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ 44	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	72%	$ 88.34	$ -	$ 13,594	$ 90	$ 6,759	$ -	$ 8,070	$ 6,495	$ 14,280	$ -	$ 11,388	$ 61	$ -	$ -	$ 3,640	$ 4,036	$ 4,159
	SES 4-5	73%	$ 88.34	$ 17,054	$ 6,189	$ 21,260	$ 18,731	$ 14,085	$ 7,111	$ 22,544	$ 25,460	$ 20,299	$ 7,147	$ 2,666	$ 4,949	$ 4,068	$ 1,475	$ 969	$ 5,122
	SES Remote	86%	$ 143.72	$ -	$ 131	$ -	$ -	$ -	$ 251	$ 2,684	$ 2,352	$ 1,417	$ -	$ -	$ -	$ -	$ -	$ -	$ -
			Credit Balance	**-$ 195,748**	**-$ 173,776**	**-$ 147,604**	**-$ 216,521**	**-$ 25,959**	**-$ 123,296**	**-$ 136,030**	**-$ 35,229**	**$ 22,230**	**-$ 80,210**	**-$ 24,446**	**-$ 152,723**	**-$ 116,481**	**-$ 227,303**	**-$ 229,961**	**-$ 100,419**

Rural			220	223	224	225	227	228	229	230	231	236	319	323	324	325	326	327
		DGP Code #	220	223	224	225	227	228	229	230	231	236	319	323	324	325	326	327
		SWPE	90,993	99,631	129,280	161,260	65,248	108,149	174,461	101,063	54,274	60,279	106,241	108,641	121,807	120,193	102,457	103,486
		ATSI	3,790	4,250	5,277	5,966	3,841	3,551	7,627	10,434	6,545	4,121	778	1,199	1,042	1,091	1,027	2,226
		% RRMA 1-2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.18%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		% RRMA 3	0.00%	68.74%	0.43%	26.76%	0.00%	53.01%	21.50%	35.13%	0.00%	61.74%	2.26%	0.00%	0.00%	71.42%	80.83%	45.12%
		% RRMA 4-5	100.00%	30.91%	99.57%	73.24%	100.00%	46.13%	73.71%	61.86%	96.46%	38.26%	97.74%	100.00%	100.00%	28.58%	19.17%	54.88%
		% RRMA 6-7	0.00%	0.34%	0.00%	0.00%	0.00%	0.86%	4.61%	3.01%	3.54%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SCENARIO Y (NATIONAL W'TED AVERAGE ACTIVITY)	Stream A services per capita (A_n)		0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545
	Stream C services per capita (C_n)		0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
	Stream C vulnerable social groups (VC_n)		0.032	0.029	0.032	0.031	0.033	0.030	0.034	0.034	0.037	0.030	0.031	0.032	0.032	0.028	0.028	0.030
	Performance Ratio ($\beta = VC_n/VC'$)		0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529
		Median unit values ($)																
Stream A mean unit value ($) x total services		$ 33.66	$ 1,668,432	$ 1,826,817	$ 2,370,456	$ 2,956,836	$ 1,196,376	$ 1,983,001	$ 3,198,887	$ 1,853,074	$ 995,159	$ 1,105,265	$ 1,948,017	$ 1,992,023	$ 2,233,432	$ 2,203,838	$ 1,878,634	$ 1,897,501
Stream C mean unit value ($) x total services		$ 13.60	$ 117,747	$ 128,925	$ 167,292	$ 208,675	$ 84,433	$ 139,948	$ 225,757	$ 130,778	$ 70,232	$ 78,003	$ 137,479	$ 140,584	$ 157,621	$ 155,533	$ 132,582	$ 133,914
ω_{cvd} SES 1-2	20%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ 1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SES 3	28%	$ 0.84	$ -	$ 419	$ 3	$ 264	$ -	$ 350	$ 229	$ 217	$ -	$ 227	$ 15	$ -	$ -	$ 525	$ 506	$ 285
SES 4-5	33%	$ 0.84	$ 655	$ 222	$ 927	$ 851	$ 470	$ 359	$ 926	$ 450	$ 377	$ 166	$ 748	$ 782	$ 877	$ 247	$ 141	$ 409
Remote	1.9%																	
Non SES	56%	$ 1.02	$ -	$ 5	$ -	$ -	$ -	$ 14	$ 119	$ 45	$ 29	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SES Remote	44%	$ 1.95	$ -	$ 8	$ -	$ -	$ -	$ 21	$ 179	$ 68	$ 43	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ATSI	4.22%																	
Non SES, Non rem	27%	$ 22.32	$ 590	$ 662	$ 822	$ 929	$ 598	$ 553	$ 1,188	$ 1,625	$ 1,019	$ 642	$ 121	$ 187	$ 162	$ 170	$ 160	$ 347
SES 1-2	60%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ 5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SES 3	72%	$ 25.17	$ -	$ 1,381	$ 11	$ 755	$ -	$ 890	$ 775	$ 1,733	$ -	$ 1,203	$ 8	$ -	$ -	$ 368	$ 393	$ 475
SES 4-5	73%	$ 25.17	$ 1,814	$ 629	$ 2,515	$ 2,092	$ 1,839	$ 784	$ 2,691	$ 3,090	$ 3,022	$ 755	$ 364	$ 574	$ 499	$ 149	$ 94	$ 585
SES Remote	86%	$ 28.92	$ -	$ 9	$ -	$ -	$ -	$ 20	$ 226	$ 202	$ 149	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ω_{cc} SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Remote	1.9%																	
Non SES	56%	$ 8.56	$ -	$ 114	$ -	$ -	$ -	$ 308	$ 2,670	$ 1,007	$ 638	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SES Remote	44%	$ 8.56	$ -	$ 89	$ -	$ -	$ -	$ 242	$ 2,098	$ 792	$ 501	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ATSI	4.22%																	
Non SES, Non rem	27%	$ 88.34	$ 6,221	$ 6,976	$ 8,662	$ 9,793	$ 6,305	$ 5,829	$ 12,519	$ 17,127	$ 10,743	$ 6,764	$ 1,277	$ 1,968	$ 1,710	$ 1,791	$ 1,686	$ 3,654
SES 1-2	60%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ 50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SES 3	72%	$ 88.34	$ -	$ 12,911	$ 99	$ 7,055	$ -	$ 8,318	$ 7,247	$ 16,199	$ -	$ 11,243	$ 78	$ -	$ -	$ 3,443	$ 3,669	$ 4,438
SES 4-5	73%	$ 88.34	$ 16,958	$ 5,878	$ 23,510	$ 19,551	$ 17,186	$ 7,330	$ 25,154	$ 28,881	$ 28,247	$ 7,055	$ 3,402	$ 5,365	$ 4,662	$ 1,395	$ 881	$ 5,466
SES Remote	86%	$ 143.72	$ -	$ 125	$ -	$ -	$ -	$ 259	$ 2,994	$ 2,668	$ 1,973	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Credit Balance	-$ 105,663	-$ 118,536	-$ 141,535	-$ 184,756	-$ 63,448	-$ 126,073	-$ 184,885	-$ 84,996	-$ 35,924	-$ 64,650	-$ 120,247	-$ 131,847	-$ 144,742	-$ 157,850	-$ 137,238	-$ 122,801

Rural			DGP Code #	220	223	224	225	227	228	229	230	231	236	319	323	324	325	326	327
			SWPE	90,993	99,631	129,280	161,260	65,248	108,149	174,461	101,063	54,274	60,279	106,241	108,641	121,807	120,193	102,457	103,486
			ATSI	3,790	4,250	5,277	5,966	3,841	3,551	7,627	10,434	6,545	4,121	778	1,199	1,042	1,091	1,027	2,226
			% RRMA 1-2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.18%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 3	0.00%	68.74%	0.43%	26.76%	0.00%	53.01%	21.50%	35.13%	0.00%	61.74%	2.26%	0.00%	0.00%	71.42%	80.83%	45.12%
			% RRMA 4-5	100.00%	30.91%	99.57%	73.24%	100.00%	46.13%	73.71%	61.86%	96.46%	38.26%	97.74%	100.00%	100.00%	28.58%	19.17%	54.88%
			% RRMA 6-7	0.00%	0.34%	0.00%	0.00%	0.00%	0.86%	4.61%	3.01%	3.54%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SCENARIO Z (BENCHMARK ACTIVITY)	Stream A services per capita (A')			0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471
	Stream C services per capita (C')			0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
	Stream C vulnerable social groups (VC')			0.061	0.056	0.061	0.059	0.062	0.057	0.065	0.065	0.070	0.057	0.060	0.060	0.060	0.053	0.053	0.056
	Performance Ratio ($\beta = VC_n/VC'$)			1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Median unit values ($)																
Stream A mean unit value ($) x total services			$ 33.66	$ 1,443,031	$ 1,580,018	$ 2,050,213	$ 2,557,374	$ 1,034,748	$ 1,715,102	$ 2,766,724	$ 1,602,728	$ 860,715	$ 955,947	$ 1,684,844	$ 1,722,905	$ 1,931,701	$ 1,906,105	$ 1,624,835	$ 1,641,153
Stream C mean unit value ($) x total services			$ 14.28	$ 233,888	$ 256,092	$ 332,301	$ 414,503	$ 167,713	$ 277,986	$ 448,435	$ 259,772	$ 139,506	$ 154,941	$ 273,082	$ 279,251	$ 313,093	$ 308,944	$ 263,355	$ 266,000
ω_{cvd}	SES 1-2	20%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ 3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ 0.84	$ -	$ 792	$ 6	$ 499	$ -	$ 663	$ 434	$ 410	$ -	$ 430	$ 28	$ -	$ -	$ 992	$ 957	$ 540
	SES 4-5	33%	$ 0.84	$ 1,239	$ 420	$ 1,753	$ 1,609	$ 889	$ 680	$ 1,752	$ 852	$ 713	$ 314	$ 1,414	$ 1,480	$ 1,659	$ 468	$ 268	$ 774
	Remote	1.9%																	
	Non SES	56%	$ 1.02	$ -	$ 10	$ -	$ -	$ -	$ 26	$ 226	$ 85	$ 54	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES Remote	44%	$ 1.95	$ -	$ 14	$ -	$ -	$ -	$ 39	$ 339	$ 128	$ 81	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	4.22%																	
	Non SES, Non rem	27%	$ 22.32	$ 1,116	$ 1,252	$ 1,554	$ 1,757	$ 1,131	$ 1,046	$ 2,246	$ 3,073	$ 1,928	$ 1,214	$ 229	$ 353	$ 307	$ 321	$ 302	$ 656
	SES 1-2	60%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ 10	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	72%	$ 25.17	$ -	$ 2,613	$ 20	$ 1,428	$ -	$ 1,683	$ 1,466	$ 3,278	$ -	$ 2,275	$ 16	$ -	$ -	$ 697	$ 742	$ 898
	SES 4-5	73%	$ 25.17	$ 3,431	$ 1,189	$ 4,757	$ 3,956	$ 3,478	$ 1,483	$ 5,090	$ 5,844	$ 5,716	$ 1,428	$ 688	$ 1,086	$ 943	$ 282	$ 178	$ 1,106
	SES Remote	86%	$ 28.92	$ -	$ 18	$ -	$ -	$ -	$ 37	$ 428	$ 381	$ 282	$ -	$ -	$ -	$ -	$ -	$ -	$ -
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	1.9%																	
	Non SES	56%	$ 8.56	$ -	$ 215	$ -	$ -	$ -	$ 582	$ 5,049	$ 1,905	$ 1,206	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES Remote	44%	$ 8.56	$ -	$ 169	$ -	$ -	$ -	$ 457	$ 3,967	$ 1,497	$ 947	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	ATSI	4.22%																	
	Non SES, Non rem	27%	$ 88.34	$ 11,766	$ 13,194	$ 16,382	$ 18,521	$ 11,924	$ 11,024	$ 23,677	$ 32,391	$ 20,318	$ 12,793	$ 2,415	$ 3,722	$ 3,235	$ 3,387	$ 3,188	$ 6,910
	SES 1-2	60%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ 94	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	72%	$ 88.34	$ -	$ 24,419	$ 188	$ 13,342	$ -	$ 15,732	$ 13,705	$ 30,636	$ -	$ 21,264	$ 147	$ -	$ -	$ 6,512	$ 6,938	$ 8,394
	SES 4-5	73%	$ 88.34	$ 32,071	$ 11,117	$ 44,464	$ 36,976	$ 32,503	$ 13,863	$ 47,572	$ 54,622	$ 53,423	$ 13,344	$ 6,434	$ 10,146	$ 8,817	$ 2,639	$ 1,666	$ 10,338
	SES Remote	86%	$ 143.72	$ -	$ 236	$ -	$ -	$ -	$ 490	$ 5,663	$ 5,046	$ 3,731	$ -	$ -	$ -	$ -	$ -	$ -	$ -
			Credit Balance	**$ 165,092**	**$ 175,775**	**$ 250,148**	**$ 292,668**	**$ 148,439**	**$ 189,539**	**$ 352,160**	**$ 279,590**	**$ 173,704**	**$ 128,992**	**$ 176,716**	**$ 166,339**	**$ 190,510**	**$ 159,819**	**$ 131,730**	**$ 170,143**

Rural			DGP Code #	329	330	331	409	413	418	419	420	506	507	508	509	510	513	607	613	702	703	801
			SWPE	100,903	80,622	64,877	156,221	126,993	311,022	129,018	172,202	36,263	24,791	45,907	34,975	62,978	31,218	142,196	67,377	137,847	107,918	154,545
			ATSI	1,494	653	1,232	4,284	12,165	3,983	5,973	5,023	318	582	818	933	785	1,249	2,329	1,673	3,775	5,943	40,031
			% RRMA 1-2	0.00%	0.00%	18.42%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	44.07%
			% RRMA 3	75.86%	0.00%	0.00%	60.27%	94.27%	37.14%	46.24%	34.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	64.41%	0.00%	0.00%
			% RRMA 4-5	24.14%	100.00%	77.33%	39.73%	3.93%	62.86%	52.91%	64.59%	100.00%	100.00%	99.45%	99.61%	100.00%	100.00%	100.00%	100.00%	34.95%	98.49%	25.95%
			% RRMA 6-7	0.00%	0.00%	4.25%	0.00%	1.80%	0.00%	0.84%	0.80%	0.00%	0.00%	0.55%	0.39%	0.00%	0.00%	0.00%	0.00%	0.64%	1.51%	29.98%
SCENARIO X (CURRENT ACTIVITY)	Stream A services per capita (A_n)			0.581	0.465	0.478	0.557	0.606	0.576	0.565	0.573	0.465	0.465	0.505	0.464	0.516	0.542	0.521	0.528	0.562	0.532	0.532
	Stream C services per capita (C_n)			0.103	0.070	0.074	0.096	0.111	0.096	0.096	0.095	0.070	0.070	0.077	0.069	0.079	0.084	0.080	0.082	0.097	0.083	0.082
	Stream C vulnerable social groups (VC_n)			0.030	0.023	0.025	0.029	0.036	0.030	0.031	0.031	0.023	0.023	0.026	0.024	0.026	0.029	0.027	0.028	0.030	0.029	0.044
	Performance Ratio ($\beta = VC_n/VC'$)			0.570	0.386	0.409	0.532	0.617	0.535	0.531	0.529	0.386	0.386	0.430	0.386	0.441	0.469	0.446	0.454	0.541	0.459	0.453
			Median unit values ($)																			
Stream A mean unit value ($) x total services			$ 33.66	$ 1,971,855	$ 1,260,618	$ 1,043,760	$ 2,927,434	$ 2,590,362	$ 6,028,546	$ 2,454,592	$ 3,318,282	$ 567,014	$ 387,636	$ 780,080	$ 545,972	$ 1,093,008	$ 569,032	$ 2,491,173	$ 1,196,993	$ 2,606,681	$ 1,931,492	$ 2,766,012
Stream C mean unit value ($) x total services			$ 13.60	$ 140,689	$ 76,238	$ 64,861	$ 203,408	$ 191,886	$ 406,972	$ 167,565	$ 223,083	$ 34,291	$ 23,443	$ 48,291	$ 33,013	$ 68,005	$ 35,836	$ 155,366	$ 74,913	$ 182,474	$ 121,228	$ 171,283
ω_{cvd}	SES 1-2	20%	$ 0.84	$ -	$ -	$ 40	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 255
	SES 3	28%	$ 0.84	$ 504	$ -	$ -	$ 579	$ 854	$ 714	$ 366	$ 365	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 555	$ -	$ -
	SES 4-5	33%	$ 0.84	$ 189	$ 424	$ 279	$ 450	$ 42	$ 1,424	$ 493	$ 802	$ 191	$ 130	$ 267	$ 183	$ 379	$ 199	$ 865	$ 417	$ 355	$ 665	$ 247
	Remote	1.9%																				
	Non SES	56%	$ 1.02	$ -	$ -	$ 32	$ -	$ 40	$ -	$ 16	$ 20	$ -	$ -	$ 3	$ 1	$ -	$ -	$ -	$ -	$ 13	$ 21	$ 589
	SES Remote	44%	$ 1.95	$ -	$ -	$ 48	$ -	$ 60	$ -	$ 24	$ 31	$ -	$ -	$ 5	$ 2	$ -	$ -	$ -	$ -	$ 20	$ 32	$ 885
	ATSI	4.22%																				
	Non SES, Non rem	27%	$ 22.32	$ 251	$ 74	$ 148	$ 671	$ 2,212	$ 627	$ 934	$ 783	$ 36	$ 66	$ 104	$ 106	$ 102	$ 173	$ 306	$ 224	$ 601	$ 803	$ 5,339
	SES 1-2	60%	$ 25.17	$ -	$ -	$ 69	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,939
	SES 3	72%	$ 25.17	$ 577	$ -	$ -	$ 1,228	$ 6,332	$ 707	$ 1,311	$ 823	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,176	$ -	$ -
	SES 4-5	73%	$ 25.17	$ 186	$ 228	$ 352	$ 820	$ 267	$ 1,212	$ 1,519	$ 1,555	$ 111	$ 204	$ 317	$ 325	$ 314	$ 530	$ 941	$ 688	$ 646	$ 2,432	$ 4,258
	SES Remote	86%	$ 28.92	$ -	$ -	$ 26	$ -	$ 165	$ -	$ 33	$ 26	$ -	$ -	$ 2	$ 2	$ -	$ -	$ -	$ -	$ 16	$ 50	$ 6,609
0	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	1.9%																				
	Non SES	56%	$ 8.56	$ -	$ -	$ 707	$ -	$ 887	$ -	$ 363	$ 457	$ -	$ -	$ 68	$ 33	$ -	$ -	$ -	$ -	$ 298	$ 470	$ 13,162
	SES Remote	44%	$ 8.56	$ -	$ -	$ 556	$ -	$ 697	$ -	$ 285	$ 359	$ -	$ -	$ 53	$ 26	$ -	$ -	$ -	$ -	$ 234	$ 369	$ 10,341
	ATSI	4.22%																				
	Non SES, Non rem	27%	$ 88.34	$ 2,642	$ 783	$ 1,562	$ 7,076	$ 23,316	$ 6,611	$ 9,840	$ 8,254	$ 381	$ 698	$ 1,091	$ 1,117	$ 1,075	$ 1,819	$ 3,228	$ 2,360	$ 6,339	$ 8,468	$ 56,278
	SES 1-2	60%	$ 88.34	$ -	$ -	$ 644	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 55,513
	SES 3	72%	$ 88.34	$ 5,397	$ -	$ -	$ 11,481	$ 59,179	$ 6,611	$ 12,251	$ 7,692	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,992	$ -	$ -
	SES 4-5	73%	$ 88.34	$ 1,738	$ 2,135	$ 3,293	$ 7,663	$ 2,495	$ 11,327	$ 14,193	$ 14,532	$ 1,040	$ 1,903	$ 2,959	$ 3,033	$ 2,931	$ 4,957	$ 8,799	$ 6,432	$ 6,039	$ 22,734	$ 39,802
	SES Remote	86%	$ 143.72	$ -	$ -	$ 345	$ -	$ 2,179	$ -	$ 431	$ 342	$ -	$ -	$ 31	$ 22	$ -	$ -	$ -	$ -	$ 209	$ 664	$ 87,464
			Credit Balance	**-$ 205,201**	**$ 8,341**	**-$ 2,775**	**-$ 223,454**	**-$ 294,931**	**-$ 570,436**	**-$ 194,484**	**-$ 291,848**	**$ 3,798**	**$ 3,291**	**-$ 20,268**	**$ 5,220**	**-$ 39,472**	**-$ 31,087**	**-$ 99,108**	**-$ 53,773**	**-$ 212,631**	**-$ 84,156**	**-$ 12,883**

Rural			DGP Code #	329	330	331	409	413	418	419	420	506	507	508	509	510	513	607	613	702	703	801
			SWPE	100,903	80,622	64,877	156,221	126,993	311,022	129,018	172,202	36,263	24,791	45,907	34,975	62,978	31,218	142,196	67,377	137,847	107,918	154,545
			ATSI	1,494	653	1,232	4,284	12,165	3,983	5,973	5,023	318	582	818	933	785	1,249	2,329	1,673	3,775	5,943	40,031
			% RRMA 1-2	0.00%	0.00%	18.42%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	44.07%
			% RRMA 3	75.86%	0.00%	0.00%	60.27%	94.27%	37.14%	46.24%	34.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	64.41%	0.00%	0.00%
			% RRMA 4-5	24.14%	100.00%	77.33%	39.73%	3.93%	62.86%	52.91%	64.59%	100.00%	100.00%	99.45%	99.61%	100.00%	100.00%	100.00%	100.00%	34.95%	98.49%	25.95%
			% RRMA 6-7	0.00%	0.00%	4.25%	0.00%	1.80%	0.00%	0.84%	0.80%	0.00%	0.00%	0.55%	0.39%	0.00%	0.00%	0.00%	0.00%	0.64%	1.51%	29.98%
SCENARIO Y (NATIONAL W'TED AVERAGE ACTIVITY)	Stream A services per capita (A_n)			0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545
	Stream C services per capita (C_n)			0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
	Stream C vulnerable social groups (VC_n)			0.028	0.032	0.032	0.029	0.031	0.030	0.031	0.031	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.029	0.034	0.052
	Performance Ratio ($\beta = VC_n/VC'$)			0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529
			Median unit values ($)																			
Stream A mean unit value ($) x total services			$ 33.66	$ 1,850,140	$ 1,478,271	$1,189,573	$ 2,864,441	$ 2,328,522	$ 5,702,846	$ 2,365,652	$ 3,157,466	$ 664,912	$ 454,564	$ 841,743	$ 641,296	$ 1,154,754	$ 572,408	$ 2,607,281	$ 1,235,413	$ 2,527,539	$ 1,978,766	$ 2,833,710
Stream C mean unit value ($) x total services			$ 13.60	$ 130,571	$ 104,327	$ 83,953	$ 202,154	$ 164,332	$ 402,470	$ 166,953	$ 222,834	$ 46,925	$ 32,080	$ 59,405	$ 45,259	$ 81,495	$ 40,397	$ 184,005	$ 87,188	$ 178,378	$ 139,649	$ 199,985
ω_{cvd}	SES 1-2	20%	$ 0.84	$ -	$ -	$ 52	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 297
	SES 3	28%	$ 0.84	$ 468	$ -	$ -	$ 575	$ 732	$ 706	$ 365	$ 364	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 543	$ -	$ -
	SES 4-5	33%	$ 0.84	$ 175	$ 581	$ 361	$ 447	$ 36	$ 1,408	$ 492	$ 801	$ 261	$ 179	$ 329	$ 251	$ 454	$ 225	$ 1,024	$ 485	$ 347	$ 766	$ 289
	Remote	1.9%																				
	Non SES	56%	$ 1.02	$ -	$ -	$ 41	$ -	$ 34	$ -	$ 16	$ 20	$ -	$ -	$ 4	$ 2	$ -	$ -	$ -	$ -	$ 13	$ 24	$ 688
	SES Remote	44%	$ 1.95	$ -	$ -	$ 62	$ -	$ 51	$ -	$ 24	$ 31	$ -	$ -	$ 6	$ 3	$ -	$ -	$ -	$ -	$ 20	$ 36	$ 1,033
	ATSI	4.22%																				
	Non SES, Non rem	27%	$ 22.32	$ 233	$ 102	$ 192	$ 667	$ 1,895	$ 620	$ 930	$ 782	$ 50	$ 91	$ 127	$ 145	$ 122	$ 195	$ 363	$ 261	$ 588	$ 926	$ 6,234
	SES 1-2	60%	$ 25.17	$ -	$ -	$ 89	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,935
	SES 3	72%	$ 25.17	$ 536	$ -	$ -	$ 1,221	$ 5,422	$ 700	$ 1,306	$ 822	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,150	$ -	$ -
	SES 4-5	73%	$ 25.17	$ 173	$ 313	$ 456	$ 815	$ 229	$ 1,198	$ 1,513	$ 1,553	$ 152	$ 279	$ 389	$ 445	$ 376	$ 598	$ 1,115	$ 801	$ 632	$ 2,802	$ 4,972
	SES Remote	86%	$ 28.92	$ -	$ -	$ 34	$ -	$ 141	$ -	$ 32	$ 26	$ -	$ -	$ 3	$ 2	$ -	$ -	$ -	$ -	$ 15	$ 58	$ 7,717
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	1.9%																				
	Non SES	56%	$ 8.56	$ -	$ -	$ 915	$ -	$ 759	$ -	$ 361	$ 456	$ -	$ -	$ 84	$ 45	$ -	$ -	$ -	$ -	$ 291	$ 541	$ 15,367
	SES Remote	44%	$ 8.56	$ -	$ -	$ 719	$ -	$ 597	$ -	$ 284	$ 358	$ -	$ -	$ 66	$ 35	$ -	$ -	$ -	$ -	$ 229	$ 425	$ 12,074
	ATSI	4.22%																				
	Non SES, Non rem	27%	$ 88.34	$ 2,452	$ 1,072	$ 2,022	$ 7,032	$ 19,968	$ 6,538	$ 9,804	$ 8,245	$ 522	$ 955	$ 1,343	$ 1,531	$ 1,289	$ 2,050	$ 3,823	$ 2,746	$ 6,196	$ 9,755	$ 65,708
	SES 1-2	60%	$ 88.34	$ -	$ -	$ 834	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 64,815
	SES 3	72%	$ 88.34	$ 5,009	$ -	$ -	$ 11,410	$ 50,681	$ 6,538	$ 12,206	$ 7,683	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,746	$ -	$ -
	SES 4-5	73%	$ 88.34	$ 1,613	$ 2,922	$ 4,263	$ 7,616	$ 2,137	$ 11,201	$ 14,141	$ 14,516	$ 1,423	$ 2,604	$ 3,640	$ 4,158	$ 3,512	$ 5,588	$ 10,421	$ 7,485	$ 5,903	$ 26,189	$ 46,471
	SES Remote	86%	$ 143.72	$ -	$ -	$ 446	$ -	$ 1,866	$ -	$ 429	$ 341	$ -	$ -	$ 38	$ 31	$ -	$ -	$ -	$ -	$ 204	$ 765	$ 102,121
			Credit Balance	-$ 131,874	-$ 88,107	-$ 69,336	-$ 189,530	-$ 136,198	-$ 394,464	-$ 147,152	-$ 206,644	-$ 39,543	-$ 25,732	-$ 51,064	-$ 35,819	-$ 72,313	-$ 33,900	-$ 162,248	-$ 75,531	-$ 168,504	-$ 109,250	-$ 10,260

Rural			DGP Code #	329	330	331	409	413	418	419	420	506	507	508	509	510	513	607	613	702	703	801
			SWPE	100,903	80,622	64,877	156,221	126,993	311,022	129,018	172,202	36,263	24,791	45,907	34,975	62,978	31,218	142,196	67,377	137,847	107,918	154,545
			ATSI	1,494	653	1,232	4,284	12,165	3,983	5,973	5,023	318	582	818	933	785	1,249	2,329	1,673	3,775	5,943	40,031
			% RRMA 1-2	0.00%	0.00%	18.42%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	44.07%
			% RRMA 3	75.86%	0.00%	0.00%	60.27%	94.27%	37.14%	46.24%	34.61%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	64.41%	0.00%	0.00%
			% RRMA 4-5	24.14%	100.00%	77.33%	39.73%	3.93%	62.86%	52.91%	64.59%	100.00%	100.00%	99.45%	99.61%	100.00%	100.00%	100.00%	100.00%	34.95%	98.49%	25.95%
			% RRMA 6-7	0.00%	0.00%	4.25%	0.00%	1.80%	0.00%	0.84%	0.80%	0.00%	0.00%	0.55%	0.39%	0.00%	0.00%	0.00%	0.00%	0.64%	1.51%	29.98%
SCENARIO Z (BENCHMARK ACTIVITY)	Stream A services per capita (A')			0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471
	Stream C services per capita (C')			0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
	Stream C vulnerable social groups (VC')			0.053	0.060	0.061	0.055	0.058	0.057	0.058	0.059	0.060	0.061	0.061	0.061	0.060	0.061	0.060	0.061	0.056	0.064	0.098
	Performance Ratio ($\beta = VC_n/VC'$)			1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Median unit values ($)																			
Stream A mean unit value ($) x total services			$ 33.66	$ 1,600,190	$ 1,278,560	$1,028,865	$ 2,477,462	$ 2,013,944	$ 4,932,404	$ 2,046,058	$ 2,730,900	$ 575,084	$ 393,153	$ 728,025	$ 554,658	$ 998,749	$ 495,077	$ 2,255,044	$ 1,068,512	$ 2,186,074	$ 1,711,439	$ 2,450,883
Stream C mean unit value ($) x total services			$ 14.28	$ 259,361	$ 207,231	$ 166,760	$ 401,550	$ 326,423	$ 799,451	$ 331,628	$ 442,628	$ 93,210	$ 63,723	$ 117,999	$ 89,900	$ 161,879	$ 80,243	$ 365,501	$ 173,186	$ 354,322	$ 277,392	$ 397,242
ω_{cvd}	SES 1-2	20%	$ 0.84	$ -	$ -	$ 99	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 562
	SES 3	28%	$ 0.84	$ 885	$ -	$ -	$ 1,088	$ 1,384	$ 1,335	$ 690	$ 689	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,026	$ -	$ -
	SES 4-5	33%	$ 0.84	$ 332	$ 1,098	$ 683	$ 846	$ 68	$ 2,663	$ 930	$ 1,515	$ 494	$ 338	$ 622	$ 475	$ 858	$ 425	$ 1,937	$ 918	$ 656	$ 1,448	$ 546
	Remote	1.9%																				
	Non SES	56%	$ 1.02	$ -	$ -	$ 77	$ -	$ 64	$ -	$ 31	$ 39	$ -	$ -	$ 7	$ 4	$ -	$ -	$ -	$ -	$ 25	$ 46	$ 1,300
	SES Remote	44%	$ 1.95	$ -	$ -	$ 116	$ -	$ 97	$ -	$ 46	$ 58	$ -	$ -	$ 11	$ 6	$ -	$ -	$ -	$ -	$ 37	$ 69	$ 1,953
	ATSI	4.22%																				
	Non SES, Non rem	27%	$ 22.32	$ 440	$ 192	$ 363	$ 1,262	$ 3,583	$ 1,173	$ 1,759	$ 1,479	$ 94	$ 171	$ 241	$ 275	$ 231	$ 368	$ 686	$ 493	$ 1,112	$ 1,750	$ 11,791
	SES 1-2	60%	$ 25.17	$ -	$ -	$ 169	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 13,115
	SES 3	72%	$ 25.17	$ 1,014	$ -	$ -	$ 2,309	$ 10,255	$ 1,323	$ 2,470	$ 1,555	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,174	$ -	$ -
	SES 4-5	73%	$ 25.17	$ 326	$ 591	$ 863	$ 1,541	$ 432	$ 2,267	$ 2,861	$ 2,937	$ 288	$ 527	$ 737	$ 841	$ 711	$ 1,131	$ 2,109	$ 1,515	$ 1,195	$ 5,299	$ 9,404
	SES Remote	86%	$ 28.92	$ -	$ -	$ 64	$ -	$ 267	$ -	$ 61	$ 49	$ -	$ -	$ 5	$ 4	$ -	$ -	$ -	$ -	$ 29	$ 109	$ 14,594
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	1.9%																				
	Non SES	56%	$ 8.56	$ -	$ -	$ 1,731	$ -	$ 1,436	$ -	$ 684	$ 862	$ -	$ -	$ 158	$ 85	$ -	$ -	$ -	$ -	$ 550	$ 1,024	$ 29,063
	SES Remote	44%	$ 8.56	$ -	$ -	$ 1,360	$ -	$ 1,128	$ -	$ 537	$ 678	$ -	$ -	$ 124	$ 67	$ -	$ -	$ -	$ -	$ 432	$ 804	$ 22,836
	ATSI	4.22%																				
	Non SES, Non rem	27%	$ 88.34	$ 4,638	$ 2,027	$ 3,825	$ 13,299	$ 37,765	$ 12,365	$ 18,542	$ 15,593	$ 987	$ 1,807	$ 2,539	$ 2,896	$ 2,437	$ 3,877	$ 7,230	$ 5,194	$ 11,719	$ 18,449	$ 124,271
	SES 1-2	60%	$ 88.34	$ -	$ -	$ 1,576	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 122,582
	SES 3	72%	$ 88.34	$ 9,473	$ -	$ -	$ 21,579	$ 95,851	$ 12,365	$ 23,085	$ 14,531	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,323	$ -	$ -
	SES 4-5	73%	$ 88.34	$ 3,051	$ 5,526	$ 8,062	$ 14,404	$ 4,041	$ 21,185	$ 26,745	$ 27,454	$ 2,691	$ 4,925	$ 6,884	$ 7,865	$ 6,643	$ 10,569	$ 19,708	$ 14,157	$ 11,165	$ 49,529	$ 87,889
	SES Remote	86%	$ 143.72	$ -	$ -	$ 843	$ -	$ 3,529	$ -	$ 812	$ 645	$ -	$ -	$ 72	$ 58	$ -	$ -	$ -	$ -	$ 387	$ 1,446	$ 193,137
			Credit Balance	**$ 138,831**	**$ 140,427**	**$ 120,886**	**$ 254,470**	**$ 290,907**	**$ 447,155**	**$ 242,503**	**$ 286,983**	**$ 63,473**	**$ 48,048**	**$ 81,037**	**$ 69,404**	**$ 104,753**	**$ 60,777**	**$ 241,804**	**$ 120,549**	**$ 222,292**	**$ 234,693**	**$ 665,867**

Rural/Remote			DGP Code #	232	241	328	332	410	411	414	416	417	511	512	609	612	615
			SWPE	63,177	23,594	75,600	87,561	70,185	118,282	172,374	115,669	106,091	56,218	25,901	73,751	60,634	47,599
			ATSI	2,694	2,206	1,521	3,198	3,283	4,367	8,704	15,583	23,981	2,933	4,172	2,990	6,972	2,369
			% RRMA 1-2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 3	0.26%	0.00%	0.00%	0.00%	0.16%	57.91%	0.00%	0.05%	0.74%	38.29%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	88.89%	86.50%	88.66%	82.17%	45.60%	36.92%	72.39%	62.72%	55.98%	45.77%	60.06%	84.91%	60.47%	79.15%
			% RRMA 6-7	10.85%	13.50%	11.34%	17.83%	54.24%	5.18%	21.10%	37.23%	43.28%	15.94%	39.94%	15.09%	39.53%	20.85%
SCENARIO X (CURRENT ACTIVITY)	Stream A services per capita (A_n)			0.497	0.556	0.513	0.502	0.475	0.548	0.454	0.449	0.430	0.526	0.457	0.497	0.489	0.426
	Stream C services per capita (C_n)			0.076	0.088	0.080	0.078	0.076	0.103	0.073	0.069	0.066	0.088	0.070	0.077	0.077	0.063
	Stream C vulnerable social groups (VC_n)			0.031	0.039	0.033	0.036	0.054	0.036	0.034	0.042	0.044	0.038	0.044	0.034	0.048	0.030
	Performance Ratio ($\beta = VC_n/VC'$)			0.425	0.488	0.442	0.433	0.424	0.575	0.404	0.385	0.368	0.487	0.390	0.426	0.428	0.352
			Median unit values ($)														
Stream A mean unit value ($) x total services			$ 33.66	$ 1,056,736	$ 441,208	$ 1,305,932	$ 1,480,280	$ 1,120,848	$ 2,182,152	$ 2,632,634	$ 1,746,598	$ 1,534,581	$ 995,953	$ 398,074	$ 1,233,512	$ 997,792	$ 682,591
Stream C mean unit value ($) x total services			$ 13.60	$ 65,681	$ 28,200	$ 81,819	$ 92,685	$ 72,908	$ 166,368	$ 170,277	$ 108,871	$ 95,445	$ 67,061	$ 24,753	$ 76,934	$ 63,463	$ 40,993
ω_{cvd}	**SES 1-2**	20%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ 37	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ 0.84	$ 1	$ -	$ -	$ -	$ 1	$ 455	$ -	$ 0	$ 3	$ 121	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ 325	$ 136	$ 404	$ 424	$ 185	$ 342	$ 686	$ 380	$ 297	$ 171	$ 83	$ 364	$ 214	$ 181
	Remote	24%															
	Non SES	56%	$ 1.02	$ 82	$ 44	$ 106	$ 189	$ 454	$ 99	$ 412	$ 465	$ 474	$ 123	$ 113	$ 133	$ 288	$ 98
	SES Remote	44%	$ 1.95	$ 123	$ 66	$ 160	$ 285	$ 681	$ 148	$ 619	$ 698	$ 712	$ 184	$ 170	$ 200	$ 432	$ 147
	ATSI	7.75%															
	Non SES, Non rem	20%	$ 22.32	$ 255	$ 240	$ 150	$ 308	$ 310	$ 559	$ 782	$ 1,334	$ 1,963	$ 318	$ 363	$ 284	$ 664	$ 186
	SES 1-2	60%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ 170	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	72%	$ 25.17	$ 3	$ -	$ -	$ -	$ 2	$ 1,300	$ -	$ 3	$ 59	$ 489	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ 921	$ 844	$ 540	$ 1,029	$ 575	$ 839	$ 2,303	$ 3,403	$ 4,468	$ 592	$ 886	$ 980	$ 1,632	$ 597
	SES Remote	86%	$ 28.92	$ 151	$ 177	$ 93	$ 300	$ 919	$ 158	$ 902	$ 2,713	$ 4,639	$ 277	$ 791	$ 234	$ 1,433	$ 211
ω_{cc}	**SES 1-2**	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	24%															
	Non SES	56%	$ 8.56	$ 1,826	$ 976	$ 2,378	$ 4,235	$ 10,137	$ 2,208	$ 9,210	$ 10,390	$ 10,587	$ 2,740	$ 2,534	$ 2,976	$ 6,431	$ 2,191
	SES Remote	44%	$ 8.56	$ 1,435	$ 767	$ 1,868	$ 3,327	$ 7,964	$ 1,735	$ 7,237	$ 8,163	$ 8,319	$ 2,153	$ 1,991	$ 2,338	$ 5,053	$ 1,721
	ATSI	7.75%															
	Non SES, Non rem	20%	$ 88.34	$ 2,686	$ 2,529	$ 1,579	$ 3,246	$ 3,270	$ 5,890	$ 8,245	$ 14,065	$ 20,689	$ 3,355	$ 3,824	$ 2,991	$ 6,998	$ 1,957
	SES 1-2	60%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,588	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	72%	$ 88.34	$ 25	$ -	$ -	$ -	$ 19	$ 12,147	$ -	$ 25	$ 548	$ 4,575	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ 8,608	$ 7,886	$ 5,046	$ 9,618	$ 5,377	$ 7,840	$ 21,522	$ 31,807	$ 41,759	$ 5,537	$ 8,280	$ 9,157	$ 15,256	$ 5,584
	SES Remote	86%	$ 143.72	$ 1,998	$ 2,341	$ 1,227	$ 3,968	$ 12,165	$ 2,091	$ 11,932	$ 35,910	$ 61,398	$ 3,668	$ 10,472	$ 3,096	$ 18,971	$ 2,797
			Credit Balance	**-$ 15,460**	**-$ 24,924**	**-$ 41,331**	**-$ 28,004**	**$ 14,539**	**-$ 155,486**	**$ 67,261**	**$ 75,811**	**$ 111,679**	**-$ 39,045**	**$ 16,475**	**-$ 17,546**	**$ 9,048**	**$ 30,945**

Rural/Remote			DGP Code #	232	241	328	332	410	411	414	416	417	511	512	609	612	615
			SWPE	63,177	23,594	75,600	87,561	70,185	118,282	172,374	115,669	106,091	56,218	25,901	73,751	60,634	47,599
			ATSI	2,694	2,206	1,521	3,198	3,283	4,367	8,704	15,583	23,981	2,933	4,172	2,990	6,972	2,369
			% RRMA 1-2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 3	0.26%	0.00%	0.00%	0.00%	0.16%	57.91%	0.00%	0.05%	0.74%	38.29%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	88.89%	86.50%	88.66%	82.17%	45.60%	36.92%	72.39%	62.72%	55.98%	45.77%	60.06%	84.91%	60.47%	79.15%
			% RRMA 6-7	10.85%	13.50%	11.34%	17.83%	54.24%	5.18%	21.10%	37.23%	43.28%	15.94%	39.94%	15.09%	39.53%	20.85%
SCENARIO Y (NATIONAL W'TED AVERAGE ACTIVITY)	Stream A services per capita (A_n)			0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545	0.545
	Stream C services per capita (C_n)			0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
	Stream C vulnerable social groups (VC_n)			0.039	0.042	0.039	0.043	0.067	0.033	0.045	0.058	0.063	0.041	0.060	0.042	0.059	0.046
	Performance Ratio ($\beta = VC_n/VC'$)			0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529	0.529
			Median unit values ($)														
Stream A mean unit value ($) x total services			$ 33.66	$ 1,158,403	$ 432,616	$ 1,386,189	$ 1,605,503	$ 1,286,900	$ 2,168,798	$ 3,160,620	$ 2,120,887	$ 1,945,266	$ 1,030,804	$ 474,916	$ 1,352,286	$ 1,111,775	$ 872,767
Stream C mean unit value ($) x total services			$ 13.60	$ 81,753	$ 30,531	$ 97,828	$ 113,306	$ 90,821	$ 153,060	$ 223,056	$ 149,679	$ 137,284	$ 72,748	$ 33,517	$ 95,436	$ 78,462	$ 61,594
ω_{cvd}	SES 1-2	20%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ 49	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ 0.84	$ 1	$ -	$ -	$ -	$ 1	$ 419	$ -	$ 0	$ 5	$ 132	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ 404	$ 147	$ 483	$ 518	$ 230	$ 314	$ 899	$ 523	$ 428	$ 185	$ 112	$ 451	$ 264	$ 271
	Remote	24%															
	Non SES	56%	$ 1.02	$ 102	$ 47	$ 127	$ 232	$ 565	$ 91	$ 540	$ 639	$ 681	$ 133	$ 154	$ 165	$ 356	$ 147
	SES Remote	44%	$ 1.95	$ 153	$ 71	$ 191	$ 348	$ 849	$ 137	$ 811	$ 960	$ 1,024	$ 200	$ 231	$ 248	$ 534	$ 221
	ATSI	7.75%															
	Non SES, Non rem	20%	$ 22.32	$ 317	$ 260	$ 179	$ 377	$ 387	$ 514	$ 1,025	$ 1,835	$ 2,823	$ 345	$ 491	$ 352	$ 821	$ 279
	SES 1-2	60%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ 223	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	72%	$ 25.17	$ 3	$ -	$ -	$ -	$ 2	$ 1,196	$ -	$ 4	$ 84	$ 531	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ 1,146	$ 913	$ 646	$ 1,258	$ 717	$ 772	$ 3,016	$ 4,679	$ 6,427	$ 643	$ 1,200	$ 1,215	$ 2,018	$ 898
	SES Remote	86%	$ 28.92	$ 188	$ 192	$ 111	$ 367	$ 1,145	$ 145	$ 1,181	$ 3,731	$ 6,673	$ 301	$ 1,071	$ 290	$ 1,772	$ 318
ω_{cc}	SES 1-2	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	24%															
	Non SES	56%	$ 8.56	$ 2,273	$ 1,057	$ 2,843	$ 5,177	$ 12,627	$ 2,031	$ 12,065	$ 14,284	$ 15,228	$ 2,972	$ 3,431	$ 3,692	$ 7,951	$ 3,292
	SES Remote	44%	$ 8.56	$ 1,786	$ 830	$ 2,234	$ 4,068	$ 9,921	$ 1,596	$ 9,480	$ 11,223	$ 11,965	$ 2,336	$ 2,696	$ 2,901	$ 6,247	$ 2,586
	ATSI	7.75%															
	Non SES, Non rem	20%	$ 88.34	$ 3,343	$ 2,737	$ 1,887	$ 3,969	$ 4,074	$ 5,419	$ 10,801	$ 19,337	$ 29,759	$ 3,640	$ 5,177	$ 3,710	$ 8,652	$ 2,940
	SES 1-2	60%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,080	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	72%	$ 88.34	$ 31	$ -	$ -	$ -	$ 23	$ 11,175	$ -	$ 34	$ 788	$ 4,963	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ 10,715	$ 8,538	$ 6,034	$ 11,758	$ 6,698	$ 7,213	$ 28,192	$ 43,729	$ 60,065	$ 6,006	$ 11,211	$ 11,359	$ 18,862	$ 8,390
	SES Remote	86%	$ 143.72	$ 2,486	$ 2,535	$ 1,467	$ 4,851	$ 15,153	$ 1,924	$ 15,630	$ 49,371	$ 88,312	$ 3,979	$ 14,179	$ 3,840	$ 23,454	$ 4,203
			Credit Balance	**-$ 62,116**	**-$ 20,509**	**-$ 81,988**	**-$ 86,375**	**-$ 54,753**	**-$ 144,539**	**-$ 152,397**	**-$ 50,427**	**$ 1,745**	**-$ 56,686**	**-$ 8,166**	**-$ 71,891**	**-$ 33,981**	**-$ 39,002**

Rural/Remote			DGP Code #	232	241	328	332	410	411	414	416	417	511	512	609	612	615
			SWPE	63,177	23,594	75,600	87,561	70,185	118,282	172,374	115,669	106,091	56,218	25,901	73,751	60,634	47,599
			ATSI	2,694	2,206	1,521	3,198	3,283	4,367	8,704	15,583	23,981	2,933	4,172	2,990	6,972	2,369
			% RRMA 1-2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
			% RRMA 3	0.26%	0.00%	0.00%	0.00%	0.16%	57.91%	0.00%	0.05%	0.74%	38.29%	0.00%	0.00%	0.00%	0.00%
			% RRMA 4-5	88.89%	86.50%	88.66%	82.17%	45.60%	36.92%	72.39%	62.72%	55.98%	45.77%	60.06%	84.91%	60.47%	79.15%
			% RRMA 6-7	10.85%	13.50%	11.34%	17.83%	54.24%	5.18%	21.10%	37.23%	43.28%	15.94%	39.94%	15.09%	39.53%	20.85%
SCENARIO Z (BENCHMARK ACTIVITY)	Stream A services per capita (A')			0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471	0.471
	Stream C services per capita (C')			0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
	Stream C vulnerable social groups (VC')			0.074	0.079	0.074	0.082	0.127	0.062	0.085	0.109	0.120	0.077	0.113	0.079	0.111	0.086
	Performance Ratio ($\beta = VC_n/VC'$)			1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
			Median unit values ($)														
Stream A mean unit value ($) x total services			$ 33.66	$ 1,001,905	$ 374,170	$ 1,198,918	$ 1,388,604	$ 1,113,043	$ 1,875,799	$ 2,733,627	$ 1,834,360	$ 1,682,465	$ 891,544	$ 410,756	$ 1,169,595	$ 961,576	$ 754,858
Stream C mean unit value ($) x total services			$ 14.28	$ 162,390	$ 60,646	$ 194,322	$ 225,067	$ 180,404	$ 304,032	$ 443,070	$ 297,316	$ 272,696	$ 144,503	$ 66,576	$ 189,570	$ 155,854	$ 122,348
ω_{cvd}	**SES 1-2**	20%	$ 0.84	$ -	$ -	$ -	$ -	$ -	$ -	$ 93	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ 0.84	$ 2	$ -	$ -	$ -	$ 1	$ 792	$ -	$ 1	$ 9	$ 249	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ 0.84	$ 765	$ 278	$ 913	$ 980	$ 436	$ 595	$ 1,700	$ 988	$ 809	$ 350	$ 212	$ 853	$ 499	$ 513
	Remote	24%															
	Non SES	56%	$ 1.02	$ 192	$ 89	$ 241	$ 438	$ 1,069	$ 172	$ 1,021	$ 1,209	$ 1,289	$ 252	$ 290	$ 312	$ 673	$ 279
	SES Remote	44%	$ 1.95	$ 289	$ 134	$ 361	$ 658	$ 1,605	$ 258	$ 1,534	$ 1,816	$ 1,936	$ 378	$ 436	$ 469	$ 1,011	$ 418
	ATSI	7.75%															
	Non SES, Non rem	20%	$ 22.32	$ 600	$ 491	$ 339	$ 712	$ 731	$ 972	$ 1,938	$ 3,470	$ 5,340	$ 653	$ 929	$ 666	$ 1,552	$ 528
	SES 1-2	60%	$ 25.17	$ -	$ -	$ -	$ -	$ -	$ -	$ 421	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	72%	$ 25.17	$ 6	$ -	$ -	$ -	$ 5	$ 2,261	$ -	$ 7	$ 159	$ 1,004	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 25.17	$ 2,168	$ 1,728	$ 1,221	$ 2,379	$ 1,355	$ 1,460	$ 5,705	$ 8,849	$ 12,154	$ 1,215	$ 2,269	$ 2,299	$ 3,817	$ 1,698
	SES Remote	86%	$ 28.92	$ 355	$ 362	$ 210	$ 693	$ 2,166	$ 275	$ 2,234	$ 7,056	$ 12,621	$ 569	$ 2,026	$ 549	$ 3,352	$ 601
ω_{cc}	**SES 1-2**	20%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	28%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5	33%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remote	24%															
	Non SES	56%	$ 8.56	$ 4,299	$ 1,998	$ 5,377	$ 9,791	$ 23,881	$ 3,842	$ 22,819	$ 27,015	$ 28,801	$ 5,622	$ 6,489	$ 6,982	$ 15,037	$ 6,225
	SES Remote	44%	$ 8.56	$ 3,377	$ 1,570	$ 4,225	$ 7,693	$ 18,764	$ 3,019	$ 17,929	$ 21,226	$ 22,629	$ 4,417	$ 5,099	$ 5,486	$ 11,815	$ 4,891
	ATSI	7.75%															
	Non SES, Non rem	20%	$ 88.34	$ 6,323	$ 5,177	$ 3,570	$ 7,505	$ 7,705	$ 10,249	$ 20,428	$ 36,572	$ 56,282	$ 6,884	$ 9,791	$ 7,017	$ 16,363	$ 5,560
	SES 1-2	60%	$ 88.34	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,934	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3	72%	$ 88.34	$ 59	$ -	$ -	$ -	$ 44	$ 21,135	$ -	$ 64	$ 1,490	$ 9,386	$ -	$ -	$ -	$ -
	SES 4-5	73%	$ 88.34	$ 20,265	$ 16,147	$ 11,411	$ 22,237	$ 12,667	$ 13,642	$ 53,319	$ 82,703	$ 113,598	$ 11,360	$ 21,203	$ 21,483	$ 35,673	$ 15,867
	SES Remote	86%	$ 143.72	$ 4,703	$ 4,794	$ 2,775	$ 9,175	$ 28,659	$ 3,639	$ 29,560	$ 93,373	$ 167,022	$ 7,525	$ 26,817	$ 7,263	$ 44,359	$ 7,949
			Credit Balance	**$ 140,112**	**$ 65,215**	**$ 143,145**	**$ 194,645**	**$ 206,584**	**$ 199,974**	**$ 435,426**	**$ 472,793**	**$ 601,389**	**$ 127,305**	**$ 117,384**	**$ 166,015**	**$ 226,541**	**$ 125,884**

Remote				DGP Code #	233	610	611	614	802
				SWPE	16,993	34,928	55,370	38,608	46,984
				ATSI	4,441	16,001	6,483	6,556	21,559
				% RRMA 1-2	0.00%	0.00%	0.00%	0.00%	0.00%
				% RRMA 3	0.00%	0.00%	0.00%	0.00%	0.00%
				% RRMA 4-5	0.00%	0.00%	0.00%	0.00%	0.00%
				% RRMA 6-7	100.00%	100.00%	100.00%	100.00%	100.00%
SCENARIO X (CURRENT ACTIVITY)	Stream A services per capita (A_n)				0.266	0.385	0.490	0.516	0.429
	Stream C services per capita (C_n)				0.037	0.062	0.084	0.089	0.071
	Stream C vulnerable social groups (VC_n)				0.037	0.062	0.084	0.089	0.071
	Performance Ratio ($\beta = VC_n/VC'$)				0.205	0.343	0.465	0.495	0.393
				Median unit values ($)					
Stream A mean unit value ($) x total services				$ 33.66	$ 152,207	$ 452,276	$ 913,524	$ 670,872	$ 677,731
Stream C mean unit value ($) x total services				$ 13.60	$ 8,524	$ 29,282	$ 62,998	$ 46,786	$ 45,238
ω_{cvd}	SES 1-2		20%	$ 0.84	$ -	$ -	$ -	$ -	$ -
	SES 3		28%	$ 0.84	$ -	$ -	$ -	$ -	$ -
	SES 4-5		33%	$ 0.84	$ -	$ -	$ -	$ -	$ -
	Remote		100%						
		Non SES	56%	$ 1.02	$ 98	$ 336	$ 723	$ 537	$ 519
		SES Remote	44%	$ 1.95	$ 147	$ 504	$ 1,085	$ 806	$ 779
	ATSI		28.54%						
		Non SES, Non rem	0%	$ 22.32	$ -	$ -	$ -	$ -	$ -
		SES 1-2	60%	$ 25.17	$ -	$ -	$ -	$ -	$ -
		SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -
		SES 4-5	73%	$ 25.17	$ -	$ -	$ -	$ -	$ -
		SES Remote	86%	$ 28.92	$ 1,107	$ 6,665	$ 3,665	$ 3,948	$ 10,314
ω_{cc}	SES 1-2		20%	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3		28%	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5		33%	$ -	$ -	$ -	$ -	$ -	$ -
	Remote		100%						
		Non SES	56%	$ 8.56	$ 2,185	$ 7,505	$ 16,147	$ 11,992	$ 11,595
		SES Remote	44%	$ 8.56	$ 1,717	$ 5,897	$ 12,687	$ 9,422	$ 9,110
	ATSI		28.54%						
		Non SES, Non rem	0%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES 1-2	60%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES 4-5	73%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES Remote	86%	$ 143.72	$ 14,649	$ 88,211	$ 48,504	$ 52,243	$ 136,500
				Credit Balance	**$ 28,119**	**$ 72,195**	**$ 22,029**	**$ 10,076**	**$ 92,923**
SCENARIO Y (NATIONAL W'TED AVERAGE ACTIVITY)	Stream A services per capita (A_n)				0.545	0.545	0.545	0.545	0.545
	Stream C services per capita (C_n)				0.095	0.095	0.095	0.095	0.095
	Stream C vulnerable social groups (VC_n)				0.095	0.095	0.095	0.095	0.095
	Performance Ratio ($\beta = VC_n/VC'$)				0.529	0.529	0.529	0.529	0.529
				Median unit values ($)					
Stream A mean unit value ($) x total services				$ 33.66	$ 311,581	$ 640,434	$ 1,015,255	$ 707,910	$ 861,491
Stream C mean unit value ($) x total services				$ 13.60	$ 21,989	$ 45,198	$ 71,650	$ 49,960	$ 60,799
ω_{cvd}	SES 1-2		20%	$ 0.84	$ -	$ -	$ -	$ -	$ -
	SES 3		28%	$ 0.84	$ -	$ -	$ -	$ -	$ -
	SES 4-5		33%	$ 0.84	$ -	$ -	$ -	$ -	$ -
	Remote		100%						
		Non SES	56%	$ 1.02	$ 252	$ 518	$ 822	$ 573	$ 697
		SES Remote	44%	$ 1.95	$ 379	$ 779	$ 1,234	$ 861	$ 1,047
	ATSI		28.54%						
		Non SES, Non rem	0%	$ 22.32	$ -	$ -	$ -	$ -	$ -
		SES 1-2	60%	$ 25.17	$ -	$ -	$ -	$ -	$ -
		SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -
		SES 4-5	73%	$ 25.17	$ -	$ -	$ -	$ -	$ -
		SES Remote	86%	$ 28.92	$ 2,856	$ 10,288	$ 4,168	$ 4,215	$ 13,862
ω_{cc}	SES 1-2		20%	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3		28%	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5		33%	$ -	$ -	$ -	$ -	$ -	$ -
	Remote		100%						
		Non SES	56%	$ 8.56	$ 5,636	$ 11,585	$ 18,365	$ 12,805	$ 15,584
		SES Remote	44%	$ 8.56	$ 4,428	$ 9,102	$ 14,430	$ 10,061	$ 12,244
	ATSI		28.54%						
		Non SES, Non rem	0%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES 1-2	60%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES 4-5	73%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES Remote	86%	$ 143.72	$ 37,790	$ 136,157	$ 55,166	$ 55,787	$ 183,452
				Credit Balance	**$ 12,009**	**$ 51,725**	**-$ 18,147**	**-$ 4,315**	**$ 66,655**
SCENARIO Z (BENCHMARK ACTIVITY)	Stream A services per capita (A')				0.471	0.471	0.471	0.471	0.471
	Stream C services per capita (C')				0.180	0.180	0.180	0.180	0.180
	Stream C vulnerable social groups (VC')				0.180	0.180	0.180	0.180	0.180
	Performance Ratio ($\beta = VC_n/VC'$)				1.000	1.000	1.000	1.000	1.000
				Median unit values ($)					
Stream A mean unit value ($) x total services				$ 33.66	$ 269,487	$ 553,913	$ 878,096	$ 612,273	$ 745,105
Stream C mean unit value ($) x total services				$ 14.28	$ 43,679	$ 89,779	$ 142,323	$ 99,238	$ 120,768
ω_{cvd}	SES 1-2		20%	$ 0.84	$ -	$ -	$ -	$ -	$ -
	SES 3		28%	$ 0.84	$ -	$ -	$ -	$ -	$ -
	SES 4-5		33%	$ 0.84	$ -	$ -	$ -	$ -	$ -
	Remote		100%						
		Non SES	56%	$ 1.02	$ 477	$ 980	$ 1,554	$ 1,084	$ 1,319
		SES Remote	44%	$ 1.95	$ 716	$ 1,473	$ 2,335	$ 1,628	$ 1,981
	ATSI		28.54%						
		Non SES, Non rem	0%	$ 22.32	$ -	$ -	$ -	$ -	$ -
		SES 1-2	60%	$ 25.17	$ -	$ -	$ -	$ -	$ -
		SES 3	72%	$ 25.17	$ -	$ -	$ -	$ -	$ -
		SES 4-5	73%	$ 25.17	$ -	$ -	$ -	$ -	$ -
		SES Remote	86%	$ 28.92	$ 5,401	$ 19,458	$ 7,884	$ 7,972	$ 26,217
ω_{cc}	SES 1-2		20%	$ -	$ -	$ -	$ -	$ -	$ -
	SES 3		28%	$ -	$ -	$ -	$ -	$ -	$ -
	SES 4-5		33%	$ -	$ -	$ -	$ -	$ -	$ -
	Remote		100%						
		Non SES	56%	$ 8.56	$ 10,660	$ 21,910	$ 34,733	$ 24,218	$ 29,473
		SES Remote	44%	$ 8.56	$ 8,375	$ 17,215	$ 27,290	$ 19,029	$ 23,157
	ATSI		28.54%						
		Non SES, Non rem	0%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES 1-2	60%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES 3	72%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES 4-5	73%	$ 88.34	$ -	$ -	$ -	$ -	$ -
		SES Remote	86%	$ 143.72	$ 71,470	$ 257,509	$ 104,333	$ 105,508	$ 346,956
				Credit Balance	**$ 132,254**	**$ 379,043**	**$ 257,454**	**$ 211,891**	**$ 504,632**