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Strategies for Gain - the evidence on strategies to improve the health and wellbeing of Victorian children

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Table of Contents

1	EXECUTIVE SUMMARY AND KEY MESSAGES IN RELATION TO POLICY AND ACTION	I
1.1	Where to from here?-----	vii
1.2	Key messages for policy makers about each priority area -----	ix
2	INTRODUCTION AND OVERVIEW	1
2.1	Purpose -----	1
2.2	Objectives -----	1
2.3	Overview of project methodology -----	1
2.4	Scope -----	1
2.5	Limitations and caveats -----	2
3	THE ROLE AND THE LIMITS OF EVIDENCE IN INFORMING POLICY	3
4	RESEARCH METHODS AND STRATEGIES	4
4.1	Electronic databases -----	4
4.2	Search strategies -----	4
4.3	Literature review template -----	5
4.3.1	Actionable determinants.....	5
4.3.2	Intervention type.....	5
4.3.3	Health Benefit Group (HBG) and Health Resource Group (HRG) framework.....	5
4.3.4	Sub-populations	6
4.3.5	Level and type of intervention	6
4.3.6	Level and type of evidence	7
4.3.7	A standard schema for evaluating the evidence.....	8
4.3.8	Applicability to Victoria	9
4.4	Access database -----	9
4.5	Evidence: analysis and synthesis-----	9
5	RESULTS AND FINDINGS IN RELATION TO EACH PRIORITY AREA	11
	Areas suited to immediate action -----	11
5.1	Asthma -----	11
5.1.1	Key messages for policy makers about asthma	11
5.1.2	Search strategies	11
5.1.3	Epidemiology.....	12
5.1.4	The evidence.....	12
5.1.4.1	Actionable determinants/risk factors	12
	Parent smoking	12
	Breastfeeding	13
	Cow's milk protein avoidance, hydrolysed milk and probiotics in early life.....	13
	Diet.....	14
	Allergen avoidance.....	14

	Education	15
5.2	Child abuse -----	16
5.2.1	Key messages for policy makers about child abuse	16
5.2.2	Search strategy.....	16
5.2.3	Epidemiology	17
5.2.4	The evidence	18
5.2.4.1	Model/approach	18
5.2.4.2	Actionable determinants/risk factors.....	18
5.2.4.3	Interventions/factors affecting implementation	19
	Primary prevention: All children and their parents.....	19
	Secondary prevention: Families at risk.....	20
	Tertiary prevention: Preventing recurrence of abuse and minimising harm.....	22
5.2.4.4	Economic evaluation.....	24
5.2.4.5	Other considerations.....	24
5.3	Child behaviour problems -----	25
5.3.1	Key messages for policy makers about child behaviour problems	25
5.3.2	Search strategy.....	25
5.3.3	Epidemiology	25
5.3.4	The evidence	26
5.3.4.1	Actionable determinants/risk factors.....	26
5.3.4.2	Interventions/factors affecting implementation	26
	Types of intervention programs available.....	26
	Parent/family training programs.....	27
	Home visiting programs	28
	School based programs.....	29
	Child focussed programs	30
5.3.4.3	Economic Evaluation	30
5.4	Dental caries -----	31
5.4.1	Key messages for policy makers about dental caries	31
5.4.2	Search strategy.....	31
5.4.3	The evidence	31
5.4.3.1	Actionable determinants/risk factors.....	31
5.4.3.2	Interventions/factors affecting implementation	31
	Water fluoridation.....	31
	Fluoride supplements	32
	Health promotion	32
	Oral hygiene	33
	Fluoride varnish	34
5.5	Children with high developmental needs (disability) -----	35
5.5.1	Key messages for policy makers about children with high developmental needs (disability)	35
5.5.2	Search strategy.....	35
5.5.3	The evidence	36
5.5.3.1	Actionable determinants/risk factors.....	36
5.5.3.2	Interventions/factors affecting implementation	36
	Informal family support	36
	Comprehensive formal support	37

Early childhood interventions and specific behavioural intervention strategies.....	37
Parent education	38
Substitute care	38
5.6 Injury-----	39
5.6.1 Key messages for policy makers about injury prevention and management	39
5.6.2 Search strategy	39
5.6.3 Epidemiology.....	40
5.6.4 The evidence.....	40
5.6.4.1 Model/approach.....	40
5.6.4.2 Actionable determinants/risk factors	41
5.6.4.3 Interventions/factors affecting implementation.....	41
Home visiting.....	41
Provision of free, low-cost or loaned home safety equipment	41
One-to-one counselling in clinical settings.....	42
Child education for behaviour change	42
Community-based interventions.....	43
Equipment and engineering solutions	44
5.6.4.4 Economic evaluation	45
5.6.4.5 Other considerations	45
5.7 Language and literacy difficulties-----	47
5.7.1 Key messages for policy makers about language and literacy difficulties.....	47
5.7.2 Search strategy	47
5.7.3 Epidemiology.....	48
5.7.4 The evidence.....	48
5.7.4.1 Model/approach.....	48
5.7.4.2 Actionable determinants/risk factors	49
5.7.4.3 Interventions/factors affecting implementation.....	50
Community language enrichment programs	50
Comprehensive programs for disadvantaged populations	50
Early detection of children with speech and language impairments.....	52
Treatment for children with speech and language impairments	52
5.8 Low birth weight -----	54
5.8.1 Key messages for policy makers about low birth weight	54
5.8.2 Search strategy	54
5.8.3 Epidemiology.....	54
5.8.4 The evidence.....	55
5.8.4.1 Model/approach.....	55
5.8.4.2 Actionable determinants/risk factors	55
5.8.4.3 Interventions/factors affecting implementation.....	56
Socio-economic status (SES)	56
Maternal smoking.....	56
Social support and education.....	56
Nutrition and maternal weight	57
Exercise.....	59
Periodontal disease.....	59
Alcohol and substance abuse	59
Assisted conception	59
Maternal age	60

Progesterone	60
Corticosteroids.....	60
5.8.4.4 Treatment interventions for LBW infants	60
Lung disease	60
Longer term growth and development.....	61
Nutrition	61
Early discharge programs.....	62
5.8.4.5 Economic evaluation.....	62
5.8.4.6 Other considerations.....	62
5.9 Overweight and obesity -----	63
5.9.1 Key messages for policy makers about overweight and obesity.....	63
5.9.2 Search strategy.....	63
5.9.3 Epidemiology	63
5.9.4 The evidence	64
5.9.4.1 Model/approach	64
5.9.4.2 Actionable determinants/risk factors.....	64
5.9.4.3 Interventions/factors affecting implementation	64
5.9.4.4 Economic evaluation.....	67
5.9.4.5 Other considerations.....	68
5.10 Parent mental health -----	69
5.10.1 Key messages for policy makers about parent mental health.....	69
5.10.2 Search strategy.....	69
5.10.3 Epidemiology	70
5.10.4 The evidence	72
5.10.4.1 Actionable determinants/risk factors.....	72
5.10.4.2 Interventions/factors affecting implementation	72
Psychosocial and psychological support to prevent postnatal depression	72
Breastfeeding.....	72
Home visiting	73
Parent skills training and family intervention	73
Centre-based day care or preschool education	74
School-based programs	74
Peer support groups	75
Individual therapies for children.....	76
Service and policy changes.....	76
Areas in which to maintain effort-----	78
5.11 Congenital heart disease -----	78
5.11.1 Key messages for policy makers about congenital heart disease	78
5.11.2 Search strategy.....	78
5.11.3 The evidence	79
5.11.3.1 Model/approach	79
5.11.3.2 Actionable determinants/risk factors.....	79
5.11.3.3 Interventions/factors affecting implementation	80
Assessment of new surgical techniques	80
Safety and outcomes.....	81
Medical management of complications of CHD	81
Long-term outcomes.....	81

Links with adult services	82
5.11.3.4 Economic evaluation	82
5.12 Infant mortality-----	83
5.12.1 Key messages for policy makers about infant mortality.....	83
5.12.2 Search strategy	83
5.12.3 Epidemiology.....	84
5.12.4 The evidence.....	84
5.12.4.1 Actionable determinants/risk factors	84
Indigenous infant mortality	84
5.12.4.2 Interventions/factors affecting implementation.....	85
Interventions targeted at infectious disease.....	85
Antibiotics for prevention of infectious disease	85
Interventions targeted at mortality due to respiratory conditions	86
Other interventions	87
5.13 Melanoma -----	88
5.13.1 Key messages for policy makers about melanoma	88
5.13.2 Search strategy	88
5.13.3 Epidemiology.....	89
5.13.4 The evidence.....	89
5.13.4.1 Model/approach.....	89
5.13.4.2 Actionable determinants/risk factors	90
5.13.4.3 Interventions/factors affecting implementation.....	90
Sunscreens	91
Setting for intervention	91
Other interventions.....	92
Outcomes of childhood interventions.....	92
5.13.4.4 Economic evaluation	93
5.14 PKU/CF/HT -----	94
5.14.1 Key messages for policy makers about PKU/CF/HT	94
5.14.2 Search strategy	94
5.14.3 The evidence.....	95
5.14.3.1 Model/approach.....	95
5.14.3.2 Interventions/factors affecting implementation.....	95
Prevention	95
Early identification	96
5.14.3.3 Economic evaluation	96
5.14.3.4 Other considerations	97
5.15 SIDS -----	98
5.15.1 Key messages for policy makers about SIDS.....	98
5.15.2 Search strategy	98
5.15.2.1 Key Terms	98
5.15.2.2 Culling strategy.....	98
5.15.3 The evidence.....	99
5.15.3.1 Model/approach.....	99
5.15.3.2 Actionable determinants/risk factors	99

5.15.3.3	Interventions/factors affecting implementation	99
	Smoking/alcohol or drug abuse	99
	Prone sleeping	100
	Bed sharing.....	100
	Overwrapping and overheating	100
	Breastfeeding and immunisation	100
	Adult haemoglobin and magnesium levels at birth.....	100
	Continuing education of health professionals.....	100
	Gas poisoning caused by deteriorating cot mattresses.....	101
	Collaboration between agencies involved in SIDS death investigation.....	101
	Implementing youth education seminars	101
5.15.3.4	Economic Evaluation	101
5.15.3.5	Other considerations.....	101
5.16	Spina Bifida	102
5.16.1	Key messages for policy makers about Spina Bifida	102
5.16.2	Search strategy.....	102
5.16.3	The evidence	102
5.16.3.1	Model/approach	102
5.16.3.2	Actionable determinants/risk factors.....	102
5.16.3.3	Interventions/factors affecting implementation	103
5.16.3.4	Economic evaluation.....	103
5.16.3.5	Other considerations.....	104
5.17	Visual acuity screening	105
5.17.1	Key messages for policy makers about visual acuity	105
5.17.2	Search strategy.....	105
5.17.3	The evidence	105
5.17.3.1	Interventions/factors affecting implementation	105
6	RESULTS AND FINDINGS ACROSS PRIORITY AREAS	108
6.1	Actionable determinants	108
6.2	Sub-populations among Victorian children.....	110
6.3	Levels of intervention.....	114
6.4	Investment across the care continuum	116
7	CONCLUSIONS – WHERE TO FROM HERE.....	124
	REFERENCES	125
	ATTACHMENT 1.....	141
	The literature review template used in the analysis	
	ATTACHMENT 2.....	143
	Literature search strategy and results	

List of Figures

Figure 1	Conceptual framework underpinning the review.....	ii
Figure 2	Summary of the evidence on strategies for investment across priority areas	iii
Figure 3	Summary of the evidence on strategies for investment within each priority areas.....	iv
Figure 4	The ‘best bet’ on where to focus to improve the health and wellbeing of Victorian children in each priority area.....	vi
Figure 5	Best bet investments at different points along the development path	viii
Figure 6	The research to policy and practice cycle	3
Figure 7	The Health Benefit Group/Health Resource Group framework used in the analysis.....	6
Figure 8	The Path to Child Abuse	19
Figure 9	The opportunities for influencing a child’s environment.....	64
Figure 10	Transforming the focus of science	65
Figure 11	Potential societal level solutions for obesity prevention.....	66
Figure 12	Actionable determinants that impact on more than one priority area	108
Figure 13	Interventions that impact on more than one priority area	109
Figure 14	The ‘best bet’ on where to focus to improve the health and wellbeing of Victorian children in each priority area	110
Figure 15	Summary of the evidence at the priority sub-population level	112
Figure 16	Interventions with demonstrated effective at the sub-population level	113
Figure 17	Best bet investments at different points along the development path	114
Figure 18	Interventions at different levels with convincing evidence or that look promising.....	114
Figure 19	Interventions with convincing evidence.....	117
Figure 20	Interventions that look promising	119
Figure 21	Interventions that are not effective or for which there is no conclusive evidence.....	120
Figure 22	Interventions that are priorities for further evaluation and research	122

1 Executive summary and key messages in relation to policy and action

Victorian children enjoy, by both national and international standards, a high level of health and wellbeing. Nevertheless, there are important opportunities for improvement.

To this end, the Department of Human Services (DHS) Victoria established the *Children's Health and Wellbeing Policy Flagship* project, of which this review is a part. Its purpose is to guide and structure the Department's efforts to support and improve the health, development, learning and wellbeing of Victorian children. The project will assist DHS in determining strategic investments (or 'best bets') for improving the health and wellbeing of children in Victoria.

This report contributes to the *Children's Health and Wellbeing Policy Flagship* project by, in summary, reviewing the international and national evidence and, based on that, identifying what DHS might do to improve the health and wellbeing of Victorian children. The specific objectives were to:

- Identify evidence-based strategies that will deliver improved outcomes in the designated priority areas for gain for all children in Victoria; and
- Present the strategies for each priority area in a format that, amongst other things, identifies how strategies will deliver more equitable outcomes for different target groups of children within Victoria's child population.

Accordingly, the strategies discussed in this review are those that have been judged to be applicable and practicable in the Victorian context.

The priority areas for gain contained in this review were identified by DHS after consultation with key stakeholders and serve as the headings in Section 5 of the report¹. A number of these priority areas are already the subject of program activities and/or strategy development within DHS and include asthma, injury, child abuse, dental caries, overweight and obesity and children having high developmental needs.

This report is longer than DHS anticipated or we aimed to produce. But each of the priority areas identified by DHS is important in its own right. At the same time, there are a set of 'actionable determinants' and interventions that are common to many of the priority areas.

This report is set out in 7 sections. The next section (Section 2) provides an overview of the purpose and scope. Section 3 discusses the role and limits of evidence. The key message from this section is that, for DHS to make best use of research findings as the basis for evidence-based policy, it needs to actively influence research priorities. To the extent possible, DHS should not simply be the passive recipient of research priorities set by others.

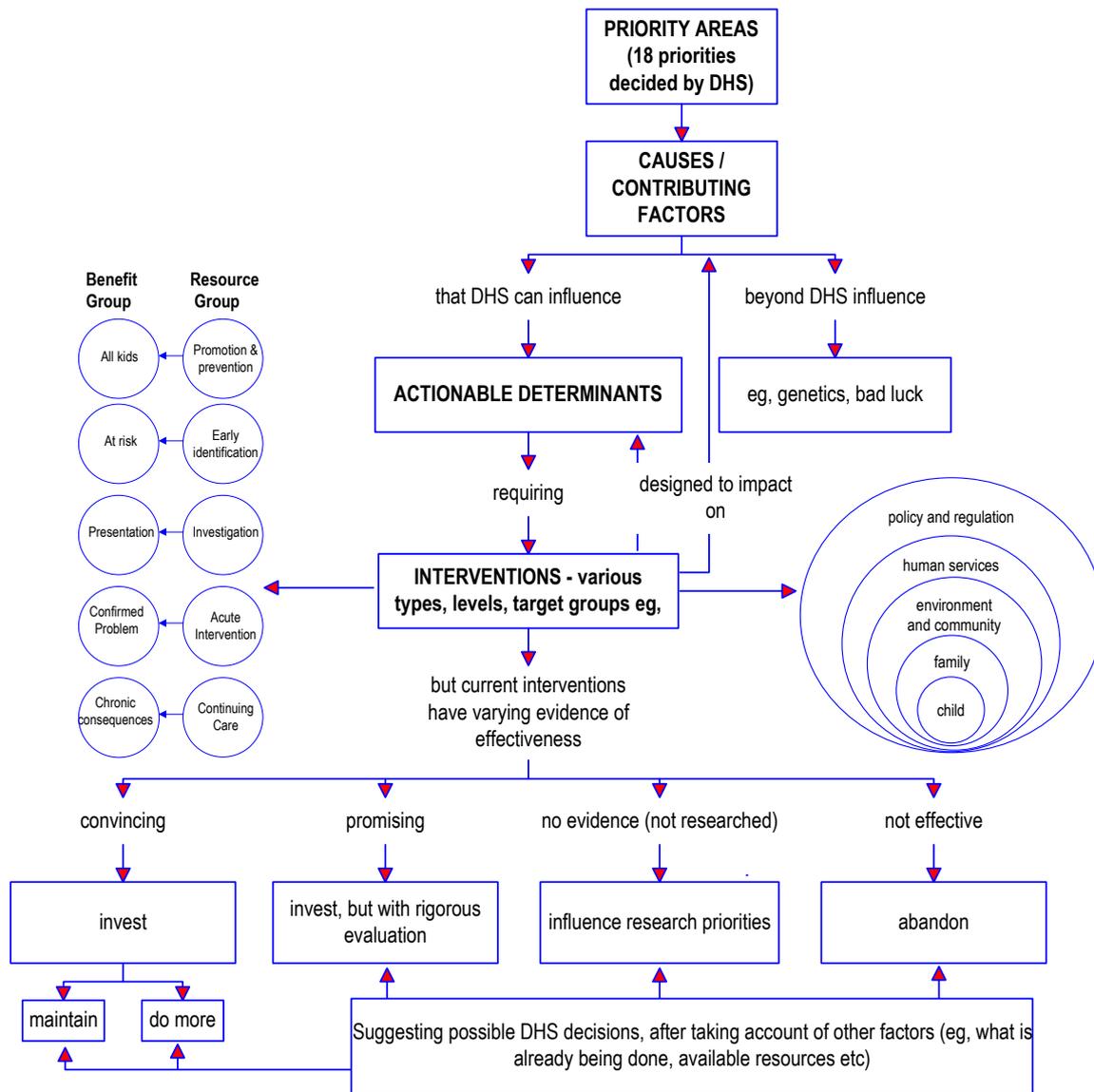
Section 4 summarises our research methods. It includes some key terms used in the remaining sections of the report and in Figure 1 below.

Section 5 summarises the evidence on each of the priority areas. Each begins with a set of key messages for policy makers.

Underlying each is a common conceptual framework and approach summarised in Figure 1 below. More detail is provided in Section 4.

¹ The original brief included 18 separate priority areas. We grouped 'language' and 'literacy' together as the evidence suggests that they are intrinsically linked.

Figure 1 Conceptual framework underpinning the review



As shown in Figure 1 above, the evidence could be organised in many different ways. Section 6 reorganises the evidence and summarises the results and findings across priority areas.

The bottom section of Figure 1 suggests options for responding to the evidence in this review. Figure 2 provides a high level summary that maps to these options. It shows those interventions that have convincing evidence, and those that look promising, at each of the various levels shown in Figure 1. The interventions in this table are those that, on the evidence, warrant investment of time or resources. Figure 3 also shows interventions that have convincing evidence, and those that look promising. But the interventions in this figure are limited to those that are specific to each priority area.

As detailed in Section 6, the evidence for many of these interventions is convincing. But some interventions included in this summary are, on the evidence, only promising at this stage. Investment in promising interventions is warranted, but only if rigorous evaluation is undertaken. Section 6 provides a summary table of those interventions those that are, on the evidence, not effective interventions and those that are priorities for research and development. In considering these options, it is important to stress that the strength of the evidence is only one factor to be

taken into account. There are a range of other factors (eg, what is already been done, epidemiological evidence and so on) that are well beyond the scope of this report.

Figure 2 Summary of the evidence on strategies for investment across priority areas

Level	Intervention	Convincing evidence or shows promise in the following priority areas	Any evidence of effectiveness at the sub-population level?	Type	Children who benefit
Policy and regulation	Government policy and regulation	Dental caries, Injury, SIDS, Spina Bifida	Yes	Varies by priority area	Varies by priority area
	Road safety	Injury, Overweight and obesity	Yes	Mainstream	All
Environment and community	Environmental and engineering interventions	Injury, Overweight and obesity	Yes	Mainstream	All
Service system	Better coordinated/integrated service response	Child abuse, Disability, Language and literacy, Overweight and obesity, Parent mental health, SIDS	Yes	Varies by priority area	Varies by priority area
Parent	Antenatal care, including education	Asthma, Dental caries, Disability, Infant mortality, Low birth weight, SIDS, Spina Bifida	Yes	Mainstream	All
	Breast feeding promotion	Asthma, Infant mortality, SIDS, Parent mental health	No	Mainstream	All
	Mass media or community education campaigns targeted to parents	Dental caries, Injury, Low birth weight, SIDS, Spina Bifida	No	Mainstream	All
	Parenting programs	Child behaviour, Disability, Language and literacy, Parent mental health	Yes	Varies by priority area	Varies by priority area
	Smoking cessation programs	Asthma, Infant mortality, Low birth weight, SIDS	No	Mainstream	At risk
Child and family	Home visiting	Child abuse, Child behaviour, Dental caries, Disability, Infant mortality, Injury, Language and literacy, Parent mental health	Yes	Varies by priority area	Varies by priority area
	Intensive family support programs	Child abuse, Child behaviour, Disability, Infant mortality, Language/literacy, Parent mental health	Yes	Intensive	Varies by priority area
	Screening	Infant mortality, Low birth weight (maternal screening), PKU/CF/HT	Yes	Mainstream	All
Child	Pre-school interventions targeted to children	Child behaviour, Dental caries, Language and literacy, Overweight and obesity, Parent mental health	Yes	Varies by priority area	Varies by priority area
	School interventions targeted to children	Child abuse, Child behaviour, Dental caries, Language and literacy, Injury, Melanoma, Parent mental health	Yes	Varies by priority area	Varies by priority area

Figure 3 shows interventions that are either convincing or promising and that are specific to each priority area. Improving the health and wellbeing of Victorian children will not be achieved by focusing only on those interventions that have an impact across priority areas. Many potential ‘best bets’ are those that have a significant impact within just one priority area. In some cases, the implementation of a single intervention has been demonstrated to be effective. But in some priority areas (notably child abuse, disability, language and literacy, overweight and obesity and parent mental health) the implementation of just a single intervention is unlikely to result in demonstrable improvement. A multi-pronged strategy is required to significantly improve health and wellbeing. Interventions that have impact across priority areas are excluded from this figure as they were included in the figure above.

Figure 3 Summary of the evidence on strategies for investment within each priority areas

Priority area	Level	Interventions with convincing evidence or that show promise	
Asthma	Child	Allergy testing as part of clinical assessment	
		Asthma self-management programs	
	Child and family	Asthma management plans	
Child abuse	Child	Cognitive-behavioural therapy	A multi-pronged integrated strategy works best. Single interventions, on their own, are unlikely to be effective
	Child and family	Family preservation programs	
	Service system	Clinical indicators	
Child behaviour problems	Child	Play therapy for severe child behavioural problems	
	Child and family	Triple P Program	
		Perry Preschool model	
Dental caries	Child	Twice daily brushing of teeth with fluoride toothpastes	
	Child and family	Provision of free fluoride toothpaste and toothbrushes	
	Policy & regulation	Fluoridation of the water supply	
Disability	Child	Early identification	A multi-pronged integrated strategy works best. Single interventions, on their own, are unlikely to be effective
	Parents	Respite	
	Child and family	Substitute care in some cases	
Injury	Child	First aid	
		Rehabilitation of children after serious injury	
	Child and family	Free home safety equipment	
Language and literacy	Child	Preschool and school based language and literacy programs	A multi-pronged integrated strategy works best. Single interventions, on their own, are unlikely to be effective
	Parents	Adult literacy programs	
	Child and family	Community language enrichment programs	
	Service system	Accessible speech pathology services	
Low birth weight	Child	Corticosteroids	
	Parents	Periodontal intervention	
		Nutritional supplements	
	Service system	Early discharge programs	
Overweight and obesity	Child and family	Treatment programs focusing on family lifestyle changes	A multi-pronged integrated strategy works best. Single interventions, on their own, are unlikely to be effective

Priority area	Level	Interventions with convincing evidence or that show promise	
Parent mental health	Child	Peer support groups	A multi-pronged integrated strategy works best. Single interventions, on their own, are unlikely to be effective
	Child	Psychological interventions promoting social competence	
	Parents	Psychosocial support to prevent PND	
Congenital Heart Disease	Child	Rehabilitation of children with congenital heart disease	
	Service system	Centralised database to assist with quality control	
		Surgery concentrated in high volume units	
Infant Mortality	Child	Vaccination	
		Vitamin A	
	Child and family	Routine screening/ antibiotics for Strep B	
Melanoma	Child and family	Sun protective clothing (not sunscreens)	
PKU/Cystic Fibrosis/ HT	Child	Venipuncture rather than heel prick	
		Early intervention	
	Parents	Counselling	
Spina Bifida	Child	Rehabilitation of children with spina bifida	
	Policy & regulation	Mandatory fortification of foods with folic acid	
Sudden Infant Death	Child	New cot mattress (cotton) for each newborn	
	Child and family	Magnesium and haemoglobin testing at birth	
	Service system	SIDS education in nursing and medical schools	

Figure 21 on page 120 summaries those interventions that, on the current evidence, are not effective. No investment in these interventions seems warranted. While most are specific to a priority area, the issue of the effectiveness of screening programs runs across several priority areas. As shown in the previous two figures, there is evidence of the effectiveness of some screening programs. But the evidence is inconclusive, and not promising (at least at this stage), in many other areas. These include standardised screening tools to identify children at risk, population screening for language delay, routine ultrasound, and visual acuity screening. While the reasons vary somewhat across the priority areas, the most common reason is that many screening tools and programs lack sensitivity and/or specificity (too many 'false positives' and/or 'false negatives'). Given the number of interventions available that have conclusive evidence of their effectiveness, these interventions have high opportunity costs.

One of the key challenges confronting DHS is to strike the right balance between a population-wide focus and a focus on addressing the needs of specific population sub-groups, particularly those most disadvantaged.

This report synthesises the evidence and identifies interventions that improve and maintain the health and wellbeing of all Victorian children such as immunisation, fluoridated water, safe playgrounds and healthy food.

It also includes interventions that, based on the best available evidence, are the 'best bets' in improving the health and wellbeing of Victoria's most vulnerable children. Without doubt, children of low socio-economic status are Victoria's most vulnerable children. Within this group, Aboriginal children have the poorest prospects, followed by other children living in rural Victoria. The available epidemiological data suggest that interventions targeted to the Victorian community as a whole do not work as well for these groups. Special and ongoing efforts are required.

That said, the role of the CHSD was not to undertake an epidemiological study of Victorian children or to identify those most at risk. That work had already been done by DHS as part of

determining the priority areas included in this review. Our role was to review the international and national evidence and, based on that, to identify what DHS might do to improve the health and wellbeing of all Victorian children, including those most at risk. Figure 4 summarises our findings.

Figure 4 *The 'best bet' on where to focus to improve the health and wellbeing of Victorian children in each priority area*

Priority area	Population wide or sub-population?	Comment
Asthma	Sub-population/s in highest need based on epidemiological evidence	Children of low SES are at higher risk, as are Aboriginal children. Both have higher rates of hospital attendances for asthma. Little is known about how best to target these groups
Behaviour problems	Sub-population/s at highest risk based on epidemiological evidence	Different interventions work best for different age groups
Child abuse	Sub-population/s at highest risk based on epidemiological evidence	Children in families where there is parental alcohol or drug abuse or mental illness. Children of low SES are at higher risk, as are Aboriginal children.
Dental caries	Sub-population/s at highest risk based on epidemiological evidence	Fluoridation of the water supply in rural/regional Victoria would result in a significant improvement in the oral health of rural children.
Disability	Children with high developmental needs	Culturally appropriate and safe services required for Aboriginal and CALD families
Injury	All children	But children of low SES are at higher risk, as are Aboriginal children.
Language and literacy	Sub-population/s at highest risk based on epidemiological evidence	But children of low SES are at higher risk, as are Aboriginal and CALD children.
Low birth weight	Sub-population/s at highest risk based on epidemiological evidence	Smoking cessation programs and periodontal disease interventions benefit all at risk, but particularly Aboriginal communities
Obesity and overweight	All children	Although there are sub-populations at higher risk, the 'best bet' model is population-wide and multi-pronged
Parent mental health	Sub-population/s at highest risk based on epidemiological evidence	Children in families where there is parental alcohol or drug abuse, depression (including postnatal depression), anxiety, personality disorder, schizophrenia, bipolar disorder.
Congenital heart disease	Children with confirmed CHD	Rehabilitation to improve outcomes for those with chronic consequences of congenital heart disease
Infant mortality	Sub-population/s at highest risk based on epidemiological evidence	Aboriginal communities have significantly higher infant mortality rate, including infant mortality due to infectious disease
Melanoma	All children	Interventions in schools to improve sun protective behaviour of children
PKU/Cystic Fibrosis/HT	All children	Continue Newborn Screening Program. Early detection should be linked to early intervention.
Spina bifida	All children	But children of low SES are at higher risk, as are Aboriginal children.
Sudden infant death	Sub-population/s at highest risk based on epidemiological evidence	Continue <i>Reducing the Risk of SIDS</i> Program. Target parents with lower levels of education, young mothers, Aboriginal families, especially where the father is unemployed. Implement structured supportive smoking cessation programs targeting both parents, encourage collaboration between agencies involved in SIDS death investigation and promote immunisation of all kids.
Visual acuity	Screening not recommended	This review focused specifically on screening

A further issue for DHS is how best to intervene to impact on the ‘actionable determinants’ that cause, or contribute to, health and wellbeing problems. DHS provided a preliminary list of what it described as ‘actionable determinants’ for each priority area. These were developed and refined over the life of the project. Figure 12 on page 108 summarises the key actionable determinants that have an impact on more than one priority area. Actionable determinants specific to one priority area are excluded here but are included in the review of each priority area. Many of these specific actionable determinants are also ‘best bets’ for increasing the health and wellbeing of Victorian children.

Further, many ‘priority areas’ are, in turn, actionable determinants for other priority areas. As one example, child abuse, parental mental illness, communication (language and literacy) problems and low birth weight are all actionable determinants for child behaviour problems. Effective interventions in these priority areas can be expected to have flow-on effects that reduce child behaviour problems.

Another challenge confronting DHS is to identify where best to invest along the care continuum. Priority has been given in this review to prevention and early intervention strategies including, where appropriate, treatment options. The possible strategies and interventions that have been identified range right across the care continuum with some, but by no means all, being pitched at more than one point along the care continuum and at more than one level of intervention.

Figure 5 summarises the evidence using a developmental model. Different interventions are the ‘best bet’ at different times in a child’s development. As well, the focus of service interventions needs to change as children get older. One example is injury prevention. When children are young, the most effective strategies involve raising the awareness and knowledge of parents. By the time the child is at school, the focus needs to shift to promoting the child’s own safety and self-protective behaviour.

1.1 Where to from here?

A concurrent project (being undertaken by the Children’s Health and Wellbeing Policy Project team within DHS) is mapping existing service settings and activities that relate to the priority areas for gain.

The next step is that the Children’s Health and Wellbeing Policy Project team within DHS will bring together the identified strategies for gain and the service settings information to identify how strategies can best be implemented in the Victorian context. Translating the available evidence into sustainable action, making policy choices and identifying priorities for strategic investments are key challenges in the next steps.

The evidence on strategies to improve the health and wellbeing of Victorian children will continue to accumulate and evolve as further studies are conducted. This review of the literature in each of the priority areas for gain captures the evidence available up to this point in time. The literature database that accompanies this report should accordingly be regarded not only as a valuable resource for guiding current practice but also as an asset that can (and should) be further developed and refined over time. As the evidence grows, so will the database change. It is to be hoped that this will make the choices confronting DHS policy makers in the future much clearer and more straightforward.

A key challenge facing DHS policy makers is that the means and tools for improving the health and wellbeing of Victoria’s children will continue to develop, perhaps indefinitely, but the economic, social and other resources able to be devoted to this important task will remain finite. Thus, even where the evidence is compelling, policy makers have no choice but to make choices.

Figure 5 Best bet investments at different points along the development path

Perinatal/infancy	Preschool children	School aged children
Identify problems/risks		
Coordinate services where problems are identified		
Effective clinical management of unwell children		
Create safe homes		
	Create safe care centres	Create safe schools and communities
Enhance parent-child interactions (mothers and fathers)		
Statewide fluoridation of the water supply		
Support parents to promote physical and mental health		
	Enhance parenting skills in (eg) effective discipline to address behaviour problems	
Improve maternal nutrition		
Promote and support breast feeding	Educate parents re good child nutrition	Educate children re good nutrition and benefits of exercise
Create stimulating home environments to support cognitive development		Encourage parent support for, and commitment to, education
	Provide early childhood education	Promote social competence (= self control, communication skills, decision making and problem solving, resisting negative influences)
Raise parents' awareness and knowledge of safe practices		Promote safe and self protective behaviour (road safety, child abuse, protective clothing, tooth brushing, etc)
Build peer support for parents		Build peer support for children
Train and support staff (home visitors, mental health workers, child care workers, health professionals, teachers)		

Equally, investment in evaluating the extent to which human services actually contribute to the health and wellbeing of children and learning how to use this information as the basis for future planning is critical. Warner (1994) succinctly describes both the dilemma and the challenge in arguing that, regardless of what we do, we will never catch up on reviewing existing interventions. Equally, there is no justification for suspending current activity until it has been reviewed. The best we can do is to move towards evidence-based strategies for improving health and wellbeing, grabbing the best available evidence as we go. This review aims to make an important contribution to this ongoing process.

1.2 Key messages for policy makers about each priority area

Asthma

- Childhood asthma admission rates to hospital remain high although asthma education strategies have the potential to reduce exacerbations and therefore reduce admissions in early childhood.
- Primary prevention of asthma through promotion of breastfeeding for at least 6 months and avoidance of tobacco smoke exposure remains a priority.
- Avoidance of allergens and manipulation of diet may have an important role in the primary prevention of asthma but only early data are available and, from rigorous trials to date, there is little evidence of long term benefits. There is some evidence to support the avoidance of solid foods for at least the first 4 months and the use of hypoallergenic formula if a supplement is required in the first 4 months.
- There is a need for the development and evaluation of new programs that are relevant for hard to reach groups such as indigenous children and under-served communities.

Child abuse

- Community-wide interventions offering several layers or 'tiers' of support to parents are promising, although few evaluations have been published to date.
- Child education programs, although intended as a primary prevention measure, have proved most useful in helping to prevent the recurrence of maltreatment by encouraging children to report incidences of abuse.
- Home visiting for at-risk families is well supported as a useful approach to reducing the risk of child abuse and neglect. Home visiting may be less beneficial where there is domestic violence. Enhancements such as group sessions or cognitive retraining appear to increase its effectiveness.
- The available standardised tools for screening and early detection of child abuse have poor predictive accuracy.
- A set of early indicators of child abuse based on clinical experience has consensus support from academics and practitioners in Britain but it is unclear how useful these might be in the Australian context.
- Legislation requiring certain professionals to report suspected child abuse has led to increased notification of cases of abuse and neglect nationally. There is, however, no evidence that mandatory reporting legislation in Australia or elsewhere has been effective in protecting children.
- Cognitive behavioural therapy is effective in reducing trauma among children and parents in cases of confirmed abuse.
- Family preservation strategies focusing on improving parent-child interactions in families where abuse has occurred have promise.
- There is clearly a need for more and better quality evaluations of Australian programs supporting children exposed to domestic violence.

Child behaviour problems

- Child behaviour problems are common but there are a range of interventions with demonstrated effectiveness.
- Problem behaviours are addressed most effectively when children are young.
- For younger children, intensive preschool interventions are effective.
- Home visiting programs are effective in improving the behaviour of both younger and older children.
- Group based parenting programs can improve the emotional and behavioural adjustment of both younger and older children, but there is little evidence of their long-term effectiveness.
- Play therapy is an effective intervention for children with severe behaviour problems.

Dental caries

- Community wide fluoridation of drinking water reduces caries prevalence in children and is the most effective and socially equitable measure for caries prevention among children.
- Twice daily brushing of teeth with fluoride toothpaste is beneficial for the prevention and control of dental caries, reducing incidence by as much as 30%.
- Supervised toothbrushing programs in schools using fluoride toothpaste is an effective health promotion measure.
- Oral health promotion messages are best directed towards parents and should focus on the importance of reducing high frequency exposures to obvious and hidden sugars.

Children with high developmental needs (disability)

The recommendations of the *'Listen to us'* report should continue to be implemented, in particular:

- Service gaps, difficulties with access to service and obstacles with the delivery of services need to be explored and remedied in order to reduce negative impacts on the child and their family members.
- The cultural needs of different ethnic groups need to be identified and respected to improve the efficacy of interventions.
- The capacity and limits of Australian informal and formal support networks for families caring for a child with disability need to be explored further.
- Research studies designed to provide evidence based information on the effectiveness of family support strategies, early childhood interventions and parent education schemes for families with a child with disability should have immediate priority.
- There is an urgent need for longitudinal studies to examine the impact of support and services provision on family resilience and a need for smaller scale testing of innovation, monitoring of service use and the evaluation of outcomes for both children and their parents.

Injury

- The most effective prevention strategies overall are safety equipment and engineering solutions backed by legislation and enforcement.

- Home visiting programs have proved effective in reducing child injury rates within the intervention communities. Benefits have been demonstrated for disadvantaged groups.
- There is evidence that providing free or low-cost home safety equipment, one-to-one counselling in a clinical environment and safety education for school-aged children can reduce hazards and promote safer behaviours. Effects on injury rates are unknown, however. Few studies measure this outcome, and there are significant methodological problems involved.
- Community-based, multi-strategy approaches are promising, but more high-quality evaluations are needed.
- It is not clear whether some interventions (particularly safety engineering and equipment) that have proved effective for general populations in urban areas work as well for disadvantaged groups or in rural areas.
- There is a lack of studies that evaluate prevention strategies for certain types of injuries that lead to large numbers of hospital admissions among Victorian children; namely, hit/struck/crush by objects, cutting/piercing, choking and dog bites.
- Appropriate first aid treatment for burns and scalds has the potential to reduce the severity of injuries.

Language and literacy difficulties

- Communication problems (both speech and language) in the under fives are relatively common.
- At the individual level, children with persisting problems should be assessed as early as possible for optimal outcomes, as language delay is a key risk factor for later literacy difficulties. Emergent literacy skills need to be developed prior to school entry.
- Children from low SES backgrounds more frequently lack the spoken language skills to develop reading and writing.
- In English-speaking countries, speaking a language other than English at home also predicts lower language and communication skills. This message is specifically about the language spoken at home and not about all children of culturally and linguistically diverse backgrounds or bilingual children.
- At the population level, there is insufficient evidence to recommend general screening at present. Early detection tools are inaccurate and cannot distinguish between children whose language delay will persist at ages 3 and 4 and those who will spontaneously improve. More research is required to develop better parent-based assessments as a cost-efficient method of population screening.
- Treatment can be effective for some speech and language problems, but the evidence is less clear for others and there can be long term educational effects. There is a concern that low SES parents may not access services and this should be monitored. If not picked up, communication disorders can lead to behavioural problems.
- Community language enrichment programs and projects such as *Best Start* have the potential to improve language and literacy outcomes for disadvantaged populations, including the Aboriginal community. Long term commitment and rigorous evaluation of outcomes over time are necessary. Service change, including improved access for minority groups and improved integration of services, should be part of the evaluation.
- '*Let's Read*' is a recent project aiming to develop an Australian program to promote reading to young children from 4-6 months to 5 years of age. This project has published a detailed literature review that identifies the evidence on which the program will be based. The project has not been implemented but, given its evidence-base, it must be regarded as promising.

Low birth weight

- There are a large number of potential interventions intended to either prevent or treat mortality and morbidity due to low birth weight (LBW). There are, overall, relatively few interventions for which strong evidence of effectiveness exists.
- In terms of prevention, the interventions for which the most compelling evidence exists are smoking cessation programs, maternal periodontal disease interventions, certain nutritional supplements (such as iron and perhaps also magnesium) and education and support programs for pregnant adolescents (<20 years).
- In terms of clinical interventions for LBW infants, administration of corticosteroids to the mother when preterm birth seems likely or inevitable has been found to provide benefit to the neonate in terms of reduced incidence of lung disease.
- Feeding LBW babies with supplemented formula milk has been shown to enhance short term growth.
- Early discharge programs for LBW babies have the potential to both provide quality outcomes and reduced health service costs.
- Women of low socio-economic status (SES), including indigenous women, are at substantially elevated risk of delivering LBW babies. However, very few strategies designed to address specific risk factors among these women (smoking, alcohol/substance abuse, stress, violence etc.) have been shown to be effective. Rather, there is a degree of consensus that resources would be better targeted to addressing the underlying causes of low SES (low income, education, employment, community improvements).

Overweight and obesity

- Victoria should continue to maintain a high profile in initiatives that aim to prevent overweight and obesity in children. The evidence clearly indicates whole of government, multi-level, population-focused interventions are required, supported by a realignment of research funds and initiatives to policy-based interventions.
- Prevention of childhood overweight and obesity has been identified as a national priority in Australia and requires a whole of government approach if it is to be successful.
- Reviews of intervention trials have not identified reliable evidence for successful strategies. The most recent Cochrane review in this area is due for completion at the end of March 05 (review leader: Professor Elizabeth Waters, Deakin University).
- The reliance on Randomised Controlled Trials (RCTs) for evidence to proceed has been critiqued. RCTs are unlikely to provide the evidence required. Formal monitoring of programs and local benchmarking linked with interventions that assess sustainability, reach and population impact is more promising.
- Australian researchers are at the forefront of obesity prevention work. They have developed a framework for translating evidence into action in this area and identified levels of intervention that balance individual approaches with organisational, national and international policies that address the social and environmental factors that have significantly contributed to increases in obesity prevalence.
- Evidence does exist for effective childhood obesity treatment programs that focus on positive lifestyle changes for the whole family and incorporate principles of behaviour modification and provide caregivers and children with diet and exercise education and the tools required to put knowledge into practice.

Parent mental health

- Intensive postpartum support provided by public health nurses or midwives can be effective in preventing depression among new mothers. Prevention programs are most effective when delivered after babies are born to new mothers most 'at risk'.
- Breastfeeding buffers the negative effects of postnatal depression on children, especially boys.
- Home visiting, delivered as a stand-alone intervention or as part of a multi-component strategy, reduces the risk of postnatal depression and improves parenting skills and mother-child interactions. The benefits for parents with substance-related disorders are still being evaluated. The report, *An audit of home visitor programs and the development of an evaluation framework* (Department of Health and Family Services, 1996) makes a number of recommendations which, if implemented, could ultimately benefit children affected by parent mental illness.
- Family-based interventions targeting parent-child interactions have benefits for all family members. In particular, an intervention in which mentally ill parents were taught to communicate better with their children about their illness reduced depressive symptoms in children and improved family functioning.
- Preschool education for young children of depressed, drug dependent or otherwise disadvantaged parents helps protect against conduct disorders and school failure, which are risk factors for later depression, substance abuse and suicide.
- Teachers who take part in short workshops about mental illness gain knowledge and feel more confident about taking a role in supporting children affected by parent mental illness. School-based programs for children may help reduce the stigma of mental illness. There is insufficient evidence that such programs help prevent depression.
- A number of peer support groups are running in Victoria for children affected by parent mental illness. Results from pilot studies are encouraging.
- Targeted psychological interventions to prevent depression among currently well children produced significant short-term reduction in risk, but their long-term benefits have not been evaluated.
- Strategies to improve integration of services available to children affected by parent mental illness are in place nationally and in several States. Implementation of new guidelines for service providers (*Principles and Actions for Services and People working with Children of Parents with a Mental Illness*, April 2004, Australian Government Department of Health and Ageing 2004) is expected to improve support structures for mentally ill parents and their children.

Congenital heart disease

- There is insufficient evidence to support or not support a screening program for congenital heart disease (CHD). A systematic review and cost-effectiveness analysis is currently in progress and is due to report in June 2005.
- Intra-operative transoesophageal echocardiography (TOE) during surgery for CHD is now considered standard care. However, there is no evidence that this procedure results in better patient outcomes and there is only limited evidence of the safety and cost effectiveness of the procedure.
- Various alternatives to surgical repair of congenital heart defects have been introduced in recent years using catheter-based techniques. Systematic reviews or randomised controlled

trials of these techniques have not been conducted and there has been limited economic evaluation.

- The establishment of a centralised database for paediatric cardiac surgery has the potential to assist in quality control of interventions for CHD.
- There is some evidence that improved outcomes (measured by mortality) are associated with increased volume of surgery for CHD, both at an individual surgeon level and at hospital level.
- Research on long-term outcomes for CHD demonstrate mixed results with a wide range of potentially adverse outcomes for this group of children. Research on suitable rehabilitation interventions for this client group is almost non-existent.

Infant mortality

- Victoria has, by national and international standards, a low infant mortality rate. However, the Aboriginal infant mortality rate in Victoria is 2½ times above the non-Aboriginal rate (23.7 deaths per 1000 births compared to 9.7 across Victoria as a whole).
- The majority of effective interventions for reducing infant mortality are to be found in the areas of SIDS and Low Birth Weight, which are covered elsewhere in this report as priority areas in their own right. Other significant causes of infant mortality include various respiratory diseases and infectious diseases. The latter may be of particular relevance to the indigenous population.
- Strategies for reducing infant mortality due to infectious disease for which good evidence exists include vaccination, Vitamin A supplementation (intestinal infections, measles), breastfeeding for the prevention of infectious disease and maternal screening and antibiotic administration for Streptococcal infection.
- Evidence-based strategies for reducing infant mortality due to respiratory disease include surfactant treatments and Inositol, both used to treat Respiratory Distress Syndrome (RDS).
- Interventions which cannot be recommended include routine ultrasound, for which there is not only no evidence of effectiveness with respect to reducing infant mortality, but which does not appear to confer any measurable benefits to mother or baby, and may even be harmful. To the extent that these are publicly funded, they would appear to constitute a sub-optimal allocation of resources.
- Two interventions for which evidence suggests infant mortality may be *increased* include Prophylactic Continuous Airways Pressure (CPAP) and Digoxin, both used in the treatment of neonatal respiratory conditions.

Melanoma

- It is estimated that exposure to the sun causes 65% of melanoma worldwide, and up to 95% in areas such as Australia. The exact nature of the relationship between sun exposure and melanoma is still the subject of debate.
- Exposure to the sun during childhood is a strong determinant of melanoma risk.
- It is generally accepted that it is preferable to reduce sun exposure for the whole population, rather than targeting those at high risk. However, specific targeting of sun protection messages may be worth considering.
- The intervention with the highest level of evidence as a prevention strategy is the use of sun protective clothing.
- There is no clear evidence to support the efficacy of sunscreens to prevent melanoma.
- There is some evidence to support interventions in primary schools using a variety of approaches to improve the wearing of sun protective clothing by children.

- Interventions in schools have focused on education programs to increase knowledge and change behaviour, rather than more systematic approaches such as changing the schedule of the school day. At the same time, there is insufficient evidence to determine the effectiveness of interventions in primary schools to improve other sun protective behaviour eg, avoiding the sun.
- There is a lack of evidence to determine the effectiveness of interventions in child care centres to improve the sun protective behaviour of children.
- There is little published work to assist in determining the cost-effectiveness of skin cancer prevention programs. The biggest impact on the cost calculations in any such analysis is inclusion of costs to individuals and their families.
- The Victorian *Sunsmart* program is acknowledged as a world leader in providing a comprehensive population-based approach to the primary prevention of skin cancer.

PKU/CF/HT

- The Newborn Screening Program for phenylketonuria, cystic fibrosis and congenital hypothyroidism is a classic public health success story and should be continued.
- The impact of adding multiple new conditions to newborn screening programs should be monitored to ensure that the quality of existing congenital hypothyroidism programs is not threatened.
- Early detection should be linked to early interventions.
- Venipuncture is more efficient and less painful than heel lancing when taking blood samples from neonates. One skin puncture using venipuncture is sufficient to obtain enough blood for screening whereas with heel lancing this is only true in about 40% of cases.

SIDS

- The children most at risk of SIDS have parents with lower levels of education, young mothers, Aboriginal and Torres Strait Islander parents and families in which the father is unemployed.
- Since the introduction of the “Reducing the Risk (RTR) of SIDS Program”, the SIDS rate in Australia declined from 1.87 per 1000 live births in 1990 to 0.78 per 1000 live births in 1995. The four messages conveyed in the RTR campaign were to place baby to sleep in a supine (back) position, keep baby in a smoke free environment, do not let baby overheat and breastfeed. Parents need to continue to receive these messages.
- In addition to the risk factors above, the evidence suggests that infants with low adult haemoglobin and magnesium levels at birth have an elevated risk of SIDS. An adequate maternal diet needs a magnesium intake corresponding to 300mg/kg/day.
- Exposure to toxins in old mattresses is also a risk factor. A new cot mattress (made from cotton) should be used for every new baby. Alternatively, an old mattress should be securely wrapped in polythene sheet to prevent toxin exposure.
- The evidence suggests that structured supportive smoking interventions have the greatest effect rather than just providing information to parents. Such programs can be targeted towards women considering pregnancy and maintained through the antenatal period. Fathers should also be encouraged to participate.
- There is some evidence to suggest that collaboration between agencies involved in SIDS death can improve the investigation process and avoid misdiagnosis.
- There is some evidence to suggest that youth education seminars can be used as a platform to educate teenagers regarding the effects of long term alcohol and drug abuse, teen pregnancy, and to encourage formal education to improve current socioeconomic status.

- There is a need to support efforts to include SIDS in medical and nursing school curricula. Health professionals should be encouraged to keep themselves up to date with current SIDS research findings.

Spina Bifida

- Population wide strategies have been shown to be effective overseas – an increase in periconceptional dietary folate will significantly decrease the incidence of spina bifida. Currently there is some unresolved contention regarding rates of breast cancer in women taking folate supplements during pregnancy.
- Mandatory fortification of foods with folic acid has shown to be effective in the USA, particularly amongst mothers who were older (>30years), had more than high school education and were not in a lower socio-economic group. No reporting of possible negative consequences on other groups (eg, masking of pernicious anaemia). Area of contention includes possible increased rates of twinning.
- Food Standards Australia New Zealand is currently considering under Proposal P295 the possibility of mandatory fortification of the food supply in Australia and New Zealand. DHS Victoria should actively support this Proposal (FSANZ, 2004).
- Recommendations of physicians and health care providers positively influence women's decision to take folic acid supplements (evidence from Australia and USA)
- Some groups of women appear to be at higher risk of a child with spina bifida. Conclusive evidence: women in lower socio-economic groups. Inconclusive evidence at this stage: mothers on epilepsy medication; women with a BMI greater than 29; women with a family history of spina bifida in the mother's family; women on diets with high glycaemic index; women in agricultural or cleaning occupations; households with > 10 micrograms/litre of lead in the water; fathers working with wood preservatives eg, in sawmills.

Visual acuity screening

- There is insufficient evidence to make a recommendation for or against neonatal screening
- There is fair evidence to recommend against screening for risk factors for amblyopia
- There is insufficient evidence to support either preschool or school visual acuity screening
- Training teachers to detect visual acuity problems shows promise. More research is required on this issue.

2 Introduction and overview

2.1 Purpose

This project is a component of the Victorian Department of Human Services (DHS) Children's Health and Wellbeing Policy Flagship project. Its aim is to guide and structure DHS's efforts to support and improve the health, development, learning and wellbeing of Victorian children. In contributing to this, this review of the literature aims to assist DHS in determining, within budgetary constraints, strategic investments (or 'best bets') for improving the health and wellbeing of children in Victoria.

2.2 Objectives

1. To identify evidence-based strategies for delivering improved outcomes for all Victorian children in the identified priority areas.
2. To present the strategies for each priority area for gain in a format describing the purpose of the intervention, the site or focus, and the identified target groups; to identify how strategies will produce more equitable outcomes for different target groups in the overall population.
3. To review the relevant evidence leading to the development of these strategies.
4. To ensure that the strategies are practical and applicable in the Victorian context.

2.3 Overview of project methodology

1. Review relevant literature and evidence to identify initiatives or strategies for delivering improved outcomes for children in the priority areas for gain, including their actionable determinants.
2. Undertake a critical evaluation of the relevance and importance of these initiatives and strategies in the Victorian context.
3. Employing a common framework, propose evidence-based strategies operating across a range of service settings and intervention foci.

2.4 Scope

The priority areas for gain had already been identified by DHS after consultation with key stakeholders. These priority areas form the headings in Section 5 of this report. In addition, DHS provided a preliminary list of the actionable determinants for each priority area. These were further developed and refined over the life of the project.

The focus of this report is on the priority areas for gain categorised by DHS as either:

- areas suited to immediate action or
- areas in which to maintain effort.

With respect to areas suited to immediate effort, the goal was that strategies should offer a balance between a population-wide focus and strategies that address disadvantage within specific population sub-groups. With respect to areas in which to maintain effort, the focus was on strategies that relate particularly to identified sub-population(s).

The review of literature and evidence in relation to the priority areas for gain included relevant Australian and overseas information. In developing strategies, the literature and evidence was assessed in terms of their reliability, validity and applicability to the Victorian context.

Consistent with the brief for the project, strategies identified are those that are firmly grounded in evidence. Where possible, they are underpinned by an articulated theoretical model able to inform implementation, ensuring consistency across the range of strategies, and assisting with integration.

We have given priority to prevention and early intervention responses, including relevant treatment issues. The identified strategies and interventions are targeted at different levels of intervention, namely:

- Child
- Parent/s
- Child and family
- Environment/community
- Service system & structures
- Policy & regulation

A more limited literature and evidence review was undertaken in instances where the priority area for gain was already the subject of program activities and/or strategy development within DHS. These priority areas included:

- Asthma
- Injury
- Child abuse
- Dental caries
- Overweight and obesity
- Children with high developmental needs

The above notwithstanding, the evidence and proposed strategies have been considered in relation to the needs of children aged 0-8 years and are presented in a manner consistent with the format described above.

2.5 Limitations and caveats

In reviewing this report, the following limitations and caveats should be noted:

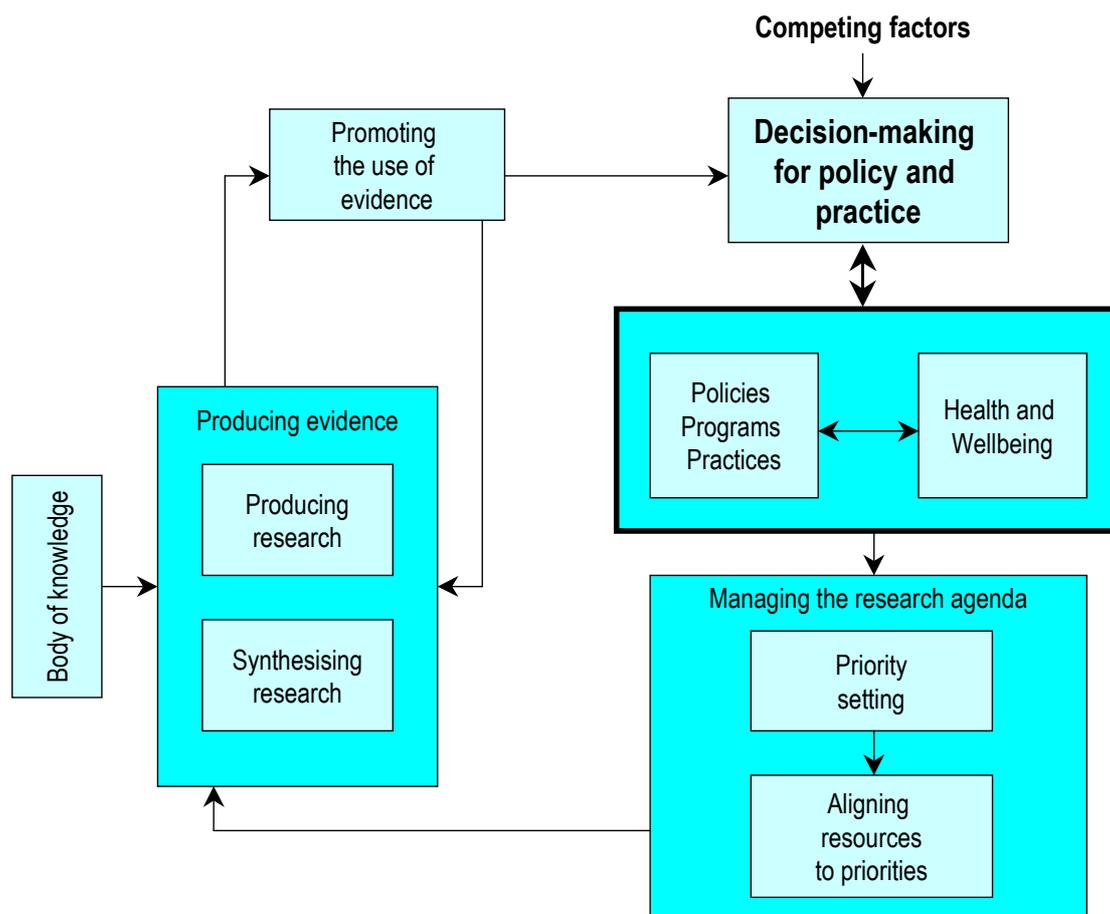
1. The period of operation of the project was only 12 weeks. Thus the review was very focussed and concentrated on areas in which DHS has influence.
2. The CHSD team working on the project comprises staff that are skilled and experienced health researchers and policy consultants. They are not necessarily established experts in the priority areas for gain, or their actionable determinants. Nevertheless this should be regarded as a plus. The team members' knowledge and understanding of the health sector and health policymaking environment enabled them to evaluate and assess the literature with a view to providing DHS policy makers with sound and actionable policy advice for the improvement and wellbeing of children that is relevant to the Victorian context.

- The review of the published literature in each of the priority areas critically evaluates the latest research that has been conducted and made publicly available in these fields and assesses its relevance in the Victorian context. Thus, the Access research database that has been developed by the project team should be regarded not as a finished project but as a policy making tool or guide that is subject to ongoing development and improvement.

3 The role and the limits of evidence in informing policy

Figure 6 provides a schematic representation of how research and, in particular, review and assessment of the available evidence, informs policy and how, in turn, policy drives the agenda and priorities of researchers working in the field of health services and policy. The figure highlights the important role that evidence potentially plays in the development of policies, programs and practices for selecting and guiding possible interventions in particular settings. Evidence is also useful in helping policy makers and practitioners in deciding where resources should be allocated and in weighing up competing priorities in terms of the costs and benefits of particular interventions in various settings. Policy makers and practitioners alike are particularly interested in whether suggested interventions actually improve people’s health and wellbeing, and accordingly require evidence to be evaluated and synthesised with this criterion in mind.

Figure 6 The research to policy and practice cycle



Source: Modified from Alliance for Health Policy and Systems Research (2004) *Strengthening health systems: the role and promise of policy and system research*. Geneva, ISBN 2-940286-25-6 Alliance for Health Policy and Systems Research, Switzerland. <http://www.alliance-hpsr.org/jahia/Jahia/pid/184?language=>

Notwithstanding the potential value of evidence in guiding policy makers and practitioners on the selection of interventions and health promotion strategies and in deciding on resource allocations

between them, it should not be regarded as the sole or definitive basis for action. Resource scarcities and competing political priorities at times either overrule or exaggerate the firmness of the available evidence. And the evidence itself is not always unqualified and without limitations.

In the case of the *Strategies for Gain* project (DHS, 2004c), for example, the amount and quality of evidence vary considerably across the different priority areas. Sometimes there is no evidence at all on the efficacy or otherwise of particular interventions and strategies. Or, what evidence there is could be ambivalent or contaminated. In such cases, it has been difficult to identify key messages and best bets for policy makers and practitioners.

Nevertheless, the project team has been determined to highlight the best available evidence available in each of the priority areas, and where the evidence is not of such a high standard, to assess its usefulness and relevance in the Victorian context. The evidence has accordingly been evaluated and assessed using the following four-part system of classification.

For a relatively small number of interventions, such as fluoridation, the evidence is so *convincing* as to leave policy makers and practitioners with little room for manoeuvre or delay. In some cases, the evidence is *inconclusive but promising* suggesting to policy makers that there is scope for innovation and experimentation. In other cases, the evidence of the effectiveness or otherwise of particular interventions has been evaluated as *inconclusive and unpromising*, suggesting that the intervention does not represent a good investment. In still other cases where further testing and research are required, *research and development priorities* have been identified.

Using evidence as the sole basis for determining policy and practice in the health sector is not sensible. There is a danger of policy makers and practitioners being lulled into inaction when there is insufficient, ambivalent or inconclusive evidence of the efficacy of particular interventions and strategies or their effectiveness with key target groups. This is of particular concern in situations where there is a need for immediate and decisive action. Doing nothing when there is insufficient or doubtful evidence only serves to worsen and perpetuate existing problems. In these cases, innovation and experimentation are required with implementation and evaluation being done concurrently rather than successively.

4 Research methods and strategies

4.1 Electronic databases

1. Electronic databases, accessible through the University of Wollongong library, were employed to compile a list of the relevant literature in each of the priority areas, including actionable determinants.
2. The databases used to conduct the literature searches were chosen for their breadth of coverage of the available literature across all of the priority areas. These were Medline, Cinahl, Meditext, APAFT, Cochrane, DARE, CCRT, and ACP Journal Club. Exceptions were only made in cases where a certain database did not index literature relevant to a particular priority area.
3. The databases were deployed in consultation with University librarians in order to enhance the efficiency and effectiveness of the literature searches. The librarians were particularly helpful in developing appropriate search strategies.

4.2 Search strategies

1. In consultation with the project librarians, a list of search terms was compiled for each of the priority areas and their actionable determinants.

2. For almost all priority areas, it was found that the initial list of terms was too broad, indiscriminately identifying all available literature irrespective of its relevance to the project.
3. The list of terms was then progressively refined with terms being used in different combinations in order to narrow the search and enhance efficiency and effectiveness. This process was continued until a manageable list of the most relevant and up-to-date.
4. An Endnote library was then created for each priority area.

4.3 Literature review template

A template common to all priority areas was developed by the research team with input from DHS staff. It was used for the collection and presentation of the literature reviews and critical evaluations submitted by members of the project team in the priority areas that had been assigned them. Information on each article reviewed was entered using this standard template and incorporated from there into a Microsoft Access database for analysis. The literature review template is included as Attachment 1.

Consistent with the aims of the project, the template enabled team members to present the strategies for each priority area for gain in a standard format describing the purpose of the intervention, the site or focus, and the identified target groups, and identifying how strategies will produce more equitable outcomes for different target groups in the overall population. It also provided them with a common framework for proposing evidence-based strategies operating across a range of service settings and intervention foci relevant to the Victorian context. Key variables captured in the analysis are described below.

4.3.1 Actionable determinants

These are factors that mitigate against health and wellbeing and that may be amenable to intervention. A list of likely actionable determinants relevant to more than one priority area was built into the template (see Attachment 1). Actionable determinants specific to a priority area (eg, fluoridation as a protection against dental caries) were also recorded.

4.3.2 Intervention type

Single or multiple

Some literature deals with a single intervention (eg, immunisation) while other literature (both articles and reviews) deals with multiple interventions (eg, social support program with several elements).

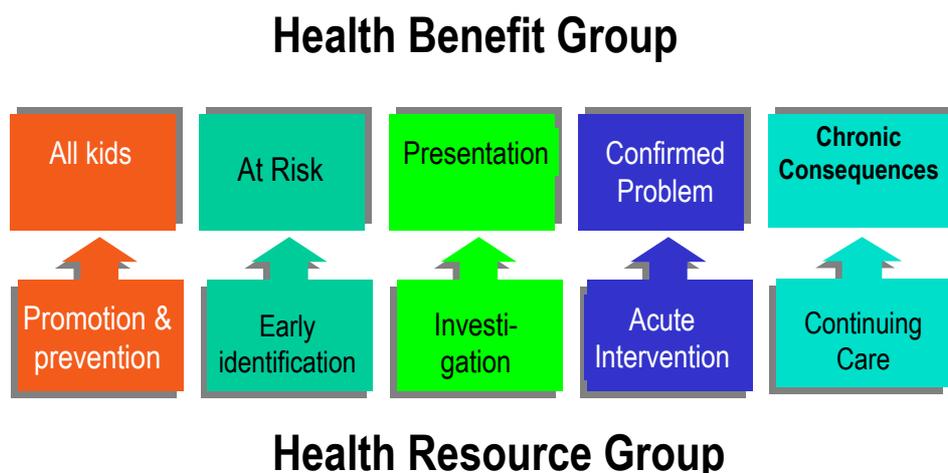
Priority area or actionable determinant

Some articles selected for review primarily focussed on a specific priority area (eg, SIDS) while others focussed on an actionable determinant (eg, smoking cessation programs).

4.3.3 Health Benefit Group (HBG) and Health Resource Group (HRG) framework

We used this decision-making framework, shown in Figure 7, to present aggregated information on both children and interventions. The results are in Section 6.4.

Figure 7 The Health Benefit Group/Health Resource Group framework used in the analysis



The aim was to organise and summarise the available evidence into:

- **Health Benefit Groups** (in this context, a HBG is a grouping of children who have similar health and wellbeing needs and who can be expected to achieve similar outcomes given similar interventions) and
- **Healthcare Resource Groups** (in this context, groupings of interventions that are similar in resource type and organisation, including the setting of care).

The HBG/HRG approach is helpful because it reflects the natural history of health/wellbeing problems and maps this natural history to health and community care processes. It thus enables the most effective points of intervention to be described, both within and between HBGs.

For information about the HBG/HRG framework, see Beaver (2003), Beaver and Zhao (2004), Eagar, Garrett and Lin (2001) and Sanderson and Raftery (2000).

4.3.4 Sub-populations

Articles that focussed on particular sub-populations were identified. These included Aboriginal and Torres Strait Islander children, children living in rural areas, children from families of low socio-economic status, children from culturally and linguistically diverse backgrounds and children in specific age groups.

4.3.5 Level and type of intervention

We identified the level of each intervention, classified as:

- **Child.** These are interventions that aim to directly impact on the child eg, preschool safety education.
- **Parents.** These are interventions that aim to directly impact on the parent/s (eg, smoking cessation programs) and have indirect impacts on the child.
- **Child and family.** These are interventions that aim to directly impact on both children and their parents (eg, home visiting programs for new families).
- **Environment/community.** These are interventions that aim to change the environment or community in which a child lives (eg, traffic calming as an injury prevention strategy).

- **Service system and structures.** These are interventions that aim to change the human service system or the processes it employs. They were further classified by type - more resources or an expansion of services, infrastructure investment (eg, investing in information technology as a strategy to promote information sharing), changing the mix/model of care (including integration/coordination/collaboration) and staff/skill development (eg, training staff in the early identification of children at risk).
- **Policy and regulation.** These are interventions that aim to change policy and/or regulation (eg, mandatory notification of child abuse).

Some articles dealt with interventions at multiple levels, in which case all were recorded.

Interventions at the child/parent and family levels were further classified by the place of intervention:

- Home
- GP
- Community health type
- Childcare type
- Schools
- Other community
- Hospital ED
- Hospital outpatients
- Inpatient

They were also classified by Service Type:

- Mainstream or Specialist
- Universal or Targeted
- If targeted, whether the intervention represented intensive or routine/standard care.

4.3.6 Level and type of evidence

The Cochrane hierarchies of study design and levels of evidence was modified and expanded to summarise the nature of the evidence:

- Systematic review of all relevant randomised controlled trials
- At least one properly designed and randomised controlled trial
- Well-designed pseudo-randomised controlled trial
- Comparative study with concurrent controls and allocation not randomised
- Case control studies, or interrupted time series with a control group
- Cohort study
- Analysis of routine data
- Economic evaluation
- Expert opinion
- Systematic review - other

- Literature review
- Service evaluation
- Other (specify)

4.3.7 A standard schema for evaluating the evidence

Drawing on the work of Rychetnik and Frommer (2002), a standard schema was developed to evaluate the strength of the evidence and the significance of the effects. It had three components:

Is there evidence in the article of an impact or change on the actionable determinant?

- Conclusive
- Inconclusive
- No
- Not applicable (the article was not about an actionable determinant)

What is the (self-reported) strength of the impact or change on the priority area?

- High
- Modest
- Low
- Not applicable (the article was not about a priority area)

Is there evidence of service/system change?

- Yes, short term
- Yes, long term
- No
- Not applicable (the article was not about changing service systems and structures).

In the event that the strength of the evidence was unclear, another member of the research team reviewed the article and a decision was made jointly about how to classify it.

This method for assessing the strength of the evidence was subsequently modified during the analysis stage because the reasons varied as to why interventions were rated as having inconclusive evidence.

Some interventions have been the subject to a considerable amount of research, with variable results. An example is vision screening. Most studies on vision screening report that it is ineffective in achieving improved outcomes. But some study results are inconclusive. Either way, there is little or no evidence to suggest that vision screening is actually effective. Interventions such as these were assessed as having inconclusive evidence, without much likelihood that they will be shown to be effective if further research is undertaken.

In contrast, some interventions look promising but the evidence is not strong enough (at least at this stage) to conclude that they achieve good outcomes. This may be because the intervention is new or difficult to evaluate. But promising interventions also include some types of interventions that have historically found it difficult to attract the attention of researchers or funding from traditional research funding agencies. Only a small number of studies have been undertaken in

some cases. This applies to many social and community interventions because of the historic bias in research funding toward medical and clinical research. Interventions that fell into this category were classified as inconclusive, but promising.

4.3.8 Applicability to Victoria

Our goal was not to undertake a systematic review of the literature but to review the literature relevant to improving the health and wellbeing of Victorian children. Articles assessed as not being relevant to Victorian children were excluded from further review.

Articles that were reviewed were classified as being applicable or as being applicable, but with caveats. Caveats were recorded in the template.

4.4 Access database

A customised Microsoft Access database was developed so that it was accessible to all members of the project team. The Endnote libraries for all priority areas were imported into the Access database. As noted above, the Access database is subject to ongoing development and improvement. The database is being submitted to DHS as an Annex to this Report.

4.5 Evidence: analysis and synthesis

As summarised in Table 1, a total of 13,877 articles were identified for potential inclusion. These were ruthlessly culled to identify those relevant to improving the health and wellbeing of Victorian children. Attachment 2 summarises the search strategies that were used and the final number of articles identified as relevant and reviewed. Culling strategies specific to each priority area are included in the relevant sections within Section 5.

Table 1 *The size of the evidence*

Priority Area	Number of articles
Behaviour Problems	1514
Asthma	1445
Child Abuse	1405
Cystic Fibrosis/HT/PKU	1123
Disability	1085
Low Birth Weight	1073
Injury	998
Infant Mortality	850
Obesity and Overweight	796
Dental Caries	649
Parent Mental Health	599
Sudden Infant Death	547
Congenital Heart Disease	521
Spina Bifida	406
Melanoma	337
Visual Acuity	222
Literacy	165
Language	142
All	13877

As described above, the literature in each priority area was reviewed and analysed with a view to identifying initiatives or strategies for delivering improved outcomes for children in that priority area, including its actionable determinants, and in order to allow a critical evaluation to be undertaken of the relevance and importance of these initiatives and strategies in the Victorian context.

The scope and limitations of the project precluded the production of new evidence and the generation of novel initiatives. Instead, the standard format and common framework in which literature reviews and evaluations have been presented in the Access database enabled the available literature and evidence for each priority area to be analysed and synthesised in such a way as to ensure their value and usefulness to DHS policy makers. Accordingly, potential initiatives and strategies were evaluated in terms of how applicable they were thought to be to the Victorian context.

The evidence from the literature was synthesised in such a way as to highlight those strategies and initiatives that are relevant in the Victorian context across a number of different priority areas, highlighting again the value of the standard format and common framework. This was not, of course, possible in all cases.

For some priority areas, there was very little or no available evidence of the efficacy of strategies and initiatives or no strategies and initiatives currently in operation to report on.

5 Results and findings in relation to each priority area

Areas suited to immediate action

5.1 Asthma

5.1.1 Key messages for policy makers about asthma

- Childhood asthma admission rates to hospital remain high although asthma education strategies have the potential to reduce exacerbations and therefore reduce admissions in early childhood.
- Primary prevention of asthma through promotion of breastfeeding for at least 6 months and avoidance of tobacco smoke exposure remains a priority.
- Avoidance of allergens and manipulation of diet may have an important role in the primary prevention of asthma but only early data are available and, from rigorous trials to date, there is little evidence of long term benefits. There is some evidence to support the avoidance of solid foods for at least the first 4 months and the use of hypoallergenic formula if a supplement is required in the first 4 months.
- There is a need for the development and evaluation of new programs that are relevant for hard to reach groups such as indigenous children and under-served communities.

5.1.2 Search strategies

A search of 8 databases produced 229 references of which 39 are included in this review. Two recent articles from an Australian trial of allergen avoidance and dietary modification were also included. Review articles excluded had a primary focus on the following:

- epidemiology only including hospital use of beds etc, or only from other countries;
- outdoor air quality including exposure to farm animals;
- virus induced asthma;
- pharmacological treatments and medication compliance;
- efficacy of food challenges;
- measurements of home allergen levels without measurement of health outcomes;
- lung physiology;
- adolescent self management;
- adults including late-onset, occupational, brittle and aspirin induced asthma;
- general narrative reviews related to a wide number of health outcomes;
- unpublished abstracts presented at meetings.

Note: this review has been compiled as an adjunct to the Review of Public Health Interventions for Asthma published by Victoria Health (<http://www.health.vic.gov.au/nhpa/asth-resc.htm>) and, as such, updates or emphasises previous recommendations.

5.1.3 Epidemiology

Although 1 in 4 children may experience some degree of wheezing in childhood, this may be a normal phenomenon related to small airways and not a symptom of asthma. Many children with symptoms of wheeze in early childhood do not go on to have asthma (Wright, 2002). It seems likely that less than 1 in 20 young children have 'asthma that matters', that is asthma with long term sequelae for respiratory health outcomes. Death from asthma in early childhood is now a rare event although hospital admission rates remain high and links have been made between asthma and obesity (Chinn, 2003). Paediatricians agree that asthma cannot be reliably diagnosed in the first years of life and therefore, in research, the error in classifying asthma outcomes will decrease as children become older. Investigations of asthma causation and prevention will involve less misclassification error if measuring asthma outcomes is postponed until children are at least between 3-5 years of age.

5.1.4 The evidence

The recommendations derived from cohort and randomised controlled trials have previously been published (Host, 2000). Although the evidence is inconclusive, the following measures are simple, without major economic burden and may have wider benefits in the form of other positive health outcomes

- No special diet in pregnancy or during lactation
- Exclusive breast feeding and avoidance of solid foods for first 4 months
- Use of hypoallergenic formula if supplement is required in first 4 months
- Avoidance of exposure to tobacco smoke
- Reduced exposure to housedust mite allergens, pets etc

These guidelines have been shown to be effective in a birth cohort in Sweden (Carlsen, 2003). It has been suggested that some primary avoidance measures may only be effective in reducing a). symptoms and b). the need for medication in the presence of other avoidance measures. An example of this is allergen avoidance in the presence of food allergen avoidance (Capristo, 2004) or in the presence of parent smoking avoidance (Halcken, 2004).

5.1.4.1 Actionable determinants/risk factors

Children at risk of developing asthma are males (Businco, 1997), low birth weight children, children with a genetic predisposition, ie, a parent or sibling with asthma (Tattersfield, 2002) and children who develop allergy in early life (Burr, 1997; Halcken, 2004). Although a family history predicts an increased risk of asthma, this only identifies a minority of at risk children (Burke, 2003).

Parent smoking

Level of evidence

Primary prevention: Inconclusive
Tertiary prevention: Inconclusive
Other health benefits: Yes

Background

Parental smoking may be a primary causative agent of asthma in pre-natal babies or in young children, or may be an airway irritant for children who have already developed asthma. ABS data

in Australia show that children aged 0-4 years have an increased risk of asthma if exposed to parent smoking (Lister, 1998). There is also evidence that children exposed to parents who smoke have higher serum cotinine levels (Irvine, 1997) and higher symptom levels (von Mutius, 2001).

Some studies have associated utero exposure with impaired lung growth and wheezing. In other studies, children with asthma have more symptoms if exposed to parent smoking (Landau, 2001; Hansen, 2000; Halken, 2004). Avoidance of tobacco smoke exposure is thought to be the most well documented preventive measure for childhood asthma (Bjorksten, 2001).

Conclusion: Parent smoking may have an impact on respiratory health throughout life. Parents who smoke may benefit their child's health by modifying their smoking habits within the home. Asthma education programs can help parents of an asthmatic child to recognise the importance of restricting smoking within the home (Hovell, 1994). Although the evidence is inconclusive, reduction in parent smoking will have many varied health benefits for both the parent and the child.

Breastfeeding

Level of evidence

Primary prevention: Inconclusive
Other health benefits: Yes

Primary prevention

The NH&MRC guidelines (www.health.gov.au/nhmrc/publications/pdf/n34.pdf) state that exclusive breastfeeding to the age of 6 months provides the best nutritional start for infants. However, the evidence for breastfeeding providing a primary preventive effect against asthma remains inconclusive (Halken, 2004). The majority of methodologically sound cohort studies show that breastfeeding protects against the development of allergy and asthma (Businco, 1997). However, two large prospective studies cast doubt on the benefits (Kemp and Kakakios, 2004). Although the questions concerning these studies are unresolved (Kemp and Kakakios, 2004), a recent review based on evaluating study methodology questions the methodology and interpretation of one of these studies (Oddy, 2003). There is no evidence that the introduction of solid foods after the age of 17 weeks is harmful (MacDonald, 2003).

More could be done to positively encourage and support mothers to continue breastfeeding for a longer period. Although the evidence for asthma is inconclusive, breastfeeding has other benefits for children including a reduction in gastrointestinal infection (MacDonald, 2003).

Cow's milk protein avoidance, hydrolysed milk and probiotics in early life

Level of evidence

Primary prevention: Inconclusive
Other health benefits: Yes

There is evidence from several studies that dietary intervention in high risk infants can be beneficial (Halken, 2004). Hypoallergenic (hydrolysed) formula if a supplement is required in the first 4 months delays exposure to dietary allergens and reduces food allergy (Arshad, 2001). In high risk infants, randomised controlled trials show that hydrolysed formula for a minimum of 4 months combined with dietary restrictions and environment measures can reduce the risk of asthma or wheeze developing in the first year of life but there is no evidence that soya-based milk formula has any benefit (Ram et al., 2002).

Two intervention studies of dietary probiotics in early life show that they reduce the risk of asthma (Mellis, 2002).

Diet

Primary prevention

Supplementation with omega-3 fatty acids has the potential to reduce airway inflammation. An 'as-treated' analysis of supplementation with omega-3 fatty acids shows some potential in reducing asthma symptoms up to age 18 months (Mihirshahi, 2004).

Tertiary prevention

Cohort studies suggest that children who eat a diet high in omega-3 fatty acids have high omega-3 serum phospholipid levels (Oddy, 2004) and a decreased risk of airway inflammation with asthma (Hughes and Armour, 1998). However, a review of randomised controlled trials suggests that there is little evidence to recommend that modification of diet in children with asthma improves asthma control (Thien, 2004).

Allergen avoidance

Level of evidence

Primary prevention: Inconclusive

Tertiary prevention: Inconclusive

Other health benefits: Yes

Primary prevention

Allergen avoidance is recognised as an important asthma primary prevention strategy (Lau, 2002). There seems to be a dose-dependent relationship between exposure to allergens and atopy and between atopy and the development of asthma (Halcken, 2004). Initial results from the primary preventive trials of allergen avoidance that are underway continue to look promising (Simpson, 2004; Peat, 2004). However, the long term benefits and timing and duration of allergen avoidance in primary prevention need to be more thoroughly investigated (Boner, 2002). Good ventilation and avoidance of dampness in the home which reduces housedust mite and mould allergens may have other health benefits.

Secondary prevention

Cohort studies show that children with atopic dermatitis are more likely to develop asthma if exposed to high levels of pet or housedust mite allergens (Businco, 1997). Several Randomised Controlled Trials (RCT) show that allergen control is effective in improving disease control (Host and Halcken, 2000).

Tertiary prevention

Avoiding allergens that have been identified as relevant to a patient with asthma seems a logical treatment method. Some studies have shown that allergen reduction methods in bedding can be effective (Halcken, 2004) but the evidence is not conclusive. Studies that focus on mattress covers or chemical applications alone have been largely unsuccessful but some more intense multifaceted interventions have been successful (Sandel et al., 2004).

Cohort studies suggest that children who use feather bedding, and who therefore have lower bed allergen levels, have less frequent asthma but there is insufficient evidence to date to support the use of feather bedding in the management of asthma (Campbell and Jones, 2000).

Effect modification and reverse causation is a problem in studies of the effects of pet allergens and much further research is needed to prove or disprove the role of pet allergens (Apter, 2003). The trials of the use of air-filtration units to reduce pet allergen levels in the management of pet allergic asthma have been too small to provide adequate evidence of effectiveness (Kilburn, 2003). There have been no trials of pet washing or pet removal. While some studies show that early exposure to pets protects against asthma, although a systematic review shows that exposure to pets appears to increase the risk of asthma (Halcken, 2004).

Education

Level of evidence

Tertiary prevention: Inconclusive

Other health benefits: Yes

Improving asthma management through improving patient communication and focussing on how behavioural change can be achieved now underpins contemporary thinking about asthma self management (Sawyer and Shah, 2004).

Parental asthma management programs have the potential to improve health outcomes for young children with asthma. However, on the basis of published trials, there is no firm evidence to support the use of asthma education programs for children with severe asthma. Some trials show a clear evidence of benefit but the reasons for different outcomes between these trials and negative trials are not clear (Haby et al., 2001).

There is evidence that self-management education programs for children improve a wide range of outcome measures and should be incorporated into routine care (Wolf, 2002). There is also evidence that asthma education by school nurses can help in the management of asthma (Baker, 2002a; Baker, 2002b). However, there is a need for the development of new programs that are relevant for hard to reach groups such as indigenous children (Sawyer and Shah, 2004) and under-served communities (Christiansen, 2002).

5.2 *Child abuse*

5.2.1 Key messages for policy makers about child abuse

- Community-wide interventions offering several layers or ‘tiers’ of support to parents are promising, although few evaluations have been published to date.
- Child education programs, although intended as a primary prevention measure, have proved most useful in helping to prevent the recurrence of maltreatment by encouraging children to report incidences of abuse.
- Home visiting for at-risk families is well supported as a useful approach to reducing the risk of child abuse and neglect. Home visiting may be less beneficial where there is domestic violence. Enhancements such as group sessions or cognitive retraining appear to increase its effectiveness.
- The available standardised tools for screening and early detection of child abuse have poor predictive accuracy.
- A set of early indicators of child abuse based on clinical experience has consensus support from academics and practitioners in Britain but it is unclear how useful these might be in the Australian context.
- Legislation requiring certain professionals to report suspected child abuse has led to increased notification of cases of abuse and neglect nationally. There is, however, no evidence that mandatory reporting legislation in Australia or elsewhere has been effective in protecting children.
- Cognitive behavioural therapy is effective in reducing trauma among children and parents in cases of confirmed abuse.
- Family preservation strategies focusing on improving parent-child interactions in families where abuse has occurred have promise.
- There is clearly a need for more and better quality evaluations of Australian programs supporting children exposed to domestic violence.

5.2.2 Search strategy

Electronic databases (list) were searched under the subject heading ‘prevention and control’ using the phrase ‘risk OR promotion OR education OR environment OR intervention’ and limiting age groups to ‘fetus OR newborn infant to child (6 to 12 years)’. Only articles published in the last 10 years (1994-2004) were sought. The search strategy was limited to systematic reviews, clinical trials, literature reviews and meta analysis. This search strategy resulted in a total of 1405 articles.

The field was narrowed by applying the following criteria for exclusion:

- Language other than English
- Articles in professional newsletters
- Long-term consequences for adults (eg, chronic pain)
- Treatment of adult survivors of child abuse
- Sexual health, sexually transmitted diseases, female genital mutilation
- Child abuse in health care or day care settings
- Corporal punishment

- Legal aspects (but not mandatory reporting)
- Eyewitness testimony research with children
- Recovered memories
- Sibling incest
- Development of sexually abusive behaviour
- Treatment of child molesters
- Research specific to disabled mothers
- Race-related abuse, where ethnic group not relevant to Victoria
- General trauma (eg, terrorism, natural disaster)
- Specific perspectives (eg, feminist philosophy)

In addition to the database search, hand searches were conducted of various journals including Injury Prevention (2002-2004) and Child Abuse Review (2003-2004).

Internet searches were also conducted, focusing on research conducted for Australian and State government departments and agencies.

This strategy resulted in a final list of approximately 100 articles, of which 50 were included in this review. These were selected on the basis that they were the most recent evidence available, and the most relevant to Victoria and to the major risk factors for child abuse among Australian children aged 0-8 years.

This review was compiled as an adjunct to the recent DHS document:

Department of Human Services (2004d). *Protecting children: ten priorities for children's wellbeing and safety in Victoria*. Community Care Division. DHS, Melbourne.

5.2.3 Epidemiology

There are four types of child abuse: physical, neglect, emotional and sexual (MacMillan et al., 2000; Puttnam, 2002). These have been defined by DHS as:

- *Physical Abuse* occurs when a child suffers or is likely to suffer significant harm from an injury inflicted by a child's parent or caregiver. The injury may be inflicted intentionally or may be the inadvertent consequence of physical punishment or physically aggressive treatment of a child.
- *Neglect* is the failure to provide the child with the basic necessities of life such as food, clothing, shelter, medical attention or supervision, to the extent that the child's health and development is, or is likely to be, significantly harmed.
- *Sexual Abuse* occurs when a person uses power or authority over a child to involve the child in sexual activity and the child's parent or caregiver has not protected the child. Physical force is sometimes involved.
- *Emotional Abuse* occurs when a child's parent or caregiver repeatedly rejects the child or uses threats to frighten the child. This may involve name calling, put downs or continual coldness from the parent or caregiver, to the extent that it significantly damages the child's physical, social, intellectual or emotional development (DHS, 2004e).

Every year, thousands of young children come into contact with Victoria's Child Protection system due to suspected or confirmed abuse or neglect. On average, around 2000 cases of physical abuse and 600 of sexual abuse are substantiated annually (DHS, 2001). More than 70% of these

children come from low income families, affected by substance abuse, mental health problems, intellectual disability and family violence. More than 40% have two or more of these problems within their families. Poor parenting and social isolation have been identified as other risk factors for child abuse (Geeraert et al., 2004). Parent mental health, including substance abuse, is dealt with elsewhere in this document (see Section 5.10).

Aboriginal children are nine times more likely to have abuse or neglect substantiated, 10 times more likely to be placed on a protective order and 13 times more likely to be placed in out-of-home care than non-Aboriginal children (DHS, 2004a). Disabled children are also at increased risk, particularly those who are highly dependent, have communication difficulties, and/or are in institutional care (Westcott and Jones, 1999).

A known risk factor for child abuse is exposure to domestic violence. In Australia, domestic violence is commonly defined as violence occurring between people who are in or have been in an intimate relationship. Children's 'witnessing' of domestic violence include experiences such as being hit or threatened while in the mother's arms, being used as a hostage to ensure the mother's return to the home, watching or taking part in assaults, being involved in spying on the mother, and attempts to break down the parent-child bond (Tomison, 2000, cited in Kovacs and Tomison, 2003). The number of children exposed to domestic violence in Australia is unknown. A recent survey of Australian youth found that one-quarter of those surveyed reported having witnessed physical domestic violence against their mothers or stepmothers. An older study, conducted in Victoria, revealed that children were present in 79 per cent of domestic disputes involving the use of a weapon (usually a knife) (Kovacs and Tomison, 2003).

It is acknowledged that abuse is likely to recur in families in which maltreatment has already occurred (Geeraert et al., 2004). In such cases, the critical variable in determining outcomes for the child appears to be the level of disturbance in parenting. Parenting capacity, rather than the category of abuse or its physical severity, is the best predictor of the future wellbeing and safety of an abused child (Donald and Jureidini, 2004).

5.2.4 The evidence

5.2.4.1 Model/approach

Bethea (1999) provides a useful model of the parent, child and societal factors that contribute to the development of child abuse (see Figure 8). This indicates certain characteristics of the child (eg, low birth weight) and the parent (eg, poor coping skills), their interactions (eg, feeding problems) and other family characteristics (eg, domestic violence) along with their social context (eg, poverty) which may lead to abusive behaviour. More importantly, it suggests that a starting point for interventions designed to prevent child abuse is to target some of these contributing factors.

5.2.4.2 Actionable determinants/risk factors

Child abuse interventions are targeted at three distinct population groups, which are defined by the level of risk of harm. At the first level, primary preventive efforts are aimed at all children and their parents and include efforts to enhance parenting skills and provide children with knowledge and assertiveness training. At the second level, families at risk are offered additional support through home visiting or parent training. Various screening and evaluation methods have been evaluated. Tertiary prevention involves minimising harm to children in cases of confirmed abuse. This is the largest and most diverse group of interventions, incorporating various types of therapeutic support for abused children, education or counselling for abusive and non-offending parents, and support for foster parents or the family of origin.

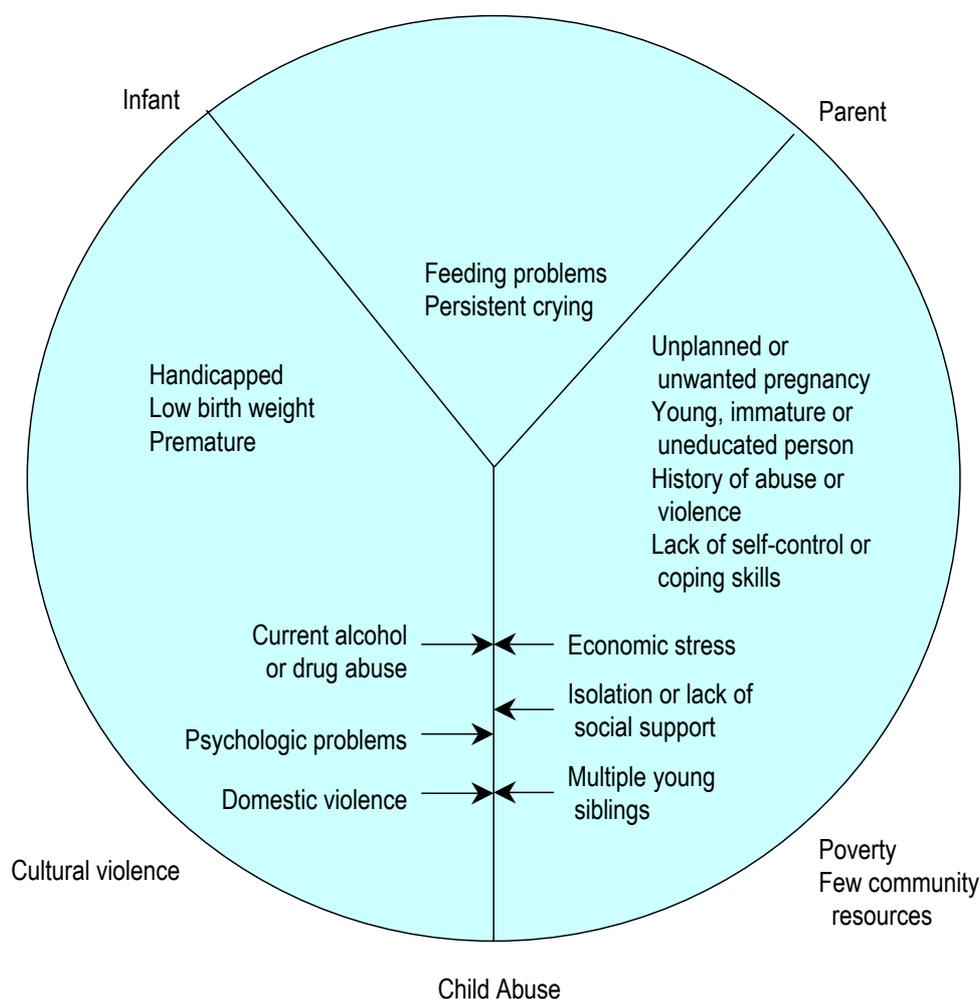
5.2.4.3 Interventions/factors affecting implementation

Primary prevention: All children and their parents

Community-wide tiered support for parents

The *Positive Parenting Program* ('Triple P') developed at the University of Queensland is a population-based strategy to enhance parental competence, prevent dysfunctional parenting practices, change parental attributions about their children's behaviour and promote teamwork between partners (Sanders et al., 2003).

Figure 8 The Path to Child Abuse



Source: Bethea (1999)

The program is composed of a five-tiered continuum of interventions of increasing strength but narrowing reach. At its most universal, Triple P involves a media-based information campaign, progressing through information and advice for specific parenting concerns, and parent skills training, to behavioural family intervention in the case of concurrent problems with child behaviour and parent difficulties. The specific content of each strategy is manualised and professional training and support is available. Strategies are based on well-established theoretical perspectives for which there is empirical support.

Evaluation materials are provided to practitioners, and it is expected that this standardised data collection will ultimately allow for comparisons of effectiveness across sites. The Triple P system is

currently being evaluated with families notified for child maltreatment. No outcomes data are available to date.

A three-tiered intervention using community (policy), practice and family level strategies to improve the care of mothers and newborns (starting from pregnancy) was implemented in the United States (Margolis et al., 2001). Time-series analysis of the outcomes showed positive effects at all three levels, demonstrating that that such tiered and inter-related interventions are feasible.

Child education

A recent audit of Australian initiatives for children exposed to domestic violence identified a number of school-based personal safety programs (Kovacs and Tomison, 2003). These programs aimed to teach children to protect themselves against sexual abuse, child maltreatment overall, and/or other unsafe situations. The objective was to educate children, not to make them solely responsible for their own safety.

According to a recent systematic review, such programs can increase child disclosure of physical abuse and neglect (Kaplan et al., 1999). Results of a meta-analysis of 16 studies evaluating school programs aimed at the prevention of child sexual abuse found that these were successful in teaching children concepts and self-protection skills (Rispen et al., 1997). Most effective were programs that focused on skills training, allowing sufficient time for children to integrate self-protection skills into their cognitive repertoire. An innovative method of delivering sexual assault prevention concepts to children was evaluated in a rural area in the United States. A theatre presentation designed for children in grades 3 and 4 increased their knowledge about secrets and touching by authority figures, known individuals and strangers (Hayward and Pehrsson, 2000).

There is little evidence, however, that child education programs can prevent the initiation of abuse, particularly within the family (Kovacs and Tomison, 2003). Instead, the available evidence suggests that such measures are best able to prevent the recurrence of maltreatment, by encouraging children to report incidences of abuse.

Secondary prevention: Families at risk

Early prevention programs

A meta-analysis of 43 studies evaluating early prevention strategies for at-risk families with young children found a significant overall positive effect, indicating that these programs can be useful (Geeraert et al., 2004). Interventions began either before or immediately after children were born and lasted up to five years, although more than half were completed within two years. On the whole, the programs reduced the incidence of abusive and neglectful acts. They also lowered the risk of child physical abuse and neglect by improving parents' skills and personal functioning, child health and development, family functioning and context, and social networks. Little was known about the specific content of each program because of a lack of process evaluation. The vast majority (38) of the programs included in this meta analysis involved home visits by professionals or para-professionals; the others involved group sessions, consultations and 'rooming in' with new mothers.

Home visiting

Many individual studies, including some large-scale randomised controlled trials with long-term follow up, have demonstrated that home visiting by professionals or para-professionals has benefits for at-risk families (eg, Armstrong et al., 1999; Olds, 2002).

Three systematic reviews (Kaplan et al., 1999, Leventhal, 2001; Rubin et al., 2001) found that home visiting programs were effective in preventing physical abuse and neglect. Two others (Hodnett and Roberts, 2004; Lagerberg, 2000) found that home visiting of socially disadvantaged

new mothers had no impact, although surveillance bias - that is, the increased likelihood of detecting child abuse in families who receive regular visits – was an important methodological problem. (Note: The Hodnett and Roberts (2004) review was recently withdrawn from the Cochrane database as the authors consider it out of date.) Benefits were observed, however, for unintentional injury and postnatal depression (Lagerberg, 2000).

Recent findings suggest it is essential to consider the family context – including fathers - when developing home visiting programs (Duggan et al., 2004). The presence of domestic violence may limit their effectiveness (Eckenrode et al., 2000).

Parent group meetings designed to draw on practical experience to promote parent-infant attachment can enhance participation in home visiting interventions (Constantino et al., 2001). A meta analysis of 56 interventions found that home visiting was more effective when programs ran for more than six months and involved at least 12 visits (McLeod and Nelson, 2000).

A home visiting program which incorporated cognitive retraining of mothers was more effective than home visiting alone. Lower levels of harsh parenting were found among mothers in the cognitive retraining group (enhanced home visits) than among those in the unenhanced home visitation or control conditions. Prevalence of physical abuse in the first year of the child's life was 4% among mothers given the additional training, compared with 26% in the control condition and 23% in the unenhanced home visitation condition (Bugental et al., 2002).

Parent support and/or training

The Triple P program reviewed above, although designed as a primary prevention measure, may also be used with families at higher risk of child abuse and neglect. As indicated above, evaluation data are not yet available for this intervention.

Promising results have been obtained in trials of another Australian parenting support model which specifically targets at-risk groups. The NEWPIN program is run by large non-government organisations in Victoria, NSW and Tasmania. It provides group therapy, play therapy, parenting information, a 24-hour peer support network and vocational skills training to vulnerable families. Clients include a high proportion of indigenous (Aboriginal and Torres Strait Islander) parents and parents from culturally and linguistically diverse backgrounds. NEWPIN has been shown to reduce parental stress and the overall potential for physical abuse, although impacts on incidence rates have not been reported (Mondy and Mondy, 2004).

Screening and forensic evaluation

A systematic review of instruments (eg, checklists, clinical interview protocols) designed to predict future child maltreatment found that their predictive accuracy was limited, suggesting that they should only be used to focus non-punitive interventions (Peters and Barlow, 2003).

An attempt to identify early indicators of child abuse and neglect by using the Delphi technique with a large sample of British child protection academics and practitioners produced a consensus opinion on 46 physical, behavioural/developmental and parental factors (Powell, 2003). The potential usefulness of these items was then judged against a retrospective case-notes review of 20 children known to child protection services. There was a strong correlation between items which reached high levels of consensus and positive findings of possible early indicators in the notes. The indicators identified through this study may help practitioners achieve earlier diagnosis of child abuse and neglect, although it is essential to proceed with caution, gather information and consider alternative explanations and differential diagnoses (Powell, 2003).

The emotional relationship between parent and child is the focus of an alternative view of risk assessment in suspected or confirmed child abuse. While other approaches examine a range of parent skills, social supports and other risk factors, the method advocated by Donald and Jureidini

(2004) assumes that the core issue is a parent's capacity for empathy with his or her child. Under this model, assessments explore parents' perceptions of their children and their needs. This approach is based on clinical experience and no formal evaluation is reported.

Legislation

Victorian law (Section 64(1C) of the Children and Young Persons Act 1989) allows any person to notify the authorities of any instance of possible or known child abuse. It also lists certain professionals who are or will be obliged to report when child abuse is suspected. So far, professionals who are gazetted under mandatory reporting requirements are:

- Medical practitioners, registered nurses and members of the Victorian police force (from November 1993); and
- Primary and secondary school teachers and principals (from July 1994).

These groups of people are required to make their reports without delay, and they do not have to be able to prove that abuse has occurred. The law allows for the extension of mandatory reporting to other professional groups, including qualified child care workers and youth workers.

Other States and Territories have similar legislation, which followed from the United Nations Convention on the Rights of the Child 1989. Nationally, these laws have resulted in an increase in notifications and substantiations of child abuse and neglect (AIHW, 2003, cited in Farrell, 2004).

The effectiveness of mandatory reporting is, however, a highly contentious issue. A recent review commissioned by the Western Australian Child Protection Panel (Harries and Clare, 2002) concluded that there was fundamentally no evidence that mandatory reporting systems were effective in protecting children. While mandatory reporting may lead to greater screening of children who are the subject of reports, there is no evidence that it results in better or more timely provision of services to children at risk and their families.

The Western Australian review identified eight arguments for and against mandatory reporting and presented and evaluated the evidence on each argument. This process led to the conclusion that these arguments ignored the most important issue, namely:

"...what is the best location for the portal of entry to services for children and families. Is it through a highly forensic, investigatory portal or through a community development model?" (Harries and Clare, 2002, p.48).

Tertiary prevention: Preventing recurrence of abuse and minimising harm

Family preservation programs

One approach to promoting recovery from child abuse is the use of multi-component, intensive family preservation interventions. Several reviews and individual trials have highlighted aspects of such programs which are associated with greater success (eg, Thomlison, 2003). These include:

- Targeting families of higher-risk children
- Intervening during early childhood
- Using professionals to teach parenting competency skills
- Focusing on parent-child interactions in the home.

Intensive family preservation programs are most beneficial when they involve high levels of participant involvement, an empowerment/strengths based approach, and a component of social support (McLeod and Nelson, 2000).

A randomised trial which compared two interventions for preventing re-reports of physical abuse by abusive parents demonstrated that parent-child interaction therapy was much more effective than a standard community-based parenting group (Chaffin et al., 2004). The value of focusing on parent-child interactions was confirmed by other randomised controlled trials. Multi-systemic interventions (combined parental training and child treatment) were shown to be more effective in preventing and treating child psychopathology than approaches that only targeted the caregivers (Brown, 2003).

Treatment programs for domestic violence offenders in Australia aim to educate these adults about how their behaviour can affect their children's development (Kovacs and Tomison, 2003). Violent fathers often deny or are unaware of the impact of their violence on their children. Offender programs focus on children's experiences, feelings and behaviours resulting from witnessing domestic violence. There is a lack of rigorous evaluations of these programs.

Support for non-offending parents

There is little evaluation evidence on interventions for non-offending parents. A recent audit of Australian programs for children exposed to domestic violence identified a number of interventions aimed at mothers who have been the victims in violent relationships (Kovacs and Tomison, 2003). Evaluation evidence is unavailable, however.

The use of a short videotaped presentation to support non-offending mothers in cases of suspected abuse produced promising results in a randomised controlled trial. Mothers who viewed the treatment tape were more likely to engage in supportive behaviours with their child, as well as identify supportive behaviours at one-week follow-up. There was some evidence that this intervention also had an effect on the children (Jinich and Lintrownik, 1999).

Support for children in foster care

There are indications that an intense assessment and treatment intervention for children in foster care can significantly reduce the recurrence of maltreatment (Zeanah et al., 2001). This was tested in one trial, which used a cohort design of two groups before and after the change in practice (1991-1994 versus 1995-1998). The intervention incorporated an assessment period of 15 - 20 hours of face-to-face contact with the child and their caregivers, case-conferences and implementation of a court-ordered case plan.

Therapeutic support groups for children

A number of Australian programs have been designed to meet children's emotional and therapeutic needs and address any ongoing trauma following exposure to domestic violence (Kovacs and Tomison, 2003). It is unclear, given the limited number and quality of evaluations carried out in this area, whether such programs are effective.

Therapeutic child care has been shown to benefit maltreated toddlers and infants, when compared with standard community services (Moore et al., 1998). A 12-year follow-up study found that children who did not receive therapeutic child care displayed significantly more behaviour problems (as reported by caregivers), earlier arrest and violent delinquency and school disciplinary problems. Children who did receive therapeutic child care demonstrated more positive home environments and care-giver child relationships.

Individual therapies

Cognitive behavioural therapy (CBT) has demonstrated benefits for abused children and their caregivers. In a review of psychological interventions in child abuse, CBT for children who were symptomatic had the strongest research evidence of efficacy. Involving a non-abusing parent was associated with an improved outcome for the child (Ramchandani and Jones, 2003). A randomised controlled trial comparing trauma-focused CBT with child-centred therapy found significantly greater improvement in the CBT group. Therapies were provided to children with PTSD and related emotional and behavioural problems as a result of sexual abuse. Parents who participated in the CBT program showed less depression, less distress, and greater support of the child and better parenting practices. (Cohen et al, 2004)

Caregivers in CBT and family therapy experienced greater improvements than those in routine community services on factors such as parental distress, physical abuse risk and family cohesion and conflict. Their children showed a greater decrease in anxiety, depression, behavioural problems, and child to parent aggression (Brown, 2003).

5.2.4.4 Economic evaluation

None

5.2.4.5 Other considerations

There have been no prevention programs explicitly directed to the prevention of emotional abuse (Cox, 1997).

Relatively few agencies around Australia offer programs supporting children exposed to domestic violence. Only a quarter of these have attempted to incorporate pre- and post-test comparisons of impacts on participants. More rigorous evaluations, in which control groups are used, follow-up assessments are undertaken, and potentially confounding variables are controlled, are very rare (Kovacs and Tomison, 2003). Barriers to quality evaluation include:

- Fears by service providers that findings may be negative and threaten future funding
- A perception that evaluation diverts scarce resources away from service provision
- A lack of evaluation expertise among staff
- Ethical concerns about issues such as assignment of children to control rather than treatment groups
- The short time frame of many programs, which means they are unable to undertake long-term follow-up of participants.

There is clearly a need to enhance the quality and quantity of program evaluation studies. This research should consider how children differ in their reactions to programs, in order to establish which children are most likely to benefit from particular program models (Kovacs and Tomison, 2003).

5.3 *Child behaviour problems*

5.3.1 Key messages for policy makers about child behaviour problems

- Child behaviour problems are common but there are a range of interventions with demonstrated effectiveness
- Problem behaviours are addressed most effectively when children are young
- For younger children, intensive preschool interventions are effective
- Home visiting programs are effective in improving the behaviour of both younger and older children
- Group based parenting programs can improve the emotional and behavioural adjustment of both younger and older children, but there is little evidence of their long-term effectiveness
- Play therapy is an effective intervention for children with severe behaviour problems

5.3.2 Search strategy

Key terms

Child, behaviour, problem, intervention, family intervention, early intervention, prevention, risk factors, neonatal, infancy, preschool age, child behaviour disorders, risk, education, environment.

Refinement of search strategy specific to this priority area

Limited search in CCTR, Psycinfo, Cinahl and Medline to articles published between 2000 and .

Culling strategy

The following were excluded:

- Articles referred to in broad systematic reviews
- Non-English language articles
- Articles not relevant to Victoria
- Articles focussing on autism, epilepsy and ADHD (ADHD is a separate priority area within the Victorian strategy)
- Articles focussing on mental illness and psychiatric interventions.
- Articles focussing on children with intellectual or developmental disabilities (children with disabilities are included in Section 5.5.1 starting on page 35).

5.3.3 Epidemiology

There is no simple definition of a 'behaviour problem'. Behaviour regarded as a problem by some parents will be regarded as acceptable to others. The threshold at which behaviour becomes a 'problem' is strongly influenced by social and cultural norms. In turn, these are influenced by factors such as socio-economic status, ethnicity, age and educational status.

That said, child behaviour problems are common. For example, parents and carers of children aged 4–12 years who participated in the New South Wales Child Health Survey in 2001 were asked about emotional and behavioural problems experienced by their child over the previous six

months, and about help that they needed for these problems. Overall, almost one-third of children aged 4–12 years (31.4 per cent) were reported to have had emotional or behavioural problems in the past six months (clinical and non-clinical). These problems were more frequently reported among males (35.0 per cent) than among females (27.6 per cent), and their prevalence increased with age, from 17.9 per cent in children aged four years, to 30.2 per cent in children aged 8 years. Of those with reported behavioural problems, over one third of parents reported that their child needed professional help (Centre for Epidemiology and Research, NSW Department of Health, 2002).

5.3.4 The evidence

5.3.4.1 Actionable determinants/risk factors

Many of the actionable determinants for child behaviour problems are priority areas that are dealt with elsewhere in this report. They include child abuse, parental mental illness, communication (language and literacy) problems and low birth weight. Effective interventions in these areas can be expected to have flow-on effects to child behaviour problems.

A major review was recently undertaken by the Victorian Parenting Centre for the Department of Family and Community Services which summarises the current state of knowledge about the factors that impinge upon parenting. These factors include characteristics of the parent and child, and the social, familial and environmental context (Centre for Community Child Health, 2004).

Some of these risk factors have direct links to child behaviour problems. They include parent characteristics such as parenting experience and age (adolescent parents are more likely to have children with behavioural problems), family disruption, poverty and parental perceptions of the temperament of the child.

Some child behaviour problems are linked to physical/biological factors in the child. A review of the literature was carried out in 2002 to investigate the biological bases of antisocial and aggressive behaviour in children with a focus on low autonomic functioning, prefrontal deficits, and early health factors. The review reported that low resting heart rate and prefrontal structural and functional deficits of the brain could be related to antisocial and aggressive behaviour throughout the lifespan. Birth complications and minor physical anomalies can also be associated with later violent behaviour. This review also makes reference to a link between both cigarette smoking and malnutrition during pregnancy and antisocial and violent behaviour in later life (Raine, 2002).

There is a growing literature on the possible causal role of maternal smoking during pregnancy and later child behaviour problems. The evidence, however, is inconclusive at this stage (Wakschlag et al., 2002, Markusson et al, 2003).

5.3.4.2 Interventions/factors affecting implementation

Types of intervention programs available

In December 2001, the Department of Human Services published a report conducted by the Centre for Community Child Health and the Victorian Parenting Centre. *“Best Start: Effective Intervention programs”* formed the background reading to the Victorian Governments ‘Best Start’ project. This report included a review of intervention programs that have been proven to be effective with children and their families (Centre for Community Child Health and the Victorian Parenting Centre, 2001a).

More recently in June 2004, the Centre for Community Health conducted a literature review on the effectiveness of parent education. This review was carried out for the Department of Family and Community Services for the Parenting Information Project (Centre for Community Child Health, 2004).

No single strategy stands out in either report as being more effective than the others. Many contextual factors are involved and the interventions range from brief and highly-specific to prolonged and intensive. The programs that deal specifically with child behavioural problems are discussed in more detail below within the following categories:

- Parent/family training programs
- Home visiting programs
- School based programs
- Child based programs

In order to build on the work of these two reports, other relevant child behaviour programs have also been included.

Parent/family training programs

Most of the research conducted in childhood behavioural and emotional disorders is focused upon either parent training, the inclusion of parents in primarily individual focused treatment or family group therapy.

The number and quality of studies focussing on family interventions for childhood behavioural and emotional disorders varies significantly by diagnosis and age group.

Parenting-training programs are focused, short-term interventions aimed at helping parents improve their relationship with their child, and preventing or treating a range of problems including behavioural and emotional adjustment. These programs can be offered in a variety of settings.

A recent systematic review of randomised control trials showed that group based parenting programs are effective in improving behaviour problems in 3 – 10 year old children. There is also some evidence to suggest that group based parenting programs can improve the emotional and behavioural adjustment of children under 3 years of age, but there is little evidence of their long-term effectiveness (Barlow and Parsons, 2003).

A similar review conducted in 1997 looked at the delivery and setting of parenting programs and reported that these community-based group programs may produce better changes in children's behaviour and be more cost-effective and user-friendly than individual clinic based programs (Barlow, 1997).

Positive Parenting Program (Triple P)

The Parenting and Family Support Centre at the University of Queensland developed Triple P in 1999. Triple P is a multi-level parenting and family support strategy that aims to prevent severe behavioural, emotional and developmental problems in children by enhancing the knowledge, skills, and confidence of parents. This multi-levelled approach recognises that parents have differing needs and desires regarding the type, intensity and mode of assistance they require. In this way, the Triple P system maximises efficiency, contains costs, and ensures the program has wide reach in the community (Centre for Community Child Health, 2004).

Triple P has generated a considerable amount of research interest that includes several randomised controlled trials, often with children with specific behavioural problems, using various levels of the Triple P intervention modalities. Well-designed studies have consistently demonstrated significant child and parent benefits from the program. Triple P has been developed, used and researched within the Australian context and is appropriate for use in Australia. Parent Tip Sheets, the Positive Parenting Booklet, the Positive Parenting Video Series and a

Developmental Wall Chart are available to Victorian service providers from the Victorian Parenting Centre (Centre for Community Child Health, 2004).

The Parents and Children Series

The Parents and Children Series was specifically designed for parents of children aged between two and eight years with behavioural problems. The program is videotape-based and aims to improve long term outcomes for children with behavioural problems by assisting their parents to improve their communication, limit setting, anger management and problem solving skills. There are nine videotapes in the series that include over 200 brief vignettes that depict parents handling various situations with their children.

This program has been extensively evaluated over a period of more than 17 years using control group comparisons and reliable and valid outcome measures. The results have found that, following participation in the program, parents engage in less criticism and physical punishment and use more praise and effective discipline practices. This has resulted in a reduction in child problem behaviour and an increase in pro-social behaviour following program completion. The program's strong evidence and research support make it one of the best-corroborated mental health interventions for conduct-disordered children available. However, the program has not been formally evaluated in Australia and it is therefore not known how the program would translate to the Australian context (Centre for Community Child Health and the Victorian Parenting Centre, 2001a).

Defiant Children

This program was designed to treat children with severe behavioural problems, such as those associated with ADHD, Oppositional Defiant Disorder and Conduct Disorder. It aims to improve parent's knowledge, management and competence in dealing with child behaviour. The program can be delivered in group or individual format and includes around ten 2½ hour sessions. A recent review of this program suggests that up to 64% of children with severe behavioural problems can expect to demonstrate clinically significant change in the level of behavioural difficulties they experience. Greater improvement in behaviour is achieved in younger children (under 6 years) and in children with less severe problems.

The effectiveness of this program has only been evaluated in a few studies. However, it is based on other studies that have been extensively researched and found to be effective in the treatment of children with behavioural problems (Centre for Community Child Health and the Victorian Parenting Centre, 2001a).

Home visiting programs

Mother-infant clinical home visit

A study was recently conducted to assess the long-term effects of clinical infant home-visiting services on child outcomes at school entry in the United States. This study showed that early home-visiting services reduced the incidence of aggressive behaviour problems among 63 socially at-risk children for up to 3.5 years after the end of the services. Furthermore, cost-benefit analyses indicated that the savings to government for serving low-income single mothers (but not lower-risk mothers) exceeded the cost of the program by a factor of four over the life of the child (Lyons-Ruth and Melnick, 2004).

Parents as Teachers (PAT)

A program developed in 1981 by the Centre for Parent Education (Newton, Massachusetts) that is now delivered in 49 US States, five US Territories, and six other countries. PAT aims to help parents to understand what to expect during each stage of their child's development, and to provide practical ways of promoting their child's development, manage misbehaviour effectively and promote strong parent-child relationships.

The program has been shown to enhance the cognitive and social development of children, and improve parental knowledge of child development. However, although the program has generated a lot of research interest, no research has yet appeared in the scientific literature. Nevertheless, from the material that is available, this program appears to have been thoroughly evaluated, and evaluation of program outcomes is continuing.

From a practical perspective, PAT is designed as a universal intervention involving several services and is therefore quite costly to implement and run. It should also be noted that the US does not have universal early childhood services such as Victoria's Maternal and Child Health Service, so there is a question about the appropriateness of total implementation of the program in an Australian context (Centre for Community Child Health, 2004).

School based programs

Problem behaviours are addressed most effectively when children are young, through the avenues of family-centred early intervention services. Later in life, school based programs have been shown to be effective in reducing problem behaviours and increasing family competencies and abilities to resolve future problems. As children grow, however, the transitions from early intervention and family-centred services to school-based interventions are associated with a variety of challenges that can affect the quality and efficacy of behaviour support. Recent research highlights that prevention is critical and that teachers have a key role to play (Forness et al., 2000).

Teacher Child Interaction Therapy (TCIT)

TCIT focuses on improving the teacher-child relationship and in identifying new ways for teachers to address current and possible future behavioural problems of children within their classroom. The focus is on teaching behavioural therapy skills to teachers, and on providing teachers with training in problem solving so that they can develop more adequate strategies for dealing with behavioural problems displayed by children within their classrooms. This strategy is assisted by direct coaching by school psychologists to assist teachers in modifying aggressive, disruptive and non-compliant behaviour in children.

Based upon a recent case study in the USA, teachers were found to be more likely to generalise the skills learned during TCIT sessions when addressing other behaviours displayed by the child and with other children within their classroom. The efficacy of TCIT in decreasing disruptive behaviours of preschool children has not been substantiated (McIntosh and Rizza, 2000).

The Perry Preschool Project

The Perry Preschool Project involved a randomised trial in which families were allocated to either an intensive pre-school program or to a control group with no extra support. A twenty year follow up demonstrated strong and lasting positive effects for the intervention group including an increased likelihood of completing secondary school, increased likelihood of employment, avoidance of teenage pregnancy and of a criminal record. It also concluded that economic benefits accompanied these positive outcomes with regard to reduced costs in the areas of welfare and the criminal justice system. Another valuable finding was that the best results were obtained when

home visits were included in the program and mothers were taught how to engage in pre-school education with their children through structured play (Department of Human Services, 2001).

Child focussed programs

Play Therapy Treatment (PTT)

"Play Therapy is the dynamic process between child and Play Therapist in which the child explores at his or her own pace and with his or her own agenda those issues, past and current, conscious and unconscious, that are affecting the child's life in the present. The child's inner resources are enabled by the therapeutic alliance to bring about growth and change. Play Therapy is child-centred, in which play is the primary medium and speech is the secondary medium." (British Association of Play Therapists, 2004)

A meta-analysis of 94 research studies investigating the clinical effectiveness of Play Therapy was carried out in 2001. The authors concluded that Play Therapy is an effective intervention for a broad range of children's difficulties (British Association of Play Therapists, 2004) .

More recently, in 2003, a meta-analysis of the efficacy of play therapy was carried out. Based on the 42 studies included in the analysis, the results indicate that children who received PTT performed 25 percentile units higher when compared to children who did not receive PTT (Le Blanc and Ritchie, 2001).

Cooperative learning (CL)

A literature review was carried out in 2004 to examine the effectiveness of CL as an instructional model for use with students with emotional and behavioural disorders. The review suggests that CL does hold promise as an instructional model for students with emotional and behavioural disorders, particularly in providing structured opportunities for students to practice learned communication skills. However, there remains some uncertainty as to the efficacy of CL from the perspective of academic achievement and classroom behaviour. The review concluded that further research is required with regard to CL and academic performance and classroom behaviour (Sutherland et al., 2000).

5.3.4.3 Economic Evaluation

A cost benefit analysis to determine the cost consequence of parent training programs as an intervention strategy for child behaviour problems was carried out in the UK in 1999. Parent focussed training programs were found to be cost-effective when considering the short and long term benefits to the National Health Service, other statutory bodies and to society as a whole (Dimond and Hyde, 1999).

5.4 Dental caries

5.4.1 Key messages for policy makers about dental caries

- Community wide fluoridation of drinking water reduces caries prevalence in children and is the most effective and socially equitable measure for caries prevention among children.
- Twice daily brushing of teeth with fluoride toothpaste is beneficial for the prevention and control of dental caries, reducing incidence by as much as 30%.
- Supervised toothbrushing programs in schools using fluoride toothpaste is an effective health promotion measure.
- Oral health promotion messages are best directed towards parents and should focus on the importance of reducing high frequency exposures to obvious and hidden sugars.

5.4.2 Search strategy

Key Terms

Dental caries, child or infant, prevention, risk, promotion, education, environment, intervention

Culling strategy

- Articles referred to in broad systematic reviews were not included in this review
- Non-English language articles
- Articles not relevant to Victoria

The review was limited to promotion and prevention services, with treatment services excluded. However, dental interventions for pregnant women are included in Section 5.8.4 (page 55) as part of the review of the literature on low birth weight babies.

5.4.3 The evidence

5.4.3.1 Actionable determinants/risk factors

The key actionable determinant is fluoridation of the water supply.

Community water fluoridation is the most effective and socially equitable measure for caries prevention among all ages by achieving community-wide exposure to the caries preventive effects of fluoride (Spencer et al., 1996).

This is reinforced by a study carried out in the North of England in 2000. The subsequent report was able to confirm that the implementation of water fluoridation, especially in areas of social deprivation, was effective in halving tooth decay in 5-year-old children (Jones, 2000).

5.4.3.2 Interventions/factors affecting implementation

Water fluoridation

There is voluminous evidence relating to the beneficial effect of water fluoridation on dental caries.

A systematic and scientific review of 214 studies relating to fluoride and health reported that the fluoridation of drinking water does reduce caries prevalence in children. This review also indicated

that there is insufficient evidence that the fluoridation of a water supply has negative effects (Centre for Reviews and Dissemination, 2000).

More recently in 2002 the Centre for Community Child Health conducted an Australian review for the NHMRC. This review highlighted that there is Level I evidence (good systematic review) indicating that water fluoridation is a beneficial strategy for the prevention and control of dental caries. It also highlights how the prevalence of dental caries is greatly influenced by water fluoridation. This is demonstrated by the fact that 6 year old Victorian children living in fluoridated areas have been shown to have 42% lower incidence of dental caries than those living in non-fluoridated areas (DHS, 2002b).

Level of evidence
Primary prevention: Conclusive
Other health benefits: No

Fluoride supplements

A review of the literature relating to the efficacy of fluoride supplements was recently carried out in 1999. The review findings indicate that in children exposed to fluoride from other sources such as toothpaste, the marginal effect of fluoride supplements is very small. However, there is some evidence that fluoride lozenges, designed to maximise any local effect, may have a small caries preventive effect, particularly in deciduous teeth. However, poor compliance from children and the increased potential for dental fluorosis makes fluoride supplements a poor public health measure (Riordan, 1999).

Level of evidence
Primary prevention: Inconclusive
Other health benefits: No

Health promotion

Supervised tooth brushing – The school can be an important venue for health promotion messages associated with dental hygiene. A clinical trial conducted by Curnow in 2002 investigated the outcomes from a daily supervised tooth brushing program on school-days with fluoride toothpaste combined with recommended daily home use. The results indicated that the trial was successful after a two year period with the children in the study group having significantly less caries than the control group who did not have any intervention (Curnow et al., 2002).

Level of evidence
Primary prevention: Conclusive
Other health benefits: No

The provision of free fluoride toothpaste – Two randomised control trials in the UK in 2003 and 2004 studied the efficacy and cost effectiveness of providing free fluoride toothpaste to children living in deprived non-fluoridated areas of England. Both trials highlighted that such a program is effective in reducing the prevalence of dental caries in the community (Davies et al., 2003) (Ellwood et al., 2004).

Level of evidence
Primary prevention: Conclusive
Other health benefits: No

Diet and oral health – A review of the literature relating to dietary recommendations for oral health in children was conducted in 2003. The review points out that the most successful health promotion messages are directed at teaching parents the importance of reducing high frequency exposures to obvious and hidden sugars (Pine et al., 2000). The review also states that there is

good evidence to suggest that health promotion messages about nutrition should ideally begin with the mother before birth and continue through infancy and childhood (Tinanoff and Palmer, 2003).

This theme is explored in an evaluation of the mother and child Preventative Dental Program (PDP) in Chile. This program, delivering oral hygiene and dietary education to mothers starts with the pregnant woman and continues in the mothers and their children. This approach was found to be highly effective for a long-term reduction of dental caries (Gomez et al., 2001).

Level of evidence

Primary prevention: Conclusive

Other health benefits: Yes

Oral hygiene

Tooth brushing with fluoride – The NHMRC report of 2002 highlighted that there is Level I evidence (good systematic review) that regular brushing of teeth with fluoride toothpastes is beneficial for the prevention and control of dental caries, reducing incidence by as much as 30% (DHS, 2002b).

This is reinforced in a randomised control trial to determine the benefit of twice daily tooth brushing on newly erupted first permanent molars. This trial included supervised tooth brushing on school-days with fluoride toothpaste for two years together with a school and home-based incentive scheme which including toothbrushing charts, 6-monthly dental examinations and parental questionnaires. In summary, the benefit of twice daily toothbrushing on caries development in newly erupted first permanent molar teeth was found to be 50% compared to brushing once a day or less.

Level of evidence

Primary prevention: Conclusive

Other health benefits: No

Fluoride varnishes, gels and mouth rinses - More recently in 2004, a Cochrane review of topical fluoride therapy in the form of varnish, gel, mouth rinses or toothpaste was conducted to determine their effectiveness and safety in the prevention of dental caries in children. This review highlighted that children aged 5 to 16 years who applied fluoride in the form of toothpastes, mouth rinses, gels or varnishes had fewer decayed, missing and filled teeth regardless of whether their drinking water was fluoridated (Marinho et al., 2004). However, the efficacy of using an alternative Topical Fluoride Therapy (mouth rinses, gels, or varnishes) in addition to fluoride toothpaste was negligible with only a 10% reduction in caries (Marinho et al., 2004a).

Level of evidence

Primary prevention: Inconclusive

Other health benefits: No

Xylitol Gum - A comprehensive review of the literature was conducted in 2003 to determine the efficacy of chewing xylitol gum for dental health benefits. The review found that xylitol exhibits dental health benefits which are superior to other polyols in all areas where polyols have been shown to have an effect. Of particular interest is the finding that xylitol has a substantial reduction in the numbers of caries in children whose mothers had chewed xylitol gum (Maguire and Rugg-Gunn, 2003). However, other effects of sugar substitutes should be understood and taken into account (NSW Oral Health Promotion Steering Committee, 2003).

Level of evidence

Primary prevention: Inconclusive

Other health benefits: No

Fluoride varnish

A review in 2002 of the safety and effectiveness of fluoride varnishes in the prevention of dental caries in children suggests a substantial caries-inhibiting effect of fluoride varnish in both the permanent and the deciduous dentitions based largely on trials with no treatment controls. However, given the relatively poor quality of most of the included studies and the wide confidence intervals around the estimates of effect, there remains a need for further trials (Marinho and Higgins, 2002).

The need for further trials in this area is also emphasised by a more recent review of randomised and controlled clinical trials to evaluate the caries-preventive effect of professional fluoride varnish treatments. This review argued that there is inconclusive evidence (evidence level 4) for fluoride varnish treatment in the primary dentition and in adults (Petersson et al., 2004).

Level of evidence

Primary prevention: Inconclusive

Other health benefits: No

5.5 Children with high developmental needs (disability)

5.5.1 Key messages for policy makers about children with high developmental needs (disability)

The recommendations of the *'Listen to us'* report should continue to be implemented, in particular:

- Service gaps, difficulties with access to service and obstacles with the delivery of services need to be explored and remedied in order to reduce negative impacts on the child and their family members.
- The cultural needs of different ethnic groups need to be identified and respected to improve the efficacy of interventions.
- The capacity and limits of Australian informal and formal support networks for families caring for a child with disability need to be explored further.
- Research studies designed to provide evidence based information on the effectiveness of family support strategies, early childhood interventions and parent education schemes for families with a child with disability should have immediate priority.
- There is an urgent need for longitudinal studies to examine the impact of support and services provision on family resilience and a need for smaller scale testing of innovation, monitoring of service use and the evaluation of outcomes for both children and their parents.

5.5.2 Search strategy

Culling strategy

A PsychInfo search of was conducted. Articles were excluded if their primary focus was as follows:

- Articles unrelated to disability or to younger children
- Book reviews
- Descriptions of social capital and care of refugees
- Role of grandparents, profiles of carers or support needs of classroom teachers
- Interventions in institutions
- Parent concerns of inclusive education
- Eating behaviours or growth patterns
- Quality of life and perceptions of parent-child relationships
- Development of measurement tools

This review builds on three reports:

1. 'Listen to us. Supporting families with children with disabilities' compiled by La Trobe University ([http://hnb.dhs.vic.gov.au/ds/disabilityimages.nsf/Downloads/frpch3_servicemodels/\\$File/frpch3_servicemodels.doc](http://hnb.dhs.vic.gov.au/ds/disabilityimages.nsf/Downloads/frpch3_servicemodels/$File/frpch3_servicemodels.doc)). The focus of this report on children and young people with disability and their families is to identify key factors that, with early targeting and support, may strengthen the capacity of families to care for disabled children. This report was compiled as a comprehensive examination of service responses that can strengthen and support families with children with disabilities and thus impact positively on their capacity to continue to care for the child at home. The report

examines the capacity and resources of both the immediate family, of their extended family and friendship networks, and of professional service systems to meet their support needs. The report identifies key factors that, with early targeting and support, may strengthen the ability of families to care for their children.

2. 'Current responses to meeting service needs of people with disability and the effectiveness of strategies to support families' (<http://www.nucleusgroup.com.au>). The focus of this report was to identify workable, cost-effective responses for caring with families with a disabled person. The aim was to identify responses that are consistent with contemporary research and social policy to better meet the needs of families caring for a disabled person, with an emphasis on deferring full time residential care.
3. Evaluation of family options. The focus of this report was to evaluate specialised family based placements for children with a disability.
([http://hnb.dhs.vic.gov.au/ds/disabilityimages.nsf/Downloads/famop_eval/\\$File/famop_eval.doc](http://hnb.dhs.vic.gov.au/ds/disabilityimages.nsf/Downloads/famop_eval/$File/famop_eval.doc).)

5.5.3 The evidence

No randomised controlled trials of the efficacy of family support in caring for a child with a disability were identified. The reports and literature identified were based on qualitative studies and uncontrolled trials, some with very small numbers of participants. In the future, it will be important that priority funding is made available to researchers who undertake studies to inform evidence based care of children with a disability.

5.5.3.1 Actionable determinants/risk factors

The actionable determinants as identified in the reports cited above with additional evidence from a review of the recent literature are discussed below. The reports stress the need for the recognition of the specialised information requirements of different disability groups, along with shared information needs. Evidence from overseas shows that different ethnic groups caring for disabled children may have different needs and sources of support (Darling and Gallagher, 2004) and that some caregivers find that service providers are not respectful of their culture (Walker, 2001). In Australia, there is a need for culturally safe programs so that Aboriginal people are not prevented from accessing disability services (Kendell and Marshall, 2004).

5.5.3.2 Interventions/factors affecting implementation

Informal family support

Informal support includes the need for material support, emotional support, referral and information; parent mutual support networks; and Internet based support. The 'Listen to us' review identifies the need for a range of quality services for families caring for a child with disability, and for more consistent policy goals, both across services and early childhood, that address both child and family outcomes. The report highlights the importance of informal support systems for families and the impact that community attitudes to disability have on the adaptation and capacity to provide support within the extended family and friendship networks. It is acknowledged that Australian service systems have not yet explored the capacity and limits of informal support.

Home based support is needed to provide practical assistance to maintain children with a disability in their own home. A qualitative study of families with developmental disabilities (Freedman and Capobianco Boyer, 2000) showed that:

- family support enhances the wellbeing of disabled children and their carers;
- families require supports that are proactive and preventive in focus rather than crisis driven;

- families need information about programs and resources to enable them to become effective decision makers;
- targeted outreach is needed to address the specialised information and supports needs of families; and
- interagency collaboration in planning and coordinating services is needed to help eliminate barriers faced by families in accessing and using supports.

Caring for a disabled child can be challenging. Experience shows that nearly all caregivers of children with sickle cell syndrome report problems with the child's nutrition, pain episodes and feelings about their disability (Levers-Landis et al., 2001).

Coping with caring for a child with disability can be related to gender, life stage and family structure (Grant and Whittell, 2000). Research shows that parent contact with other parents of children with special needs provides support and is a powerful stress buffer in helping parents to cope with children with congenital abnormalities (Kerr and McIntosh, 1999). The provision of information about appropriate local organisations and contacts by health professionals has the potential to enable parents to benefit from this type of support.

Comprehensive formal support

Comprehensive formal support includes core family support such as respite and child care; adaptive equipment and home modifications; support groups and family counselling; systematic assistance; in-home assistance etc; case management; financial assistance and traditional developmental services. The 'Listen to us' report found that both the family input and literature review endorsed the need for a wide range of different kinds of support throughout the families' lifecycle. The report makes special mention of addressing the impact on families of the level and way in which child-focussed services such as education and allied health are provided. This reflects the trend towards more flexible and comprehensive family support programs with both families and providers signalling the importance of sufficient and appropriate respite care.

Social support is seen as a positive strategy that can mitigate the effect of a child's disability on the family. A Canadian study of school aged children with a disability and their parents found that mothers and fathers experienced a similar amount of stress when living with a disabled child. However, the study found a need for more specialised programs to help fathers become emotionally closer to their atypical children and for more respite services for mothers (Keller and Sterling Honig, 2004).

In California, out-of-pocket expenses and foregone earnings represented a substantial burden for many low-income families with special-needs children (Lukemeyer et al., 2000).

Early childhood interventions and specific behavioural intervention strategies

Early childhood intervention and specific behavioural intervention strategies have been shown to be effective in mitigating problems of challenging behaviours and their potential to precipitate out of home placement. The 'Listen to us' report highlights the value of early intervention services along with the need for broadening early intervention models and practices to include stronger focus on parent-child relationships, social competence in children and the prevention of challenging behaviours. The review stresses the importance of change-orientated intervention and support, and facilitative strategies being available at primary, secondary and tertiary levels of intervention.

Recent literature of the efficacy of early interventions is limited. In a small trial of two pre-school children, one with Down's syndrome and one with physical, developmental and speech concerns, a positive support behaviour program resulted in increased engagement and a reduction of challenging behaviours (Duda et al., 2004). Another study of two developmentally delayed

children found that an individualised intervention program helped parents to teach their children how to make some verbal requests in functional home areas (Mobayed et al., 2001). In a larger study of 82 children with disabilities, in-home training and a program that included massage therapy found that children's sleeping and eating patterns, communication and other body functions improved (Cullen and Barlow, 2004).

Learning opportunities that are interesting, engaging, competence producing and mastery-orientated have been associated with optimal behaviour change (Dunst et al., 2001). However, a study of carer language intervention for children with cognitive and language delays concluded that the success of interventions for heterogeneous groups of children with mixed attributes and varying language levels are likely to be limited (Girolametto et al., 2000). Also, rates of reinforcement of interventions for alternative behaviours may be impractical for caregivers to implement (Roane et al., 2004).

Parent education

The 'Listen to us' report (DHS, 2003) stresses that parenting skills education and resource materials be available to parents of children with disabilities, in particular including information about preventing the emergence of challenging behaviours and about managing behaviour. Parent education and empowerment is also needed to enable parents to set reasonable expectations for the future. Studies of factors that influence resilience show that unless a carer believes that improvement is possible or that some success can be achieved, it is unlikely that learning how to manage problems with child disability will be implemented or effective in daily life (Horton and Wallander, 2001).

Substitute care

The 'Listen to us' report recommends that respite, or 'short break', care continue to be provided as a critical service for supporting parents. It also recommends priority be given to models that provide culturally normative and inclusive developmental, leisure and socialisation opportunities for children with disability. Both families and providers recognise the importance of in-home and out-of-home based services and the value of flexibility and choice for parents as to when and how respite hours might be best utilised. The importance of being able to accommodate emergency care requirements for children with disabilities was also highlighted.

Substitute care, that is permanent out of home care, can also be an effective model of care for children who require out of home placement due to a breakdown in family coping and/or the need for child protection. The report 'Evaluation of family options' found that placements were evaluated as successful in three domains: stable placement, nurturing relationships and quality of life with families reporting improved outcomes for their disabled children when placed in substitute care.

5.6 Injury

5.6.1 Key messages for policy makers about injury prevention and management

- The most effective prevention strategies overall are safety equipment and engineering solutions backed by legislation and enforcement.
- Home visiting programs have proved effective in reducing child injury rates within the intervention communities. Benefits have been demonstrated for disadvantaged groups.
- There is evidence that providing free or low-cost home safety equipment, one-to-one counselling in a clinical environment and safety education for school-aged children can reduce hazards and promote safer behaviours. Effects on injury rates are unknown, however. Few studies measure this outcome, and there are significant methodological problems involved.
- Community-based, multi-strategy approaches are promising, but more high-quality evaluations are needed.
- It is not clear whether some interventions (particularly safety engineering and equipment) that have proved effective for general populations in urban areas work as well for disadvantaged groups or in rural areas.
- There is a lack of studies that evaluate prevention strategies for certain types of injuries that lead to large numbers of hospital admissions among Victorian children; namely, hit/struck/crush by objects, cutting/piercing, choking and dog bites.
- Appropriate first aid treatment for burns and scalds has the potential to reduce the severity of injuries.

5.6.2 Search strategy

Electronic databases were searched under the subject heading 'prevention and control', using the phrase 'risk OR promotion OR education OR environment OR intervention' and limiting age groups to 'fetus OR newborn infant to child (6 to 12 years)'. Only articles published in the last 10 years (1994-2004) were sought. Although the search strategy was limited to systematic reviews, many other types of articles were identified, including original research and commentaries. This search strategy resulted in a total of 998 articles. Two additional keywords were used ('accident' and 'unintentional') to reduce this list to 233.

The field was narrowed further by applying the following criteria for exclusion:

- Language other than English
- Clinical/treatment oriented (eg, use of pain medications with children)
- Clinical/prevention oriented (eg, birthing positions)
- Sun protection/skin cancer prevention
- Violence-related
- Not relevant to Victoria (ie, reflecting local cultural practices)
- Not traumatic injuries (eg, overuse or repetitive strain)
- Legal issues.

This approach reflected our refining of the priority area definition to "prevention of unintentional traumatic injury". Unintentional injury accounts for 90% of all child injury deaths in Australia (DHS, 2000a). The focus on traumatic injury is consistent with the emphasis on reducing deaths and

hospitalisations set down in 'Priorities for Gain' (DHS, 2004c). Intentional injury is partially covered by the priority topic of Child Abuse (see Section 5.10 of this document).

In addition to the database search, hand searches were conducted of various journals including *Injury Prevention* (2002-2004) and the *American Journal of Health Education* (Special issue Sept/Oct 2003 on 'Injury prevention for children and youth').

Internet searches were also conducted, focusing on research conducted at Australian universities (particularly Monash University Accident Research Centre and the National Injury Surveillance Unit at Flinders University) and for Australian and State government departments and agencies. Known researchers and research groups overseas were also targeted.

This strategy resulted in a final list of approximately 75 articles, of which 39 were included in this review. These were selected on the basis that they were the most recent evidence available, and the most relevant to Victoria and to the major causes of injury among Australian children aged 0-8 years.

Note: this review has been compiled as an adjunct to the Victorian Public Health report, *Evidence-Based Health Promotion: No. 4 Child Injury Prevention*, published in 2001. That review excluded transport-related causes of child injury.

5.6.3 Epidemiology

About 300 Australian children (aged 0-14 years) are killed each year and 60,000 hospitalised by unintentional injuries, at an estimated cost of 1.5 billion dollars to the nation (DHS, 2000a). The major causes of injury are well described in a recent review (Pointer et al., 2003). Transport injuries, drowning and the 'other unintentional' category of injury accounted for 257 (77%) of the 332 child deaths from injury in 2000. 'Other intentional' includes causes such as cutting and piercing, choking and dog bites. Poisoning, falls and fire/burns/scalds caused a relatively small number of deaths (12, 12 and 14 respectively) but were responsible for many thousands of injuries requiring hospitalisation.

More than 28,000 children were admitted to hospital with injuries following falls. This amounted to 42% of the total injury count of 68,133 in 1999-2000. The main categories of injury were 'other unintentional' (27%), transport accidents (14%), poisoning (5%) and fire/burns/scalds (3%). Hospital admissions due to pharmaceutical poisoning, near-drowning and fire/burns/scalds are concentrated in early childhood, reflecting the vulnerability of young children and infants (ages 0-4). The reviewers recommended that interventions should focus on developmental and environmental factors that contribute to injury in young children, as well as monitoring past successes in injury reduction in older children (Pointer et al., 2003).

Recent Victorian data mirror the national findings on the major causes of child injury (Clapperton et al., 2003). In 2001 there were 36 injury-related child deaths, of which almost half (47%) were due to transport accidents (mostly as car occupants), followed by drowning, hit/struck/crush and choking/suffocation, then homicide. Falls led to 45% of hospital admissions and 40% of emergency department attendances by children. Other main causes of injury requiring medical attention were transport (mostly cyclists), accidents in which children were hit, struck or crushed, poisoning, cutting/piercing and animal bites.

5.6.4 The evidence

5.6.4.1 Model/approach

Recent developmental approaches to injury prevention take into account the fact that the epidemiology of injury and the likely success of preventive efforts are closely linked with the stages of human development and the social contexts in which it occurs. Injury prevention may be most

effective when linked with current knowledge about human development. These models suggest that developmentally appropriate strategies implemented over several stages may be more likely to motivate and sustain safe behaviour change in the long term than a single intervention or policy change (Mercy et al., 2003). Research on human development can be used to understand influences on injury risk over the life course and to tailor specific programs to the cognitive and physical skills of children and their social worlds.

5.6.4.2 Actionable determinants/risk factors

From a developmental perspective, the safety of infants and toddlers depends mainly on parenting and safe home and community environments. Injury prevention should therefore aim to:

- enhance child-rearing and supervision skills of new parents through home visits and other strategies;
- modify the home and community environment;
- improve safety in day care;
- adopt and/or enforce laws in areas such as pool fencing, child-resistant packaging, vehicle seats, design of nursery furniture and toys and flame-resistant sleepwear.

In later childhood (ages 4-11) the provision of supervision and appropriate safe role models is crucial. Strategies include laws/regulations and the use of protective gear. Some approaches for modifying individual child behaviours have been effective. These are important because behaviour patterns established now can influence injury risk in later life (Mercy et al., 2003).

5.6.4.3 Interventions/factors affecting implementation

A number of different types of interventions were identified. These were:

- Home visiting programs, with/without safety equipment provided
- One-to-one counselling in clinical settings
- Educational approaches to changing children's behaviour
- Community-based interventions involving multiple strategies
- Specific equipment or engineering solutions, with/without legislation and enforcement.

Home visiting

There have been several reviews of home visiting programs, all with slightly different criteria for including studies (Roberts et al., 1996; Lagerberg, 2000; Centre for Reviews and Dissemination, 2004). There is good evidence that home visiting by nurses, other professionals or lay workers reduces the incidence of child injuries among the intervention groups, compared with controls. Benefits of home visiting have been demonstrated for socially disadvantaged groups.

Home visiting has a number of additional benefits, including enhancing mother-child bonding and recovery from postnatal depression, and improving developmental outcomes for low-birth-weight or premature children (Lagerberg, 2000).

Provision of free, low-cost or loaned home safety equipment

Home hazards can be significantly reduced by programs in which safety equipment is provided to parents of young children. There is insufficient evidence, however, to conclude that such interventions reduce child injuries, according to two systematic reviews (Lyons et al., 2004; Towner et al., 2001). A recently published study found that providing safety equipment improved

safety practices for up to two years but did not reduce injuries requiring medical attention (Watson et al., 2004). Nevertheless, this does not mean that such interventions are ineffective. The ability to detect changes in injury rates in the reviewed studies was limited by small sample sizes, short timescales of evaluation, and poor uptake in the community despite the fact that the equipment was free (Lyons et al., 2004). There was a 25% (statistically significant) reduction in injuries requiring medical attention among children in the intervention group in one randomised controlled trial (RCT).

Two non-randomised trials demonstrated that distribution of free smoke alarms significantly increased ownership of functioning alarms and reduced fire-related injuries (DiGuseppi and Higgins, 2004).

One-to-one counselling in clinical settings

Counselling as part of primary health care surveillance proved the most promising of various interventions designed to increase ownership of functioning smoke alarms (DiGuseppi and Higgins, 2004). Counselling interventions (evaluated in five randomised and two non-randomised trials) increased the likelihood of ownership and function, but effects on injury rates were not reported.

Interventions conducted in a physician's office, clinic, emergency department or hospital and involving counselling and written educational materials (some included offers of subsidised safety devices) increased some safety practices among parents. A systematic review of Randomised Controlled Trials (RCTs) concluded that counselling in clinical settings had a positive impact on the use of child restraints, smoke alarms and lower hot tap water temperatures, but did not affect bicycle helmet use or general 'childproofing' of the home (Centre for Reviews and Dissemination, 2004).

Child education for behaviour change

Safety training for school children has been advocated in recent School Health Guidelines released by the US Centers for Disease Control (Barrios et al., 2003). These guidelines for injury prevention recommend a number of measures for creating a 'safety culture' within school communities. Specific strategies included:

- encourage students' feelings of connectedness to the school;
- designate a person responsible for coordinating safety activities;
- infuse injury prevention into multiple activities and classes;
- conduct regular safety and hazard assessments;
- maintain play equipment and other structures adequately;
- provide active supervision;
- use active learning strategies in injury prevention activities;
- develop, teach and enforce safety rules;
- establish strong links with community resources and bring services into schools;
- educate, support and involve students' families in injury prevention; and
- train and support staff to be positive role models.

Two recent systematic reviews concluded that safety education (specifically, road safety) produced safer attitudes and behaviours among school children, but the impact on injury outcomes is unknown (Duperrex et al., 2004; Towner et al., 2001).

Community-based interventions

The community-based approach involves the use of multiple strategies combining social and environmental interventions. The community and professionals share ownership of the problem and jointly devise solutions. This approach has been used in various health promotion fields and appears well suited to injury prevention activities. The use and evaluation of community-based interventions has therefore increased substantially in recent years.

▪ All injuries

In 2001, Towner and colleagues reviewed five studies and concluded that there was some evidence of health gain, but the quality of the evidence was limited. An updated version of this review a year later (Dowswell and Towner, 2002) included 10 studies. Evidence of effectiveness was emerging, and the keys to success appeared to be long-term strategies, tailoring to local needs, use of local surveillance, effective leadership and development of local networks and multi-agency collaborations. Using more stringent inclusion criteria, Spinks and colleagues (2004) found that, of the nine studies reviewed, five demonstrated significant benefits for child injury reduction. Only three of these had a contemporary control group. However; the other two used a before-after (historical control group) design which is vulnerable to long-term trends in injury rates. Those authors concluded that insufficient evidence exists regarding the effectiveness of community-based programs for prevention of child injuries.

A controlled evaluation of the Safe Living Program in Victoria (Ozanne-Smith, 2002) showed that the campaign led to increased awareness of the program and reduction of some hazards (on the roads, in schools and, to a lesser extent, within homes). There was, however, no change in injury rates.

▪ Mass media

Road safety mass media campaigns are most likely to succeed if messages are persuasive and emotional in content rather than rational and informational, and if campaign strategies and designs are based on theoretical models (Delaney et al, 2004). A systematic review of mass media interventions for general child injury prevention found that exhibitions and public information campaigns can increase knowledge, but there is no evidence of any impact on injury rates (Towner et al., 2001).

▪ Burns and scalds

Intensive, multi-strategy campaigns aimed at reducing hot tap water temperature in homes and child care centres have proved effective in Australia in reducing child injuries from scalds (DHS, circa 1996; NSW Health, 1998). Publicity and education strategies of the 'Hot Water Burns Like Fire' campaigns in New South Wales and Victoria were targeted at parents of young children, health professionals and plumbers. Concurrent changes to building codes mandated lower temperature settings in new hot water installations. Process evaluations of these campaigns demonstrated the reach of specific strategies including brochures and testing kits, and thus were able to show greater behaviour change among people who received these campaign materials. Both evaluations were based on before-after (historical control group) designs. A review which focused only on trials with contemporary control groups found that only one of the three studies included showed reductions in burns/scalds injury among children in the intervention community (Turner et al., 2004).

▪ Poisoning

Evaluations of community-based interventions targeting child poisoning were recently reviewed (Nixon et al., 2004). Only four controlled studies were identified, and of these only one provided convincing evidence that such interventions can reduce the incidence of child poisoning. The

successful campaign targeted a specific poisoning agent (paraffin) and provided child-resistant closures to the intervention group. A health education campaign run concurrently in both communities had no impact on incidence rates.

Equipment and engineering solutions

Intervention	Evaluation	Comments	Reference(s)
Bicycle helmets	Effective	There is well-established scientific evidence that bicycle helmets protect against head, brain, severe brain and facial injuries. This protection extends to crashes from various causes including collisions with motor vehicles.	Thompson et al., 2004; Towner et al., 2001
Child furniture design including bunk beds	Promising	Better furniture design should reduce the incidence and severity of falls injuries. This would require development, review and enforcement of standards.	Ashby and Corbo, 2000; Steenkamp and Cripps, 2001; Watson et al., 2000.
Child-resistant closures (CRCs)	Partially effective	Some children can gain access to properly closed CRCs, so safe storage is needed. Children are at risk when medicines are not in their usual places (eg, just purchased or just used). CRCs could be mandated for some additional common medicinal and non-medicinal poisoning agents (eg, dishwasher powder).	O'Connor, 2000, 2001; Ozanne Smith et al., 2002; Towner et al., 2001
Child restraints	Effective	Properly used, rear-facing child restraints (RFCRs) are extremely effective in preventing injury in actual crashes. Large RFCRs as used in Sweden may have benefits for children as old as three years. Forward-facing child restraints are also effective, particularly when used with a tether to anchor the top of the restraint to the vehicle (current practice in Australia).	Torpey et al., 1991; Towner et al., 2001; Weber, 2000
Conspicuity devices for pedestrians and cyclists	Promising	Daytime detection and recognition by drivers is enhanced by fluorescent materials in red, yellow and orange colours. For improving night-time visibility, lamps, flashing lights and retroreflective materials in red and yellow or arranged in a 'biomotion' configuration are effective. The effects on injury outcomes are unknown.	Kwan and Mapstone, 2004
Lower hot tap water temperatures to <50 degrees C	Effective	Hot tap water scalds are among the most serious because they often occur in the bath, where large surface areas may be exposed for relatively long periods before rescue. The best way to prevent these scalds is by changing the delivery temperature from the hot tap.	Cassell et al., 2004; NSW Health, 1998
Play equipment design including trampolines and baby walkers	Promising	Environmental changes to playgrounds have been shown to reduce falls injuries. Lowering the maximum height of play equipment to 1.5m and enforcement of an Australian Standard for trampolines has the potential to prevent significant numbers of injuries. There is no Australian Standard for baby walkers. Falls down steps account for 60% of injuries involving baby walkers.	Ozanne Smith, 2001; Steenkamp and Cripps, 2001; Towner et al., 2001
Pool fencing	Effective	Pool fencing significantly reduces risk of drowning in children less than five years old. Isolation fencing (enclosing the pool only) is superior to perimeter fencing (enclosing the property and the pool).	Thompson and Rivara, 2004; Watson et al., 2000
Smoke alarms	Effective	Smoke alarms reduce the risk of fire death, especially in homes with young children. The extent to which smoke alarms are installed and functioning in Victorian homes is unclear, and updated data are needed. There is recent evidence that 10-year lithium battery smoke alarms are more likely than conventional alarms to remain functional after installation.	Cassell et al., 2004

Intervention	Evaluation	Comments	Reference(s)
Traffic calming	Effective	Area-wide traffic calming has the potential to reduce deaths and injuries among road users of all ages. Speed humps protect children who live near them. Local zones in which speed limits are reduced to around 30km/h also protect children.	Bunn et al., 2004; Tester et al., 2004; Towner et al., 2001
Wrist guards	Promising	Wrist guards prevent wrist or forearm fractures from in-line skating and snowboarding. It is reasonable to assume this protection would extend to falls during cycling, scooter riding and skateboarding.	Ozanne Smith, 2001

5.6.4.4 Economic evaluation

Estimated cost savings as a result of injury prevention interventions were presented in two studies published by the Monash University Accident Research Centre (MUARC). The first presented estimates of the benefits and costs of road trauma countermeasures which could be introduced or escalated in Victoria. Extending the baby capsule loan scheme and introduction of a \$A20 rebate to encourage purchase of child seats were not expected to provide net cost savings (Torpey et al., 1991).

Another MUARC study estimated that the introduction of three measures to prevent injury from falls and reduce severity would prevent 814 hospital presentations in Victoria and save \$A1,046,508 in their first year (Ozanne Smith, 2001). These are: wrist guards to prevent arm fractures in sport and recreation; lowering the height of all new play equipment to less than 1.5m; promotion of more stringent trampoline standards via the development of an Australian Standard. Strategies for increasing wrist guard use would include media advertising, promotion by sports role models and working with equipment importers and retailers to promote sales. Education and advocacy programs for industry, relevant authorities, retailers and the community would be needed to implement changes to play equipment and trampoline design.

The number of serious scalds requiring hospital stays of five days or more fell sharply during the *Hot Water Burns Like Fire* campaign in NSW. Assuming that all of these were due to the campaign, the prevention of 128 serious scalds cases saved the health system between \$7.6m and \$12.6m, far more than the estimated \$2m cost of the intervention measures (NSW Health, 1998).

5.6.4.5 Other considerations

Only 24 of the 109 children who presented with burns or scalds to the emergency department at Sydney's Westmead Children's Hospital during a recent study had been given adequate first aid (McCormack et al., 2003). Although cold water had been applied to almost all of the children (92%), in most cases (78%) it was of inadequate duration. Wider public knowledge of appropriate first aid treatment for burns and scalds has the potential to reduce the severity of injuries. Recommended first-aid treatment for minor burns and scalds is as follows:

- run cold tap directly on burn for at least 20 minutes, which can be cumulative, in the first three hours;
- keep rest of the patient warm;
- continue cooling throughout transport (fine mist spray or frequently changed soaked dressings);
- never use ice.

Starting first aid within three hours after a burn is beneficial.

Childhood unintentional injuries are more likely to occur in socially disadvantaged groups. A recent review (Dowswell and Towner, 2002) identified 32 studies on child injury prevention where the issue of social deprivation was specifically addressed. Target areas for prevention were transport injuries, home injuries and community-based programs. The reviewers concluded that there is a lack of evidence that interventions aimed at reducing injury are effective in socially disadvantaged groups. Very few potentially valuable interventions to prevent transport injuries, particularly in the areas of environmental change, have been evaluated with these groups. Behaviour change was achieved in some of the studies, but in many it was unclear whether this differed according to socio-economic status, and no transport-related studies reported changes in injury rates. Families provided with home safety devices tended to use them, but there was little evidence that this led to reduced injury rates. The exception was the provision of smoke alarms to disadvantaged households, which may be an effective way to address inequalities in health. There was little information on the reach of programs, and it is possible that groups most at risk are least likely to be exposed to health promotion activities. Other recent reviews have demonstrated that home visiting programs may reduce child injuries in disadvantaged groups (Roberts et al., 1996; Lagerberg, 2000).

Children living in rural areas suffer higher rates of both medicinal (especially paracetamol) and non-medicinal poisoning than children in urban areas (O'Connor, 2000; O'Connor, 2001).

The provision of child-resistant closures for paraffin containers reduced child poisoning in one study. This study was conducted in South Africa, which limits the ability to generalise the results to the Victorian context. In general, it is unclear whether injury-prevention interventions which have proved effective in urban communities would be useful with rural populations. No reviews have specifically highlighted this issue.

5.7 Language and literacy difficulties

5.7.1 Key messages for policy makers about language and literacy difficulties

- Communication problems (both speech and language) in the under fives are relatively common.
- At the individual level, children with persisting problems should be assessed as early as possible for optimal outcomes, as language delay is a key risk factor for later literacy difficulties. Emergent literacy skills need to be developed prior to school entry.
- Children from low SES backgrounds more frequently lack the spoken language skills to develop reading and writing.
- In English-speaking countries, speaking a language other than English at home also predicts lower language and communication skills. This message is specifically about the language spoken at home and not about all children of culturally and linguistically diverse backgrounds or bilingual children.
- At the population level, there is insufficient evidence to recommend general screening at present. Early detection tools are inaccurate and cannot distinguish between children whose language delay will persist at ages 3 and 4 and those who will spontaneously improve. More research is required to develop better parent-based assessments as a cost-efficient method of population screening.
- Treatment can be effective for some speech and language problems, but the evidence is less clear for others and there can be long term educational effects. There is a concern that low SES parents may not access services and this should be monitored. If not picked up, communication disorders can lead to behavioural problems.
- Community language enrichment programs and projects such as *Best Start* have the potential to improve language and literacy outcomes for disadvantaged populations, including the Aboriginal community. Long term commitment and rigorous evaluation of outcomes over time are necessary. Service change, including improved access for minority groups and improved integration of services, should be part of the evaluation.
- 'Let's Read' is a recent project aiming to develop an Australian program to promote reading to young children from 4-6 months to 5 years of age. This project has published a detailed literature review that identifies the evidence on which the program will be based. The project has not been implemented but, given its evidence-base, it must be regarded as promising.

5.7.2 Search strategy

Refinement of search strategy specific to this priority area

This search was supplemented by published reports and content searching of some key journals.

Culling strategy

A sample of material was chosen based on the applicability of the articles to the Victorian situation, the needs of the DHS and levels of evidence.

This review also utilises the following reports:

- Centre for Community Child Health and the Victorian Parenting Centre (2001a), *Best Start Effective Intervention Programs: examples of effective interventions, programs and service models*. Department of Human Services, Melbourne. Available at <http://www.beststart.vic.gov.au>

- Centre for Community Child Health and the Victorian Parenting Centre (2001b), *Best Start Evidence Base Project: the evidence base underlying investment in the early years (children 0-8 years)*; Department of Human Services, Melbourne. Available at <http://www.beststart.vic.gov.au>
- Centre for Community Child Health (2004b). *Let's read: literature Review*. http://www.rch.org.au/ccch/pub/index.cfm?doc_id=430
- Department of Human Services (DHS 2004a), *Aboriginal Best Start Status Report*, available from <http://www.beststart.vic.gov.au>.
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5.7.3 Epidemiology

Prevalence rates vary in different studies due to differences in definitions, populations studied, cut-off points and methodologies. Law et al estimate between 5% and 10% of children aged three have speech and language difficulties (Law et al., 1998). Law and Conti-Ramsden give the figures of 5-8% for children under five, a proportion which is higher than for any neuro-developmental condition occurring at that age (Law and Conti-Ramsden, 2000). In Australia, estimates for the incidence of developmental speech disorder in the normal infant and primary school population range from 3% to 5% (Leitao et al., 2000).

Language delay is a risk factor for later literacy difficulties (Larney 2002; Poe et al., 2004). It has been estimated that 40% to 75% of preschool children with speech and language impairments will have reading problems (Bashir and Scavuzzo, 1992). Outcomes are likely to be poor if problems persist past this age and there is a high risk of language, literacy and educational difficulties continuing into adolescence (Stothard et al., 1998; Conti-Ramsden et al., 2001; Snowling et al., 2001).

Language delay can be the result of a resource poor social environment, which means that children from disadvantaged socio-economic backgrounds can lack the spoken language skills to develop reading and writing (Locke et al., 2002). The review for the DHS Best Start project of the evidence base underlying investment in children 0-8 cites longitudinal studies which show that low SES, especially poverty and living in disadvantaged communities, is associated with lower levels of school achievement, lower cognitive functioning, and increased behaviour and emotional problems. It cited the Australian Early Childhood Study which found that SES was the best predictor of beginning reading ability, while speaking a language other than English at home predicted lower language and communication skills (Ochiltree and Edgar, 1995). Masters and Forster (1997) report similar findings for literacy in older children. Another Australian study found that school age children with high SES parents were more competent at reading, practical life skills, self concept, self control and independence than their low SES counterparts (Centre for Community Child Health and the Victorian Parenting Centre, 2001a).

5.7.4 The evidence

5.7.4.1 Model/approach

The Department of Human Services (<http://hnb.dhs.vic.gov.au/commcare>) employs the term 'communication disorders' for speech and language problems and points out the connection between early language delay and later difficulties in literacy. Communication disorders encompass language (spoken language, reading, and writing) and speech (articulation and phonology, fluency and voice).

"The development of literacy skills (reading and writing) is different from the development of language, although dependent on it...Although formal literacy education usually begins once a

child commences school, the building blocks for success in literacy are laid much earlier in childhood. Researchers have identified a number of independent and identifiable skill sets that are early predictors of later reading success, often referred to as emergent literacy. These skills include language abilities (vocabulary), the ability to identify the names and sounds of letters (the alphabet), an ability to identify and manipulate sounds, an understanding of “print convention” together with literacy environments (having books in the home). A significant body of research has demonstrated a strong relationship between a number of recognised emergent literacy skills and later success in reading, particularly links between “letter knowledge” or phonological awareness and later reading proficiency.” (Centre for Community Child Health, 2004).

Some children may have deficits in more than one area and the distinction between delay and disorder is not always clear. Delay relative to other developmental skills may have no known cause or be secondary to range of other conditions including hearing loss, autism, cleft palate, and intellectual disability. Some children affected by expressive language delay have been shown to spontaneously improve without intervention by the time they start school, while children with both receptive and receptive language difficulties tend to have continuing problems (Law et al., 1998; NHMRC, 2002; Howden 2003).

5.7.4.2 Actionable determinants/risk factors

Language delay and later problems with literacy development can result from a resource poor environment. Low SES and CALD children are at risk groups. The Best Start Evidence Base Project undertaken for the Department of Human Services (Centre for Community Child Health and the Victorian Parenting Centre, 2001b) reviewed the literature which shows that the early childhood language and print experiences of some cultural minorities and low income groups disadvantage children when they go to school. The Best Start report concluded that well designed and implemented interventions could make a significant difference to young children and their families, especially those at risk (Centre for Community Child Health and the Victorian Parenting Centre, 2001b).

It is known that parenting behaviours have an impact on children’s language development (Hammer et al., 2001). Evidence suggests that early language delay can potentially be prevented by sustained language enrichment programs, including parent education and support programs such as adult literacy initiatives (Cronan et al., 1996; NHMRC, 2002). Advice to parents about the importance of reading to children and the provision of suitable books can assist language development (Golova et al., 1999; Fletcher and Reese 2004).

Projects such as Best Start have the potential to improve language and literacy outcomes for disadvantaged populations and a number of demonstrations projects have begun. Consultations for the Best Start Aboriginal project, however, identified a number of factors which impact on the ability of Aboriginal people to access services; these include a lack of respect, lack of knowledge about Aboriginal culture, an inability of services to work with Aboriginal people and poor promotion of services (DHS 2004a). These factors will need to be addressed if the Best Start programs are to be successful for these communities.

Speech and language impairments can have long term educational effects and, if not picked up, can lead to behavioural problems because they cause frustration, loss of self-esteem and lack of motivation (Law et al., 1998; Lindsay and Dockrell 2000). Early assessment of affected children and intervention should be the goal to achieve optimal outcomes. Children whose speech and language impairments persist may need specialist services throughout primary school and into high school.

5.7.4.3 Interventions/factors affecting implementation

Community language enrichment programs

Several major literature reviews focusing on pre-school (3-5) children indicate that specific language skills and emergent literacy skills may be enhanced by interventions such as picture book reading. Less research attention has been focussed on the under threes, although community based literacy programs for this group have been implemented, often as part of comprehensive programs for disadvantaged communities. Fletcher and Reese have critically reviewed the available cross-sectional, longitudinal and intervention reading research and concluded that picture book reading experience also influences language development at this earlier age, with those children who are read to having higher scores on language measures. Picture book reading potentially exposes children to new vocabulary and adults talk in more complex ways during picture book reading compared to other interactions (Fletcher and Reese 2004).

Other kinds of literacy programs have been trialed in the US, particularly with low income Hispanic families. A randomised controlled trial showed that 65 intervention families who were given an age-appropriate bilingual children's book, a bilingual handout explaining the benefits of reading to children and literacy-promoting anticipatory guidance at enrolment into the program, when their infants were aged 5 to 11 months, and then during two consecutive well-child visits, were more likely at follow-up to read to their children than the 70 control parents and they also had a greater number of books at home (Golova et al., 1999).

Little is known in the Australian context. Community based Randomised Controlled Trials (RCTs) of parent-based early intervention for very young children (8-24 months) at risk of language delay are needed (NHMRC, 2002).

Underdeveloped areas of reading research with young children include looking at emergent literacy rather than language skills, the role of the child in the reading interaction and the effect of individual characteristics such as sex and temperament, and identifying the specific factors or combination of factors (ie, parent behaviours, child behaviours and book type) during reading which contribute to language development (Fletcher and Reese, 2004).

While early intervention should be the goal, it is still possible to improve literacy outcomes for disadvantaged minority groups at school age. Professional development activities with teachers in poor schools in New Zealand, for example, have been shown to improve the achievement of Maori and Pacific Islander children (Phillips et al., 2004). US longitudinal data show that high family involvement in education resulted in positive feelings towards literacy and better average literacy performance at school regardless of maternal education (Dearing et al., 2004). Even early stage English language learners appear to benefit from literacy instruction in small groups (Roberts and Neal, 2004).

Comprehensive programs for disadvantaged populations

A number of comprehensive programs have been developed internationally which aim to enhance a range of outcomes for disadvantaged children. In the US, Head Start began in the 1960s and caters for the 3-5 age groups. Early Head Start, a broader program for the 0-3s, commenced in 1995 and has an intensive focus on all aspects of child development: social and emotional, cognitive and language, physical health and resiliency. It currently has 700 programs involving 62,000 children. An evaluation by the Early Head Start Research and Evaluation Project (EHSRE 2003 available from http://www.acf.hhs.gov/programs/core/ongoing_research/ehs/intro.html) showed it was broadly effective across a wide array of outcomes and family subgroups. There were positive impacts in many aspects of parenting including more stimulating home environments, more support for language and learning, and more daily reading. It was important to begin services

early, during pregnancy if possible. However, it is not known if American models are applicable to the Australian context.

The UK program Sure Start, for children from conception to 14 (or 16 for those with special needs), commenced in 1999 and aims to integrate early education, childcare, health and family support. Sure Start Local Programs are based in areas of disadvantage and target children under 4 and their families. A National Evaluation of Sure Start has been in operation since 2001, and is currently studying 15,000 9 and 36 months old children in 150 Sure Start Local Program communities and a further 3,000 in comparison communities. Programs are only just being established and hence only very preliminary results from partial datasets are available. These are said to show some promising signs of effectiveness, but findings from other intervention studies suggest that positive effects tend to emerge after longer durations of receiving the interventions and later in life (Summary of Findings, 2004) available from <http://www.ness.bbk.ac.uk/documents/findings/402.pdf>.

The Sure Start program has a target that relates specifically to language development in young children. The Sure Start Language Measure (SSLM) is a parental tool to measure change in the language skills of two year olds in Sure Start communities. There are small indicators of change so far. The SSLM provides data at a population level never before collected in speech and language intervention, although such data would never be included in a meta-analysis (no specific interventions, no control groups). None the less the measure is said to appear robust, though lacking specificity (Law, 2004).

The Victorian Best Start program currently has a number of demonstration programs at a preliminary stage, including an Aboriginal project. Evidence for Head Start and Sure Start suggests that Best Start requires long term commitment to see beneficial outcomes. Ongoing evaluation, preferably with comparison communities, should focus on not just increased participation of families in projects but longer term outcomes, including service change in the areas of access and integration.

The Best Start Evidence Base report (Centre for Community Child Health and the Victorian Parenting Centre, 2001b) considered that further research is needed in a number of areas. It is not yet known, for example, how to match the intensity or type of intervention with the characteristics of the individual child and family, or how to help families build supportive social networks. CALD families are under-represented in service provision and more research is needed on the appropriateness of existing models of parenting and family support.

'Let's Read' is a recent project aiming to develop an Australian program to promote reading to young children from 4-6 months to 5 years of age. It was initiated in mid 2002 by the Centre for Community Child Health in partnership with The Smith Family Australia and is funded by the Telstra Foundation. This project has published a detailed literature review that identifies the evidence on which the program will be based (Centre for Community Child Health 2004b). Based on this evidence, it concludes that all of the following key components are required to achieve optimum outcomes:

- Shared reading between child and care giver;
- Easy accessibility to age appropriate free books.
- Professional involvement to convey guidance messages and model shared reading practices to parents;
- Built upon an emergent literacy framework, which promotes emergent literacy knowledge skills and environments, including language abilities, letter sound/name knowledge, phonological awareness and conventions of print; and
- Community involvement to assist in the sustainability of a community-based early literacy program.

Early detection of children with speech and language impairments

While early detection is desirable for optimal outcomes, a critical review of the screening and surveillance literature by the National Health and Medical Research Council concluded that there was insufficient evidence at this stage to recommend the implementation of a formal population screening program for language delay (NHMRC, 2002).

A large cohort study by Dale et al. of 8,386 children in the UK demonstrates the problems with early population screening. Only 44.1% of children designated as language impaired at age two, following a range of parent-based assessments, met the criteria for persistent language difficulties at age three, and this percentage fell slightly again by age four. This is similar to the findings of other studies. Neither severity of problems at aged two, nor measures of parental education and the child's history of ear infections improved the prediction (Dale et al., 2003).

The authors concluded that screening at age two is currently too inaccurate to be useful and, while early language delay is a risk factor for language difficulties at age 3 and 4, it would be inefficient if not unethical to provide speech and language treatment to children who are likely to improve spontaneously. In Australia, high quality cohort studies are required to better understand the natural history of early language delay and its outcomes for at least the first seven years of life, with a view to developing tools to reliably detect those children whose delay does not resolve (NHMRC, 2002).

The development of better parent report measures could potentially assist in distinguishing between children with transient and persistent delays, or at least identify high risk children for further professional screening, which would improve the targeting of treatments (Dale et al., 2003). Parent-based assessments are a more cost-efficient method of population screen than tests requiring a health professional (NHMRC, 2002).

While formal population screening is not currently recommended, individual children with speech and language delay should be identified by less formal means (Law et al., 1998). There are many suitable assessment tests for monolingual children when they are seen by early childhood workers and health professionals, however, assessment of English language learners and bilingual children poses particular problems in terms of suitable tools and access to speech pathologists experienced in multicultural settings (Crutchley, 2000; Maas, 2000; Snow and Dodd, 2003).

Treatment for children with speech and language impairments

A systematic review of speech and language therapy interventions concluded treatments are effective for children with phonological and expressive vocabulary difficulties. The evidence for expressive syntax difficulties is more mixed but it may be beneficial if the children do not have concomitant difficulties in receptive language (Law et al., 2003). Speech therapists can also play a role in enhancing the early reading and spelling development of children with spoken language impairment (Gillon, 2002).

According to the review authors, the finding that interventions for children with receptive language difficulties are less effective needs further evaluation, as natural history studies have shown that these problems are unlikely to resolve without intervention (Law et al., 2003). Pring, in a narrative review, points out that client groups are heterogeneous and may receive different therapy leading to failure to obtain significant results in RCTs (Pring, 2004).

According to Law et al, it is not known which the most important outcomes of therapy are; for some children the most important may not be an improvement in their abilities but in the communication skills of those around them (Law et al., 2003).

British trials produced lower effect sizes than American trials which may be the result of a smaller number of hours of contact. These UK data suggest that normal levels of speech and language intervention available there, which are related to case load and coverage, may not be sufficient to affect most children (Glogowska et al., 2000; Law, 2004).

The systematic review found that 'indirect' treatment by a parent or teacher may be as effective as 'direct' treatment by a health professional and potentially less expensive to administer (Law et al., 2003). A small group experimental design study in the UK also indicates that parent-based interventions can lead to significantly greater language gains for children with expressive language delay compared to standard individual general care and, though more investigation is needed, this approach may mean no significant additional costs (Gibbard et al., 2004).

A UK wide audit of current patterns of service delivery suggests that disadvantaged parents may make less use of speech and language services. If there is no system of surveillance, inequalities of service may result (Anderson and van der Gaag, 2000).

5.8 Low birth weight

5.8.1 Key messages for policy makers about low birth weight

- There are a large number of potential interventions intended to either prevent or treat mortality and morbidity due to low birth weight (LBW). There are, overall, relatively few interventions for which strong evidence of effectiveness exists.
- In terms of prevention, the interventions for which the most compelling evidence exists are smoking cessation programs, maternal periodontal disease interventions, certain nutritional supplements (such as iron and perhaps also magnesium) and education and support programs for pregnant adolescents (<20 years).
- In terms of clinical interventions for LBW infants, administration of corticosteroids to the mother when preterm birth seems likely or inevitable has been found to provide benefit to the neonate in terms of reduced incidence of lung disease.
- Feeding LBW babies with supplemented formula milk has been shown to enhance short term growth.
- Early discharge programs for LBW babies have the potential to both provide quality outcomes and reduced health service costs.
- Women of low socio-economic status (SES), including indigenous women, are at substantially elevated risk of delivering LBW babies. However, very few strategies designed to address specific risk factors among these women (smoking, alcohol/substance abuse, stress, violence etc.) have been shown to be effective. Rather, there is a degree of consensus that resources would be better targeted to addressing the underlying causes of low SES (low income, education, employment, community improvements).

5.8.2 Search strategy

Refinement of search strategy specific to this priority area

Identification of specific interventions for review was undertaken in consultation with experts nominated as contacts for the project. It was agreed to consider a range of preventive and treatment interventions separately.

Culling strategy and resulting useful literature

From the resulting list of interventions, we attempted to analyse all reviews of the available evidence contained in both the Cochrane Database of Systematic Reviews and the Database of Abstracts of Reviews of Effectiveness (DARE). This produced a relatively large body of evidence, which was supplemented by recent evidence from other international and Australian sources in areas where there were perceived gaps, or where the relevant reviews were less recent.

5.8.3 Epidemiology

Low birth weight (LBW) is often linked to premature birth, which is defined as birth at less than 37 weeks gestation. However, most concern exists for the wellbeing of neonates who are born at considerably lower weeks gestation (indicatively 23 to 32 weeks) and who are often, if not usually, of very low birth weight (VLBW), with less than 1500 grams being a benchmark for defining VLBW. Premature babies of VLBW suffer a range of often severe health conditions as well as extremely high mortality rates. Of further concern, the incidence of VLBW neonates appears to be increasing in Victoria.

LBW may also occur in neonates of full gestation (37 weeks or more), in which the condition is often termed Small for Gestational Age (SGA), defined as birth weight of less than 2500 grams. Although health outcomes for these neonates are better than those for premature VLBW babies, they nevertheless suffer from a range of conditions and complications deleterious to their development vis-à-vis full term neonates with greater birth weights. In the Victorian context, Campbell (2004) notes that it is mainly babies who are extremely SGA who are at significant risk of adverse outcomes due to LBW, with birth weight in the bottom third percentile the benchmark for extremely SGA.

Although many of the risk factors and clinical management issues for prematurity and SGA are similar, it is important to remember that the conditions are not interchangeable, and that some differences in optimal policies towards these groups are to be expected. Nevertheless, for the purposes of this review, interventions aimed at these groups have been combined.

5.8.4 The evidence

5.8.4.1 Model/approach

Whilst health and social policy are capable of influencing many of the risk factors associated with LBW, it will, of course, be impossible to eradicate this condition completely. Hence, policy considerations must include both preventive and clinical management approaches. The aim of this review has thus been twofold. First, to review the evidence on the risk factors for LBW and the efficacy of the various programs that have been designed with a view to prevent LBW. Second, to examine the literature on clinical management of the many adverse outcomes which are associated with LBW, with a view to identifying treatments which work well in providing positive health benefits to neonates who experience LBW.

5.8.4.2 Actionable determinants/risk factors

In terms of prevention of LBW, the following interventions have been evaluated:

- Maternal smoking
- Low maternal SES
- Social support and education
- Maternal nutrition and obesity
- Maternal exercise
- Maternal periodontal disease
- Alcohol and substance abuse
- Assisted conception
- Maternal age
- Corticosteroids
- Progesterone

Treatment interventions for LBW babies address the following issues:

- Chronic lung disease (CLD)
- Neonatal nutrition
- Longer term growth and development
- Early discharge programs

5.8.4.3 Interventions/factors affecting implementation

Socio-economic status (SES)

There are a number of risk factors which appear to be inextricably linked to the fact that many mothers suffer from one or more forms of social disadvantage, due to some combination of low income, low level of education, poor employment opportunities, race and ethnicity. Such risk factors include dependence on tobacco products, alcohol or chemical substances, poor nutrition, other negative lifestyle choices such as low levels of exercise, stress, violence, poor hygiene, periodontal disease and possibly even young maternal age per se.

The importance of these factors is discussed in Moore (2003), along with the corollary that successful prevention in these areas should focus on programs that reduce disadvantage, such as policies on education, employment and community improvements. Many of the above risk factors are relevant to all pregnant women, though most tend to be more prevalent among the disadvantaged.

Maternal smoking

A comprehensive recent review of the effects of smoking cessation programs on neonatal health, including LBW and pre-term birth, is provided in Lumley et al. (2004). They reviewed a large number of such trials (64 in total, including 51 Randomised Control Trials [RCTs]). The 48 trials deemed to be of sufficient quality to include in a meta-analysis reported strikingly similar reductions in maternal smoking after the intervention, with about 6 in 100 women estimated to stop smoking as a result of the program. Whether this is a quantitatively important result requires further consideration.

Smoking cessation programs were also found to reduce the probability of both LBW and pre-term birth. Average birth weight was found to be 33g higher for the intervention group. There was not, however, a statistically significant difference found for the odds of VLBW outcomes. The authors conclude that smoking cessation strategies can help women stop smoking during pregnancy, leading to better health outcomes for babies, and ameliorating the effects, both short and long term, of LBW and pre-term birth. Their evidence was consistent with earlier reviews such as Dolan-Mullen et al. (1994). Unfortunately, Zubrick et al. (2004) report that demonstrations of the effectiveness of smoking cessation programs targeted towards indigenous populations are yet to be undertaken.

Moore (2003) noted that successful interventions should occur either prior to or early in the pregnancy, and went so far as to claim that smoking cessation programs “may have more potential for reducing preterm and LBW birth than any other single strategy”. Lu et al. (2003) on the other hand, reported only “modest” benefits of such programs in their review of the benefits of prenatal care on LBW births, but smoking cessation was nevertheless one of the few strategies found to have any appreciable impact on LBW. Mullen (1999) offers additional support, derived from meta-analysis of RCT results, that maternal smoking interventions do reduce the incidence of smoking during pregnancy. A recent example of the design and development of clinical guidelines for a smoking cessation intervention is found in Maloni et al. (2003) although no evidence is provided on outcomes from the intervention.

Social support and education

There have been many trials conducted involving programs designed to give support to women considered to be at risk of delivering a LBW baby, due to issues such as nutrition, stress, rest management, alcohol and drug use. A recent review of these trials is found in Hodnett and

Fredericks (2004), which considered trials of programs involving advice, counselling, emotional support and/or tangible assistance (transport, assistance with household tasks). Solely educational and brief (2 to 3 week) interventions were excluded, as were smoking cessation programs. A total of 15 trials of acceptable quality were chosen for meta-analysis. No significant reductions in either the probability of delivering a pre-term baby or probability of LBW were found, although there was some evidence of benefits in terms of reduced stress and anxiety, and increased satisfaction with the birth outcome. The authors suggest that “given the immense social deprivation experienced by most of the women in these trials, it would be surprising if social support could have such an immediate and powerful effect” (Hodnett and Fredericks, 2004), suggesting that resources would be better utilised in addressing the sources of this social deprivation rather than focusing on support programs at the time of pregnancy (see above).

This sentiment is echoed with respect to indigenous Australians by Zubrick et al (2004), who state “that many of the key determinants of Aboriginal child health are outside the immediate influence of the health care system. This highlights the need for concerted action across and beyond the health sector to address the complex and inter-related factors that contribute to the increased risk of health problems amongst Aboriginal children.”

Similar results were found in an earlier review by Blondel and Breart (1995), who found no effect on incidence of preterm birth resulting from home visit programs offering emotional and/or medical support. Similarly, Hueston et al., (1995) reviewed a number of programs involving maternal education, often involving home visits, and found no effect on any measure of LBW or prematurity. Fischella (1995) also reviewed a number of prenatal care interventions, sometimes including home visitation and sometimes targeted at women at risk of LBW, and found no effects on the incidence of LBW or pre-term birth. Lu et al. (2003) found that evidence of the effectiveness of counselling, birth education, home visitation and psychosocial support interventions were all either negative or inconclusive.

However, a more positive review of support programs is found in Moore (2003) who outlines two programs that produced positive outcomes regarding preterm and LBW birth, and also found evidence that the efficacy of these programs may be greater among disadvantaged groups such as black American mothers. In the Australian context, Atkinson (2001) discusses the “Mums and Babies” project, designed to increase the utilisation of antenatal services of indigenous women in the Townsville area of North Queensland. There is evidence of a considerable increase in service utilisation (eg, number of visits) and limited evidence of modest reductions in both LBW and perinatal death, but the reliability of these findings is questionable.

Nutrition and maternal weight

A large body of literature discusses various interventions aimed at exploring the relationship between LBW and antenatal maternal nutrition. One recent review may be found in Kramer & Kukuma (2003). It analysed evidence from trials designed to provide either advice on intake of energy and protein during pregnancy or actual supplementation or restriction of energy and protein in the diet. Conflicting evidence was found regarding the effect of dietary advice on the incidence of pre-term birth, and the number of relevant studies was not large. Actual dietary supplementation to promote balanced protein and energy intake during pregnancy in 13 trials was found to produce a modest, almost statistically significant increase in mean birth weight and a significant reduction in the probability of SGA birth.

There was also some evidence that the effect may be greater for women who are under-nourished. There may be additional benefits in terms of reduced stillbirth and neonatal death. Overall, the findings from this review imply that programs involving dietary advice will have only limited impact on outcomes such as LBW. However, programs involving the actual balanced supplementation of protein and energy during pregnancy can be expected to provide improvements affecting not only LBW but other important neonatal outcomes as well, and may also promote equity in outcomes if benefits are greater for women who are undernourished.

Ramakrishnan (2004) notes that strategies such as the above, which focus on food intake, may be expensive and difficult to manage, and reviews the evidence on the simpler alternative of multivitamin-mineral and iron-folate supplementation. Evidence regarding the effect of multivitamin-mineral supplements on the incidence of LBW was mixed, but strong evidence was found for the effectiveness of iron supplements, among both anaemic and non-anaemic pregnant women. This study recommends the widespread use of iron supplements both for pregnant women and women of reproductive age generally. The study also highlights the link between social disadvantage and poor nutrition, including anaemia, and cautions against several problems that may arise in the implementation of iron supplementation programs. These include inadequate supply, poor quality of supplements, poor compliance and poor consumer and provider education.

Lu (2003) found no conclusive evidence to support the proposition that nutritional interventions have any positive effects in reducing LBW.

Interventions regarding the effect on incidence of LBW of Vitamin A supplementation during pregnancy for women with HIV have been conducted, and summarised in Shey Wiysonge et al. (2004). No statistically significant effects on any indicator of prematurity or LBW were found, although pooled relative risk (RR) estimates were consistently less than one.

Pre-eclampsia is a known risk factor for preterm birth, and it has been hypothesised that fish oil supplements during the second half of pregnancy may prevent this condition. As yet, no review of Randomised Controlled Trials (RCTs) exists on this topic, but one may be in preparation, and a protocol may be found in Makrides et al (2001). Also relevant to the prevention of pre-eclampsia and its associated effects on both mother and baby is magnesium supplementation. Makrides and Crowther (2001) reviewed the evidence on this. They found that “oral magnesium treatment from before the 25th week of gestation was associated with a lower frequency of preterm birth, a lower frequency of low birth weight and fewer small for gestational age infants compared with a placebo. In addition, magnesium treated women had less hospitalisations during pregnancy and fewer cases of antepartum haemorrhage than placebo treated women”. These results notwithstanding, they concluded that there “is not enough high quality evidence to show that dietary magnesium supplementation during pregnancy is beneficial”, due to their assessment that the majority of trials in this area have been of poor quality.

Hininger et al (2004) conducted a RCT in France that examined the link between LBW/preterm birth and micronutrient supplementation in pregnancy for apparently healthy women. “The subjects received a daily supplement containing vitamin C (60 mg), carotene (4.8 mg), vitamin E (10 mg), thiamin (1.4 mg), riboflavin (1.6 mg), niacin (15 mg), pantothenic acid (6 mg), folic acid (200 g), cobalamin (1 g), Zn (15 mg as citrate), Mg (87.5 mg as glycerophosphate), Ca (100 mg as carbonate) or a placebo. The supplement was iron free”. They found that in “the supplemented group, birth weights were increased by 10% but remained in the physiological range, whereas the number of infants with birth weights below 2700 g was significantly higher in placebo group (n=9 vs 2)”. This provides further evidence of the potential benefits regarding LBW of nutritional supplementation, although their sample size was not large.

Friis et al. (2004) conducted a similar RCT in Zimbabwe in which the “study intervention was a daily tablet containing approximately the RDA for pregnant or lactating women of 13 micronutrients, except for vitamin A, for which a higher amount was given”. They reported modest positive effects on both LBW and pre-term birth, but neither result was statistically significant.

There is also the possibility that LBW outcomes may be linked to maternal weight during pregnancy, in particular to obesity. Moore (2003) mentions obesity as a risk factor, and asserts that it should be addressed prior to pregnancy, but no evidence is provided regarding the efficacy of such interventions.

Exercise

Clinical considerations suggest that maternal exercise during pregnancy may have either positive or negative effects on birth outcome, including LBW. Kramer (2004) reviewed 10 trials of maternal exercise programs and found inconsistent results regarding LBW. Exercise seems to increase the risk of preterm birth, but have no impact on mean gestational age. Hence, programs to encourage exercise during pregnancy could not be recommended on the basis of LBW considerations, although Kramer's review found positive effects on maternal fitness and body image.

Periodontal disease

In recent years, an increasing body of research has emerged linking LBW and preterm birth with periodontal disease, with some studies finding that very strong associations may exist. For example, Madianos et al. (2002) report relative risk ratios for preterm birth/LBW in mothers suffering periodontitis of between 4.4 and 7.9, whilst Lopez et al (2002) estimated similarly substantial ratios of 1.65-18.22.

There have been efforts to provide clinical explanations as to why a causal link should exist between periodontal disease and LBW – see, for example, Dortbudak et al (2005). However, the existence of such a link is still controversial, with some studies failing to find any association (see, for example, the work of Moore and colleagues, including Moore et al 2005), and some reviews finding that the evidence is mixed (Scannapieco et al., 2003). In addition, McGaw (2002) finds that non-causal explanations of the association between LBW and periodontal health may also be possible.

Finally, as noted by Scannapieco et al. (2003), there is a paucity of studies which have assessed the impact of the prevention and treatment of periodontal disease on outcomes (see, however, Moore, 2003). Nevertheless, this area should be considered as one of the most promising current possibilities for designing programs capable of significantly reducing the incidence of LBW and preterm birth. Future literature should be carefully monitored, with a focus on evaluation of programs designed to improve the periodontal health of women of reproductive age.

This issue should also be considered in the context that dental health has been found to be particularly poor in modern times in the Aboriginal population, due to loss of traditional lifestyle, changes in diet and lower levels of use of dental services (Zubrick et al. (2004).

For example, one possible issue may be the extent to which interventions that occur during pregnancy are effective vis-a-vis those which aim to enhance periodontal health before pregnancy occurs. Evidence presented in Moore (2003) suggests that periodontal interventions during pregnancy, such as referral to dentists arising from antenatal examination, may still be effective.

Alcohol and substance abuse

Although alcohol and substance abuse has long been considered a risk factor for LBW (see, for example, Campbell 2004), there is no evidence of any successful interventions in these areas which have reduced the incidence of LBW. For example, Hodnett and Fredericks (2003) include alcohol and substance abuse interventions among the social support programs they reviewed, which were found not to have reduced the incidence of LBW.

Assisted conception

There is considerable evidence that assisted conception interventions increase the incidence of LBW outcomes (Schieve et al., 2004, Helmerhorst et al., 2004). This is partly due to the fact that assisted conception is associated with multiple births, but the evidence also suggests that singleton births via assisted conception have significantly higher rates of LBW outcomes. To date, this study has found no evidence regarding interventions aimed at addressing this relationship.

However, Lambert (2003) has suggested that if criteria for identifying infertile women at risk of LBW can be developed, it may be possible to institute screening programs as a response, whilst Moore (2003) notes that one recommendation aimed at reducing preterm and LBW births arising from assisted conception is to limit the number of embryos transferred.

Maternal age

Both young and older maternal ages have been identified as risk factors for LBW. In Victoria, 22% of indigenous births are accounted for by mothers aged <20, compared to just 3.3% of the non-indigenous population (Koori Human Services Unit, 2004). However, Zubrick et al (2004) found no evidence that the incidence of LBW among indigenous Western Australians was influenced by young maternal age, although they regarded reductions in the level of teenage pregnancies to be beneficial for other reasons.

A recent systematic review of programs designed to reduce the incidence of LBW in adolescent mothers (aged less than 20 years) is found in Brunton and Thomas (2001). Of the 13 studies identified as suitable for analysis, five found a significant improvement in LBW indicators as a result of the programs, and the remaining eight, though not statistically significant, nevertheless reported positive outcomes. This review recommended pregnancy counselling services focusing on the school and birth control clinic environments, as well as services which combine home visiting and clinic services.

In relation to older maternal age (over 35 years) as a risk factor for LBW, Moore (2003) cites evidence to support this, partly due to higher rates of multiple birth but in singleton births as well, but is unable to suggest any interventions aimed at this demographic group.

Progesterone

Moore (2003) cites evidence that the regular (daily or weekly) administration of progesterone to mothers at risk of preterm birth from about 16 weeks to 36 weeks gestation can significantly reduce the incidence of preterm birth, and may also have other positive effects on neonatal outcomes. Lu et al (2003), however, assessed the evidence on progesterone as being “insufficient”.

Corticosteroids

Corticosteroids may be administered to the mother in the situation where preterm birth seems likely or inevitable, in order to enhance foetal maturation, particularly of the lungs. This intervention has been found to reduce mortality, respiratory distress syndrome and intraventricular haemorrhage. No increase in neonatal or maternal infections was observed (Lu et al., 2003). In fact, Lu et al (2003) claim that “perhaps the only [prenatal] intervention of clear benefit is antenatal corticosteroid therapy for fetal maturation”.

5.8.4.4 Treatment interventions for LBW infants

Irrespective of the usefulness or otherwise of the above preventive interventions, a number of LBW and preterm babies will continue to be born, and require care, in the future. The following discusses a number of types of treatment interventions that have been used and evaluated in this area.

Lung disease

LBW and, especially, preterm babies are often afflicted with chronic lung disease (CLD) (see Campbell, (2004). A number of interventions have focused on the prevention and cure of CLD.

One treatment that has been proposed and used to reduce the incidence of CLD, especially among VLBW babies, is the steroid dexamethasone. However, recent trials have tended to find both no significant preventive effect (Vermont Oxford Network Steroid Study, 2001) and a range of serious side effects of both a short (Vermont Oxford Network Steroid Study, 2001) and long-term (O'Shea et al., 1999) nature, questioning the desirability of using this treatment.

Other interventions designed to reduce the incidence of CLD seemed to have proved more effective, however, including Vitamin A supplementation (Darlow and Graham 2002) and inhaled nitric oxide (Schreiber et al., 2003). The use of selenium supplementation, however, has not been found to reduce CLD, though other benefits may occur (Darlow and Austin 2003).

Longer term growth and development

LBW babies experience increased incidence of a number of physical and mental disabilities and developmental delays (Campbell, 2004). These include emotional and behavioural problems. In a US study of 110 LBW babies followed through their first two years of life, Weiss and Seed (2002) found that LBW per se did not help explain the incidence of such behaviours, which were instead related to environmental factors linked to social disadvantage, such as low income and family instability.

This suggests that programs designed to combat these sources of disadvantage, which are also linked to LBW in the first place, may be more effective than programs designed to treat specific behavioural problems associated with LBW infants (see above). On the other hand, Elgen et al. (2002) present evidence from a Norwegian trial of 11 year old children that those who experienced LBW were significantly more likely to suffer behavioural problems, psychiatric disorder and a range of other developmental problems. Controlling for a range of possible confounding factors including parent education, income etc. did not alter the strength of the LBW effect.

There are probably a number of disabilities and developmental problems suffered by LBW infants that are directly due to their LBW status. For example, Msall and Tremont (2002) reviewed the literature on the disability status and developmental impact of VLBW and ELBW, and found high rates of cerebral palsy, blindness, cognitive disability, functional limitations related to self-care, motor and communication skills, as well as educational, activity and vocational limitations later in life. This study found that "by examining the functional strengths and challenges of children with major neurodevelopmental impairments after very or extremely preterm birth, we can examine causal pathways that lessen the risk of severe functional disability. Among children with mild to moderate disability, we can enhance functional outcomes, optimise community participation, and provide quality family supports".

Nutrition

There is a large body of evidence concerning research into interventions designed to promote growth in LBW infants, much of it involving either various formula milks versus breast milk or supplementation of breast milk. Formula milk has been shown to have the potential to promote short-term weight gain vis-à-vis breast milk (Henderson et al., 2001), although it should be noted that weight gain is not the only factor to consider in making nutritional recommendations for the neonate. For example, Lee and Polin (2003) recommend breastfeeding as an evidence-based strategy for reducing the risk of necrotizing enterocolitis (NEC).

Supplements to breast milk that have shown the potential to promote short-term weight gain are protein (Kuschel and Harding, 2000), carbohydrate (Kuschel and Harding, 1999) and multicomponent fortifiers (Kuschel and Harding, 2004). There was no strong evidence found of any adverse side effects, although research remains inconclusive in this area. Other supplements for which evidence remains inconclusive include fat (Kuschel and Harding, 2000) and calcium and phosphorus combined (Kuschel and Harding, 2001).

Early discharge programs

There are substantial costs incurred in the hospital treatment (especially in neonatal intensive care units) of, in particular, VLBW babies. There are also significant costs to both the infants themselves (such as increased risk of infection) and their parents (travelling and time costs, as well as stress and other psychic costs). A body of literature on early discharge programs for VLBW is summarised in Merritt et al. (2003), with such programs found to be capable of facilitating quality outcomes and reducing health system costs. However, it is noted that there are a large number of factors that require consideration in designing guidelines for appropriate use of early discharge. Nevertheless, the wide variations found in models of care and discharge protocols across hospitals suggest that substantial benefits are possible from review of practices across the relevant health system. It should be borne in mind that this review pertains mainly to the US hospital system.

One type of program related to early discharge that has received some attention in the literature is an intervention known as Kangaroo Mother Care (KMC). Kangaroo Mother Care (KMC) was first developed in 1978 to deal with overcrowding of neonatal units in Colombia. It effectively uses mothers or fathers as incubators. Babies weighing 2000g or less at birth are attached to their parent in skin to skin contact and are kept upright 24 hours a day. Although only limited evidence is available, and mainly from developing countries, Conde-Agudelo et al. (2003) found encouraging results regarding neonatal morbidities and weight gain, with no obvious adverse outcomes. It is recommended that literature pertaining to this intervention be monitored into the future, particularly as programs that emphasise home care rather than hospital-based care may be attractive to certain demographic groups.

5.8.4.5 Economic evaluation

Very few of the studies identified contained information regarding the economic effects of the prevention and treatment of LBW babies. Note, however, the above discussion of the possible economic benefits of early discharge programs for VLBW infants, although no quantitative analysis was undertaken.

In regard to the cost-effectiveness of maternal smoking cessation programs, Petrou (2003) found that economic evaluations have concluded that neo-natal costs can be reduced substantially by delivering effective anti-smoking advice to pregnant women.

5.8.4.6 Other considerations

Interventions to reduce the incidence and/or impact of LBW may have effects in other areas as well. For example, maternal smoking cessation programs are likely to reduce the incidence of Sudden Infant Death Syndrome (SIDS) as well (not to mention the direct benefits to maternal health), thereby enhancing their utility further. It is important, therefore, in evaluating the desirability of such interventions, to consider whether the interventions discussed here apply to other areas of child health as well.

5.9 **Overweight and obesity**

5.9.1 **Key messages for policy makers about overweight and obesity**

- Victoria should continue to maintain a high profile in initiatives that aim to prevent overweight and obesity in children. The evidence clearly indicates whole of government, multi-level, population-focused interventions are required, supported by a realignment of research funds and initiatives to policy-based interventions.
- Prevention of childhood overweight and obesity has been identified as a national priority in Australia and requires a whole of government approach if it is to be successful.
- Reviews of intervention trials have not identified reliable evidence for successful strategies. The most recent Cochrane review in this area is due for completion at the end of March 05 (review leader: Professor Elizabeth Waters, Deakin University).
- The reliance on Randomised Controlled Trials (RCTs) for evidence to proceed has been critiqued. RCTs are unlikely to provide the evidence required. Formal monitoring of programs and local benchmarking linked with interventions that assess sustainability, reach and population impact is more promising.
- Australian researchers are at the forefront of obesity prevention work. They have developed a framework for translating evidence into action in this area and identified levels of intervention that balance individual approaches with organisational, national and international policies that address the social and environmental factors that have significantly contributed to increases in obesity prevalence.
- Evidence does exist for effective childhood obesity treatment programs that focus on positive lifestyle changes for the whole family and incorporate principles of behaviour modification and provide caregivers and children with diet and exercise education and the tools required to put knowledge into practice.

5.9.2 **Search strategy**

Refinement of search strategy specific to this priority area

Additional very recent reviews were obtained from Australian members of the International Obesity Taskforce at the NSW Centre for Public Health Nutrition and Deakin University.

Culling strategy

- Non-English language articles
- Articles focusing on the epidemiology of childhood overweight and obesity
- Restricted to recent literature.

5.9.3 **Epidemiology**

Many government reports have documented the rising trends in child and adult obesity and described factors thought to be instrumental in these changes – mainly social and environmental factors. As summarised in Lobstein et al. (2004), “macro-environmental trends include globalisation of markets and patterns of economic development, food production, urbanisation, media development and mechanisation”.

Social trends include:

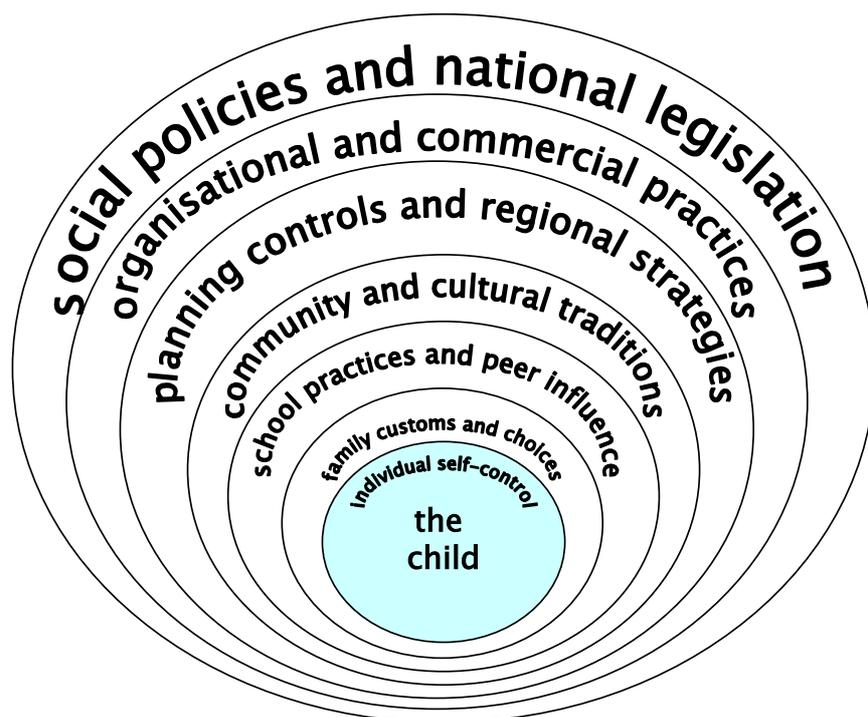
- “increase in motorised transport, eg to school;
- increase in traffic hazards for walkers and cyclists;
- fewer opportunities for recreational physical activity; increase playing of sedentary games;
- multiple TV channels around the clock;
- greater quantities and variety of food available;
- more frequent and widespread food purchasing opportunities;
- larger portions of food;
- the rising use of soft drinks to replace water; and
- more use of restaurants and fast food stores.”

5.9.4 The evidence

5.9.4.1 Model/approach

Several models have been put forward, all with the same basic elements of child, family and wider environment. The model within Lobstein, et al. (2004) is shown in Figure 9.

Figure 9 *The opportunities for influencing a child’s environment*



Source: based on Lobstein, Baur and Uauy (2004, Figure 2)

5.9.4.2 Actionable determinants/risk factors

Due to the wide spread and rapid increase in prevalence of obesity, population-wide approaches are advocated nationally and internationally (Lobstein et al., 2004). Treatment of obese children to reduce their risk of long-term health problems is also supported.

5.9.4.3 Interventions/factors affecting implementation

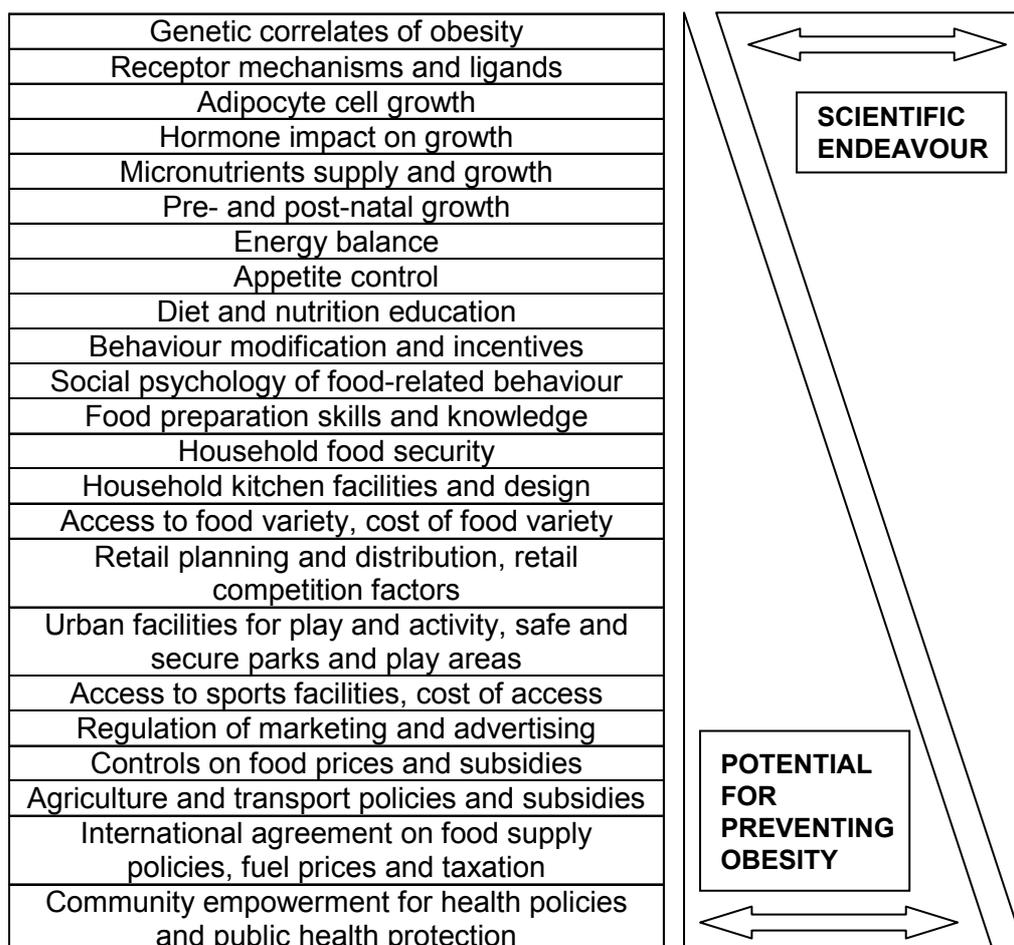
The model proposed for prevention of childhood overweight and obesity incorporates widespread action across a number of sectors and at all levels, international through to local. For this to occur, the Victorian government needs a whole of government approach to the issue.

As the issue of childhood obesity is well recognised, there has been much research undertaken and reported in the literature. However, reviews of intervention trials have not identified reliable evidence for successful strategies (Campbell et al., 2002; Lobstein et al., 2004). The most recent Cochrane review in this area is due for completion at the end of March 05 (review leader: Professor Elizabeth Waters, Deakin University) and may provide further insight into effectiveness of interventions.

As part of the scholarly and practitioner debate in the area, the role of RCTs in providing evidence has been critiqued (Lobstein et al., 2004; WHO, 2004). The critique is similar to the debate about the relevance of RCTs in many health promotion areas. Limitations have been identified, including difficulty in assuming “full control of the intervention, its delivery and the context in which it is implemented” (Lobstein et al., 2004), together with a range of other problems covering use of controls and randomisation, measurement of the parameters eg, energy balance, and the size of the effect.

Advocates for a broader approach recognise that the research upon which recommendations are made is not in proportion to where the most potential for change can occur (see Figure 10 below). RCTs are unlikely to provide the evidence required. Formal monitoring of programs and local benchmarking linked with interventions that assess sustainability, reach and population impact is more promising (Lobstein et al., 2004).

Figure 10 Transforming the focus of science



Australian researchers are at the forefront of obesity prevention work. They have developed a framework for translating evidence into action in this area (Swinburn et al., 2005) and identified levels of intervention that balance individual approaches with organisational, national and

international policies that address the social and environmental factors that have significantly contributed to increases in obesity prevalence (Lobstein et al., 2004, Figure 2). The framework is reproduced in Figure 11 below.

Figure 11 Potential societal level solutions for obesity prevention

Setting or sector	Potential societal intervention
1. National government eg, food and nutrition, transport, education, health, welfare	<ul style="list-style-type: none"> Integrate nutrition, physical activity and obesity prevention objectives into relevant policies and programs eg, Conduct obesity impact assessments for all new and existing policies.
	<ul style="list-style-type: none"> Increase ability of low-income populations to buy foods that are rich in micronutrients but low in fat and sugar, eg, Provide price support for healthy food.
	<ul style="list-style-type: none"> Reduce dependence on sugary soft drinks eg, Provide a safe, palatable and affordable water supply for all.
	<ul style="list-style-type: none"> Improve general food supply eg, Provide economic incentives for supply of 'healthy' foods and disincentives for supply of 'unhealthy' foods.
	<ul style="list-style-type: none"> Increase cycling and walking for short journeys and leisure, especially in urban areas eg, Develop and implement sustainable transport policies.
2. Food supply eg, manufacture, marketing, distribution, retail, catering	<ul style="list-style-type: none"> Improve nutrition quality of food served in catering outlets eg, Introduce award or accreditation schemes for preparation, provision and promotion of healthy food options in catering outlets.
	<ul style="list-style-type: none"> Improve nutrition quality of general food supply eg, Develop, produce, distribute and promote food products that are low in dietary fat and energy.
	<ul style="list-style-type: none"> Help consumers to make informed food purchase choices eg, Introduce new and improved food labelling schemes (covering fat, energy and salt) which do not mislead the consumer.
3. Media	<ul style="list-style-type: none"> Reduce advertising and marketing practices that promote over-consumption of food and drink eg, Regulate television food advertising aimed at children.
	<ul style="list-style-type: none"> Promote a healthy lifestyle culture eg, Incorporate positive behaviour change messages into television programs and popular magazines.
4. Non-governmental/ international organisations	<ul style="list-style-type: none"> Support action on diet, physical activity and obesity eg, Develop and implement healthy eating, physical activity and obesity prevention programs; Advocate for action on diet, physical activity and obesity.
5. Healthcare services	<ul style="list-style-type: none"> Promote healthcare intervention before obesity develops eg, Provide training in obesity prevention and management for doctors and other healthcare workers.
	<ul style="list-style-type: none"> Promote adoption of healthy activity and dietary habits by patients eg, Provide physical activity and/or nutrition and cooking skills programs for patients.
6. Education sites eg, pre-school, school, further education	<ul style="list-style-type: none"> Improve nutrition quality of foods available eg, Introduce nutrition standards for school meals.
	<ul style="list-style-type: none"> Encourage choice of healthy foods eg, Introduce reward schemes for choice of healthy foods.
	<ul style="list-style-type: none"> Empower students to prepare healthy meals eg, Provide classes in practical food preparation and cooking.
	<ul style="list-style-type: none"> Encourage uptake of physical activities eg, Increase range of enjoyable, non- competitive physical activities on offer at school.
	<ul style="list-style-type: none"> Encourage integration of walking or cycling into daily routine eg, Develop and implement 'Safe-routes-to-school' programs.
7. Worksites	<ul style="list-style-type: none"> Improve nutrition quality of foods available eg, Provide appetising healthy food and drink options in staff restaurants.
	<ul style="list-style-type: none"> Encourage choice of healthy foods eg, Subsidise healthy options in staff restaurants.
	<ul style="list-style-type: none"> Empower employees to integrate physical activity into work day eg, Provide exercise and changing facilities.
	<ul style="list-style-type: none"> Encourage integration of walking or cycling into daily routine eg, Provide incentive schemes for walking and cycling to work.

Setting or sector	Potential societal intervention
	<ul style="list-style-type: none"> Empower employees to integrate physical activity into work day and reduce reliance on convenience pre-processed food eg, Implement flexible work hours.
8. Neighbourhoods, homes and families	<ul style="list-style-type: none"> Increase access of low income groups to healthy food eg, Set-up community garden programs and food co-operatives.
	<ul style="list-style-type: none"> Increase access to safe exercise and recreation facilities eg, Pedestrianise city centres and residential areas.
	<ul style="list-style-type: none"> Promote walking (and cycling), eg, Set-up walking programs in shopping malls, parks etc, open safe-cycling routes.
	<ul style="list-style-type: none"> Increase access to, and consumption of, fruit and vegetables (and encourage physical activity) eg, Home gardening projects.

Source: Kumanyika *et al* 2002, in Lobstein *et al.*, 2004 (Table 16)

Evidence exists for effective childhood overweight treatment programs that focus on positive lifestyle changes for the whole family and incorporate principles of behaviour modification and provide caregivers and children with diet and exercise education and the tools required to put knowledge into practice (Drohan, 2002). Programs to address severe childhood obesity are mainly palliative, designed to manage and control the situation rather than attain a more appropriate body mass index (BMI). Improved self-esteem may have positive ramifications in some health areas, such as depression and social exclusion.

A major limitation to assessing effectiveness of population-wide interventions to reduce overweight and obesity is the lack of regular, comprehensive and consistent monitoring data of children health indices and food intake more generally. Such data may be used for identification of needs as well as for comparative purposes, either before or after interventions or across areas. Monitoring should occur through existing infrastructures eg, health services (early childhood nurses or GPs), education services (eg childcare centres and schools) or local governments. School-based or local-government based monitoring could be required and reported on in a similar fashion to basic skill tests, allowing schools to benchmark against the state and to monitor its own initiatives over time. Support is advocated for formal monitoring programs and local benchmarking linked with interventions that assess sustainability, reach and population impact (Lobstein *et al.*, 2004).

5.9.4.4 Economic evaluation

At this point it is difficult to estimate the burden imposed on the health system through childhood obesity, as many of the major problems will arise when these children reach adulthood. Some estimates of impact are available:

- Estimates of direct costs of adult obesity in Australia, back in 1989/90, were less than 2% of national health care costs. This figure would be unreliable in 2005 and is expected to be much greater. Indirect costs have been estimated as \$A272m (1989/90) and intangible costs in the order of \$A13-18bn, or 10 times the direct costs of obesity (Segal *et al.*, 1999).
- Direct costs of obesity in children may not be of the same order, as few treatments are provided for most overweight children. The costs would be expected in the future rather than in the present. Indirect costs associated with childhood obesity would need to factor in time taken off work for parents caring for ill obese children, time off school, specific costs to the education system and higher risk of unemployment or redundancy.
- An additional 1% of children in Australia become overweight every year.
- Childhood problems will include increased rates of hyperinsulinaemia, poor glucose tolerance and a raised risk of type 2 diabetes, hypertension, sleep apnoea, social exclusion and depression.

- Overweight and obese children are expected to have higher rates of problems as adults, including heart disease, diabetes, certain cancers, gall bladder disease, osteoarthritis and endocrine disorders.

5.9.4.5 Other considerations

A major issue to address is lack of or inappropriate action, in the face of an obvious and widespread problem. Calls have been made since the late 1970s for greater and concerted action for the prevention of childhood obesity. These calls clearly have gone unheeded at the whole of government level until quite recently (circa 2002). In the meantime, the problem of overweight and obesity in children has been allowed to develop to epidemic proportions, with an associated explosion in anticipated costs to government and, in particular, the health sector. This report does not factor into the discussion the significant personal costs to a quarter of Victoria's children who will have to deal with the individual burden of health and social consequences of government inaction. The evidence clearly indicates whole of government, multi-level, population-focused interventions are required, supported by a realignment of research funds and initiatives to policy-based interventions.

5.10 Parent mental health

5.10.1 Key messages for policy makers about parent mental health

- Intensive postpartum support provided by public health nurses or midwives can be effective in preventing depression among new mothers. Prevention programs are most effective when delivered after babies are born to new mothers most 'at risk'.
- Breastfeeding buffers the negative effects of postnatal depression on children, especially boys.
- Home visiting, delivered as a stand-alone intervention or as part of a multi-component strategy, reduces the risk of postnatal depression and improves parenting skills and mother-child interactions. The benefits for parents with substance-related disorders are still being evaluated. The report, *An audit of home visitor programs and the development of an evaluation framework* (Department of Health and Family Services, 1996) makes a number of recommendations which, if implemented, could ultimately benefit children affected by parent mental illness.
- Family-based interventions targeting parent-child interactions have benefits for all family members. In particular, an intervention in which mentally ill parents were taught to communicate better with their children about their illness reduced depressive symptoms in children and improved family functioning.
- Preschool education for young children of depressed, drug dependent or otherwise disadvantaged parents helps protect against conduct disorders and school failure, which are risk factors for later depression, substance abuse and suicide.
- Teachers who take part in short workshops about mental illness gain knowledge and feel more confident about taking a role in supporting children affected by parent mental illness. School-based programs for children may help reduce the stigma of mental illness. There is insufficient evidence that such programs help prevent depression.
- A number of peer support groups are running in Victoria for children affected by parent mental illness. Results from pilot studies are encouraging.
- Targeted psychological interventions to prevent depression among currently well children produced significant short-term reduction in risk, but their long-term benefits have not been evaluated.
- Strategies to improve integration of services available to children affected by parent mental illness are in place nationally and in several States. Implementation of new guidelines for service providers (*Principles and Actions for Services and People working with Children of Parents with a Mental Illness*, April 2004, Australian Government Department of Health and Ageing 2004) is expected to improve support structures for mentally ill parents and their children.

5.10.2 Search strategy

Electronic databases were searched, limiting age groups to 'fetus OR newborn infant to child (6 to 12 years)'. Only articles published in the last 10 years (1994-2004) were sought. This search strategy resulted in a total of 599 articles.

The field was narrowed by applying the following criteria for exclusion:

- Language other than English
- Articles in professional newsletters
- Impact of parents' or children's cancer or chronic illness on mental health

- Impact of care giving roles on women's mental health
- Impact of children on parents' mental health in general
- Infant psychopathology and psychotherapy

Articles dealing with ADHD or conduct disorders were also excluded. Interventions addressing behaviour problems among children are dealt with elsewhere in this document (see Section 5.3). ADHD has been identified as a separate priority area in children's health in the DHS document, *Strategies for Gain*. For the purposes of this review, the topic of parent mental illness encompasses problems relating to the abuse of alcohol and illicit drugs, which are defined here as 'substance-related disorders'.

Internet searches were also conducted, focusing on research conducted for Australian and State government departments and agencies.

This strategy resulted in a final list of approximately 35 articles. These were selected on the basis that they were the most recent evidence available, and the most relevant to Victoria and to Australian children aged 0-8 years.

Note: This document is written as an adjunct to the *Children of Parents affected by a Mental Illness Scoping Project Report*, (AICAFMHA, 2001) and the resulting *Principles and Actions for Services and People working with Children of Parents with a Mental Illness* (Australian Government Department of Health and Ageing, 2004).

5.10.3 Epidemiology

Prevalence

A high proportion of people with severe mental illness have children (Oates, 1997). The exact number of Australian children whose parents suffer a mental illness is unknown, but various studies have estimated that 20-50% of adult clients of mental health services have children under 18 years old (Ahern, 2003; Garvin, et al., 2002; Handley et al., 1998). Overall, almost one in five people (17.7%) suffer a mental illness at some point in their lives (Garvin et al., 2002). Though schizophrenia is the most prevalent mental illness among clients of mental health services, the most common diagnosis among patients who are parents is depression (Ahern, 2003; Handley et al., 1998).

Australian studies of parents with mental illness suggest high levels of family breakdown and disruption. In one study, 57% of respondents were single parents (Thomas and Kalucy, 2002); in another, only 28% of the children lived with both parents (Handley et al., 1998). Most of the patients were mothers. Caution is needed, however, in generalising these findings to the wider population of patients who are parents, due to problems with small sample sizes and poor response rates in these studies.

Impact on children

The damaging short- and long-term impacts of parent mental illness on children have been well documented (see Ahern, 2003, and Oates, 1997, for reviews). Overall, children whose mothers are mentally ill or alcoholic have an elevated risk of mental illness and antisocial behaviour and poorer general achievement than other children (Oates, 1997). A recent US study using a large, national sample found that children with depressed parents were approximately twice as likely to have a range of mental health problems (Olfson et al., 2003). It has been estimated that 25-50% of children with a mentally ill parent will themselves develop a psychological disorder, compared with 10-20% of their peers (Moodie, 2002, cited in Smith and Nicholls, 2002).

The timing of exposure to maternal depression appears to affect the type of problems manifested in young children, with internalising problems more common among children exposed as infants, and externalising among those whose mother became depressed when they were pre-schoolers (Essex et al., 2001). Both types of problems are more common in children if both parents have poor mental health, but the risk is reduced substantially if fathers are functioning well and able to act as a buffer to the effects of the mothers' depression (Kahn et al., 2004).

There is evidence that chronic, disabling minor disorders such as mild depression, anxiety and personality problems have worse outcomes for children than episodes of acute, severe illness and hospital admission. Child abuse is more likely to occur among parents with relatively minor disorders than those with severe illnesses (schizophrenia, bipolar disorder) (Oates, 1997).

Parenting as a risk factor

Ironically, giving birth carries with it a greatly increased risk of psychosis and major affective disorders among previously well women (Oates, 1997). Approximately one in ten new mothers experiences major depression for the first time in the first three months after her baby is born (Dennis and Creedy, 2004; NSW Health, 2000; Oates, 1997). For women who have a previous history of such illness, the risk of recurrence in the weeks immediately postpartum is 1 in 2 or 1 in 3 (Oates, 1997). Postnatal depression impairs mother-child interactions, which can affect a child's ability to form secure attachments to care-givers. The resulting emotional, social and cognitive deficits among these children (especially boys) can persist long after the maternal depression has resolved (Dennis and Creedy, 2004; Oates, 1997).

Other risk factors

Part of the increased risk of mental illness among these children is inherited. Much of it, however, is due to disruptions in parent-child interactions and stressors such as strange domestic routines, family breakdown and discontinuity of care when children have to be placed with relatives or foster carers if the parent is admitted to hospital. Qualitative studies have revealed that parents are not always aware of the impacts on their children and are loathe to discuss their illness or explain things to their children (Thomas and Kalucy, 2002). When ill, parents were often very tired, lacked motivation and struggled with basic everyday tasks such as housework and shopping. There was a lack of communication and interaction within the families, and parents admitted that they sometimes 'ignored' their children.

Children, on the other hand, described their hunger for information about their parents' illnesses and their struggle to make sense of what was happening (Handley et al., 2001). They were afraid for their parents' safety, confused, guilty (worrying that perhaps they were to blame) or fearful that they might also get the illness. Some felt a need to take on a more adult role in caring for their ill parent and the rest of the family. Older children were aware of negative reactions in society to mental illness. Their embarrassment, fear and desire to protect their parents led to social isolation, as they refused to invite friends home or reveal their family situation to friends or school teachers (Cogan, 2005).

Abuse of alcohol or illicit drugs by parents is associated with risks to the physical wellbeing and the emotional and cognitive development of children. The extent of substance-related disorder among Australian parents is unknown. A survey of pregnant and breastfeeding women in Australia found that three-quarters had consumed alcohol in the past 12 months, 18% had used marijuana and 8% had used other illicit drugs (Higgins et al., 2000, cited in Doggett, et al., 2004).

Alcohol abuse in pregnancy increases the risk of miscarriage, reduced foetal growth and impaired neurodevelopment, while drug addiction has been linked to adverse pregnancy outcomes including low birth weight and infant mortality. Infants may require treatment for neonatal abstinence syndrome, and may be at risk for sudden infant death. Environmental and lifestyle factors, and associated problems such as domestic violence and postnatal depression, may

further compromise developmental outcomes for these children (Doggett et al., 2004). Mothers who continue using drugs after their babies are born may have difficulty in providing a stable, nurturing home environment for their children. Ongoing maternal drug use and poor attitudes to parenting have been associated with less optimal behaviours by mothers during interactions with their children at 18 months of age (Schuler et al., 2002).

5.10.4 The evidence

5.10.4.1 Actionable determinants/risk factors

There have been few evaluations of programs designed specifically for children of parents with a mental illness. Therefore, it is necessary also to consider interventions which address some of the risk factors relevant to these children. These include programs targeting parents, children or the family unit. Examples are programs designed to:

- Prevent or treat postnatal depression
- Improve parent-child interaction
- Detect, prevent or treat mental health problems in children
- Promote resilience, coping and social connectedness among children.

5.10.4.2 Interventions/factors affecting implementation

Psychosocial and psychological support to prevent postnatal depression

The risk of postnatal depression is increased significantly by psychosocial variables such as stressful life events, marital conflict and lack of social support. Interventions such as cognitive-behavioural therapy (with or without antidepressants), non-directive counselling by health visitors, peer support and interpersonal psychotherapy are effective treatments (Dennis and Creedy, 2004).

A recent systematic review considered evidence that such psychosocial and psychological interventions may help prevent postnatal depression. Fifteen trials including a total of almost 7700 women were reviewed. Overall, psychosocial interventions did not reduce the risk of developing postnatal depression compared with control groups receiving standard care. There was good evidence to show that neither antenatal classes nor psychological debriefing sessions within hospitals had any preventive effects.

Seven trials that targeted women 'at risk' had greater success, however, as did interventions that began after the babies were born, rather than incorporating an antenatal component. Evidence from two well-designed trials, including one Australian study, indicates that intensive postpartum support provided by public health nurses or midwives can be effective in preventing depression among new mothers (Dennis and Creedy, 2004).

Breastfeeding

Breastfeeding has a protective effect against the cognitive and emotional deficits associated with postnatal depression, especially for boys (Oates, 1997). The revised statement *Breastfeeding and the Use of Human Milk* (American Academy of Pediatrics, 2005) outlines various ways in which paediatricians and other health professionals can promote and support breastfeeding. These include guidelines for education, clinical practice, society (including media and government policies and legislation) and research.

Home visiting

Alone and as part of multi-component early interventions, home visiting programs have been shown to improve parenting skills, enhance parent-child interaction and protect against post-natal depression and child maltreatment (Armstrong et al., 1999; Geeraert et al., 2004; Lagerberg, 2000; Olds et al., 2000). Many of these interventions have been evaluated and found beneficial in at-risk groups, including families affected by mental health problems.

Home visits to women with substance-related disorders promoted positive changes in the families, including better mother-child interactions. Nurses visited these mothers twice weekly, beginning before delivery and continuing until the children were 18 months old (Black et al., 1994). A follow-up study using trained lay visitors instead of nurses found no effect of the intervention, however (Schuler et al., 2002). Researchers based at the Royal Prince Alfred Hospital, Sydney, are currently conducting a Cochrane systematic review of the effectiveness of home visiting during pregnancy and postpartum for women with drug or alcohol problems (Doggett et al., 2003).

An Australian report, *An audit of home visitor programs and the development of an evaluation framework* (Department of Health and Family Services, 1996), describes home visiting programs, reviews the literature regarding their effectiveness and provides an evaluation framework. This report recommends that home visiting programs be widely promoted in the general community, best practice guidelines be developed, programs integrated with other services and program plans and funding should incorporate an evaluation component. Special attention is required to developing home visiting programs relevant and accessible to Aboriginal and Torres Strait Islander families, rural and remote families, and families with a culturally and linguistically diverse background. The role and needs of fathers should also be addressed by these programs (DHFS, 1996, cited in NSW Health, 2000).

Parent skills training and family intervention

Poor communication and lack of interaction are risk factors prevalent in families affected by mental illness. Programs designed to alleviate these problems by making parents more aware of their children's needs and improving parent-child interactions have demonstrated benefits for parents and children. A longitudinal study by Beardslee (2003) and colleagues evaluated two prevention strategies for healthy children of depressed parents. The 'clinician facilitated' intervention involved 6-11 sessions with professionals, meetings with parents and children separately and together, telephone contacts or refresher meetings at 6-9 month intervals and education material linked to each family's experiences. The 'lecture' intervention involved two sessions conducted by the chief investigator and attended by groups of parents only. Follow-up was offered but not scheduled regularly. The clinician-facilitated strategy was most effective, but both strategies led to significant changes in parents' attitudes and behaviours, and these increased over time. Children's understanding of parental illness increased, while internalising symptoms (which predict later depression) were reduced. There was a positive relationship between parental and child changes, suggesting that family interactions had improved.

The Positive Parenting Programme ('Triple P') developed at the University of Queensland is a population-based strategy to enhance parental competence, prevent dysfunctional parenting practices, change parental attributions about children's behaviour and promote teamwork between partners (Sanders et al., 2003). It is described more fully elsewhere in this document, in relation to child abuse (see Section 5.2), but is also relevant to this priority area. At its highest levels of intervention, Triple P can provide intensive parent training and enhanced family intervention to address specific problems such as parenting stress and depression, difficulties in parent-child interaction, and severe child conduct disorder. The Triple P system is currently being evaluated with families notified for child maltreatment and no outcomes data are available to date. Promising preliminary results are available, however, from a large-scale community trial of a modified Triple P program developed in Western Australia. Intervention-group parents, who took part in

behavioural family interventions, were less depressed and less likely to use poor discipline strategies with their children than controls (Marshall and Watt, 1999, cited in NSW Health, 2000).

An intensive, multi-component intervention had benefits for Australian families in which parents were using methadone. Twelve families, each given 12 sessions of support, experienced significant improvements in parental functioning, parent-child relationship and parental substance use and risk behaviour at three-month follow-up (Dawe et al., undated). A short-term, intensive program for 'at risk' mothers (including those with substance-related or psychiatric disorders) in Sweden led to significant improvements in mother-child relationships, as judged by analysis of videotaped interactions (Wadsby et al., 1998).

Centre-based day care or preschool education

Healthy emotional and physical development of infants and toddlers requires 'good enough' parenting, adequate food and shelter, and an environment that encourages physical, emotional and cognitive development (NSW Health, 2000). Where these needs are not met due to parent mental illness (particularly postnatal depression), early intervention is desirable. In order to protect them against developing mental health problems later, preschool children must have the opportunity to develop impulse control and acquire adequate language skills in preparation for reading. School problems such as poor achievement are risk factors for later depression, substance abuse and suicide (NSW Health, 2000).

Full-time day care from 8-12 weeks of age, combined with home visiting and a parent support group, had long-term benefits for cognitive, social and emotional development. The program was delivered to a group of infants defined as 'high risk' on various measures including social disadvantage, lack of social support and parent emotional problems (Horacek et al., 1987, cited in NSW Health, 2000). Children who took part in the preschool intervention had better results than those who took part later, during the first three years of primary school. Benefits were still evident when these children reached 21 years of age.

NSW Health (2000) reviewed evaluations of a number of preschool programs for children aged 3-5 years. A range of long-term benefits, including lower rates of mental disorders, were achieved through a two-year program of classroom based activities attended by children when they were four or five years old. The program was intensive, involving five 90-minute sessions each week for seven months of the year over two years, plus weekly home visits by teachers to involve mothers in their children's education. The results suggested that early childhood education could be seen as an "innovative mental health strategy" (NSW Health, 2000).

School-based programs

Children with depressed parents say that one of the biggest problems for them is the social isolation caused by the stigma of the illness. In a recent qualitative study, children described their embarrassment and fears about revealing their family situation to friends or teachers at school (Cogan, 2005). Educational resources and destigmatisation campaigns within schools may be useful, as schools are potentially valuable sources of support for these children (Cogan, 2005) as well as an appropriate source of information about mental illness for their peers (Garvin et al., 2002).

An educational program designed to help teachers and schools support children affected by the mental illness of a parent and to reduce prejudice among other children was evaluated in several Australian schools (Joyce et al., 2003). The intervention consisted of three one-hour workshops for pupils in Grades 5 and 6, resulting in changed attitudes to mental illness and less use of inaccurate and derogatory terms. Following the two one-hour workshops for teachers, they reported significantly greater knowledge of mental illness and confidence that they could use their skills to support children whose parents were affected. The success of this pilot study led to wider use of the program, which is currently running in Victoria under the auspices of the Eastern Access

Community Health, and is known as *Supporting Kids in Primary Schools* (SKIPS) (Children of Parents with a Mental Illness National Resource Centre, www.copmi.net.au).

School-based programs designed to prevent depression among children and adolescents are particularly relevant for children with parents who have a mental illness, due to their increased inherited and environmental risk factors. A recent systematic review identified only one educational and two psychoeducational programs that had been evaluated and these had no effect on the later development of depressive symptoms. The authors concluded that further investigation was needed (Merry et al., 2004).

Many children with parents who have a mental illness are 'resilient'; that is, they do not develop social or emotional problems and may, in fact, have greater coping skills and sensitivity to others than their peers (Smith and Nicholls, 2002). A number of factors associated with resilience have been identified, including high academic ability, close friendships, self-help and problem solving skills and certain personality traits such as confidence, persistence and flexibility. Based on these factors, interventions have been designed to enhance children's resilience by promoting social competence and academic achievement. Social competence encompasses four types of skills: self-control, communication, decision-making or problem solving, and resisting negative influences (Weissberg et al., 1989, cited in NSW Health, 2000). Social competence training delivered in primary schools (either universally or targeted to children most at risk of problems) has demonstrated benefits for children, especially when combined with teacher training and parenting skills training (Mrazek and Haggerty, 1994, cited in NSW Health, 2000).

Peer support groups

Various models of peer support for children affected by parent mental illness are currently run in Australia. The CHAMPS model, developed over the past eight years, has been influential and is used in several States including Victoria. It aims to enhance children's social connectedness, self-esteem and coping strategies. *VicChamps* was funded for three years from July 2003, by VicHealth, Beyondblue and the Mental Health Branch of DHS. It is run by Eastern Health and Upper Murray Family Care. Specific interventions include:

- after-school programs for children aged 5-7 years, with their parent (Young Champs)
- after-school programs for children aged 8-12 years
- school holiday programs
- 'graduates' club (Kids Club)
- twice-yearly Champs Camps.

The CHAMPS model has been evaluated qualitatively using pre- and post-interviews, focus group discussions and questionnaires. Some quantitative evaluation has also been conducted. The results are encouraging. The current *VicChamps* program will be evaluated in collaboration with Charles Sturt University (Children of Parents with a Mental Illness National Resource Centre, www.copmi.net.au).

The *Parentships: Parenting and concurrent children's group program*, which completed its pilot phase in Victoria in late 2003, was set up specifically for parents with serious mental illness. This was a preventive intervention that aimed to improve parenting skills and parental wellbeing, while helping children understand mental health issues and build coping skills and resilience. Results from the pilot groups were promising (Children of Parents with a Mental Illness National Resource Centre, www.copmi.net.au).

Individual therapies for children

Well-structured psychological interventions can reduce the risk of depressive symptoms in well children and adolescents, according to a recent systematic review and meta-analysis (Merry et al., 2004). Programs targeted to 'at risk' groups (including children of parents with a mental illness) were more effective than those delivered universally. Most of these programs were based on cognitive therapy and had a positive focus on reducing stress, promoting psychological growth and enhancing social support and coping skills. They were delivered by clinicians, teachers, school counsellors or school psychologists, or trained facilitators.

The reviewers concluded that such interventions were promising but that more research was needed before they were implemented widely. In particular, there is a lack of studies comparing the effects of the intervention to a placebo or active comparison group, and long-lasting effects have not yet been demonstrated (Merry et al., 2004).

Service and policy changes

There is a need to ensure that service providers can identify children who are at risk due to parent mental illness and address their needs (Garvin et al., 2002). Australian studies involving families affected by mental illness have highlighted the fact that children often have little support from mental health services (Handley et al., 2001; Thomas and Kalucy, 2002). The Tasmanian Children's Project, which replicated and extended an earlier study in Victoria, sought the views of parents with a mental illness and their children on the services they felt they needed (Handley et al., 2001). Findings were based on almost 400 questionnaires returned from 10 mental health agencies in southern Tasmania, among them 116 consumers and their 240 children. They identified a need for:

- Respite services
- Information
- Support groups
- A greater effort to support the ill parent in his/her home.

Service providers who were surveyed agreed that respite care, structured support and education were useful strategies, and also stressed the need for better integration of child and adult services. Based on these findings, the authors recommended two strands of intervention:

- Programs to promote competency among children
- Systems change involving primary care health workers, child welfare workers, adult mental health practitioners, non-government agencies and schools.

A national scoping study which examined the needs of children of parents affected by mental illness expanded on these findings (Garvin et al., 2002). A key recommendation was that all patients of mental health services should be asked if they had children and, if so, whether support for their role as parents was needed. The Australian government responded by funding a three-year initiative, "Children of Parents with a Mental Illness", which is expected to result in:

- Uptake of good practice principles and guidelines
- Development and distribution of resources
- Provision of information to guide policy development.

Guidelines were set down in the document, *Principles and Actions for Services and People Working with Children of Parents with a Mental Illness*, April 2004. This document identifies the need to base programs and resources on systematic evaluation evidence, but acknowledges that such evidence is lacking. It makes a number of recommendations on ways in which governments and other funding bodies can help build this evidence base by developing knowledge, tools, models and interventions and conducting quality evaluations.

Areas in which to maintain effort

5.11 Congenital heart disease

5.11.1 Key messages for policy makers about congenital heart disease

- There is insufficient evidence to support or not support a screening program for congenital heart disease (CHD). A systematic review and cost-effectiveness analysis is currently in progress and is due to report in June 2005.
- Intra-operative transoesophageal echocardiography (TOE) during surgery for CHD is now considered standard care. However, there is no evidence that this procedure results in better patient outcomes and there is only limited evidence of the safety and cost effectiveness of the procedure.
- Various alternatives to surgical repair of congenital heart defects have been introduced in recent years using catheter-based techniques. Systematic reviews or randomised controlled trials of these techniques have not been conducted and there has been limited economic evaluation.
- The establishment of a centralised database for paediatric cardiac surgery has the potential to assist in quality control of interventions for CHD.
- There is some evidence that improved outcomes (measured by mortality) are associated with increased volume of surgery for CHD, both at an individual surgeon level and at hospital level.
- Research on long-term outcomes for CHD demonstrate mixed results with a wide range of potentially adverse outcomes for this group of children. Research on suitable rehabilitation interventions for this client group is almost non-existent.

5.11.2 Search strategy

Key terms

The document *Establishing priorities for gain: the health, development, learning and wellbeing of Victoria's young children* describes congenital heart disease as:

“various abnormalities of the heart, present at birth. Other words, such as disorder, defect, condition, or problem, may be used instead of disease. There are three main types of abnormality: narrowing in parts of the heart, holes in the walls between the chambers of the heart, or main vessels attached at an abnormal location.”

This description was adopted as the definition for reviewing evidence. Seven particular conditions were included within this definition and searches (Medline only) conducted for each condition - ventricular septal defect, transposition of the great vessels, coarctation of aorta, tetralogy of Fallot, hypoplastic left heart syndrome, patent ductus arteriosus, atrial septal defect.

Refinement of search strategy specific to this priority area

The literature on CHD was searched for the years 1994-2004 in Medline and Cinahl using the terms 'risk', 'promotion', 'education', 'environment' and 'intervention', with appropriate limits to restrict the search to young children. Additional searches were undertaken in the Cochrane Database of Systematic Reviews, Meditext, DARE, CCTR and ACP Journal Club. Citations were also identified by internet searching, reviewing reference lists in recently published work and searching for recent publications by key researchers in the field. The search focused on

identifying systematic reviews, evidence-based clinical guidelines, health technology assessments, randomised controlled trials and economic evaluations.

Culling strategy

Studies were excluded on the following grounds:

- reports of single cases or series of cases
- genetics of CHD
- diagnostic interventions
- pharmaceutical treatments
- management of anaesthesia
- narrative reviews
- not relevant to Victoria

The net result was a total of 629 citations, of which 561 were excluded from further review. Of the remaining 68 citations the full text of 45 were reviewed.

5.11.3 The evidence

5.11.3.1 Model/approach

The *Establishing Priorities for Gain* document identifies a treatment focus for CHD (page 20) with the aim of improving life expectancy and wellbeing by reducing the impact of disability (DHS, 2004c). This requirement and the HBG/HRG framework were combined to develop a schema for reviewing the evidence:

Health Benefit Group	Health Resource Group	Interventions
At risk	Prevention	Screening.
Confirmed problem	Acute care	Assessment of new surgical techniques. Safety and outcomes.
Chronic consequences	Continuing care	Medical management of complications of CHD. Long-term outcomes - psychosocial issues; intellectual development and education; physical activity. Links with adult services.

5.11.3.2 Actionable determinants/risk factors

Screening is the one secondary prevention intervention identified as part of this review. Assessment of the cardiovascular system is a routine part of the medical examination of newborn babies, repeated at post-natal check-ups. In some programs overseas, examinations are also undertaken at pre-school or school entry. The most authoritative recent source for information on this issue is the review of evidence by the NHMRC (National Health & Medical Research Council, 2002). This concluded that there was insufficient evidence to make a recommendation for or against screening.

Koppel and colleagues have reported the results of a study using pulse oximetry to screen newborn babies with no symptoms of cardiac disease. The results show promise for what would be a relatively simple screening tool (Koppel et al., 2003). Meta-analysis to evaluate the performance of ultrasound screening during the first trimester of pregnancy indicates that this is a “modestly efficient strategy” (Makrydimas et al., 2003) and the results of a large randomised controlled trial

show that echocardiography during the early neonatal period enhances early detection of CHD although the screening is expensive (Sands et al., 2002). None of these studies were included in the NHMRC review.

It should be noted that a systematic review of the literature on neonatal screening for CHD and cost-effectiveness analysis of alternative screening strategies is currently in progress as part of the NHS Health Technology Assessment Program (lead investigator Professor Carol Dezateux) and is due to report in June 2005. The results of this work should prove to be useful for the development of a screening policy for congenital heart disease.

5.11.3.3 Interventions/factors affecting implementation

Assessment of new surgical techniques

In recent years there has been a trend to use catheter-based techniques to replace more conventional surgical repair of congenital heart defects. Three examples of health technology assessments are included here to indicate current knowledge with these techniques, together with an assessment of the use of transoesophageal echocardiography (TOE) during surgery.

Atrial septal defect (ASD) is a defect in the atrial septum which separates the left and right atria of the heart. The most common type of ASD occurs at or near the centre of the atrial wall and is called *ostium secundum* ASD. Repair can either occur with surgery or use of an occluder device introduced into the heart via a catheter. The latter method is increasingly considered to be the standard of care. There is limited evidence to compare the two approaches. Trans-catheter repair has a higher failure rate than surgery, but lower short-term complications. Evidence of long-term follow up of patients with device closure is lacking. The evidence on comparative costs of the two procedures is limited (Canadian Coordinating Office for Health Technology Assessment, 2003).

Atrial septostomy creates a hole in the atrial wall to relieve the symptoms of cyanotic congenital heart disease, most commonly transposition of the great vessels. This can be achieved by passing a catheter through a large vein, usually in the groin, and then into the heart. Opening a hole in the atrial wall is done with use of a balloon at the end of the catheter, sometimes in combination with a blade, also at the end of the catheter. This procedure has now become standard practice despite the fact that there are no systematic reviews of the evidence and no randomised controlled trials of the procedure (National Institute for Clinical Excellence, 2003).

Surgical closure of patent ductus arteriosus has been conventional therapy for many years. An alternative is endovascular closure whereby a catheter is inserted into an artery or vein, and then into the heart. An occlusion device is then inserted into the ductus via the catheter, under X-ray guidance. There have been no systematic reviews or randomised controlled trials of the endovascular procedure. Despite this, the procedure is now standard practice (National Institute for Clinical Excellence, 2004).

Intra-operative TOE is used during cardiac surgery to obtain ultrasonic images of the heart and associated structures. The Medical Services Advisory Committee of the Australian Department of Health and Ageing conducted a systematic review of available evidence and concluded that use of TOE during congenital heart surgery is now considered standard care. Intra-operative TOE was found to detect changes in cardiac function with high specificity and the results from intra-operative TOE led to frequent changes in intra-operative management of patients. However, there is no evidence that intra-operative TOE results in better patient outcomes and there is only limited evidence of the safety and cost effectiveness of the procedure (Medical Services Advisory Committee, 2002).

Safety and outcomes

The inquiry into paediatric cardiac surgery at Bristol Royal Infirmary in the UK funded a systematic review of outcomes of open-heart paediatric surgery to develop an understanding of the knowledge-base that might reasonably be expected to have been available to the Bristol clinicians in the period 1984-1995. Despite extensive searching the review yielded only case-series data, with no randomised controlled trials or cohort studies. The reviewers then proceeded to undertake what they believed was the first systematic review of case-series data, normally considered a lower level of evidence than randomised controlled trials. The review established 30-day mortality estimates for different procedures that were consistent with clinical opinion and represented 'best achievable performance' rather than performance that would be expected in everyday practice. The review concluded that this highlighted the need for individual surgeons to collect data on their own practice and combine this with national performance data (Vardulaki et al., 2000).

Since April 2000 data from all 13 UK tertiary centres performing cardiac surgery or therapeutic cardiac catheterisation in children with congenital heart disease have been collected in a central database. Data from the first year identified no detectable differences in survival between any of the centres and established national survival rates at 30 days and one year post-procedure. Results indicate that national audit is capable of accurate data collection on which nationwide long-term quality control can be based (Gibbs et al., 2004). Work in the USA identified that lower in-hospital risk-adjusted mortality rates were associated with hospital paediatric cardiac surgical volumes of more than 100 procedures per year and with surgeon volumes of greater than 75 procedures year (Hannan et al., 1998).

Medical management of complications of CHD

No systematic reviews of direct relevance to this client group were found. As with the literature on assessment of new surgical techniques, there is a reliance on case-series reports. It would be difficult to conduct a thorough review of this literature without encompassing much of what constitutes paediatrics.

Long-term outcomes

There have been three recently published reviews of the literature on long-term outcomes for children with CHD that considered issues such as academic performance, psychosocial functioning and neurological development (Griffin et al., 2003; Green, 2004; Imms, 2004). Each one misses out some of the literature and none approach the rigour of a systematic review. However, together with some primary studies on physical activity (Limperopoulos et al., 2001; Lunt et al., 2003) and the results of a long-term follow-up study from the Netherlands (van Rijen et al., 2003) it is possible to build up a picture of some potential long-term outcomes for children with CHD. Some of these studies focus on children, others on adolescents or adults. The results for the older age groups are included to identify opportunities for improvement:

- Most research indicates that children with CHD are at risk for cognitive defects, learning disabilities and developmental delay, irrespective of heart lesion. In general, children with cyanotic heart disease such as transposition of the great vessels, hypoplastic left heart syndrome and tetralogy of Fallot have poorer cognitive and academic outcomes than children with non-cyanotic heart disease. However, this should be treated with caution as the different studies have produced mixed results, with little conclusive data (Griffin et al., 2003).
- Many factors during the acute management of CHD may influence long-term outcome, including duration of cardio-pulmonary bypass at time of surgery, delayed medical treatment, cardiac arrest with hypoxic brain damage and underlying abnormalities of cardiac rhythm that may have neurological consequences (Griffin et al., 2003).

- There is some research to suggest that children with CHD are at increased risk of poor self-esteem, behavioural difficulties and poor psychological or psychosocial functioning, although these results must also be treated with caution as some studies produce contradictory results. Some of the work on which this is based is now quite old (late 1970's, 1980's) and may not reflect improvements in acute management (Imms, 2004).
- There is very little research on functional outcomes for children with CHD. In one Canadian study children with CHD aged 1 to 3 years of age were assessed and found to have moderate disability in over one third of cases (Limperopoulos et al., 2001).
- In an Australian study the majority of adolescents with CHD reported levels of physical activity comparable to their peers although less were vigorously active, particularly boys (Lunt et al., 2003).
- Some studies have reported that children with CHD go on to have a quality of life in adulthood that is either similar to or lower than the general population (Green, 2004) although the rigour of this work has been called into question (Moons et al., 2004).

Despite all these potential problems recently published results from long-term follow-up of a group of adults in the Netherlands with CHD found that they seemed to make good use of their abilities with favourable outcomes for duration of employment, income and an optimistic outlook on career possibilities. There was a high proportion (27%) with a history of special education. Given the time lapse between initial treatment and follow-up these results may not reflect current management of children with CHD. The results may not be generalisable to other countries and cultures (van Rijen et al., 2003).

In the absence of a systematic review it is difficult to know what to make of these varied, and in some cases contradictory, findings. The number of potential adverse outcomes and the range of professional disciplines required to provide optimal care for such outcomes indicates a need for rehabilitation targeted at children with CHD. However, reported studies of rehabilitation interventions for this group of children are almost non-existent with only three studies reported in the last ten years of which only one appeared in the English language literature (the other two took place in China). This one study tested the effect of a supervised program of physical training for a group with CHD and found some improvements in exercise capacity and physical activity compared to a control group. Unfortunately assignment to the two groups was not random so the results must be treated with caution (Fredriksen et al., 2000).

Links with adult services

Because of the success of paediatric cardiology and cardiac surgery in recent years the situation will soon arise where there are more adults than children with CHD, with growing recognition of the need to develop services for this group of people. This has resulted, for example, in the establishment of a task force under the auspices of the European Society of Cardiology to develop guidelines for management of adults with CHD and focused attention on the transition from paediatric to adult care. This would typically happen sometime during adolescence and is therefore outside the terms of reference of this review. It is merely noted here as an issue worthy of consideration when designing service delivery systems to meet the needs of children with CHD.

5.11.3.4 Economic evaluation

Because of the wide spread nature of this literature, economic evaluations (where available) are referred to in the appropriate section above.

5.12 Infant mortality

5.12.1 Key messages for policy makers about infant mortality

- Victoria has, by national and international standards, a low infant mortality rate. However, the Aboriginal infant mortality rate in Victoria is 2½ times above the non-Aboriginal rate (23.7 deaths per 1000 births compared to 9.7 across Victoria as a whole).
- The majority of effective interventions for reducing infant mortality are to be found in the areas of SIDS and Low Birth Weight, which are covered elsewhere in this report as priority areas in their own right. Other significant causes of infant mortality include various respiratory diseases and infectious diseases. The latter may be of particular relevance to the indigenous population.
- Strategies for reducing infant mortality due to infectious disease for which good evidence exists include vaccination, Vitamin A supplementation (intestinal infections, measles), breastfeeding for the prevention of infectious disease and maternal screening and antibiotic administration for Streptococcal infection.
- Evidence-based strategies for reducing infant mortality due to respiratory disease include surfactant treatments and Inositol, both used to treat Respiratory Distress Syndrome (RDS).
- Interventions which cannot be recommended include routine ultrasound, for which there is not only no evidence of effectiveness with respect to reducing infant mortality, but which does not appear to confer any measurable benefits to mother or baby, and may even be harmful. To the extent that these are publicly funded, they would appear to constitute a sub-optimal allocation of resources.
- Two interventions for which evidence suggests infant mortality may be *increased* include Prophylactic Continuous Airways Pressure (CPAP) and Digoxin, both used in the treatment of neonatal respiratory conditions.

5.12.2 Search strategy

Key Terms

Definitions (see ABS, 2002)

An infant death is the death of a child before its first birthday.

The infant mortality rate is the number of deaths in a calendar year of children aged under one year per 1,000 live births in the same calendar year. It comprises neonatal and postneonatal deaths.

A neonatal death is the death of an infant within 28 days (0-27) of birth who after delivery, breathed or showed any other evidence of life such as a heartbeat.

A postneonatal death is the death of an infant on or after 28 days but less than 12 months.

Refinement of search strategy specific to this priority area

Many of the leading causes of infant mortality are covered in this report as priority areas in their own right, particularly SIDS, low birth weight, child injury and child abuse. These are not considered further in this section. The most quantitatively important additional causes of infant mortality for which evidence on the efficacy of interventions could be found involved respiratory diseases and infectious diseases. The latter may be especially important in the context of indigenous children.

Culling strategy

From the resulting list of interventions, we attempted to analyse all reviews of the available evidence contained in the Cochrane Database of Systematic Reviews. This produced a relatively large body of evidence, which was supplemented by recent evidence from other international and Australian sources in areas where there were perceived to be gaps, or where the relevant reviews were less recent.

5.12.3 Epidemiology

Approximately 95% of neonatal deaths are due to either conditions or complications relating to pregnancy, birth and the neonatal period (including respiratory and cardiovascular conditions) (64%) or to congenital malformations. These continue to constitute significant causes of postneonatal death (12% and 21% respectively), but other causes are important as well, most prominently SIDS (almost one-third in the late 1990s), which is covered in this report as a priority area in its own right. The other third of postneonatal deaths are mainly due to “external causes” (9%), diseases of the nervous system (6%), respiratory diseases (5%) and infectious diseases (3%), with 10% due to a variety of “other” causes (ABS, 2002).

It should be noted that many of the issues regarding neonatal death are closely related to low birth weight (LBW) and preterm birth, which are covered separately elsewhere in this report. Because infant mortality and prematurity/LBW are closely linked, it is inevitable that there will be overlap in the discussions of risk factors and interventions contained in this report.

5.12.4 The evidence

Excluding deaths covered under other priority areas, most evidence regarding interventions aimed at reducing infant mortality focus on causes associated with respiratory and infectious disease. An additional dimension in the Victorian context is that overall rates of infant mortality are very low by world standards, but the rate is much higher in the indigenous than in the general population. Furthermore, although the specific reasons for this excess mortality among indigenous infants are not well understood, there is evidence that it may be due, in part, to issues involving infectious disease.

Hence, the approach in this section is firstly to discuss infant mortality issues relating to indigenous Victorians, followed by analysis of interventions aimed at reducing mortality due to infectious disease and respiratory disease. Finally, several miscellaneous interventions are discussed.

5.12.4.1 Actionable determinants/risk factors

Indigenous infant mortality

Infant mortality among indigenous Victorians appears to be approximately double that of the non-indigenous population (Koori Human Services Unit, 2004). Undoubtedly this is due primarily to the economically and socially disadvantaged status of the indigenous population. However, there is little comparative data on specific causes of infant death. Much of the excess mortality may be in areas related to pregnancy, birth and the neonatal period. Rates of stillbirth, preterm birth and low birth weight are all elevated in the indigenous population.

Kile (1995), in a study of remote aboriginal communities in the Northern Territory, found that infectious disease was the main cause of excess mortality in this population, when compared to the non-indigenous population. Zubrick et al., (2004) confirm that Aboriginal children aged 0-3 suffer abnormally high rates of, in particular, recurring chest infections. This suggests that infectious disease may be a more important factor for Aboriginal infants than is suggested by overall figures, though it is uncertain to what extent the experience of Aboriginal people in remote

northern communities will be relevant to the Victorian situation. However, consistent with this finding is the fact that rates of immunisation appear to be lower in the indigenous Victorian population. Figures from Koori Human Services Unit (2004) suggest that, in 2002, only slightly more than half of indigenous children aged 12-15 months were fully immunised, compared with around 92 percent of non-indigenous children. However, AIHW (2004) presents alternative figures that suggest that 89 percent of indigenous children aged one year in Victoria in 2002 were fully immunised. Hence, it is uncertain as to whether the gap in immunisation rates is small or substantial, but to the extent that this gap exists, evidence suggests that it would lead to higher levels of infectious disease among indigenous infants.

5.12.4.2 Interventions/factors affecting implementation

Interventions targeted at infectious disease

To the extent that indigenous children suffer excess rates of infectious disease, the experience of less developed countries may be instructive in terms of suggesting beneficial interventions. In a review focusing on child deaths (aged 0-5 years) in less developed countries, Jones et al., (2003) reviewed the evidence for interventions aimed at treating a number of common causes of child death, including several that constitute infectious diseases. They found good evidence for the following interventions:

- Breastfeeding, nutritional supplementation, zinc and Vitamin A for the prevention of intestinal infectious diseases, as well as zinc, oral rehydration therapy and antibiotics for their treatment
- Vaccination, nutritional supplements and perhaps Vitamin A for the prevention of measles, and Vitamin A for its treatment
- Tetanus toxoid for the prevention of neonatal tetanus
- Breastfeeding, in addition to administration of antibiotics, for premature rupture of membranes for prevention of neonatal sepsis, and antibiotics for its treatment.

Further support for the efficacy of breastfeeding in reducing the incidence of gastro-intestinal infections is provided in Sikorski et al., (2004). They reviewed the effects of providing support for breastfeeding mothers and found that professional support significantly reduced these types of infections, with support for exclusive breastfeeding being particularly effective.

Shann et al., (2004) noted that measles is, worldwide, still a major cause of death in young children, mostly due to its association with pneumonia. They reviewed evidence on the effectiveness of administering antibiotics to children with measles, and found no evidence of reduced pneumonia or mortality. In fact, more children died in the antibiotic administration groups than in the controls in the studies reviewed.

However, when D'souza and D'souza (2004) reviewed RCTs relating to the effectiveness of megadoses of Vitamin A for children with measles, they found a 64% reduction in the risk of mortality in children who were given two doses of 200,000 IU of vitamin A compared with placebo. The effect was particularly strong in children aged under two years.

Antibiotics for prevention of infectious disease

Streptococcal infection

Group B streptococcal infection is common in pregnant women without causing harm. However it is also a significant cause of neonatal morbidity and mortality (Smaill, 2004). Pregnant women are sometimes screened during antenatal care, and if positive, antibiotics may be administered during labour. However, hospital policies are often inconsistent, even within the same hospital system. Smaill (2004) found substantial reductions in the probability of both colonisation and infection in

neonates. Although not “statistically significant”, Smaill’s review also estimated a large reduction in infant mortality. There is evidence that it would be prudent to seriously consider a policy of routine Streptococcal virus screening in combination with routine administration of antibiotics during labour where indicated. Zubrick et al., (2004) confirm that streptococcal infections are particularly prevalent in indigenous communities.

Woodgate et al., (2004) attempted to review all RCTs that addressed the effectiveness of routine antibiotic administration soon after birth in preventing streptococcal disease, which affects approximately one in one thousand births in developed countries. They identified only one large trial suitable for analysis. Although results suggested some reduction in mortality, the result was not statistically significant. In addition, given the low incidence of the condition, it seems dubious whether any benefits of this intervention would be sufficient to outweigh the direct and indirect costs incurred.

HIV

In terms of infant mortality, attention has been directed at interventions designed to reduce the transmission of HIV from pregnant women with the condition to their babies, both at birth and in the postnatal period. Brocklehurst and Volmink (2002) found that antiretroviral drugs such as zidovudine and nevirapine significantly reduced the transmission of HIV to the neonate and were associated with reduced infant mortality (indicatively, with an approximate halving of the odds of death in the first year). This type of intervention is standard in current advanced Western societies (Brocklehurst and Volmink, 2002).

Another intervention that may be warranted when pregnant women are HIV positive is delivery via Caesarean section (CS). Brocklehurst (2002) found evidence of a dramatic reduction in transmission of the disease when this mode of birth was employed. However, little support was found for the effectiveness of antenatal Vitamin A supplementation on the risk of transmission (Shey Wiysonge et al., 2002).

Interventions targeted at mortality due to respiratory conditions

Perinatal asphyxia

An important condition associated with significant mortality and morbidity, one intervention that has been proposed is use of dopamine to improve cardiac output. However, no evidence was found in a review by Hunt and Osborn (2002) of any association with reduced mortality.

Tracheal Gas Insufflation

A relatively new technique to supplement mechanical ventilation in neonatal intensive care units. Davies and Woodgate (2002) identified only one RCT which has evaluated the effectiveness of this intervention. No evidence was found of reduced infant mortality, chronic lung disease (CLD) or hospital length of stay. The only benefit of statistical significance was reduced duration of ventilation.

Prophylactic Continuous Airways Pressure (CPAP)

Suggested as an alternative to standard treatments for neonatal respiratory conditions, the intervention is commenced soon after birth on all very low birth weight (VLBW) infants. Although based on only two RCTs, Subramaniam et al., (1998) found that, although not statistically significant, CPAP appeared to be associated with *increased* risk of mortality, as well as CLD and intraventricular haemorrhage.

Digoxin

Another intervention for infants with, or at risk of, Respiratory Distress Syndrome (RDS), which cannot be recommended is administration of digoxin. Soll (1998) not only found no significant reduction in RDS with this intervention, but results suggest that, if anything, infant mortality may be increased.

Surfactant treatment

Effective in the treatment of RDS, there have been a number of studies that compare different types of intervention in this area. Administered to infants diagnosed with early signs of RDS, Yost and Soll (1999) as well as Soll and Morley (2001) reported a modest reduction in mortality, as well as other benefits such as reduction in CLD, compared with selective use for established RDS. Soll (1999) found that multiple doses have more benefit than a single dose. Soll and Blanco (2001) found infant mortality to be decreased when natural, rather than synthetic, surfactant is used.

Inositol

Used in the treatment of RDS, Howlett and Ohlsson (2004) found strong evidence that this intervention reduces neonatal mortality, as well as other morbidities associated with RDS, with no evidence of negative side effects.

Other interventions

Impaired foetal growth

Impaired foetal growth may contribute to neonatal mortality, and a number of interventions have been proposed to address this issue, such as bed rest, beta mimetics, calcium channel blockers, hormones, nutrient supplements, maternal oxygen administration and plasma volume expansion. Of these, the only one for which there is regarded as being evidence of a contribution to reduced mortality is maternal oxygen administration (Say et al., 2003). However, there was evidence that calcium channel blockers may reduce the incidence of LBW among maternal smokers (Say et al., 1996).

Availability of specialist Neonatal Intensive Care Facilities

In a large cohort study in Ohio, USA between 1995 and 1997, Warner et al (2004) found that, after controlling for demographic and clinical practice variations, infant mortality was twice as high among premature babies weighing 500g to 1499g if they were not born in a subspecialty perinatal centre. The effect was even larger when only babies 1000g to 1499g were considered. Although it is not clear to what extent hospital facilities in Ohio resemble those in Victoria, this result has implications for both the geographical distribution of neonatal care facilities and perhaps neonatal transport services as well.

Routine ultrasound

Bricker and Neilson (2000) found that the use of routine ultrasound in pregnancy on low risk or unselected populations had no systematic relationship with neonatal or maternal interventions or outcomes, including neonatal mortality. Indeed, they suggested that it may, on balance, be harmful in this context.

Restricted water intake

Research suggests that careful restriction of water intake in preterm infants could be expected to decrease the risks of patent ductus arteriosus and necrotizing enterocolitis--and perhaps the overall risk of death--without significantly increased risk of adverse consequences (Bell, 2001).

5.13 Melanoma

5.13.1 Key messages for policy makers about melanoma

- It is estimated that exposure to the sun causes 65% of melanoma worldwide, and up to 95% in areas such as Australia. The exact nature of the relationship between sun exposure and melanoma is still the subject of debate.
- Exposure to the sun during childhood is a strong determinant of melanoma risk.
- It is generally accepted that it is preferable to reduce sun exposure for the whole population, rather than targeting those at high risk. However, specific targeting of sun protection messages may be worth considering.
- The intervention with the highest level of evidence as a prevention strategy is the use of sun protective clothing.
- There is no clear evidence to support the efficacy of sunscreens to prevent melanoma.
- There is some evidence to support interventions in primary schools using a variety of approaches to improve the wearing of sun protective clothing by children.
- Interventions in schools have focused on education programs to increase knowledge and change behaviour, rather than more systematic approaches such as changing the schedule of the school day. At the same time, there is insufficient evidence to determine the effectiveness of interventions in primary schools to improve other sun protective behaviour eg, avoiding the sun.
- There is a lack of evidence to determine the effectiveness of interventions in child care centres to improve the sun protective behaviour of children.
- There is little published work to assist in determining the cost-effectiveness of skin cancer prevention programs. The biggest impact on the cost calculations in any such analysis is inclusion of costs to individuals and their families.
- The Victorian *Sunsmart* program is acknowledged as a world leader in providing a comprehensive population-based approach to the primary prevention of skin cancer.

5.13.2 Search strategy

Melanoma is a disease of the skin (cutaneous melanoma) and the eye. This review is restricted to melanoma of the skin and all subsequent use of the term 'melanoma' refers to cutaneous melanoma.

The literature on melanoma was searched for the years 1994-2004 in Medline and Cinahl using the terms 'risk', 'promotion', 'education', 'environment' and 'intervention', with appropriate limits to restrict the search to young children. Additional searches were undertaken in the Cochrane Database of Systematic Reviews, Meditext, DARE, CCTR and ACP Journal Club. The resulting citations were culled to exclude those that did not focus on either the epidemiology or prevention of melanoma. Primary studies included in a systematic review were excluded. Additional citations were identified by internet searching, reviewing reference lists in recently published work and searching for recent publications by key researchers in the field. The recently published book *Prevention of Skin Cancer*, is an authoritative work including several chapters of direct relevance to this review and proved to be an extremely valuable resource (Hill et al., 2004). The net result was 320 citations, of which 245 were excluded from further review. Of the remaining 75, citations the full text of 51 were reviewed.

5.13.3 Epidemiology

It is estimated that exposure to the sun causes 65% of melanoma worldwide. This estimate increases to as much as 95% in areas of high sun exposure, such as Australia (Armstrong, 2004). However, the exact nature of the relationship between sun exposure and melanoma is still the subject of debate and reviews of the literature appear on a regular basis. The relative importance of exposure in early childhood is an issue of particular interest. The one systematic review that focused on this issue concluded that exposure during childhood to high levels of sunlight is a strong determinant of melanoma risk, but sun exposure in adulthood also plays a role (Whiteman et al., 2001).

Although results are not always consistent across different studies and the strength of the association varies the evidence indicates that an increased risk of melanoma is associated with:

- an increased number of nevi
- fair skin
- light or red coloured hair, blue eyes and a high degree of freckling (within European origin populations)
- skin that burns easily when exposed to sunlight
- skin that tans poorly
- a family history of melanoma (Elwood, 2004)

On clear days the elevation of the sun in the sky is the most important factor in determining the amount of solar ultraviolet radiation, with higher levels in the middle of the day. In summer (with daylight saving), on days with clear sky, almost 60% of the daily total occurs between the hours of 11 am and 3 pm (Gies et al., 2004).

Differences in the incidence of melanoma between men and women do exist within populations, but these are small and inconsistent (Severi, 2004).

5.13.4 The evidence

5.13.4.1 Model/approach

The epidemiological evidence suggests that there may be value in targeting some groups at increased risk of melanoma – those with fair skin, for example. However, this approach is not evident in the literature with general acceptance of the principle that there is more to be gained from reducing risk for the whole population, rather than targeting those with high exposure to risk factors or an increased likelihood of developing melanoma. This results in two issues worthy of consideration:

- Sun protection messages delivered to the general population may be less credible to those who perceive themselves to be at low risk of melanoma (or skin cancer in general) – for example, those who tan easily.
- There are benefits to sunlight exposure, particularly enhancing the synthesis of Vitamin D. There is some evidence that deficient levels of vitamin D may be more common than generally believed (Armstrong, 2004).

Strategies to prevent melanoma face the general ‘paradox of prevention’ – many people have to change their behaviour for a small number of people to benefit – and, as with many other areas of disease prevention, this presents many challenges. Bruce Armstrong, one of the most respected

researchers in the field, has suggested that “specific targeting of sun protection messages deserves at least more research if not renewed consideration” (Armstrong, 2004)

There is a conflict between advice to children to stay out of the sun in the middle of the day and public health messages that encourage children to be physically active (Giles-Corti et al., 2004). Attempts were made to identify literature that examined the ‘trade-off’ between these two issues but none were located.

5.13.4.2 Actionable determinants/risk factors

See Section 5.13.3 above and Section 5.13.4.3 below.

5.13.4.3 Interventions/factors affecting implementation

The actionable determinant for melanoma is overwhelmingly exposure to sunlight. Most of the interventions to reduce sunlight exposure have been implemented to prevent skin cancer, rather than just melanoma. Where possible, evidence specific to melanoma has been identified but it is not always possible to make this distinction.

In 1999 the National Health & Medical Research Council (NHMRC) published clinical practice guidelines for the management of cutaneous melanoma, covering the full spectrum from prevention to treatment (National Health & Medical Research Council, 1999). Few details of the search strategy and method for reviewing the literature are included but it seems reasonable to view these guidelines as setting the benchmark for knowledge regarding melanoma management at that time.

The Scottish Intercollegiate Guidelines Network (SIGN) published a more recent set of guidelines in July 2003, based on an initial review of the literature between 1993 and 2001 (Scottish Intercollegiate Guidelines Network, 2004). The search included the scientific and ‘grey’ literature and extended back to 1970 in areas in which the evidence was scarce. The coverage of the guidelines is similar to the NHMRC work.

The NHMRC and SIGN recommendations are essentially the same:

- Use clothing as the primary means of protecting against exposure to sunlight (because this strategy has the highest level of evidence to support it). People with a fair complexion should be especially careful.
- Avoid direct exposure to sunlight in the middle of the day.
- Use a broad spectrum sunscreen with a minimum sun protective factor (SPF) of 15 as an adjunct to sun avoidance and other protective measure.
- Use sun protective structures (eg, shade structure) whenever possible during daylight hours.

Both make reference to avoidance of sunbeds, tanning booths and tanning lamps but this is not considered to be relevant in the context of children aged 0-8.

No evidence was identified to contradict the key messages regarding sun avoidance and use of sun protective clothing.

Neither the NHMRC nor SIGN published any findings about the evidence for targeting prevention strategies at children.

Sunscreens

There are no randomised controlled trials on the effect of sunscreens in preventing melanoma. Evidence regarding sunscreen use has relied on case-control studies. Three systematic reviews of the link between sunscreen use and melanoma were published in 2002 and recently reviewed (Crosby et al., 2004). The conclusion was that there is no clear evidence of the efficacy of sunscreens in preventing melanoma. Some studies identify a reduced risk of melanoma, some studies an increased risk and some studies no association between sunscreen use and melanoma. There are various explanations for these findings; including that sunscreen use may encourage increased sun exposure for some people, hence having an opposite effect to the one intended. The broader issue of the role of sunscreens in preventing other forms of skin cancer is outside the scope of this review. Suffice to say that this is problematic, with evidence that sunscreens can prevent squamous cell carcinoma but not basal cell carcinoma (Gallagher et al., 2004).

Setting for intervention

In October 2003 the *Task Force on Community Preventive Services on Reducing Exposure to Ultraviolet Light* in the USA published a systematic review of interventions to reduce exposure to ultraviolet light (Saraiya et al., 2003). The review included primary investigations of interventions published in the English language literature between 1966 and 2000. 6,373 potentially relevant titles were identified, 313 reports were retrieved and 159 were fully reviewed. Two studies on interventions in child care centres and 20 studies on interventions in primary schools met the inclusion criteria for systematic review.

The Task Force found evidence to support interventions in primary schools to improve children's sun protective 'covering up' behaviour (ie, wearing protective clothing) using a variety of approaches – didactic teaching, interactive classes, home-based activities, interactive CD-ROM multimedia programs, peer education and changes in policy. However they concluded that there was insufficient evidence to determine the effectiveness of interventions to improve other sun protective behaviour eg, avoiding the sun. This is consistent with findings from the West Australian *Kidskin* project that followed a cohort of primary school children over a six year period and found that the program had a positive effect on hat wearing by children in the playground but did not change use of shade at lunchtime (Giles-Corti et al., 2004). It is also consistent with the conclusion from a systematic review of evidence regarding health promotion initiatives in schools:

“Evidence suggests that school health promotion initiatives can have a positive impact on children's health and behaviour, but do not do so consistently. Most are able to increase knowledge but changing children's attitudes and behaviour is harder to achieve.”

(Contributors to the Cochrane Collaboration and the Campbell Collaboration 2000)

Not included in the Task Force review was a large study across 40 schools in the USA that found improvements in knowledge and some changes in intentions for sun protection achieved by a brief, standardised, sun protection program integrated in the school curriculum (Geller et al., 2002).

Education programs in schools have received the most attention with regard to sun protection measures targeted at children. Schools provide an appropriate setting and measuring changes in knowledge and behaviour provides a convenient means to assess outcomes. Less evidence was identified in the literature of more systematic and structural approaches to this issue, particularly around how the typical school day is structured. Examples of what might be done include re-scheduling sport and physical education classes for the first period of the school day, holding sporting events in the evening or changing the length of the various 'break periods' in school timetables so that the longest break is not in the middle of the day (Giles-Corti et al., 2004). The

evidence from Victorian schools is that the scheduling of outdoor activities to avoid periods of peak solar ultraviolet radiation needs improvement (Dobbinson et al., 2000).

The Task Force found that there was insufficient evidence to determine the effectiveness of interventions in child care centres to improve the sun protective behaviour of children, primarily because only two studies met the inclusion criteria of the systematic review.

The Task Force found insufficient evidence to support interventions orientated towards children's parents or caregivers. This is concerning given a couple of other recent findings in the literature. In a study in Queensland mothers of young babies reported a high level of sun protective practices but only 61% reported staying in the shade to reduce sun exposure and only 42% wore a hat when out in the sun. The sun protection methods used by mothers were found to predict the sun protection method most likely to be used for the child (Lowe et al., 2002). Work in the USA reported that sun protection methods used by a small sample of mothers declined significantly between the first and second years of a child's life, with declining use of hats, clothing and shade and increased reliance on use of sunscreens (Benjes et al., 2004). Evidence of what practices would be like in a sample of Victorian mothers was not found. Only one intervention targeting mothers of newborn babies was identified in the literature. This consisted of a nurse-led program with education and personal discussion. Follow-up after one year indicated that the mothers were receptive to the education and that the immediate post-natal period was considered appropriate for such education but in the absence of a control group these results are of limited value (Geller et al., 1999).

The Task Force concluded that there was insufficient evidence regarding interventions in recreational or tourism settings to improve children's sun protective behaviour (interestingly, there was sufficient evidence to support the effectiveness of interventions to change the sun protective behaviour of adults in the same settings).

There are numerous references in the literature to the Victorian *SunSmart* program. It is acknowledged as the most comprehensive population-based primary prevention program for skin cancer anywhere in the world. The program does not focus on either children or melanoma but no evidence was found to support its replacement with a program in existence elsewhere.

Other interventions

There is evidence of a strong association between nevus density during childhood and exposure to ultraviolet light. This suggests that it may be possible to indirectly monitor changes in sun exposure by repeated assessment of nevus density in children with cross-sectional surveys. Such information has the potential to inform interventions that target children in, for example, particular localities where sun exposure is high. Pfahlberg and colleagues have recently reported on the use of a standardised screening instrument that took 3-5 minutes to administer. This approach was assisted by the fact that in the country where the research was conducted (Germany) health assessment on school enrolment is mandatory. The researchers reported the instrument to be "feasible" and "highly practicable" (Pfahlberg et al., 2004).

Outcomes of childhood interventions

One way of assessing the outcome of interventions to improve the sun protection behaviour of young children is to examine the behaviour of adolescents. Clearly, what adolescents do is influenced by more than what happens in their earlier years and so this is at best indirect evidence but the available material in Australia indicates that there is room for improvement. Results from surveys of adolescents in all Australian states and territories conducted in 1993, 1996 and 1999 found that sun protection practices among adolescents are still below optimal levels and, for some practices, are getting worse (Livingston et al., 2003).

5.13.4.4 Economic evaluation

No economic evaluations of melanoma prevention were located in the literature but three economic evaluations of skin cancer prevention were identified. There was a common author to all three and all were based on the same premise – economic evaluation of a national skin cancer prevention program based on the Victorian *SunSmart* program. The major benefit identified by the analysis was reduced mortality due to melanoma. It was concluded that from a government perspective such a program would be highly cost-effective with a cost per life-year saved of less than \$500 (with cost offsets excluded). However, when the costs incurred by individuals are included the situation changes dramatically, with cost per life year saved increasing to more than \$20,000 (cost offsets excluded). At an individual level the costs are modest – one tube of sunscreen per year for every third person and one extra hat every 3 years for every second person. No allowance was made for increased clothing costs based on an assumption that existing clothing would be sufficient to comply with a national program. However, because of the ‘prevention paradox’ referred to earlier inclusion of these small costs to individuals has a big impact when multiplied by the number of people who have to change behaviour to save one life. This suggests that careful attention needs to be given to the cost implications for individuals of skin cancer prevention programs (Carter et al., 1999; Carter, 2004)

5.14 PKU/CF/HT

5.14.1 Key messages for policy makers about PKU/CF/HT

- The Newborn Screening Program for phenylketonuria, cystic fibrosis and congenital hypothyroidism is a classic public health success story and should be continued.
- The impact of adding multiple new conditions to newborn screening programs should be monitored to ensure that the quality of existing congenital hypothyroidism programs is not threatened.
- Early detection should be linked to early interventions.
- Venipuncture is more efficient and less painful than heel lancing when taking blood samples from neonates. One skin puncture using venipuncture is sufficient to obtain enough blood for screening whereas with heel lancing this is only true in about 40% of cases.

5.14.2 Search strategy

Key Terms

Phenylketonuria, congenital hypothyroidism, cystic fibrosis, screen, effectiveness, prevention, ethics, venipuncture, diet.

Definitions

Cystic Fibrosis

Cystic fibrosis is “an autosomal recessive disorder involving abnormal chloride and sodium transport in epithelial cells. This results in altered secretions in affected organ systems such as the airways, pancreatic exocrine ducts, biliary ducts, and vas deferens. Clinical manifestation is characterised by suppurative lung disease, pancreatic exocrine insufficiency, biliary cirrhosis and reduced fertility” (Centre for Community Child Health, 2002).

PKU

Phenylketonuria (PKU) is “A congenital disease inherited as an autosomal recessive trait. The condition is caused by the absence of phenylalanine hydrolase (pah), the enzyme that converts phenylalanine (present in all dietary protein into tyrosine in the liver. Clinical manifestation is characterised by mental retardation, hyperactivity, seizures, tremors, gait disorders, and autistic-like behaviour” (Centre for Community Child Health, 2002).

Congenital hypothyroidism

Congenital hypothyroidism is a “defective function of the thyroid gland from birth (Pollitt et al., 1997). Its effects are due to lack of normally-functioning thyroid hormone, either through insufficient production of normal thyroid hormone or through production of abnormal thyroid hormone. Congenital hypothyroidism leads to a clinical syndrome of “course facies”, lethargy and sluggish behaviours, cool skin, constipation and other features (Centre for Community Child Health, 2002).

Culling strategy

Any literature not related to the cost effectiveness or general effectiveness of neonatal screening was eliminated. The literature was narrowed further using the following criteria for exclusion:

- Non-English journals
- briefings and letters
- very small sample sizes
- articles containing the keywords 'animal testing' or 'genetics'
- unpublished abstracts presented at meetings
- pathogenesis only

This review has been compiled as an adjunct to the following reports:

- *Child Health Screening and Surveillance*. A critical review of the evidence report by Centre for Community Child Health - NHMRC, Melbourne, March 2002.
- *Child Health Screening and Surveillance - Supplementary document and context and next steps*. Child and Youth Health Intergovernmental Partnership (CHIP), September 2002.

This document updates or emphasises previous recommendations.

5.14.3 The evidence

5.14.3.1 Model/approach

The underlying model in the literature involves linking early detection through screening with early interventions to prevent poor health and wellbeing outcomes later in life.

5.14.3.2 Interventions/factors affecting implementation

Prevention

CF

Pre-conceptual or pre-natal screening for cystic fibrosis transmembrane regulator gene (CFTR) mutations is possible. Screening can be used to detect carrier status at a general population level. Couples who both carry a gene mutation can consider avoidance of pregnancy, artificial insemination by donor, pre-implantation diagnosis or pre-natal screening (Centre for Community Child Health, 2002).

PKU

There is no known primary prevention of PKU.

Hypothyroidism

There is no known primary prevention of congenital hypothyroidism.

Early identification

Screening tests are effective

There is good evidence that current screening tests for PKU, cystic fibrosis and congenital hypothyroidism are effective and cost effective. In two of the three conditions, a relatively simple intervention, namely, the provision of a phenylalanine-free diet in the case of PKU and the provision of a thyroid hormone in the case of HT, reduces the risk of the development of an intellectual disability (Stone and Lester, 2002). Screening programs should incorporate population based monitoring and management programs for women of childbearing age, aiming to systematically prevent avoidable intellectual disability in their infants. Such monitoring should meet stringent quality and reporting standards, and include reporting of long term outcomes for children (Centre for Community Child Health, 2002).

The overall benefits of neonatal screening include improved quality of life for the individual and the family and a reduction in the rate of subsequent affected pregnancies by early detection of parental carrier status. The short term advantages to early detection are that the test is relatively low cost and produces low false-positive results. However, possible adverse effects, particularly in those families that receive false-positive results, include concern, shock, disbelief, depression, anger and confusion.

Linking early detection with early interventions in sub-populations

Further work is required to determine the role of screening and other activities to assist with early identification and interventions of children with additional health needs such as Aboriginal children and those from vulnerable families (Child and Youth Health Intergovernmental Partnership, 2002).

Pain alleviation

Neonates experience pain in response to the heel-prick test as seen through their behavioural and physiological responses. This pain can be reduced effectively through the use of lancing techniques and can be alleviated through drugs or physical comforting strategies (Pollitt et al., 1997).

A randomised study conducted by Larsson et al., (1998), indicated that venipuncture on the dorsal side of the hand is less painful and more effective than heel lancing techniques.

5.14.3.3 Economic evaluation

A CDC examination of the economic impact of CF screening reported that “the Australian newborn screening protocol is the preferred prevention strategy because it detected the most CF affected newborns at the least cost” (Qualls et al., 1997).

One systematic review of the cost, yield and outcome of neonatal screening for HT was identified (Pollitt et al., 1997). All but one of six studies assessing the costs of implementing a congenital hypothyroidism screening programs concluded that such a program is beneficial. All showed screening to be cost effective.

Pollitt and colleagues (1997) reviewed the available economic evaluations and concluded that, despite the differences in methodologies and lack of consideration for psychological benefits of screening, there is good evidence that screening programs for PKU are cost effective. Only one of the 11 studies yielded inconclusive cost-benefit ratios.

5.14.3.4 Other considerations

The majority of PKU, cystic fibrosis and HT evidence comes from the USA and Europe. However, it is likely that the findings are able to be generalised to the Australian context, particularly since the incidence rates in Australia similar to those in these other countries.

An ethical consideration arises because screening to identify an individual affected with CF also identifies the carrier status of the parent. This could be considered unsolicited information and breach of confidentiality (Centre for Community Child Health, 2002).

5.15 SIDS

5.15.1 Key messages for policy makers about SIDS

- The children most at risk of SIDS have parents with lower levels of education, young mothers, Aboriginal and Torres Strait Islander parents and families in which the father is unemployed.
- Since the introduction of the “Reducing the Risk (RTR) of SIDS Program”, the SIDS rate in Australia declined from 1.87 per 1000 live births in 1990 to 0.78 per 1000 live births in 1995. The four messages conveyed in the RTR campaign were to place baby to sleep in a supine (back) position, keep baby in a smoke free environment, do not let baby overheat and breastfeed. Parents need to continue to receive these messages.
- In addition to the risk factors above, the evidence suggests that infants with low adult haemoglobin and magnesium levels at birth have an elevated risk of SIDS. An adequate maternal diet needs a magnesium intake corresponding to 300mg/kg/day.
- Exposure to toxins in old mattresses is also a risk factor. A new cot mattress (made from cotton) should be used for every new baby. Alternatively, an old mattress should be securely wrapped in polythene sheet to prevent toxin exposure.
- The evidence suggests that structured supportive smoking interventions have the greatest effect rather than just providing information to parents. Such programs can be targeted towards women considering pregnancy and maintained through the antenatal period. Fathers should also be encouraged to participate.
- There is some evidence to suggest that collaboration between agencies involved in SIDS death can improve the investigation process and avoid misdiagnosis.
- There is some evidence to suggest that youth education seminars can be used as a platform to educate teenagers regarding the effects of long term alcohol and drug abuse, teen pregnancy, and to encourage formal education to improve current socioeconomic status.
- There is a need to support efforts to include SIDS in medical and nursing school curricula. Health professionals should be encouraged to keep themselves up to date with current SIDS research findings.

5.15.2 Search strategy

SIDS is defined as “The sudden death of an infant under one year (two years in Japan) which is unexpected by history and in which a thorough post-mortem investigation, including an autopsy, examination fails to demonstrate an adequate cause of death” (Sullivan and Barlow, 2001).

5.15.2.1 Key Terms

Sudden infant death syndrome or cot death, sleep position, smoking, bed sharing, overheating, soft bedding, toxins, loose bedding, magnesium deficiency, adult haemoglobin, breastfeeding, home monitor, respiratory infection.

5.15.2.2 Culling strategy

The literature was narrowed further using the following criteria for exclusion:

- non English journals
- briefings and letters
- very small sample sizes

- articles containing the keywords 'animal testing' or 'genetics'
- unpublished abstracts presented at meetings
- SIDS pathogenesis only

A total of 547 articles from 1994 - 2005 were identified from the literature databases Cochrane, Dare, CCTR, ACP Journal Club, Medline, Cinahl, Meditext and APAFT. Of these, 219 articles focused on supine and prone sleeping positions. These were further limited to those written by key SIDS researchers. Using the above culling strategy, a total of 519 articles were eliminated, thus resulting in 28 articles.

5.15.3 The evidence

5.15.3.1 Model/approach

Nowhere in the literature is an evidence-based model for the reduction of SIDS presented. Nor does the literature report on SIDS reduction strategies at the sub-population level that are relevant in the Victorian context, with the possible exception of one New Zealand study, specifically related to the Maori population.

5.15.3.2 Actionable determinants/risk factors

The literature identifies the following SIDS risk factors:

1. exposure to smoke during and after pregnancy
2. prone sleeping position
3. bed sharing
4. overwrapping and overheating
5. poor antenatal and postnatal care – includes lack of breastfeeding and immunisation
6. low adult haemoglobin and magnesium levels at birth
7. respiratory and viral infection
8. young maternal age
9. shorter gestation
10. short inter-pregnancy interval
11. low birth weight and prematurity
12. male child
13. vulnerable age range [2-4 months]
14. low socioeconomic status
15. low level of maternal education

5.15.3.3 Interventions/factors affecting implementation

The literature reports early interventions with fair to good evidence of success.

Smoking/alcohol or drug abuse

There is a causal relationship between prenatal smoking and SIDS. Maternal smoking doubles the risk of SIDS (Anderson and Cook, 1997). Pollack 2001 found that smoking triples the relative

risk for SIDS. Previous studies indicate that smoking cessation interventions in the USA are cost effective.

Sankaran et al., (2003) report on a study identifying 94% of SIDS deaths of aboriginal infants in Alaska were associated with parental drug using, including 66% with alcohol and illicit substances. We found no additional evidence that links SIDS to alcohol and drug abuse. We can only hypothesise that parents under the influence of drugs and alcohol would be most likely to provide environments that are not safe (prone sleeping, overwrapping and overheating, bed sharing), thus increasing the likelihood of SIDS.

Prone sleeping

A review of several studies has concluded that the evidence on prone sleeping position meets the Bradford-Hill criteria as a cause of SIDS (Scragg and Mitchell, 1998). Public Health campaigns have been effective in promoting supine (back) sleep positioning. Since the “Back to Sleep” campaign was initiated in 1991 in the UK, cot deaths have halved and are still declining. Evidence suggests that such campaigns should be implemented in rural and remote areas where health services are limited. Side sleeping is not recommended as children can roll from side to prone. Prone play in supervised awake states should be encouraged to promote normal motor development, prevent positional preferences, and promote symmetrical development of the skull and neck. Head position should be monitored during supine sleep to reduce the risk of a strong positional preference (Knight, 1998).

Bed sharing

Public health policy should be directed against bed sharing by infants whose mothers smoke as they carry an increased risk of SIDS. There is no evidence that bed sharing is hazardous for infants of parents who do not smoke (Scragg and Mitchell, 1998).

Overwrapping and overheating

Overwrapping and overheating should be avoided as this may facilitate carbon dioxide rebreathing, hyperthermia and hypoxemia which could lead to a coma and death, particularly during respiratory infections (Vege and Ole Rognum, 2004).

Breastfeeding and immunisation

The evidence for breastfeeding as protective against SIDS is conflicting. Breastfeeding should be strongly encouraged for all infants, independent of SIDS risk. It may be that breast-fed infants have a lower risk of SIDS because their mothers provide a healthier environment for their child in other ways (McVea et al., 2000). Breastfeeding and immunisation both provide antibodies that contribute to protection against bacteria associated with SIDS.

Adult haemoglobin and magnesium levels at birth

Evidence suggests that infants with low levels of adult haemoglobin in the first hours after birth are at elevated risk of SIDS (Richardson et al., 2004). Routine checkups immediately after birth would identify infants at risk. Further research has identified a link between Magnesium deficiency and SIDS. It is therefore necessary to ensure in each maternal diet a magnesium intake corresponding to 300mg/kg/day (Durlach et al., 2002).

Continuing education of health professionals

According to Lerner et al. (2002), there is a need to support efforts to include SIDS in medical and nursing school curricula. It is only through understanding the complex issues surrounding SIDS that health care providers are made aware of risk reduction strategies, important issues for

investigation, and the need to deliver sensitive services to affected families. Curriculum notes are available from the Education Working Party of the SIDS Global Strategy Task Force.

Health professionals should be encouraged to keep themselves up to date with current SIDS research findings.

Gas poisoning caused by deteriorating cot mattresses

Cot mattress manufacturers should eliminate phosphorus, arsenic and antimony compounds from their products as they produce poisonous gases that can lead to SIDS. (Richardson, 2002) recommends that a new cot mattress (made from cotton) be used for every new baby or old mattress securely wrapped in polythene sheet to prevent toxin exposure.

Collaboration between agencies involved in SIDS death investigation

Experiences from the Maori SIDS prevention program indicate that it is imperative that collaboration exists between agencies (police, pathologist, coroners, ambulance officers, local doctor) involved in the investigation of a possible SIDS death. An umbrella organisation to oversee the service management and social support of the family should be established (Tipene-Leach et al., 2000).

Implementing youth education seminars

There is some evidence that such forums can be used as a platform to educate teenagers regarding the effects of long term alcohol and drug abuse, teen pregnancy, and encourage education to improve current socioeconomic status (Tipene-Leach et al., 2000).

5.15.3.4 Economic Evaluation

Based on estimates of the strength of the smoking/SIDS link from a very large data set of American births, and previous research which suggested that the cost of a "typical" pre-natal smoking cessation intervention was \$45US (in 1998) per maternal smoker, Pollack (2001) found that the cost of a SIDS death averted would be approx \$210,000US. This is definitely cost-effective – the estimation of the value of a life is, of course, controversial and fraught with difficulties, but even estimates at the lower end would value a baby's life more highly than this. Despite this, the quantitative impact on the prevalence of SIDS was found to be quite small (108 deaths averted annually in the US), notwithstanding the finding that smoking appeared to account for about 23% of all SIDS deaths. The key to understanding this result can be found in previous studies which have found that only about 15% of maternal smokers quit as a result of the intervention (Pollack 2001).

Currently there is not enough evidence to show which interventions are most effective for decreasing parental smoking and preventing exposure to tobacco smoke in childhood. Pollack (2001) suggests that structured supportive smoking interventions have the greatest effect rather than just providing information to parents.

5.15.3.5 Other considerations

The types and cost of Australian quit smoking programs may be substantially different to the US, as may be the resultant quit rate and even the strength of the link with SIDS.

Given the link between low birth weight and SIDS, anti-smoking interventions may be even more cost effective when SIDS, LBW and perhaps other conditions are considered jointly, rather than in isolation.

5.16 Spina Bifida

5.16.1 Key messages for policy makers about Spina Bifida

- Population wide strategies have been shown to be effective overseas – an increase in periconceptional dietary folate will significantly decrease the incidence of spina bifida. Currently there is some unresolved contention regarding rates of breast cancer in women taking folate supplements during pregnancy.
- Mandatory fortification of foods with folic acid has shown to be effective in the USA, particularly amongst mothers who were older (>30years), had more than high school education and were not in a lower socio-economic group. No reporting of possible negative consequences on other groups (eg, masking of pernicious anaemia). Area of contention includes possible increased rates of twinning.
- Food Standards Australia New Zealand is currently considering under Proposal P295 the possibility of mandatory fortification of the food supply in Australia and New Zealand. DHS Victoria should actively support this Proposal (FSANZ, 2004).
- Recommendations of physicians and health care providers positively influence women's decision to take folic acid supplements (evidence from Australia and USA)
- Some groups of women appear to be at higher risk of a child with spina bifida. Conclusive evidence: women in lower socio-economic groups. Inconclusive evidence at this stage: mothers on epilepsy medication; women with a BMI greater than 29; women with a family history of spina bifida in the mother's family; women on diets with high glycaemic index; women in agricultural or cleaning occupations; households with > 10 micrograms/litre of lead in the water; fathers working with wood preservatives eg, in sawmills.

5.16.2 Search strategy

Refinement of search strategy specific to this priority area

Information was obtained from Food Standards Australia New Zealand and NHMRC websites [www.foodstandards.gov.au and www.nhmrc.gov.au].

Culling strategy

Literature which specifically addressed high risk groups and reported impacts of interventions.

5.16.3 The evidence

5.16.3.1 Model/approach

Victoria should consider the issue of spina bifida with a combination of population wide strategies and specific interventions targeting higher risk women.

5.16.3.2 Actionable determinants/risk factors

Increasing the level of folate in a woman's diet 1-3 months prior to conception and for the first 10 weeks of pregnancy clearly decreases the risk of spina bifida and other neural tube defects. A general summary of the role of folate in reducing the incidence of spina bifida and other neural tube defects is provided in the introductory sections of the FSANZ Initial Assessment Report P295 (FSANZ, 2004).

To ensure women have sufficient folate status at the time of conception, women should be consuming 400 micrograms of folic acid, either in the diet or in the form of supplements, preferably commencing 3 months prior to conception. Women who already have a child with spina bifida or with a close family member with spina bifida should take a supplement with 10 times the normally recommended amount of folate (4mg) – not a multi-vitamin supplement containing this amount of folate, as overdosing of other vitamins may occur (Kennedy, 1998).

In addition to folate, other factors considered to be influential in the occurrence of spina bifida include (conclusive evidence) women in lower socio-economic groups (Meyer and Siega-Riz, 2002); (inconclusive evidence at this stage) mothers on epilepsy medication (King et al., 1996) found an association, while other findings were inconclusive (Loebstein and Koren, 1997; Kallen, 1994); women with a BMI greater than 29 (Shaw et al., 1996); women with a family history of spina bifida in the mother's family (Bryne et al., 1996); women on diets with high glycaemic index (Shaw et al., 2003); women in agricultural or cleaning occupations (Blatter et al., 1996); households with > 10 micrograms/litre of lead in the water (Bound et al., 1997); fathers working with wood preservatives, eg, in sawmills (Dimich-Ward et al., 1996).

5.16.3.3 Interventions/factors affecting implementation

Community wide education strategies have demonstrated an increase in knowledge of women of the role of folate in helping to prevent spina bifida (Watson et al., 1999; Bower et al., 1997).

There is some support for a community-wide policy advocating consumption of a daily folate supplement by all women of child-bearing age, as only about 50% of pregnancies are planned (FSANZ, 2004). In Puerto Rico a policy recommending all women of childbearing age, from 10 to 50 years with accompanying education support, has been in place since 1994 and a drop in neural tube defects has been observed, from 16/10,000 in 1996 to 7/10,000 in 2001 (Departamento de Salud) – compared with Australia's rate of 11.5 total births and terminations/10,000 (FSANZ, 2004). A possible, unresolved, down-side of supplements is claimed increased rates of breast cancer (Charles et al., 2004).

Voluntary fortification of foods with folate has been effective in increasing young children's folate status in Australia, but may not be effective in improving the folate status of young women approaching their child-bearing years (Wiltshire and Couper, 2004).

Mandatory fortification of some foods in the USA has decreased the incidence of spina bifida (Erickson, 2002). However, there is some concern in Australia and New Zealand about possible negative impacts of mandatory fortification programs masking vitamin B12 deficiency in some groups (vegans and the elderly) (FSANZ, 2004) or increased rates of twinning (Kucik and Correa 2004). The FSANZ are currently considering under Proposal P295 the possibility of mandatory fortification of the food supply in Australia and New Zealand. Based on the best available evidence, DHS Victoria should actively support this Proposal (FSANZ, 2004).

5.16.3.4 Economic evaluation

The estimates of the number of cases that could be prevented if women had the necessary folate status at the time of conception vary. Leader and Mallick (1998) estimated between 53-63%, while the FSANZ (2004) put the estimate at 70%.

An economic study of vitamin based prevention initiatives estimated that approximately \$US5.5 billion (1995 figures) could be saved if at-risk adults took folic acid and zinc to reduce the risk of low birth weight, premature births, spina bifida and cardiovascular birth defects (Leader and Mallick 1998).

5.16.3.5 Other considerations

There appears little dispute regarding the role of folate and prevention of spina bifida in a significant number of cases. The challenge is ensuring women consume the appropriate amount of folate and the level of active intervention required of government that this may require. Passive action and relying on voluntary behaviour of women will not be sufficient to safeguard a baby against spina bifida.

5.17 Visual acuity screening

5.17.1 Key messages for policy makers about visual acuity

- There is insufficient evidence to make a recommendation for or against neonatal screening
- There is fair evidence to recommend against screening for risk factors for amblyopia
- There is insufficient evidence to support either preschool or school visual acuity screening
- Training teachers to detect visual acuity problems shows promise. More research is required on this issue.

5.17.2 Search strategy

Key terms

Visual acuity, vision, acuity, screen, child or infant.

Refinement of search strategy specific to this priority area

After discussion with the DHS contact officer for this priority area, the search term 'screening' was added in order to focus the review on screening for visual acuity.

Culling strategy

- Articles referred to in broad systematic reviews were not included in this review
- Non-English language articles
- Articles focusing on the epidemiology of visual impairment
- Articles focusing on the aetiology of visual acuity
- Articles not relevant to Victoria.

5.17.3 The evidence

5.17.3.1 Interventions/factors affecting implementation

In a report entitled 'Child health screening and surveillance: a critical review of the evidence' (DHS, 2002b), the NHMRC reviewed the evidence for childhood screening for visual acuity and indicated that there was:

- Insufficient evidence to make a recommendation for or against neonatal screening
- Fair evidence to recommend against screening for risk factors for amblyopia
- Insufficient evidence to make a recommendation for or against preschool visual acuity screening
- Fair evidence to recommend against colour vision screening (DHS, 2002b).

Although there is good evidence that screening leads to the detection of refractive errors in children that would not otherwise have been detected, the evidence suggests that current screening techniques lack both sensitivity and specificity. The problem is further compounded by a lack of good quality research into the natural history of the target conditions, the disabilities

associated with them, and the efficacy of available treatments. As a result, most of the literature relating to vision screening for children is, at best, inconclusive.

For these reasons, a systematic review of the effectiveness of 85 preschool vision screening programs conducted in 1997 in the UK recommended against implementing new preschool vision screening programs unless they have been rigorously evaluated. This review also suggested that current screening programs should be discontinued (Snowdon and Stewart-Brown, 1997).

This opinion is shared by the NHMRC review that recommends that programs of preschool or school entry visual acuity screening should not be continued or instituted. Rather, the aim should be to replace visual acuity screening programs with greater support for visual acuity evaluation. This would form part of a comprehensive assessment for children who are identified to have a learning or behavioural problem (DHS, 2002b).

This lack of commitment to vision screening is reflected in the views of a task force which was put together in 2000 to review useful screening methods for visual acuity in the United States. In keeping with other similar reviews, the task force also expressed concern about the adequacy of follow up and treatment of children identified by screening programs (Hartmann et al., 2000).

In spite of this evidence there is a myriad of papers that argue that vision screening is essential for preschool children. For example, a recent screening study of 134 children aged 5-8 attending a private school in Sydney found that 28% of the children had a significant ocular disorder. The authors claim that these findings strengthen the case for early vision screening. However, they also highlight the paucity of public health cost-benefit analysis of school vision screening (Rose et al., 2003).

The need for a clear cost-benefit analysis for visual acuity screening is also highlighted in a similar research study involving 12,000 6 year old children in Germany (Kasman-Kellner and Ruprecht, 2000).

The effectiveness of different types of vision screening

The literature highlights a wide variety of vision screening methods available to detect a vast array of ocular disorders in children. These screening methods vary from simply checking the appearance of the eyes to more complicated and technical mechanisms such as photo-screening. As mentioned above there is good evidence that screening leads to the detection of refractive errors in children that would not otherwise have been detected. However, the specificity and sensitivity of these screening methods need to be reviewed.

Photo screening – the same task force which reviewed screening methods in the United States in 2000 ruled out the use of photo-screening for amblyopia on the basis that it requires some degree of interpretation of the results and only measures risk factors, not amblyopia itself (Hartmann et al., 2000).

Photo screening has also been rejected by a systematic review of 9551 citations to test the characteristics and the quality of evidence regarding available screening tests for amblyopia in pre-school aged children. The review concluded that inadequate information was provided to determine whether any of the photo screening methods evaluated would be worth recommending (Kemper et al., 1999).

However, photo-screening has been recommended for screening for amblyopia in disabled children who cannot be screened using standard technology. There is also a suggestion that photo screening could also be useful for pre-verbal children. The screening is reported to be rapid, easy to administer, low cost and able to produce results that are immediately available for interpretation (Enzenauer, 2003).

Computer screening - A computer program was developed to allow for rapid screening examinations by non-trained personnel in Beer-Sheba, Israel. When compared to the standard methods of screening (Snellen pictures and Worth four dot tests) the agreement between the computer and the standard test was high but specificity and sensitivity testing of the computer were inconsistent with standard testing mechanisms. The results indicated that the computer screening should not replace standard testing, but it does present a useful, additional way of screening for visual impairments at preschool age by non-trained personnel (Briscoe et al., 1998).

Polaroid suppression test - A review of the Polaroid suppression test (PST) which detects amblyogenic factors by screening for suppression with the use of Polaroid filters was carried out in the Netherlands in 2003. This test was found to be 100% successful in detecting for amblyopia with an average testing time of 43 seconds per test (Pott et al., 2003).

Hirschberg and Stereoacuity tests - a study to examine the validity of a preschool screening program conducted by public health nurses in Ontario, Canada was carried out in 1999. Over a three year period testing over 1100 children, the Hirschberg and Stereoacuity tests were rejected due to poor sensitivity and specificity (Robinson et al., 1999).

Sheridan Gardner Test – An Australian evaluation of the Sheridan Gardner test revealed that children under 40 months of age preferred the Sheridan Gardner singles chart to test visual acuity as opposed to the linear version of the same test. The singles test also produced better visual acuity results than the linear version (Whitton, 1997; Whitton, 1998).

Stycar chart and Snellen Chart – A comprehensive retrospective cohort study of the visual acuity of approximately 3000 school aged children was carried out over a ten year period in the States in 1996. The study used the Stycar chart for screening kindergarten children and the Snellen chart for older children. Both methods of screening were found not to refer children without problems for further evaluation (Yawn et al., 1996).

HOTV, Lea Symbols, and tumbling E charts - The task force which was put together in 2000 to review useful screening methods for visual acuity in the States recommended that the most direct way to detect amblyopia is to assess visual acuity. They recommended HOTV test, Lea Symbols, or tumbling E charts as they allow screening of younger children (Hartmann et al., 2000).

Educating the educators – an interesting study was recently carried out in the United States in 2004. It found that teachers can be trained to detect vision problems in their primary school students. After training the study showed a statistically significant increase in the ability of teachers to correctly identify children with acuity problems, as well as identifying children with functional visual problems. The authors argue that, based on these results, such teacher education programs should be delivered more widely to heighten their awareness of vision problems that may impact on learning performance (Krumholtz, 2004). More research on this issue is required.

6 Results and findings across priority areas

6.1 Actionable determinants

Actionable determinants are factors that mitigate against health and wellbeing and that may be amenable to intervention. Figure 12 summarises the key actionable determinants that were identified as having an impact on more than one priority area. Actionable determinants specific to one priority area are excluded.

Figure 12 Actionable determinants that impact on more than one priority area

Actionable determinant	Convincing evidence or shows promise in the following priority areas
Access to services	Asthma, Dental caries, Disability, Injury, Infant mortality, Language and literacy, Low birth weight, Overweight and obesity, Parent mental illness, PKU/CF/HT, SIDS, Spina Bifida, Visual acuity
Antenatal care	Dental caries, Disability, Low birth weight, Infant mortality, SIDS, Spina Bifida
Antenatal nutrition	Dental caries, Low birth weight, Infant mortality, Spina Bifida
Breastfeeding	Asthma, Infant mortality, SIDS, Parent mental health
Domestic violence	Child abuse, Child behaviour, Infant mortality, Parent mental health
Home safety	Infant mortality, Injury, SIDS
Nutrition	Asthma, Dental caries, Overweight and obesity
Parent disability/illness	Child abuse, Disability, Infant mortality, Language and literacy, Spina Bifida
Parent drug and alcohol use	Child abuse, Disability, Infant mortality, Language and literacy, Parent mental health, SIDS, Spina Bifida
Parent education and literacy	Disability, Infant mortality, Language and literacy, SIDS, Spina Bifida
Parent homelessness	Child abuse, Disability, Infant mortality, Language and literacy, Spina Bifida
Parent mental illness	Child abuse, Disability, Infant mortality, Language and literacy, Parent mental health, SIDS, Spina Bifida
Parent practice	Child abuse, Child behaviour, Dental caries, Disability, Infant mortality, Injury, Language and literacy, SIDS
Parent smoking	Asthma, Infant mortality, SIDS
Parent unemployment	Child abuse, Disability, Language and literacy, Spina Bifida
Physical activity	Overweight and obesity,
Postnatal depression	Child abuse, Infant mortality, Parent mental health
Safety regulations	Infant mortality, Injury, SIDS
Smoking in pregnancy	Infant mortality, Low birth weight
Social connectedness	Child abuse, Disability, Language and literacy, Overweight and obesity, Parent mental health

The actionable determinants in the above table are based on a list initially provided by DHS and modified as the project progressed. Some are the major cause of a problem, some contribute to, or exacerbate, a problem and some are interventions. Further, they are not mutually exclusive classes with many being actionable determinants for each other. For example, both parental unemployment and parental mental illness are actionable determinants for parental homelessness.

Many contribute in combination to the poor health and wellbeing of Victoria's most vulnerable children, particularly those living in families with few economic, educational and social resources.

The actionable determinants in the table above can be addressed in many ways. Interventions that are effective across priority areas are summarised in Figure 13. These interventions also impact on actionable determinants but there is not a one-to-one relationship. For example, home visiting has been shown to be effective across several priority areas. One important reason is that home visiting can impact on many (if not the majority) of actionable determinants. These include, but are not limited to, breastfeeding, home safety, nutrition, parent mental illness, parent practices and social connectedness.

Figure 13 Interventions that impact on more than one priority area

Intervention	Convincing evidence or shows promise in the following priority areas
Home visiting	Child abuse, Child behaviour, Dental caries, Disability, Infant mortality, Injury, Language and literacy, Parent mental health
Antenatal care, including education	Asthma, Dental caries, Disability, Infant mortality, Low birth weight, SIDS, Spina Bifida
Mass media or community education campaigns targeted to parents	Dental caries, Injury, SIDS, Spina Bifida
Smoking cessation programs	Asthma, Infant mortality, Low birth weight, SIDS
Intensive family support programs	Child abuse, Child behaviour, Disability, Infant mortality, Language/literacy, Parent mental health
Pre-school interventions targeted to children	Child behaviour, Dental caries, Language and literacy, Overweight and obesity, Parent mental health
School interventions targeted to children	Child abuse, Child behaviour, Dental caries, Language and literacy, Injury, Melanoma, Parent mental health
Breast feeding promotion	Asthma, Infant mortality, SIDS, Parent mental health
Government policy and regulation	Child abuse, Dental caries, Injury, Spina Bifida
Better coordinated/integrated service response	Child abuse, Disability, Language and literacy, Overweight and obesity, Parent mental health, SIDS
Screening	Infant mortality, Low birth weight (maternal screening), PKU/CF/HT, Parent mental health
Parenting programs	Child behaviour, Disability, Language and literacy, Parent mental health
Road safety	Injury, Overweight and obesity
Environmental interventions	Injury, Overweight and obesity

Note: Interventions specific to one priority area are excluded.

6.2 Sub-populations among Victorian children

One of the goals of this project was that strategies should offer a balance between a population-wide focus and strategies that address disadvantage within specific population sub-groups. Addressing disadvantage within specific population sub-groups requires investment in interventions that, based on the best available evidence, are the ‘best bets’ in improving the health and wellbeing of Victoria’s most vulnerable children. Without doubt, children of low socio-economic status are Victoria’s most vulnerable children. Within this group, Aboriginal children have the poorest prospects, followed by other children living in rural Victoria. The available epidemiological data suggest that interventions targeted to the Victorian community as a whole do not work as well for these groups. Special and ongoing efforts are required.

That said, the role of the CHSD was not to undertake an epidemiological study of Victorian children or to identify those most at risk. That work had already been done by DHS as part of determining the priority areas included in this review. Our role was to review the international and national evidence and, based on that, to identify what DHS might do to improve the health and wellbeing of all Victorian children, including those most at risk. Figure 14 summarises our findings.

Figure 14 The ‘best bet’ on where to focus to improve the health and wellbeing of Victorian children in each priority area

Priority area	Population wide or sub-population?	Comment
Asthma	Sub-population/s in highest need based on epidemiological evidence	Children of low SES are at higher risk, as are Aboriginal children. Both have higher rates of hospital attendances for asthma. Little is known about how best to target these groups
Behaviour problems	Sub-population/s at highest risk based on epidemiological evidence	Different interventions work best for different age groups
Child abuse	Sub-population/s at highest risk based on epidemiological evidence	Children of low SES are at higher risk, as are Aboriginal children.
Dental caries	Sub-population/s at highest risk based on epidemiological evidence	Fluoridation of the water supply in rural/regional Victoria would result in a significant improvement in the oral health of rural children
Disability	Children with high developmental needs	Culturally appropriate and safe services required for Aboriginal and CALD families
Injury	All children	But children of low SES are at higher risk, as are Aboriginal children.
Language and literacy	Sub-population/s at highest risk based on epidemiological evidence	Children of low SES are at higher risk, as are Aboriginal and CALD children.
Low birth weight	Sub-population/s at highest risk based on epidemiological evidence	Smoking cessation programs and periodontal disease interventions benefit all at risk, but particularly Aboriginal communities
Obesity and overweight	All children	Although there are sub-populations at higher risk, the ‘best bet’ model is population-wide and multi-pronged
Parent mental health	Sub-population/s at highest risk based on epidemiological evidence	Children of low SES are at higher risk, as are Aboriginal children.
Congenital heart disease	Children with confirmed CHD	Rehabilitation to improve outcomes for those with chronic consequences of congenital heart disease
Infant mortality	Sub-population/s at highest risk based on	Aboriginal communities have significantly higher infant mortality rate, including infant mortality due to infectious

Priority area	Population wide or sub-population?	Comment
	epidemiological evidence	disease
Melanoma	All children	Interventions in schools to improve sun protective behaviour of children
PKU/Cystic Fibrosis/ HT	All children	Continue Newborn Screening Program. Early detection should be linked to early intervention.
Spina bifida	All children	
Sudden infant death	Sub-population/s at highest risk based on epidemiological evidence	Continue <i>Reducing the Risk of SIDS</i> Program. Target parents with lower levels of education, young mothers, Aboriginal families, especially where the father is unemployed. Implement structured supportive smoking cessation programs targeting both parents, encourage collaboration between agencies involved in SIDS death investigation and promote immunisation of all kids.
Visual acuity	Screening not recommended	Our review focused specifically on screening

Figure 15 below summarises the evidence on the effectiveness of interventions at the sub-population level. While there is, in many cases, good evidence that these sub-populations are at greater risk or have poorer health, there is very little evidence to suggest what strategies are actually effective with these groups. This is not to suggest that strategies tested at the broader population level are ineffective at the sub-population level. Most strategies have not been evaluated at the sub-population level. Of those that have been, many are not regarded as being applicable to Victoria.

A specific example here is strategies to improve the health and wellbeing of Victorian Aboriginal children. Several programs have been established in the Northern Territory with promising results. But they were not assessed to be relevant to Victoria because of differences such as the size and density of the two populations.

The lack of evidence at the sub-population level suggests an important research and development agenda that is based on developing and evaluating models to address known actionable determinants at the sub-population level. One example is asthma and Aboriginal children. There is some (but conflicting) evidence that Aboriginal children have higher rates of asthma. There is also good evidence that two of the known actionable determinants for asthma are breastfeeding and a smoke free environment (see Figure 12 on page 108 and Section 5.1 on page 11). Working with Aboriginal communities to develop and evaluate ways to increase breastfeeding and to reduce exposure to cigarette smoke are logical 'best bets'.

Figure 15 Summary of the evidence at the priority sub-population level

Sub-population		Evidence that this sub-population is at greater risk?	
		Yes	No
Aboriginal children			
Any promising evidence applicable to Victoria of effective interventions for Aboriginal children?	Yes	Dental caries (see Figure 16)	Nil
	No	Asthma ² , Child abuse, Disability, Infant mortality, Injury, Language/literacy, Low birth weight, Overweight and obesity, PKU/CF/HT, Parent mental health, SIDS, Spina Bifida, Visual acuity	Child behaviour, Congenital heart disease, Melanoma, PKU/CF/HT
Rural children			
Any promising evidence applicable to Victoria of effective interventions for rural children?	Yes	Dental caries, Injury, SIDS, (see Figure 16)	
	No	Infant mortality, Low birth weight, Parent mental health, Spina Bifida	Asthma, Child abuse, Child behaviour, Congenital heart disease, Disability, Language/literacy, Melanoma, Overweight and obesity, PKU/CF/HT, Visual acuity,
Children of low SES			
Any promising evidence applicable to Victoria of effective interventions for children of low SES?	Yes	Child abuse, Dental caries, Injury, Language/literacy, Low birth weight, Parent mental health, SIDS (see Figure 16)	
	No	Asthma ³ , Child behaviour, Disability, Infant mortality, Overweight and obesity, Spina Bifida, Visual acuity	Congenital heart disease, Melanoma, PKU/CF/HT, SIDS,
CALD children			
Any promising evidence applicable to Victoria of effective interventions for CALD children?	Yes	Language/literacy (see Figure 16)	
	No	Disability	Asthma, Child abuse, Child behaviour, Congenital heart disease, Dental caries, Low birth weight, Infant mortality, Melanoma, Overweight and obesity, PKU/CF/HT, SIDS, Spina Bifida, Visual acuity

Figure 15 above summarised the evidence at the sub-population level. More detail is provided in Figure 16 on those interventions with demonstrated effectiveness at this level. As before, the same caveat applies. There are many blank cells in this figure because there is very little evidence to suggest what strategies are actually effective with these groups. But this is not to suggest that strategies tested at the broader population level are ineffective at the sub-population level. Most strategies have not been evaluated at the sub-population level. Of those that have been, many are not regarded as being applicable to Victoria.

² No firm evidence of a higher asthma prevalence, but there is a higher rate of ED attendance and hospital admissions

³ No prevalence gradient by socio-economic status has been established for asthma, but there is a higher rate of ED attendance and hospital admission in low SES groups.

Figure 16 Interventions with demonstrated effective at the sub-population level

Priority area	Aboriginal	Rural	Low SES	CALD
Asthma				
Child abuse			Early prevention Home visiting Parent training	Parent training
Child behaviour problems				
Dental caries	Fluoridation of the water supply			
Disability				
Injury			Home visiting Free smoke alarms Traffic calming	
Language/literacy	Community language enrichment programs and projects such as <i>Best Start</i> and <i>Let's Read</i> are promising			
Low birth weight			Support and education programs for pregnant women show promise as being more effective for those of low SES	
Overweight and obesity				
Parent mental health			Psychosocial support for PND prevention Home visiting Preschool programs	
Congenital Heart Disease				
Infant Mortality				
Melanoma				
PKU/Cystic Fibrosis/ HT				
Spina Bifida	Mandatory fortification of foods with folic acid			
Sudden Infant Death	Reducing the Risk of SIDS Program ⁴			
Visual Acuity				

⁴ Incidence of SIDS has fallen across all groups, suggesting effectiveness at the sub-population level. However, the fall has not been uniform, suggesting areas for improvement.

Figure 17 summarises the evidence using a developmental model. Different interventions are the ‘best bet’ at different times in a child’s development. As well, the focus of service interventions needs to change as children get older. One example is injury prevention. When children are young, the most effective strategies involve raising the awareness and knowledge of parents. By the time the child is at school, the focus needs to shift to promoting the child’s own safety and self-protective behaviour.

Figure 17 Best bet investments at different points along the development path

Perinatal/infancy	Preschool children	School aged children
Identify problems/risks		
Coordinate services where problems are identified		
Effective clinical management of unwell children		
Create safe homes		
	Create safe care centres	Create safe schools and communities
Enhance parent-child interactions (mothers and fathers)		
Statewide fluoridation of the water supply		
Support parents to promote physical and mental health		
	Enhance parenting skills in (eg) effective discipline to address behaviour problems	
Improve maternal nutrition		
Promote and support breast feeding	Educate parents re good child nutrition	Educate children re good nutrition and benefits of exercise
Create stimulating home environments to support cognitive development		Encourage parent support for, and commitment to, education
	Provide early childhood education	Promote social competence (= self control, communication skills, decision making and problem solving, resisting negative influences)
Raise parents’ awareness and knowledge of safe practices		Promote safe and self protective behaviour (road safety, child abuse, protective clothing, tooth brushing, etc)
Build peer support for parents		Build peer support for children
Train and support staff (home visitors, mental health workers, child care workers, health professionals, teachers)		

6.3 Levels of intervention

Section 4.3.5 on page 6 provided definitions of the classification used to describe different levels of intervention. Figure 18 summarises key findings for each priority area. Further information on each priority area is provided in Section 5, including key messages about each.

Figure 18 Interventions at different levels with convincing evidence or that look promising

Priority area	Child	Parents	Child and family	Environment / community	Service system & structures	Policy & regulation
Asthma	Allergy testing as part of clinical assessment,	Smoking cessation	Support breastfeeding			

Priority area	Child	Parents	Child and family	Environment / community	Service system & structures	Policy & regulation
	Asthma management plans, Asthma self-management programs					
Child abuse	School programs Cognitive-behavioural therapy Preschool programs	Parent training	Home visiting Family preservation programs			Mandatory reporting of child abuse
Child behaviour problems	Play therapy re severe child behavioural problems	Group based parenting programs re child behaviour problems	Home visiting programs re child behavioural problems			
Dental caries	Supervised tooth brushing					Fluoride in water supply
Disability	Early childhood and specific behavioural interventions	Respite Parent education	Comprehensive formal support Substitute care in some cases		Coordinated services	
Injury	Bicycle helmets School programs	Community-based multi-strategy programs	Home visiting Smoke alarms Lower hot tap water temperatures	Traffic calming Play equipment design		Child-resistant closures Child restraints Pool fencing
Language/literacy	Preschool and school based language and literacy programs	Adult literacy programs	Community language enrichment programs and projects such as <i>Best Start</i> and <i>Let's Read</i>		Accessible speech pathology services	
Low birth weight		Smoking cessation, periodontal intervention, pregnant adolescent programs				
Overweight and obesity			Treatment programs focusing on family lifestyle changes			
Parent mental health	Preschool programs Peer support Psychological interventions promoting	Psychosocial support to prevent PND Parent training	Home visiting	Education to de-stigmatise mental illness	Better integration of services Good practice guidelines	Mandatory reporting of child abuse

Priority area	Child	Parents	Child and family	Environment / community	Service system & structures	Policy & regulation
	social competence					
Congenital Heart Disease					Centralised database to assist with quality control Surgery concentrated in high volume units	
Infant Mortality	Vaccination, Vitamin A,	Smoking cessation				
Melanoma	Intervention in schools to improve wearing of sun protective clothing		Sun protective clothing (not sunscreens)			
PKU/Cystic Fibrosis/ HT	Newborn Screening, genetic testing, early intervention	Counselling				
Spina Bifida						Mandatory fortification of foods with folic acid
Sudden Infant Death		SIDS education campaigns, Parenting Programs Smoking cessation programs			Collaboration between agencies involved in SIDS death investigation	
Visual Acuity						

6.4 Investment across the care continuum

The next 4 figures summarise potential areas for investment based on the strength of the evidence. They use the HBG/HRG framework described in Section 4.3.3 on page 5. As discussed in Section 2, this review was targeted, and not systematic. Priority was given to the points across the care continuum where DHS has most leverage. As such, many cells in the 'confirmed problem' column are empty because the specific (clinical) interventions provided to children with confirmed problems are determined (appropriately so) by the child's treating clinician, and thus beyond the scope of DHS decision-making.

Figure 19 lists those interventions identified in our review as having convincing evidence. Investment in these interventions as strategies for gain is warranted. Figure 20 lists those interventions that look promising, but where the available evidence is inconclusive at this point. Implementation of these strategies, but within a rigorous evaluation framework, looks a good investment. Figure 21 lists interventions for which we could find no good evidence of effectiveness. Taking into account the opportunity cost, funding these interventions is not a good investment. Finally, Figure 22 identifies interventions that are priorities for further research and evaluation.

Figure 19 Interventions with convincing evidence

Priority area	All kids	At risk	Presentation	Confirmed problem	Chronic consequences
Asthma	Breastfeeding promotion	Smoking cessation	Allergy testing as part of clinical assessment		Asthma self-management programs
Child abuse		Home visiting	Mandatory reporting of child abuse	Cognitive-behavioural therapy School programs	
Child behaviour problems			Parent education		Play therapy for severe child behavioural problems
Dental caries	Fluoridation of the water supply; Twice daily brushing of teeth with fluoride toothpastes				
Disability					
Injury	Engineering and equipment	Home visiting	First aid for burns		
Language/literacy			Speech therapy and language interventions, including parent-based interventions	Speech therapy and language interventions, including parent-based interventions	Speech therapy and language interventions, including parent-based interventions
Low birth weight		Nutritional supplements, Smoking cessation	Corticosteroids		
Overweight and obesity				Treatment programs focusing on family lifestyle changes	
Parent mental health		Parent training Home visiting	Breastfeeding of infants where mother has PND Cognitive-behavioural therapy for PND		
Congenital heart disease					
Infant mortality	Vaccination	Smoking cessation		Vitamin A	
Melanoma	Sun protective clothing				
PKU/CF/HT	Screening			PKU - Restrict phenylalanine intake. HT – Throxine replacement. CF	PKU - Restrict phenylalanine intake. HT – Throxine replacement. CF

Priority area	All kids	At risk	Presentation	Confirmed problem	Chronic consequences
				– Antibiotics, nutritional supplements and pancreatic enzyme replacement	– Antibiotics, nutritional supplements and pancreatic enzyme replacement
SIDS		Parent education Smoking cessation			
Spina Bifida	Mandatory fortification of foods with folic acid				
Visual acuity					

Figure 20 lists interventions that look promising but for which the evidence is not strong enough (at least at this stage) to conclude that they achieve good outcomes. This may be because the intervention is new or difficult to evaluate. But promising interventions also include some types of interventions that have historically found it difficult to attract the attention of researchers or funding from traditional research funding agencies. Only a small number of studies have been undertaken in some cases. This applies to many social and community interventions because of the historic bias in research funding toward medical and clinical research. Interventions that fall into this category are included in the group.

Figure 20 Interventions that look promising

Priority area	All kids	At risk	Presentation	Confirmed problem	Chronic consequences
Asthma				Asthma management plans	
Child abuse	Parent training	Parent training Clinical indicators	Parent training		
Child behaviour problems		Triple P Program Mother-infant clinical home visit		Perry Preschool model Play therapy	
Dental caries	Antenatal oral hygiene and dietary education	Provision of free fluoride toothpaste and toothbrushes			
Disability			Early identification	Support for families	Coordinated services and comprehensive formal support
Injury	School programs Parent counselling Free home safety equipment	Community-based multi-strategy programs			Rehabilitation of children after serious injury
Language/literacy	Investigate parent based early assessment tools	Community language enrichment programs, projects such as <i>Best Start</i> and <i>Let's Read</i> and parent based interventions			
Low birth weight		Periodontal interventions, Pregnant adolescent programs		Early discharge programs	
Overweight and obesity					
Parent mental health	School programs	Psychosocial support to prevent PND Psychological interventions promoting social competence		Peer support groups Staff training and support (eg, teachers)	
Congenital heart disease				Centralised database to assist with quality control Surgery concentrated in high volume units	Rehabilitation of children with congenital heart disease

Priority area	All kids	At risk	Presentation	Confirmed problem	Chronic consequences
Infant mortality		Routine screening/ antibiotics for Strep B			
Melanoma	Primary school programs to improve the wearing of sun protective clothing				
PKU/CF/HT	Use of venipuncture rather than heel-prick				
SIDS	SIDS education in nursing and medical schools. New cot mattress (cotton) used for each newborn	Mg and hemoglobin testing at birth			
Spina Bifida					Rehabilitation of children with spina bifida
Visual acuity					

Some interventions have been the subject to a considerable amount of research, with variable results. An example is vision screening. Most studies on vision screening report that it is ineffective in achieving improved outcomes. But some study results are inconclusive. Either way, there is little or no evidence to suggest that vision screening is actually effective. Interventions such as these were assessed as having inconclusive evidence, without much likelihood that they will be shown to be effective if further research is undertaken. They are summarised in Figure 21.

Figure 21 Interventions that are not effective or for which there is no conclusive evidence

Priority area	All kids	At risk	Presentation	Confirmed problem	Chronic consequences
Asthma					
Child abuse		Standardised screening tools			
Child behaviour problems	Teacher Child Interaction Therapy (TCIT), Parents as Teachers (PAT)	Cooperative learning (CL)			
Dental caries		Fluoride Supplements: Xylitol gum; fluoride varnish treatment			
Disability					

Priority area	All kids	At risk	Presentation	Confirmed problem	Chronic consequences
Injury					
Language/literacy	Population screening for language delay				
Low birth weight	Maternal exercise programs			Dexamethasone for CLD	
Overweight and obesity					
Parent mental health	Antenatal education In-hospital psychological debriefing				
Congenital heart disease					
Infant mortality	Routine ultrasound			Digoxin, CPAP for RDS	
Melanoma	Sunscreen Interventions in child care centres to improve sun protective behaviour Interventions orientated towards parents or caregivers Interventions in tourist or recreation settings				
PKU/CF/HT					
SIDS		Smoking cessation programs that only provide information; programs targeting only mothers rather than both parents			
Spina Bifida					
Visual acuity	Screening				

The list of priorities for further research and evaluation included in Figure 22 below is limited to issues that are appropriate for a jurisdiction such as Victoria to consider. So, for example, research better conducted through an international randomised controlled trial is excluded. In the main, the interventions listed here are those we identified as 'promising' in Figure 20 and within the influence of DHS.

Figure 22 Interventions that are priorities for further evaluation and research

Priority area	All kids	At risk	Presentation	Confirmed problem	Chronic consequences
Asthma	Models of intervention that are effective for Aboriginal children and other hard to reach groups.				
Child abuse		Home visiting Parent training Clinical indicators Prevention strategies for ATSI and CALD children	Evaluation of support programs for children exposed to domestic violence		
Child behaviour problems				The Parents and Children Series	
Dental caries					
Disability				Family support strategies, early childhood interventions, parent education	The impact of support and service provision on family resilience
Injury	School programs Community-based multi-strategy programs	Home visiting Prevention strategies for hit/struck/crush, cutting/piercing, choking, dog bites; also for injuries to rural, ATSI and CALD children			Rehabilitation of children after serious injury
Language/literacy		Community language enrichment programs and projects such as <i>Best Start</i> and <i>Let's Read</i>			
Low birth weight		Periodontal interventions, Pregnant adolescent programs		Early discharge programs	
Overweight and obesity	Formal program monitoring, local benchmarking, monitoring of child health and food intake				Effective interventions for chronically obese children
Parent mental health		Home visiting Parent training Preschool programs		Peer support groups Psychological interventions promoting social competence	
Congenital heart disease	Screening of neonates for congenital heart			Outcomes for surgical and catheter-based	Rehabilitation of children with congenital heart

Priority area	All kids	At risk	Presentation	Confirmed problem	Chronic consequences
	disease			interventions	disease
Infant mortality		Vaccination for Aboriginal infants			
Melanoma	Interventions to change sun protective behaviour of pre-school children Structural changes in primary schools				
PKU/CF/HT					
SIDS		How to increase the effectiveness of smoking intervention programs			
Spina Bifida					Rehabilitation of children with spina bifida
Visual acuity					

It was beyond the scope of this project to identify how Victoria should pursue the R&D agenda implied in Figure 22. One option is for Victoria to fund such research and evaluation through DHS or the newly established Office for Children. Another is for Victoria to lever its influence in shaping the national research agenda through bodies such as the NHMRC.

7 Conclusions – where to from here

Strategies for Gain—the evidence on strategies to improve the health and wellbeing of Victorian children is just one element of a broader *Children’s Health and Wellbeing Policy Project*. The *Children’s Health and Wellbeing Policy Project* is a Flagship Project of DHS Victoria. Its purpose is to guide Departmental efforts to support and improve the health, development, learning and wellbeing of Victoria’s young children in line with Victorian government policy, community expectations and the Department’s responsibilities and values. In particular the project aims to provide:

- A focus on people outcomes rather than just program outcomes
- A better capacity to make systematic and informed choices over alternative priorities
- Greater capacity to align early childhood setting and services with emerging evidence on the needs of children and their families
- Improved ability to prevent damage arising from parental needs or behaviours
- A coherent policy context and evidence base to feed into the proposed Statewide Plan for Children upon which future funding priorities and targets could be based.

A concurrent element of the project (being undertaken by the Children’s Health and Wellbeing Policy Project team within DHS) is mapping existing service settings and activities that relate to the priority areas for gain.

The next step is that the Children’s Health and Wellbeing Policy Project team within DHS will bring together some of the identified strategies for gain and the service settings information to identify how some strategies can best be implemented in the Victorian context. Translating the available evidence into sustainable action, making policy choices and identifying priorities for strategic investments are key challenges in the next steps.

At the same time, the evidence on strategies to improve the health and wellbeing of Victorian children will continue to accumulate. This review captured the available evidence at this point in time. The database developed as part of the project provides a valuable resource that can be further developed over time. As the evidence grows, the choices will become clearer.

A key challenge for the next decade and beyond is that, while opportunities to improve health and wellbeing appear to be infinite, health and social resources never will be. Whatever else, there is no choice but to make choices.

Equally, investment in evaluating the extent to which human services actually contribute to the health and wellbeing of children and learning how to use this information as the basis for future planning is critical. Warner (1994) succinctly describes both the dilemma and the challenge in arguing that, regardless of what we do, we will never catch up on reviewing existing interventions. Equally, there is no justification for suspending current activity until it has been reviewed. The best we can do is to move towards evidence-based strategies for improving health and wellbeing, grabbing the best available evidence as we go.

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Attachment 1

The literature review template used in the analysis

(1) Priority Area: Melanoma ▼		(1a) Reviewer: Malcolm Masso ▼	(1b) Review no: _____
(2) Country: Australia ▼		If Other country, specify: _____	
(3) Citation: _____			
(4) Keywords: _____ _____			
(5) Description: 			
(6) Intervention Type Single <input type="checkbox"/> Cf or Multiple <input type="checkbox"/> Cf Priority Area <input type="checkbox"/> Cf Actionable determinant <input type="checkbox"/> Cf		(7) HBG All kids ▼	(8) HRG Promotion/prevention ▼
(9) Sub-populations (check all that apply) ATSI <input type="checkbox"/> Cf Rural/remote <input type="checkbox"/> Cf Urban <input type="checkbox"/> Cf Low SES <input type="checkbox"/> Cf Vulnerable parents <input type="checkbox"/> Cf 0-2 years <input type="checkbox"/> Cf 3-5 years <input type="checkbox"/> Cf 6 years + <input type="checkbox"/> Cf CALD <input type="checkbox"/> Cf Other (specify) <input type="checkbox"/> Cf		(11) Level & type of intervention (check all that apply) Child (complete 11a) <input type="checkbox"/> Cf Parents (complete 11a) <input type="checkbox"/> Cf Child and family (complete 11a) <input type="checkbox"/> Cf Environment/community <input type="checkbox"/> Cf Service system & structures (complete 11b) <input type="checkbox"/> Cf Policy & regulation <input type="checkbox"/> Cf (11a) Only if child/family level/s Setting Home <input type="checkbox"/> Cf GP <input type="checkbox"/> Cf Community health type <input type="checkbox"/> Cf Childcare type <input type="checkbox"/> Cf Schools <input type="checkbox"/> Cf Other community <input type="checkbox"/> Cf Hospital ED <input type="checkbox"/> Cf Hospital outpatients <input type="checkbox"/> Cf Inpatient <input type="checkbox"/> Cf (11b) Only if service system/structures More resources / expand services <input type="checkbox"/> Cf Infrastructure investment (eg, IT) <input type="checkbox"/> Cf Change of mix/model of care <input type="checkbox"/> Cf - integration/coordination/collaboration <input type="checkbox"/> Cf Staff/skill development <input type="checkbox"/> Cf (11c) Only if service/system change? Mainstream <input type="checkbox"/> Cf Specialist <input type="checkbox"/> Cf Universal <input type="checkbox"/> Cf Targeted <input type="checkbox"/> Cf - intensive <input type="checkbox"/> Cf - routine/standard <input type="checkbox"/> Cf	
(10) Actionable determinant/s (check all that apply) Access to services <input type="checkbox"/> Cf Antenatal care <input type="checkbox"/> Cf Antenatal nutrition <input type="checkbox"/> Cf Breastfeeding <input type="checkbox"/> Cf Domestic violence <input type="checkbox"/> Cf Home safety <input type="checkbox"/> Cf Nutrition <input type="checkbox"/> Cf Parent disability/illness <input type="checkbox"/> Cf Parent drug and alcohol use <input type="checkbox"/> Cf Parent education and literacy <input type="checkbox"/> Cf Parent homelessness <input type="checkbox"/> Cf Parent mental illness <input type="checkbox"/> Cf Parent practice <input type="checkbox"/> Cf Parent smoking <input type="checkbox"/> Cf Parent unemployment <input type="checkbox"/> Cf Physical activity <input type="checkbox"/> Cf Postnatal depression <input type="checkbox"/> Cf Safety regulations <input type="checkbox"/> Cf Smoking in pregnancy <input type="checkbox"/> Cf Social connectedness <input type="checkbox"/> Cf Other (specify): <input type="checkbox"/> Cf		(12) Type of evidence Systematic review of all relevant randomised controlled trials ▼ (13a) Evidence of impact or change on actionable determinant? <input type="checkbox"/> Cf Conclusive ▼ (13b) Strength of change (priority area) High ▼ (13c) Evidence of change re service/system change? Yes, short term ▼	
(14) Applicability to Victoria Caveats: Yes, with caveat/s ▼		(15) Reviewer comments: 	

Benefit Group:	All kids	At risk	Presentation	Confirmed problem	Chronic consequences
Resource Group:	Promotion/prevention	Early identification	Investigation	Acute intervention	Continuing Care
Type of evidence					
Systematic review of all relevant randomised controlled trials At least one properly designed and randomised controlled trial Well-designed pseudo-randomised controlled trial Comparative study with concurrent controls and allocation not randomised Case control studies, or interrupted time series with a control group Cohort study Analysis of routine data Economic evaluation Expert opinion Systematic review - other Literature review Service evaluation Other (specify)					
Significance of effect/s					
A. Is there evidence in the article of an impact or change [on the actionable determinant]?					
Conclusive					
Inconclusive					
No					
Not applicable					
B. What is the (self-reported) strength of the impact or change on the priority area?					
High					
Modest					
Low					
Not applicable					
C. Is there evidence re service/system change?				Applicability	
Yes, short term				Yes	
Yes, long term				Yes, with caveat/s	
No					
Not applicable					

Attachment 2

Literature search strategy and results

Priority Area	ORIGINAL No of Articles retrieved	Initial searching restrictions and limits placed	Additional searching restrictions or limits placed	REVISED No of Articles	FINAL No of Articles in Database
Asthma	1445	ARTICLE TYPE: review articles PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)" SUBJECT HEADING: Prevention and control YEARS: 1994- 2005	Additional keywords added- breast feeding, smoking, diet etc. Changed year limits 1998- 2004 or 2000- 2005	230	28
Behaviour Problems	1514	PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)" ARTICLE TYPE: longitudinal study, clinical trial, literature review, meta analysis, case study YEARS: 1994- 2005	n/a	n/a	15
Child Abuse	1405	SUBJECT HEADING: Prevention and control ARTICLE TYPE: Systematic Reviews, clinical trial, literature review, meta analysis PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)" YEARS: 1994- 2005	n/a	n/a	54
Dental Caries	649	PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)" SUBJECT HEADING: Prevention and control YEARS: 1994- 2005	Medline rerun; limited to: review articles and year, 1999+	101	15
Disability	1085	PHRASE: 'risk or promotion or education or environment or intervention'	- Keywords added		19

Priority Area	ORIGINAL No of Articles retrieved	Initial searching restrictions and limits placed	Additional searching restrictions or limits placed	REVISED No of Articles	FINAL No of Articles in Database
		AGE: "fetus (or) newborn infant to child (6 to 12 years)" LANGUAGE: English YEARS: 1994- 2005	to search		
Injury	998	SUBJECT HEADING: Prevention and control ARTICLE TYPE: Systematic Reviews PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)" YEARS: 1994- 2005	Additional keywords added- accident, unintentional	233	39
Language and Literacy	307	PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)" YEARS: 1994- 2005 OTHER: childhood and human			31
Low Birth Weight	1073	PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)" ARTICLE TYPE review articles YEARS: 1994- 2005	n/a	n/a	63
Obesity and Overweight	796	PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)" SUBJECT HEADING: Prevention and control YEARS: 1994- 2005			16
Parent Mental Health	599	AGE: "fetus (OR) newborn infant to child (6 to 12 years)" YEARS: 1994- 2005	n/a	n/a	23
Congenital Heart Disease	521	ARTICLE TYPE review articles PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)"	n/a	n/a	18

Priority Area	ORIGINAL No of Articles retrieved	Initial searching restrictions and limits placed	Additional searching restrictions or limits placed	REVISED No of Articles	FINAL No of Articles in Database
		SUBJECT HEADING: Prevention and control YEARS: 1994- 2005			
Infant Mortality	850	ARTICLE TYPE review articles PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)" SUBJECT HEADING: Prevention and control YEARS: 1994- 2005	CCTR Search limited to: - 1994- 2005 - PHRASE: 'risk or promotion or education or environment or intervention'	705	24
Melanoma	337	PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (or) newborn infant to child (6 to 12 years)" SUBJECT HEADING: Prevention and control YEARS: 1994- 2005	n/a	n/a	16
PKU / Cystic Fibrosis /HT/	1123	Cystic Fibrosis PHRASE: 'risk or promotion or education or environment or intervention' AGE: "newborn infant to child (6 to 12 years)" SUBJECT HEADING: Prevention and control YEARS: 1994- 2005 HT PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (or) newborn infant to child (6 to 12 years)" SUBJECT HEADING: Prevention and control YEARS: 1994- 2005 PKU	n/a	n/a	6

Priority Area	ORIGINAL No of Articles retrieved	Initial searching restrictions and limits placed	Additional searching restrictions or limits placed	REVISED No of Articles	FINAL No of Articles in Database
		PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (or) newborn infant to child (6 to 12 years)" SUBJECT HEADING: Prevention and control YEARS: 1994- 2005			
Spina Bifida	406	PHRASE: 'risk or promotion or education or environment or intervention' AGE: "newborn infant to child (6 to 12 years)" SUBJECT HEADING: Prevention and control YEARS: 1994- 2005	n/a	n/a	18
Sudden Infant Death	547	PHRASE: 'risk or promotion or education or environment or intervention' AGE: "newborn infant to child (6 to 12 years)" SUBJECT HEADING: Prevention and control YEARS 1994- 2005	n/a	n/a	27
Visual Acuity	222	ARTICLE TYPE review articles PHRASE: 'risk or promotion or education or environment or intervention' AGE: "fetus (OR) newborn infant to child (6 to 12 years)" YEARS: 1994- 2005	Additional keyword- 'screening' added and all searches rerun	110	14