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Food Safety in Pregnancy: An Exploration of Lay and Professional Perspectives

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

Doctor of Philosophy

From

University of Wollongong

By

Dolly Bondarianzadeh, BSc., MSc.

School of Health Sciences

2008

Certification

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

Dolly Bondarianzadeh

Publications

The research documented in this thesis has been presented and published as following:

Bondarianzadeh D., H. Yeatman and D. Condon-Paoloni (2006) Listeriosis in pregnancy: better safe than sorry. Proceedings of the First World Congress of Public Health Nutrition, 28-30 September 2006, Barcelona, Spain.

Bondarianzadeh D., H. Yeatman and D. Condon-Paoloni (2007) *Listeria* education in pregnancy: lost opportunity for health professionals. *Australian and New Zealand Journal of Public Health*, 31, 468-474.

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Abstract

This thesis explores pregnant women's and midwives' perspectives on food safety issues during pregnancy with an emphasis on foodborne listeriosis. Although not a prevalent illness, listeriosis has been identified as a significant public health problem during pregnancy because of its serious consequences for the baby and high fetal mortality rates. However, there is limited information available on the state of *Listeria* awareness among general public and health professionals in Australia and the socio-cultural elements that influence both lay and professionals' approaches to food safety recommendations to avoid *Listeria*. This study, therefore, aimed to investigate *Listeria* knowledge and preventive food safety practices among pregnant women and to explore their understanding of the *Listeria* risk, how they positioned it among their other health concerns during pregnancy, and how they managed to avoid the risk based on the knowledge they gained from different sources of information. The study also explored midwives' perceptions of the *Listeria* risk and their approach to the provision of advice in this regard.

The study was a mixed methods research carried out in one private and two major public hospitals in the South Eastern Sydney and Illawarra Area Health Services. Participants were pregnant women who attended antenatal clinic and/or classes in the study sites and midwives who provided antenatal services at the same sites. Pregnant women's knowledge, practice and opinions with regard to *Listeria* were investigated through a survey using a self-administered questionnaire in which 586 women took part. Semi-structured interviews were carried out with 26 pregnant women and 10 midwives to provide an in-depth understanding of the factors underpinning their *Listeria* prevention strategies and approaches to food safety recommendations.

Survey results indicated that more than 40 percent of participants had not received any information on food safety issues during their pregnancy, and relied on their lay network as the major source of *Listeria* knowledge for pregnant women. Large proportions of participants were not aware of the risk associated with some of the high *Listeria* risk foods and continued the consumption of these foods during pregnancy.

Women's level of knowledge of high risk foods was a major determinant of their eating practices/preferences. Unsafe food handling practices in keeping raw and cooked foods in the refrigerator, and keeping and reheating of leftovers were also reported by a large number of participants.

Interview data were analysed using constant comparative method and within a broad sociological framework exploring the concept of risk in the context of food and pregnancy. For most participants the safety of food was not a concern. Food safety recommendations specific to pregnancy entered the dichotomised rules that women already employed to simplify their decisions about the safety of their food. Women's accounts indicated that their strategies to avoid the *Listeria* risk were informed by their past experience with food related risks, the scientific knowledge that they gained in the course of their pregnancy, and the idea of maternal responsibility that dominated their discourses of pregnancy. The concepts of authoritative knowledge and cognitive authority were employed to investigate pregnant women's perceptions of authority of different sources of *Listeria* knowledge. It was found that *Listeria* information based on scientific knowledge was the only perceived authoritative knowledge that influenced women's food related decisions to avoid the *Listeria* risk.

Interviews with midwives revealed that food safety education was a lower priority in their agenda for pregnancy care. Midwives had a range of approaches to *Listeria* education which was informed by their personal understandings of the risk based on their previous experience with cases of illness, and a general assumption that their clients were knowledgeable about food related risks and the ways of avoiding them.

Findings of this research provide an important insight into the current position of food safety in the Australian antenatal care practice. It is anticipated that information from this study on pregnant women's approaches to *Listeria* risk information and communication, as well as the lost opportunities within the antenatal system and the compromised role of health professionals in *Listeria* education during pregnancy would be beneficial in informing future educational initiatives for the prevention of listeriosis. It also will be of value to administrators and educators who are interested in creating an environment which is supportive of food safety education for the broader community.

Table of Contents

Certification	ii
Publications.....	iii
Acknowledgements.....	iv
Abstract.....	v
Table of Contents.....	vii
List of Tables	xi
List of Figures.....	xi
1 Introduction.....	1
1.1 Introduction.....	1
1.2 Aim	2
1.2.1 Objectives	2
1.3 Significance of the study.....	2
1.4 Overview of the study.....	4
1.4.1 Study sites	5
1.4.2 Antenatal care programs	7
1.5 Thesis structure	9
2 Review of Literature	12
2.1 The search strategy	13
Part I: Food safety and pregnancy	15
2.2 Introduction.....	15
2.3 Background.....	15
2.3.1 Listeriosis as a foodborne illness	16
2.3.2 Listeriosis as a disease of pregnancy	17
2.3.3 Listeriosis as a public health problem.....	19
2.3.4 Prevention strategies	20
2.4 Food safety education	22
2.4.1 Food safety recommendations for <i>Listeria</i> prevention.....	23
2.4.2 <i>Listeria</i> education	24
2.5 Food safety knowledge and practice in the community	28
2.5.1 Food safety knowledge and practice – general public.....	29
2.5.2 Pregnant women’s <i>Listeria</i> knowledge and practice	30
2.5.2.1 Quantitative studies.....	31
2.5.2.2 Qualitative studies.....	34
2.6 Health promotion in antenatal care.....	36
2.6.1 Role of antenatal services in food safety education.....	38
2.6.2 Factors affecting provision of food safety education.....	40
2.6.2.1 Knowledge of food safety issues	41
2.6.2.2 Positioning of food safety issues	42
2.7 Summary.....	44
Part II: Conceptual framework	45
2.8 Introduction.....	45
2.9 Concepts of risk	46
2.9.1 Risk and pregnancy.....	47

2.9.2	Emergence of food as a risk.....	50
2.9.3	Risks related to food during pregnancy	54
2.10	Knowledge	55
2.10.1	Role of knowledge in the understanding of risk	56
2.10.2	Sources of food safety knowledge	59
2.10.3	Evaluation of knowledge	61
2.10.3.1	Authoritative knowledge.....	61
2.10.3.2	Cognitive authority	64
2.11	Conclusion	67
3	Methodology	69
3.1	Introduction.....	69
3.2	Research paradigms	70
3.2.1	Quantitative research	70
3.2.2	Qualitative research	72
3.2.3	Mixed methods research	73
3.3	Research paradigm and method.....	74
3.3.1	Research design	75
3.4	Study population and sampling issues	77
3.5	Research process.....	78
3.5.1	Quantitative study	78
3.5.1.1	Sampling	79
3.5.1.2	Recruitment.....	79
3.5.1.3	Survey instrument development	80
3.5.1.3.1	Readability	83
3.5.1.3.2	Validity.....	84
3.5.1.3.3	Reliability	84
3.5.1.4	Statistical analysis.....	85
3.5.1.5	Ethical considerations	87
3.5.2	Qualitative study	88
3.5.2.1	Sampling	88
3.5.2.2	Recruitment of pregnant women.....	89
3.5.2.3	Recruitment of midwives.....	90
3.5.2.4	Interviews.....	90
3.5.2.5	Qualitative analysis.....	92
3.5.2.6	Rigour	94
3.5.2.6.1	Research strategy.....	94
3.5.2.6.2	Operational techniques.....	95
3.5.2.7	Ethical considerations	96
3.6	Conclusion	97
4	Survey Results	99
4.1	Introduction.....	99
4.2	Data collection	100
4.3	Sample characteristics.....	101
4.4	Sources of <i>Listeria</i> information	105
4.5	Food related issues.....	107
4.5.1	Understanding of food safety techniques.....	107
4.5.2	Knowledge of high <i>Listeria</i> risk foods	109

4.5.3	Food consumption practices / preferences.....	112
4.5.4	Food handling practices.....	114
4.6	Perception of risk associated with <i>Listeria</i>	117
4.7	Opinions on <i>Listeria</i> related issues.....	118
4.8	Confidence in the ability to avoid high <i>Listeria</i> risk foods.....	120
4.9	Conclusion.....	121
5	Women's Perspectives on <i>Listeria</i> Risk.....	123
5.1	Introduction.....	123
5.2	Participants.....	124
5.3	Food safety as an issue during pregnancy.....	126
5.3.1	Classifying food: safe versus unsafe.....	126
5.3.1.1	Classifying food with regard to pregnancy.....	130
5.3.2	Strategies towards safe eating.....	133
5.3.2.1	Elimination or cutting out.....	133
5.3.2.2	Reduction or cutting down.....	134
5.3.2.3	Safe food handling practices.....	136
5.4	Influences on food safety practice.....	138
5.4.1	Maternal responsibility.....	139
5.4.2	Perception of risk.....	141
5.4.2.1	Positioning the risk of <i>Listeria</i>	143
5.4.2.2	Knowledge and risk.....	146
5.4.3	External factors.....	148
5.4.3.1	Social relationships.....	148
5.4.3.2	Life circumstances.....	149
5.5	Conclusion.....	150
6	Women's Perspectives on Sources of <i>Listeria</i> Knowledge.....	152
6.1	Introduction.....	152
6.2	Sources of food safety knowledge in pregnancy.....	153
6.2.1	Lay network.....	153
6.2.1.1	Provision of advice as part of social support.....	154
6.2.1.2	Authority of lay knowledge.....	155
6.2.2	Health professionals.....	158
6.2.2.1	Monitoring versus provision of advice.....	158
6.2.2.2	Active seeking of advice.....	159
6.2.2.3	Provision of advice: first-time versus subsequent pregnancies....	162
6.2.2.4	Gaps and inconsistencies in the professional advice.....	164
6.2.3	Published sources of information.....	166
6.2.3.1	Handouts offered at the antenatal visits.....	166
6.2.3.1.1	Handouts produced by government bodies/health professionals	167
6.2.3.1.2	Handouts produced by commercial companies.....	170
6.2.3.2	Pregnancy books and women's magazines.....	172
6.2.3.3	Internet.....	174
6.3	Conclusion.....	176
7	Midwives' Perspectives on <i>Listeria</i> Risk.....	177
7.1	Introduction.....	177

7.2	Participants.....	178
7.3	Antenatal visits: understanding the context.....	178
7.4	Food safety and <i>Listeria</i> education within the antenatal practice.....	181
7.4.1	Midwives' approach to the provision of <i>Listeria</i> education.....	182
7.4.1.1	Active approach.....	182
7.4.1.2	Passive approach.....	184
7.4.2	Content of the advice.....	186
7.4.2.1	HLR food education.....	186
7.4.2.2	Food hygiene and handling education.....	190
7.5	Influences on practice.....	192
7.5.1	Midwives' perception of <i>Listeria</i> risk.....	192
7.5.1.1	Positioning the risk of <i>Listeria</i>	193
7.5.1.2	Past experience.....	194
7.5.1.3	Trust in scientific knowledge.....	196
7.5.1.4	Food safety knowledge.....	197
7.5.2	System constraints.....	198
7.5.2.1	Temporal pressure.....	198
7.5.2.2	Limited availability of educational materials.....	199
7.5.2.3	Timing of advice.....	200
7.5.2.4	Low adherence to <i>Listeria</i> recommendations within the system..	201
7.6	Conclusion.....	202
8	Discussion.....	204
8.1	Introduction.....	204
8.2	Women's perception of <i>Listeria</i> risk.....	205
8.2.1	Positioning <i>Listeria</i> risk.....	206
8.2.2	<i>Listeria</i> knowledge.....	210
8.2.2.1	Scientific knowledge.....	210
8.2.2.2	Previous experience.....	213
8.3	Women's management of the <i>Listeria</i> risk.....	214
8.3.1	Maternal responsibility.....	215
8.3.2	Eating safe as a general rule.....	216
8.3.3	Consumption of HLR foods.....	217
8.3.4	Safe food handling practices.....	219
8.4	<i>Listeria</i> risk communication avenues.....	221
8.4.1	<i>Listeria</i> risk communication avenues outside the health system.....	222
8.4.1.1	Lay network.....	222
8.4.1.2	Other sources.....	224
8.4.2	<i>Listeria</i> risk communication avenues within the health system.....	226
8.4.2.1	Health professionals.....	226
8.4.2.2	<i>Listeria</i> pamphlets.....	230
8.5	Midwives' approaches to the <i>Listeria</i> risk communication.....	231
8.5.1	Midwives' provision of <i>Listeria</i> advice.....	232
8.5.2	Midwives' perception of <i>Listeria</i> risk.....	235
8.6	Conclusion.....	237
9	Conclusion.....	239
9.1	Introduction.....	239
9.2	Achievement of aims of the research.....	240

9.3	Limitations of the study	242
9.4	Implications for practice	244
9.5	Further research	248
References		250
Appendix A – Food safety recommendation by NSW Food Authority		272
Appendix B – Food safety recommendations by Food Standards Australia New Zealand 273		
Appendix C – Ethics approval		274
Appendix D – Survey instrument		275
Appendix E – Invitation notice for pregnant women’s interviews		282
Appendix F – Invitation notice for midwives’ interviews		283
Appendix G – Pregnant participant information sheet		284
Appendix H – Midwife participant information sheet		285
Appendix I – Pregnant participant consent form		286
Appendix J – Midwife participant consent form		287
Appendix K – Pregnant women’s interview guide		288
Appendix L – Midwives’ interview guide		290
Appendix M – Coding list as per NVivo printout		291
Appendix N – Tables of logistic regression		294

List of Tables

Table 3.1	Cronbach’s α coefficient of five components of the survey	85
Table 4.1	Participants’ pregnancy related profile	103
Table 4.2	Participants’ socio-demographic profile	104
Table 4.3	Channels for <i>Listeria</i> communication	105
Table 4.4	Perceived trustworthiness of providers of food safety advice	106
Table 4.5	Distribution of correct answers on safe food handling techniques	108
Table 4.6	Distribution of correct answers on HLR foods	110
Table 4.7	Reported consumption of HLR foods during pregnancy	113
Table 4.8	Reported safe food handling practices during pregnancy	116
Table 4.9	Order of perceived risks during pregnancy	118
Table 4.10	Distribution of participants’ opinions on <i>Listeria</i> related issues	119
Table 4.11	Participants’ confidence to follow the recommendations to avoid <i>Listeria</i>	121
Table 5.1	Demographic profile of participants in the interview	125

List of Figures

Figure 1.1	Map of the area under cover of South Eastern Sydney and Illawarra Area Health Services and location of public hospitals	6
Figure 3.1	Concurrent triangulation design	77

1 Introduction

1.1 Introduction

Food safety is critically important in contributing to a successful pregnancy outcome, yet is a relatively under-researched area. Foodborne listeriosis is considered to be a relatively new public health concern and has only been identified as a threat to pregnancy in recent decades. As a result, the risks associated with listeriosis, its sources and the potential ramifications of contracting the illness during pregnancy may not be fully appreciated or taken seriously, by the general public and even the health professionals.

Pregnant women's understanding of food related hazards, such as the microbiological risk of *Listeria*, and the way they manage to control the risk is not well understood. This is despite the fact that past research has investigated many other aspects of nutrition and food intake during pregnancy. Numerous studies from various disciplines have also been carried out to examine consumers' perceptions of a range of food associated risks, but none of them have particularly focused on pregnancy.

In addition, a factor that has been identified as an important influence on food related behaviours of pregnant women but which has rarely been explored in depth is food safety perceptions of health professionals, particularly midwives, and the role of these professionals in the provision of food safety advice during pregnancy.

Underpinning this study is the important premise that lay and professional perceptions of food related risks are socio-cultural constructions based on individual understandings of scientific knowledge. The primary interest for this study is exploring how *Listeria* is singled out and described as a risk during pregnancy. Exploring the ways in which lay

women and midwives conceptualize food safety issues in general and the risk of *Listeria* in particular, has implications for future educational initiatives to prevent *Listeria* infection during pregnancy.

1.2 Aim

The principal aim of this study was to gain insight into the perceptions and positioning of food safety issues, with an emphasis on the risk of *Listeria*, by pregnant women and midwives. Identifying women's perception of the risk of *Listeria* and the way they constructed their food safety knowledge during pregnancy, and comparing these to midwives' perspectives, will significantly contribute to improved food safety and *Listeria* communication within the antenatal practice.

1.2.1 Objectives

The specific objectives of the study were to:

1. explore pregnant women's knowledge and awareness about the risk of *Listeria*;
2. explore the ways that pregnant women perceived the risk of *Listeria*;
3. describe the ways that pregnant women managed the risk of *Listeria*;
4. investigate the different avenues of communication about the risk of *Listeria* that were utilised by pregnant women and the way they perceived them, and
5. explore midwives' approaches in the communication of *Listeria* risk within the antenatal practice.

1.3 Significance of the study

Listeriosis, the foodborne illness caused by bacterium *Listeria monocytogenes*, is an important public health problem during pregnancy. If contracted during pregnancy, this asymptomatic harmless illness for the mother can cause serious damage to the unborn child leading to permanent physical and mental impairments and in many cases to death. A number of food safety recommendations have been developed to help women avoid the risk of *Listeria* during pregnancy. These recommendations embrace both the foods that should be avoided and the food handling precautions that should be taken to

reduce the risk of contracting listeriosis. However, *Listeria* education during pregnancy faces some serious challenges. On one hand, *Listeria* risk communication takes place in an information saturated environment where women are inundated with a huge amount of messages about different health issues related to their pregnancy. This may cause the *Listeria* message to be overshadowed or even lost. On the other hand, the foods that are recommended to be avoided are foods that are generally considered to be safe for healthy adults. Also, the safety of domestic food handling practices is taken for granted among the majority of people and generate few worries. These factors may affect pregnant women's compliance with the food safety recommendations and *Listeria* advice.

It is not known whether women receive the message with regard to *Listeria*, what their sources of information about the *Listeria* risk are, and which sources they trust and draw upon in developing their strategies to avoid this risk. Our understanding of how pregnant women respond to the imperatives on food behaviours issued by experts to avoid the *Listeria* risk is limited. Structural factors that influence pregnant women's practices to prevent the risk of *Listeria* within the social and cultural context of their everyday life need more exploration.

This research aims to shed light on the pregnant women's perceptions of the risk of *Listeria* and the way they manage to avoid the risk through their practices. Understanding of lay women's perspectives of food related *Listeria* risk is essential to inform future educational initiatives that target pregnant women for *Listeria* as well as other food safety issues.

The role of midwives as educators and food related risk communicators in the antenatal care has remained a neglected area in the literature, where doctors have been the main focus of studies in this area. Health professionals have frequently been identified as one of the major sources of information during pregnancy. The process of offering antenatal services to pregnant women is complex. A range of health professionals from doctors, including obstetricians and general practitioners (GPs), to midwives and consultants potentially have some degree of information input into the pregnancy care. For the

majority of women who experience an uncomplicated pregnancy, a midwife is the health professional most frequently encountered and questioned regarding all aspects of pregnancy including food and nutrition.

The approach of pregnancy care providers, particularly midwives, in the provision of food safety education and *Listeria* risk communication within the antenatal practice is under-explored. This research will thus contribute to current knowledge through providing an in-depth understanding of factors underpinning midwives' approaches to food safety issues and provision of *Listeria* education and advice. It is anticipated that the findings of this research will assist in creating an environment within the antenatal practice which is supportive of appropriate food safety education.

1.4 Overview of the study

The study was carried out over a nine-month period in the area serviced by the South Eastern Sydney and Illawarra Area Health Services (SESAHS), which is one of the eight geographical divisions for the provision of health services within New South Wales (NSW), Australia.

The study used mixed methods, and drew upon a broad sociological perspective as its core framework. A survey to assess pregnant women's knowledge, practices and opinions about the risk of *Listeria* initiated the study, since no data on the topic were available at the time of the study. This background information was deemed to be essential in informing the final results of the research. Concurrent with the survey, semi-structured interviews were carried out with pregnant women and midwives for in-depth exploration of their perceptions of *Listeria* risk.

Finally, findings from statistical analysis of the survey and interpretive analysis of qualitative data from the interviews were pulled together to provide a holistic view of *Listeria* risk from lay and professionals' perspectives.

1.4.1 Study sites

As mentioned earlier, the study was carried out in the geographical area in which the SESIAHS provided services. Pregnant women and midwives were recruited from three hospitals (two public and one private) within this area.

The SESIAHS covers approximately 6,331 square kilometres in NSW, stretching from Sydney Harbour in the north to Durras in the south. The area includes highly urbanised areas of eastern Sydney, southern Sydney, Wollongong and Port Kembla, which contrast with the predominately rural areas of Kiama and Shoalhaven. The area comprises 13 local government areas (SESI AHS 2007).

In 2004, the estimated resident population of the SESIAHS was 1,162,580 representing 17% of the total population of NSW. Residents who speak a language other than English at home account for about 18% of the SESIAHS population. The major employers in the area are the steel industry, the SESIAHS and the education sector including a number of universities (SESI AHS 2007). In 2005, 16.4 percent of the total NSW annual births happened in the SESIAHS, the third highest among the eight Area Health Services within NSW (NSW Department of Health 2007).

Residents have access to a range of health services in the area covered by the SESIAHS, including health promotion, disease prevention, primary health care, community health services, home care, hospital services and nursing home care. The public facilities include four principal referral hospitals, three specialised referral hospitals, three major district hospitals, three small district hospitals, and seven sub-acute facilities. Figure 1.1 shows the location of public facilities within the SESIAHS. There are also five private hospitals within this area that provide service to residents who have private health insurance.

Please see print copy for image



Figure 1.1 Map of the area under cover of South Eastern Sydney and Illawarra Area Health Services and location of public hospitals (SESIAHS 2007)

Five hospitals among the public facilities and two hospitals among the private facilities were involved in the provision of antenatal services and conducted antenatal classes at the time of study. Recruitment of pregnant women and midwives from all of the sites with antenatal services was not possible due to time limitations and financial constraints. As a result, three hospitals (one private and two public) in different local government areas were selected to enable access to a reasonable cross section of population with different socio-economic backgrounds.

Site A is a major teaching and referral public hospital at the regional level providing services to 250,000 residents, 15 percent of whom are from a non-English speaking background (NESB). The hospital provides a wide range of antenatal services under different care schemes by both doctors and midwives. Approximately 150 pregnant

women from urban and rural areas attend antenatal clinics each week. There are some major pregnancy care programs in which midwives have a prominent role. The hospital also has an adolescent antenatal program, specifically designed for and targeting young pregnant women under the age of 20, which is run by the midwives. Midwives are also responsible for conducting antenatal classes.

Site **B** is a principal teaching and referral public hospital in a metropolitan area offering a comprehensive range of in-patient, maternity and community based services to more than 250,000 residents of SESIAHS. More than 200 pregnant women, generally from middle and working classes, attend antenatal clinics within the hospital and in two separate community health centres. Approximately 35 percent of the residents under cover of this site are from NESB. Doctors as well as midwives provide antenatal services under a wide range of pregnancy care schemes. However, there is an emphasis on the role of midwives for the provision of care, and community health centres are exclusively run by the midwives. Midwives also carry out the antenatal classes.

Site **C** is a general surgical private hospital at the regional level which has delivery suites and a maternity ward. There is no antenatal clinic in this hospital since all of the pregnant clients have private health insurance and their obstetricians look after them during the antenatal period. However, the hospital holds regular antenatal classes presented by the midwives, and midwives are also available for antenatal consultation in the ward.

The following section provides a brief overview of different schemes for antenatal care which illuminates the role of different care providers within the antenatal practice and their potential contribution to education and provision of information and advice.

1.4.2 Antenatal care programs

The following information about various antenatal care programs available at the time of the study was provided by the head of maternity units and managers of the antenatal clinics in the three study sites.

Public patients: For care as a public patient under Medicare, pregnant women need a referral by their GP. After an initial assessment, they then have the following options for continuing care, providing their pregnancy is low risk and no complications develop:

- **Care in the antenatal clinic at a hospital:** The hospital appoints an obstetrician who pregnant women see at the Booking session and at 36 and 41 weeks. If their pregnancy is considered low risk, they are likely to see a team of midwives for the rest of their pregnancy. If their pregnancy is high risk, they are more likely to see their appointed obstetrician each time.
- **Shared care with a local GP:** Under the 'shared care' scheme, women split their check-ups between their GP and the maternity clinic at the hospital. After an initial assessment at the hospital, the scheme allows them to visit their GP for regular check-ups, whilst they visit the hospital for scans, antenatal classes and any tests above and beyond those that can be carried out by the GP. Regular checks after approximately 36 weeks (depending on the maternity facility) will usually take place at the hospital.
- **Care through a midwife managed 'birthing centre' at a hospital:** 'Birthing centres' provide for more natural 'at-home' style antenatal care, labour and birth. Managed by midwives, the philosophy is to have minimal medical intervention during the birth. Centres are located within hospitals so that more intensive medical care is immediately available should an emergency arise.
- **Care through a community based midwifery program or a community based antenatal clinic:** Low risk pregnancies are often managed by a team of midwives in a hospital or community clinic. Appointments usually take place with different midwives on rotation (Team Midwifery) or women may choose to have one midwife as their primary care provider (Midwifery Group Practice). Birthing options include a normal public hospital admission or a midwife managed birthing centre or a local community midwifery program. Midwives normally visit their pregnant clients every four weeks up to 28 weeks and every two weeks up to 36 weeks and then weekly after that. On average midwives may visit their client twelve times in a pregnancy.

Private patients: Pregnant women may be treated privately by an obstetrician who looks after all their medical needs during pregnancy and takes responsibility for all types of pregnancy from low to high risk. In this case all the antenatal care takes place in the obstetrician's private premises and also she/he attends the labour. More than one third of pregnant women in NSW in 2004 were private patients (NSW Department of Health 2007).

This brief overview of pregnancy care options shows that midwives have a prominent role in the antenatal care for the majority of women. As a result their approach to food safety and *Listeria* education is of importance in influencing women's compliance with food safety recommendations and proscriptions to avoid *Listeria* in pregnancy.

1.5 Thesis structure

This thesis is divided into nine chapters. This section provides a brief overview of the succeeding chapters.

Chapter Two provides a review of the literature relevant to this thesis and is presented in two parts. Part one commences with background information about listeriosis as a disease of pregnancy and why it is considered a public health problem in the antenatal period. It then reviews the relevant literature on consumers' food safety knowledge and practices in general and further reviews the limited studies on *Listeria* knowledge and practice among pregnant women. Part one also provides an overview of the factors that have been identified in the literature that affect food safety behaviours of the general public and pregnant women. Part two deals with the conceptual frameworks that have influenced the thinking behind this study. It provides an overview of socio-cultural theories of 'risk' relevant to *Listeria* as a food risk and as a risk to pregnant women. It also presents the theories of 'authoritative knowledge' and 'cognitive authority' as a basis for data analysis with regard to the role of scientific knowledge and sources of information in women's perceptions of *Listeria* risk.

Chapter Three introduces ‘mixed methods’ as the methodology for this study and provides an overview of positivism, constructivism and pragmatism as the relevant paradigms to this research. The chapter describes the concurrent triangulation design of the study and includes details of quantitative and qualitative methods of data collection and analysis as well as ethical considerations and issues related to rigor.

Chapter Four presents the findings of the quantitative component of research. Descriptive and inferential results of statistical analyses of data from food safety survey of pregnant women are provided. Pregnant women’s level of knowledge about high *Listeria* risk (HLR) foods and safe food handling techniques are examined and the patterns of consumption of HLR foods and implementation of safe food handling practices are identified. Also, the predictive factors of women’s knowledge, practices and opinions about *Listeria* risk during pregnancy are explored. Findings of this chapter have been published (Bondarianzadeh et al. 2007).

Chapters *Five* to *Seven* deal with the findings of the qualitative part of the study and present the findings of semi-structured interviews with pregnant women and midwives. *Chapter Five* provides an overview of pregnant women’s understandings of safety pertaining to food, their perceptions of *Listeria* risk and the strategies they used to manage the risk within their eating routines. It also identifies the underlying factors that influenced women’s decision making with regard to food practices to prevent *Listeria*.

An analysis of women’s accounts about sources of *Listeria* information is the focus of *Chapter Six*. The main sources of *Listeria* knowledge for pregnant women are identified and women’s perceptions and expectations of each source are explored. Women’s perceptions of ‘authority’ for different sources of knowledge are examined within the frameworks of ‘authoritative knowledge’ and ‘cognitive authority’ and the way in which these perceptions affected women’s decision making processes with regard to *Listeria* risk management during pregnancy is explored.

Chapter Seven provides an analysis of the midwives’ accounts with regard to their perceptions of food related *Listeria* risk and their approach to the provision of *Listeria*

advice to their pregnant clients. The analysis identifies the principal influences on midwives' practices and explores the underpinning personal and organisational factors that affected the provision of food safety and *Listeria* education and advice within the antenatal care.

A summary and discussion of major findings is presented in *Chapter Eight* where results from both quantitative and qualitative parts of research are pulled together and positioned against the available literature. Finally, *Chapter Nine* presents the conclusions of this study and outlines its implications for future *Listeria* prevention initiatives within the public health, the limitations of the study and suggestions for further research.

2 Review of Literature

Food safety has emerged as an important issue during pregnancy in recent years. While there has been a growing body of research addressing health behaviours such as smoking and alcohol use during pregnancy, there have been very few studies in the relatively new area of food safety. Given the serious consequences of some foodborne illnesses during pregnancy, this review focuses on *Listeria* infection and lay and professionals' perspectives of its importance and control during pregnancy.

This review of the literature is in two main parts. Part I broadly examines the issues related to food safety and *Listeria* during pregnancy. It establishes the importance of *Listeria* during pregnancy in the Australian public health context and then reviews current food safety recommendations to reduce the risk of *Listeria* during pregnancy, particularly focusing on women's knowledge and food practices. It goes on to examine what is known of women's current knowledge and practice vis-à-vis these recommendations. As a consideration in relation to women's access to appropriate information, literature relating to current antenatal practice within health services are also reviewed to determine the extent to which *Listeria* related education is being undertaken, i.e. to what extent are health service practices supporting the dissemination of scientific recommendations regarding *Listeria*.

Part II of the literature review examines concepts relating to food risk and pregnancy. As this concept has not specifically been explored in the literature, other appropriate literature is reviewed, firstly to understand concepts of risk in relation to pregnancy and then to explore concepts of risk in relation to food. As one of the underpinning factors in shaping perceptions of risk is knowledge, the literature is explored to shed light on how women use different types of knowledge to inform their perceptions of *Listeria* risk

during pregnancy. Two key approaches to evaluating the influence of knowledge – authoritative knowledge and cognitive authority – are also described.

Key findings from this review of the literature form the basis for the further investigation of lay and professional perspectives of food safety, and in particular *Listeria* risk, during pregnancy. To commence the chapter, an overview of the search strategy used for the literature review is presented.

2.1 The search strategy

A number of sources were used to search the scholarly literature about different aspects of the study around food safety issues during pregnancy. Empirical work in this area was accessed through databases relevant to health, behavioural, and social sciences. Proquest 5000, Expanded Academic Index (1980-present), and Science Direct were among the most commonly used databases. Synergy (1999-present), Sociological Abstracts, PubMed (1966-present), Cinahl (1966-present), Medline (1966-present), Health Reference Center Academic, Annual Reviews and Cochrane database of systematic reviews were also frequently accessed. The search for journal articles within these databases was limited to publications within scholarly journals and in English language. No restrictions were set for sample size and studies with both quantitative and qualitative methodology were included. However, as was expected, there was a great deal of duplication among these databases.

The grey literature was also covered in a number of ways. Official websites of Australian government bodies were accessed for booklets, fact sheets and government reports containing relevant information and statistics. These included the official websites of the New South Wales (NSW) Food Authority, Food Standards Australia New Zealand (FSANZ), the OzFoodNet, the NSW Department of Health, the Food Safety Information Council (FSIC), the Australian Bureau of Statistics (ABS), and the World Health Organization (WHO). The database of Australian Digital Theses (ADT) was also accessed to scan for any relevant dissertations which may have been published in a similar field.

A wide range of key words were used to search within the mentioned data sources to access the pertinent literature. The main search terms included food; foodborne illness/disease; food safety; *Listeria*; listeriosis; pregnancy/pregnant; woman; health; diet; eating; recommendation; directive; guideline; advice; habit; knowledge; understanding; awareness, information; source of information; information seeking; practice; behaviour; change; compliance; decision making; antenatal; prenatal; maternal; mother/motherhood; care; responsibility; risk; perception; response; management; communication; health professional; care provider; midwife; pamphlet; handout; educational material; approach; satisfaction; expectation; authoritative knowledge; and cognitive authority. A combination of search terms was applied using the Boolean operators and truncation to manage the scope of search. To increase the likelihood of finding relevant materials, alternative terms were used to describe the same concepts, and synonyms, plural/singular forms of the word (eg. woman/women), spelling variations (eg. behaviour, behavior) and acronyms were also taken into account.

Studies of food safety knowledge and practices, socio-cultural studies of food related risks, relevant studies based on the concepts of ‘authoritative knowledge’ and ‘cognitive authority’, and studies of health education and promotion during pregnancy were the main studies included in the literature review to inform the current research. Articles that dealt with microbiological, epidemiological and clinical aspects of listeriosis, or focused on other nutritional, social, behavioural, pharmacological, and pathophysiological risks during pregnancy were excluded.

In addition to the journal articles a range of books, particularly in relation to the conceptual and methodological aspects of the study, were reviewed. These were either introduced by research supervisors or through discussion with colleagues or accessed through a further search using relevant key words within the library catalogue, interlibrary loans, and Google scholar search engine. Hand searches of bibliographies and reference list of retrieved journal articles and relevant books/chapters also expanded the search.

Part I: Food safety and pregnancy

2.2 Introduction

This part reviews the existing literature to position this study within the context of current knowledge about and practices regarding *Listeria* prevention during pregnancy. It commences with an overview of listeriosis as a disease of pregnancy and examines the importance of the illness from a public health perspective. Following a description of food safety recommendations for the prevention of listeriosis during pregnancy, studies of *Listeria* knowledge and practice among pregnant women are reviewed. This part of the chapter concludes with a review of current food safety education within the antenatal services and an examination of available information on health professionals' practice in this regard. This provides the background to the second part of the chapter, which reviews conceptual frameworks that may be helpful in the development of the research ideas and the subsequent analysis of the research results.

2.3 Background

Food is essential to life but if contaminated can cause illness and even death. Fortunately, the latter only happens in a minority of cases, although the morbidity associated with the millions of cases of food related illness worldwide has significant social and economic consequences (Griffith 2006).

Foodborne illnesses, as defined by the World Health Organization are 'diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food' (WHO 2007) and include illness caused by chemical, physical or microbiological hazards which may be present in food (WHO 2002).

Foodborne illness caused by micro-organisms is generally considered to be the most important food hazard (Baumgartner 2000) because of the substantial changes in contemporary eating patterns such as a preference for processed and ready-to-eat foods, the increasingly longer interval between processing and consumption of foods, and the growing prevalence of eating food prepared outside the home (WHO 2002). *Listeria*

monocytogenes (*Listeria*) has been one of the emerging foodborne pathogens in the last few decades (Morris and Potter 1997), affecting mostly people with a suppressed immune function such as pregnant women, patients with hematologic malignancies, patients with AIDS, organ transplant recipients and those who are receiving corticosteroid therapy (Lorber 1997). *Listeria* can cause febrile gastroenteritis in healthy individuals and life-threatening invasive infections in neonates, elderly and immunocompromised persons (Braden 2003). The significance from a public health point of view of *Listeria* as a microbiological food hazard during pregnancy and listeriosis, the illness caused by this bacterium, are discussed in the following section.

2.3.1 Listeriosis as a foodborne illness

Of all listeriosis cases, 85 to 95 percent are attributed to food (Pinner et al. 1992). However, identifying the source of *Listeria* infection has been difficult because of a highly variable incubation period (1-21 days) before clinical symptoms appear and the unavailability of food samples for analysis at the time of onset (Ryser 1999).

Foods that have been most often associated with human listeriosis are ready-to-eat foods that support growth of *Listeria*, have a long refrigerated shelf life and are consumed without further bactericidal treatments (e.g. heating/cooking). Ready-to-eat foods that are exposed to less strenuous methods of processing such as mild heating and freezing provide an ideal culture for *Listeria* (Lou and Yousef 1999). For example, the organism can survive the sub-pasteurization temperatures (60–67.5°C) used in the treatment of soft cheeses (Woteki and Kineman 2003) and it can grow at the freezing temperatures used to store soft-serve ice creams (Holsinger et al. 1992).

There is not a consensus regarding the infectious dose of *Listeria*, though research has shown that humans can be exposed to high doses by consuming some common foods. For example, *Listeria* can grow to extremely high cell count levels in hot dogs, soft cheeses and pâté (Tompkin 2002).

Problems associated with consuming foods containing *Listeria* have been reported only relatively recent. The first clearly documented listeriosis outbreak was caused by contaminated coleslaw in Nova Scotia, Canada, in 1981 (Schlech et al. 1983). Most cases of human listeriosis, including those during pregnancy, have been sporadic with occasional epidemic common-source outbreaks. Food sources implicated in epidemics have included coleslaw (Canada), pasteurized milk (USA), soft cheeses (Switzerland, Denmark, Germany, and France), Mexican-style cheese (USA), pâté (England and France), raw vegetables (USA and Austria), raw seafood (USA and New Zealand) and pork tongue (France) (Ryser 1999). Turkey franks, soft cheeses, delicatessen foods and raw seafood have been documented to be the source of listeriosis in sporadic cases (Ryser 1999).

Foods suggested as a source of sporadic *Listeria* infection and outbreaks in Australia since 1987 have been raw vegetables, raw seafood (including shellfish and smoked salmon), cold processed meats (including pre-packaged sliced meat and sliced ham from delicatessen), pâté, cooked chicken products and fruit salads (Ryser 1999; Kirk et al. 2003).

2.3.2 Listeriosis as a disease of pregnancy

Due to a suppressed immune function, women are at a higher risk for contracting listeriosis during pregnancy. Certain immunological and hormonal changes must take place in the woman's body in order to have a successful pregnancy (Smith 1999). Since the fetus, having paternal genetic traits, is antigenically different to the mother, the woman's body may consider it as an external graft and reject it. In order to prevent rejection of the fetus by the maternal immune system, cell-mediated immunity is suppressed during pregnancy by high levels of progesterone (Szekeres-Bartho 1992). Reduced cell-mediated immune function, however, leads to increased susceptibility of the woman and her fetus to infections by intracellular pathogens such as *Listeria* (Posfay-Barbe and Wald 2004). As a consequence, pregnant women are 20 times more at risk of contracting listeriosis than other healthy adults (Lorber 1997).

Typically, systemic infection occurs most frequently following ingestion of food contaminated with *Listeria*. The bacteria cross the mucosal barrier of the intestine, probably aided by active endocytosis of organisms by epithelial cells (Posfay-Barbe and Wald 2004). Once in the bloodstream, bacteria spread to different sites, but they have a particular tendency to migrate to the central nervous system and placenta. If cell-mediated immunity, including cytotoxic T cells and B cells, is suppressed and unable to release lymphotoxins to kill the bacteria (Southwick and Purich 1996), the bacteria are internalized by macrophages and other plasma cells and can thereafter spread cell-to-cell through phagocytosis to reach their target organs (Posfay-Barbe and Wald 2004).

Women may become infected with *Listeria* at any time during pregnancy, but listeriosis is most frequently documented during the third trimester of pregnancy (Smith 1999), probably because of the major decline in cell-mediated immunity that occurs at 26 to 30 weeks of gestation (Szekeres-Bartho 1992). Listeriosis in pregnant women is usually asymptomatic or relatively mild and may be manifested as a flu-like illness with fever, headache, back pain and less often gastrointestinal symptoms (e.g. diarrhea and abdominal cramping) (Mylonakis et al. 2002). Infected pregnant women can transmit the disease to their fetus/newborn either before or during delivery (Silver 1998). Listeriosis is not generally life threatening to the mother and does not cause an increased risk of *Listeria* infection in subsequent pregnancies (Paul and Gibb 1996).

Fetal infection usually occurs three to seven days after the onset of symptoms in the mother, primarily as the result of transplacental transmission to the fetus following infection of the mother. Listerial infection in the first trimester may result in spontaneous abortion. In the later stages of pregnancy infection outcomes include stillbirth, premature termination of pregnancy or live birth of a critically ill newborn (Lorber 1997; Silver 1998; Smith 1999). Neonates may be born with either an early-onset or late-onset form of listeriosis, as described in the following sections.

Early-onset listeriosis. Approximately 45 to 70 percent of newborn cases of listeriosis are early-onset (Smith 1999). The mothers of affected children often have the flu-like illness a few days before delivery (Posfay-Barbe and Wald 2004). The mean onset of

symptoms in the child is 1.5 days after birth (Silver 1998). In early-onset listeriosis the child is generally preterm with low birth weight and septicemia (decreased blood pressure and capillary leakage) (Smith 1999; Posfay-Barbe and Wald 2004). This may progress to a syndrome known as granulomatosis infantisepticum, which has manifestations such as widely disseminated granulomas, respiratory distress, circulatory failure and sometimes pneumonia (Slutsker and Schuchat 1999; Smith 1999; Posfay-Barbe and Wald 2004). The mortality rate of live-born neonates ranges from 15 to 50 percent among those with early-onset listeriosis (Smith 1999).

Late-onset listeriosis. Late-onset listeriosis in a newborn appears between 8 to 30 days of life, with a mean onset of illness at 14 days after birth (Silver 1998). Mothers of late-onset neonates usually have an uneventful pregnancy without illness, and the babies are born apparently healthy and at full-term (Posfay-Barbe and Wald 2004). Meningitis (inflammation of the tissue surrounding the brain and/or spinal cord) rather than sepsis is more common in late-onset neonates (Slutsker and Schuchat 1999; Smith 1999; Posfay-Barbe and Wald 2004). Mortality in late-onset listeriosis ranges from 10 to 20 percent and a portion of babies with meningitis go on to develop lifelong chronic physical, neurological, and/or physiological complications (Smith 1999).

2.3.3 Listeriosis as a public health problem

As mentioned previously, listeriosis is a relatively new foodborne illness and is most probably associated with changes in food production and eating patterns. The *Listeria* organism is common in nature and distributed worldwide but human illness is reported most frequently in developed countries (Ryser 1999). In Western countries, listeriosis has the highest mortality rate of any foodborne pathogen with an overall mortality rate of 20 percent (Wing and Gregory 2002). By comparison, other foodborne infections such as *Campylobacter* species infections have a mortality rate of 0.02 to 0.1 percent and mortality rates for infections from *Vibrio* species range from 0.005 to 0.01 percent (Altekruse et al. 1997). Of particular concern is that fetal mortality rates from listerial infection may be as high as 50 percent (Wing and Gregory 2002).

Listeriosis is a rare disease in Australia (FSANZ 2005). When compared with countries such as United States, England and France, the number of listeriosis cases in Australia has been relatively low for many years (Mead et al. 1999; OzFoodNet Working Group 2006; Ross et al. 2006). According to the OzFoodNet the reported cases of listeriosis in Australia declined from 62 cases in 2002 to 56 cases in 2005. However, the materno-fetal *Listeria* infections increased from two cases in 2002 (0.8 cases per 100,000 births) to four cases in 2005 (1.6 cases per 100,000 birth) with a fetal mortality rate of 50 and 25 percent, respectively (OzFoodNet Working Group 2003, 2006). The true incidence of materno-fetal cases is, however, difficult to know because the illness is often not diagnosed and miscarried fetuses are not routinely tested for listerial infection (FSANZ 2005). Nonetheless, the illness is considered to be an important public health issue because of the serious consequences for pregnancy outcome in terms of severity of symptoms and high case fatality rates (Kirk et al. 2003; Hall and Kirk 2005).

2.3.4 Prevention strategies

The prevention of foodborne disease requires that contamination be prevented or controlled at all stages of the food chain from production to consumption. The World Health Organization describes the strategy for preventing foodborne illnesses in terms of three lines of defence – improvement of the hygienic quality of raw foodstuff, application of food processing technologies and control contaminants, and education of food handlers and consumers (WHO 2002).

Despite all efforts, the production of food free from pathogens is not yet possible, and a large proportion of foodstuffs reaching consumers is contaminated. Contamination of foodstuffs is sometimes unavoidable as some organisms such as *Listeria* are widespread in the nature and are part of the natural flora of the human environment (WHO 2002).

The application of food processing technologies to eliminate or reduce pathogens or contaminants, as the second line of defence, is also not sufficient by itself to ensure food safety. Many countries, particularly industrialised ones, have an extensive food control infrastructure and food laws that have effective enforcement mechanisms and are

updated regularly to control *Listeria* contamination. The USDA has developed a 'zero tolerance' policy in the United States (Centre for Disease Control and Prevention 2003), and the European Union has developed a 'maximum allowable concentration' (Koutsoumanis and Angelidis 2007) for *Listeria* in the foods that support the growth of the bacteria.

In Australia, the food industry, State and Territory regulatory authorities and FSANZ have developed risk management systems, in terms of implementation of Codes of Hygienic Practice and adherence to microbiological standards requirements in the Food Standards Code, to minimize *Listeria* contamination during food production (FSANZ 2002, 2005). 'Not detected' regulations have been established for *Listeria* in a range of products including packaged cooked cured/salted meats, soft and semi-soft cheeses and smoked seafood. 'Recall' guidelines also exist for a variety of foods for which there are no standards but may occasionally contain the bacteria at the retail levels (FSANZ 2001).

However, avoiding and eliminating *Listeria* in the food processing plant environment has been a difficult challenge. *Listeria* is able to grow over a wide range of temperatures from -1.5 to 50°C and within pH ranges of 4.3 to 9.6. The organism also survives freezing and drying, is relatively resistant to heat, and can survive salt concentrations of up to 25.5 percent NaCl (Tompkin 2002) and even survives adverse conditions in food processing plants (Woteki 2001). These characteristics render *Listeria* a very difficult organism to control by classical food processing techniques. A survey of ready-to-eat foods in the United States indicated that up to 4.7 percent of these foods may be contaminated with *Listeria* (Gombas et al. 2003).

Finally, foods might become contaminated after processing or at some later stage between the processing plant and the consumer's plate. Contamination might also occur through improper hygiene of food handlers, or by cross-contamination after contact with raw foods or contaminated surfaces (FSANZ 2005). Since the preparation of food for consumption is the final stage in the food chain, it is critically important in the reduction of foodborne illness. Any contamination, whether introduced earlier or

resulting from handling and preparation, which is not controlled at this stage will have a direct negative bearing on the health of the consumer (WHO 2000). As a result, consumer food safety education, as the last line of defence, remains the salient feature of *Listeria* prevention, particularly among high risk groups, including pregnant women.

Since listeriosis is a preventable illness and measures for its control at the consumption level are to a great extent known and simple to implement, *Listeria* education may be regarded as an effective way of dealing with the illness, particularly to tackle its serious consequences for pregnancy outcome. The following section explores the issues related to *Listeria* education and the reported impact of this strategy on women's food safety knowledge and practices.

2.4 Food safety education

Food safety means that 'when food is consumed it does not contain contaminants at levels which cause harm' (WHO 2000, pg. 57). For this to happen, and given the substantial amount of food handling and preparation that occurs in domestic kitchens, consumers need to be adequately informed and educated on how to carry out these tasks in a safe way.

Food safety specialists and experts have developed a range of food safety recommendations over the years to inform the consumers of the potential hazards associated with their malpractices and to educate them on the correct ways of performing food related tasks. Five practices that have been suggested to have a key role in the prevention of foodborne illnesses and have been the focus of most food safety recommendations and educational efforts are personal hygiene, adequate cooking, avoiding cross-contamination, keeping food at safe temperatures, and avoiding food from unsafe sources (Medeiros et al. 2001a).

Food safety education of specifically targeted individuals and groups within a community, provided that it is well designed and implemented, is regarded as a feasible and cost-effective means of preventing foodborne illnesses (WHO 2000; Kreuter and

McClure 2004). Given the importance of food safety education in the prevention of listeriosis during pregnancy, this section provides a description of food safety recommendations that have been developed to help women make safer food choices and handle their food in a safer way and reviews the *Listeria* education efforts targeted at pregnant women and their impact on the prevention of the illness.

2.4.1 Food safety recommendations for *Listeria* prevention

Since the identification of *Listeria* as a foodborne pathogen, several food safety recommendations have been developed to help ‘at risk’ groups, including pregnant women, choose and prepare their foods safely (Schuchat et al. 1992; Lorber 1997; Smith 1999; USDA/FSIS 2001; Kaiser and Allen 2002; Braden 2003; Kendall et al. 2003). These recommendations were primarily based on avoiding practices that were known to be the major underlying causes of illness.

Using a more systematic approach, a study was undertaken in the United States to develop food safety guidelines for targeted audiences. A group of food specialists (Medeiros et al. 2001b) used a web-based Delphi process to reach consensus among a national panel of 41 food safety experts, including epidemiologists, microbiologists, food safety educators and food safety policy makers, about food handling practices of special importance in reducing the risk of foodborne illnesses among pregnant women, infants and young children, elderly people and other immunocompromised groups. The top-ranked important food related risks for pregnant women, identified by 80 percent of experts in this study, were associated with *Listeria monocytogenes*, *Toxoplasma gondii* and *Salmonella* species (Kendall et al. 2003). This study emphasised a number of food safety recommendations to be particularly taken into consideration during pregnancy: pregnant women should avoid soft cheeses, raw and cold smoked fish and cold deli salads, luncheon meats which are served without reheating until steaming hot, unpasteurized dairy products and raw and undercooked eggs. Pregnant women were also advised to wash knives, cutting boards, and food preparation surfaces with hot water and soap after contact with raw poultry, meat and seafood and should not handle pets while preparing food (Kendall et al. 2003).

According to Food Standards Australia New Zealand (FSANZ 2005) most food safety recommendations, including those related to *Listeria*, have been adopted from such work in the United States (USDA/FSIS 2001; FDA/USDA 2003), and also from international recommendations by the WHO/FAO (2004) (see Appendices A and B).

The main goal of *Listeria* recommendations in general have been to help the susceptible groups: a) avoid foods that are considered to be at a higher risk for *Listeria* contamination, b) prevent the potential contamination of safe foodstuff with *Listeria* (through appropriate hand washing and prevention of cross contamination), c) reduce or eliminate *Listeria* in foodstuffs that may have already been contaminated (through appropriate cooking/heating), and d) prevent the growth of the micro-organism to a disease-causing level (through appropriate storage).

These recommendations on how to reduce the risk of *Listeria* contamination of foods has formed the basis of food safety education informing consumers about safe food related practices, with the aim to raise public knowledge and awareness about listeriosis. Such education initiatives are designed to complement the government's regulatory measures and risk-management strategies undertaken by the food industry to reduce the risk of *Listeria* contamination of food products.

2.4.2 *Listeria* education

In Australia, as in many other developed countries with high literacy rates, printed materials in the form of booklets, brochures, pamphlets and fact sheets have been the major educational tool for informing general public about various health and food related issues. This has also been the case with *Listeria*. Most States have published their own version of *Listeria* materials, both in hard copy and on their website, to educate pregnant women and other high risk groups (Queensland Health Department 2001; Tasmania Department of Health and Human Services 2003; FSANZ 2004a, 2005; NSW Food Authority 2005a, 2005b; Department of Health of Western Australia 2006; NSW Food Authority 2006; Victorian Department of Human Services 2007).

There is, however, limited information available on the suitability of these materials for their intended audience. Shaw (1995) in an evaluation of free written dietary educational materials (DEMs) addressing the issue of listeriosis for pregnant women in the Australian Capital Territory, found that the DEMs containing *Listeria* information were fairly difficult to read. Using SMOG readability scores, she found the materials had an average SMOG score of 12.14 ± 2.6 , whereas educational materials intended for the general public are recommended to be prepared below the 8 grade level. Shaw also reported that most women expressed a need for reinforcement and explanations by health professionals to understand the message of these materials (Shaw 1995). Written educational materials from other States were not included in this study, so the results cannot be generalised. However, no other studies of this kind have been reported.

Previous studies suggest that health professionals' interaction with their clients would be more effective in improving lay performance and behaviour change if the biomedical advice is backed by printed materials (Birmingham et al. 2004; Gal and Prigat 2005; RACGP 2005; Krewski et al. 2006). However, printed materials may be of little value in increasing awareness if they do not reach the target group. Findings of the limited studies that have investigated the availability of *Listeria* educational materials in Australia are not consistent. In a study in Western Australia, 86 percent of participants reported that they had seen the *Listeria* pamphlet (Torvaldsen et al. 1999), while only 35 percent of respondents in a study in Victoria indicated having done so (Jackson et al. 2005).

The mode of distribution of education materials and the context within which they are made available may impact on their reach. In Western Australia pamphlets were distributed as a component of a broadly-based *Listeria* awareness campaign and were accessible on display stands in all major crowded sites of the city (Torvaldsen et al. 1999). Conversely, *Listeria* pamphlets in Victoria were distributed among Department of Human Services' offices throughout the state and to local councils. This was undertaken as a routine information dissemination service, that is, without a broader campaign to heighten public awareness. Not only was the overall recall of the pamphlets low, no respondent cited councils or government agencies as a source of the

pamphlet (Jackson et al. 2005). Studies are yet to be undertaken on the distribution, availability and recall of *Listeria* and/or food safety educational materials in NSW.

In order to increase public recall of *Listeria* education information, it may be important to determine the influence of broader awareness campaigns, as implied in the Western Australia study previously mentioned. Unfortunately, examples of successful educational approaches in food safety are scarce. One significant example is the reduction of listeriosis documented in the United States following combined regulatory measures and educational efforts. In 1989 a case report of listeriosis linked to processed poultry (Centre for Disease Control and Prevention 1989) led the United States' regulatory agencies to enforce concrete food monitoring policies and prompted the industry to invest in sanitation, environmental clean-up and systems for hazard analysis and control of critical points (HACCP) to minimize contamination by *Listeria* (Food Safety and Inspection Service 1989). Later, in 1992, food safety recommendations in the form of brochures and other educational materials were disseminated among the public and particularly among special populations at increased risk for listeriosis (Food Safety and Inspection Service 1992). The study by Tappero and colleagues (1995) indicated that these efforts were successful in reducing the number of cases of illness and deaths due to listeriosis by 44 percent and 48 percent respectively, between 1989 and 1993.

Another example of this type has been documented in Australia. In 1990, there was a *Listeria* outbreak in Western Australia involving ten pregnant women and resulting in six stillbirths (Watson and Ott 1990). This happened when regulatory measures were already in place. There was strong evidence for a foodborne origin to the outbreak and a particular brand of pâté was subsequently withdrawn from sale (Watson and Ott 1990). Consequently, the Health Department of Western Australia in conjunction with King Edward Memorial Hospital for Women, produced a pamphlet aimed at pregnant women which was distributed to all general practitioners and obstetricians throughout Western Australia in late 1990 (Theobald 1996). No stillbirths due to *Listeria* infection were subsequently identified in Western Australia during the four years following this education initiative.

The only reported *Listeria* awareness campaign in Australia was launched in 1995 in Western Australia, in response to a case of listeriosis in 1994. The mother in that case, despite being well informed about her pregnancy needs, had not received any information about listeriosis (Theobald 1996). It was concluded that *Listeria* pamphlets were not reaching a sufficient proportion of the target population and a *Listeria* awareness campaign was launched (Theobald 1996). The campaign included television and radio commercials, posters on buses and displaying educational pamphlets in public places other than hospitals and medical centres (Theobald 1996). Cases of listeriosis were again low until, in early 1997, five cases of listeriosis occurred in pregnant women who were aware of *Listeria* but who did not have a clear idea of what constituted a high risk food (Torvaldsen et al. 1999).

Follow-up evaluation of the Western Australia campaign had three key findings. Firstly, the effects of targeted campaigns on food safety can be long lasting, secondly, gaps in knowledge may still occur and thirdly, there are subgroups of women for whom the education campaign did not reach. Two years after the *Listeria* awareness campaign in Western Australia, a study by Torvaldsen and colleagues (1999) on 509 postpartum women (response rate 75%) showed that nearly 90 percent of women had heard of *Listeria* and had, to some extent, avoided high *Listeria* risk (HLR) foods in their pregnancy. Another study by Begley (2002) during 1999-2000 in Western Australia showed the long lasting effect of the *Listeria* campaign and found that women had remained highly aware of the risk of *Listeria* and reported avoiding HLR foods. The study by Torvaldsen and colleagues (1999), however, identified that a number of HLR foods such as sandwiches made with chicken or ham, soft-serve ice cream, and cold prawns or mussels, were not recognized as unsafe foods during pregnancy. Such gaps in knowledge may have resulted in the subsequent cases of listeriosis. Their study also found that women living in rural areas, from non-English speaking background (NESB), who were younger or had a less formal education were more at risk of lower levels of *Listeria* knowledge and awareness (Torvaldsen et al. 1999). No other examples of broadly based *Listeria* awareness campaigns have been found in the published literature.

The limited literature that does exist indicates that *Listeria* education is potentially an effective measure in preventing the illness. Since regulatory measures in food industry have now been in place for many years and *Listeria* is still a threat to pregnancy, it could be implied that women have not gained the necessary food safety knowledge and skills to avoid the illness or are not using their knowledge and skills for some reason. By investigating women's knowledge and food related practices to avoid listeriosis, this study provides an indication of the effectiveness of current educational measures regarding *Listeria* and can inform future educational initiatives in this regard.

Pregnant women need to practice a high standard of food hygiene and to avoid some foods that are generally considered to be safe for other healthy adults to prevent listeriosis. Since women's food safety efforts to prevent listeriosis during pregnancy should take place within a broader context of safe food choices and safe food handling practices, the next section will review literature that reports current food safety knowledge and practices among the general public.

2.5 Food safety knowledge and practice in the community

The incidence of foodborne illness in the community could be considered a barometer of food safety knowledge and practice. Unfortunately, foodborne illness in Australia is reported to be increasing. In 2005, OzFoodNet sites recorded 25,779 notifications of major foodborne diseases (Shiga toxin-producing *E. coli*, shigellosis, haemolytic uraemic syndrome, salmonellosis, campylobacteriosis). This was 12.5 per cent higher than the mean for the previous five years and 12 percent of the outbreaks were reported to be caused by food prepared in private homes (OzFoodNet Working Group 2006). This increase in the incidence of foodborne illnesses may be a result of more accurate tracing and recording of the causes of illness (WHO 2000). However, these statistics also indicate a need to increase public awareness of foodborne illnesses and its prevention and to identify potential barriers to safe food handling practices. This section commences with a review of the studies on general food safety knowledge and practices among Australians and goes on to explore the available literature on women's food safety knowledge and practice with regard to *Listeria*.

2.5.1 Food safety knowledge and practice – general public

Few Australian studies have examined consumers' food handling knowledge and practices. Jay and colleagues (1999a) in a national food safety telephone survey of randomly selected Australian households found major gaps in safe food handling knowledge and practices that included cooling cooked food at room temperature before refrigerating, thawing frozen food at room temperature and lack of knowledge about the importance of hand washing in the prevention of cross contamination and food poisoning (Jay et al. 1999a). Further study of 40 home kitchens in Melbourne by video observation demonstrated that lack of hand washing, poor hand washing technique, inadequate cleaning of kitchen surfaces, involvement of pets in the kitchen and lack of separate hand and dish towels were the most common malpractices (Jay et al. 1999b). There was also a significant variation between self-reported practices of participants and the actual practices observed in each household, that suggested an over-reporting of safe practices (Jay et al. 1999b). These studies raised concerns about domestic food handling practices in Australia and indicated that continuous and increased efforts in public education for safe food preparation were needed.

Underpinning safe practice is adequate knowledge of food safety procedures but research indicates that many people still do not have enough information on the safe handling and storage of food products (Redmond and Griffith 2003b). Microbiologic safety has been shown to be one of the most frequently volunteered food safety concerns of consumers (Bruhn 1997; Smith and Riethmuller 1999). There has been evidence of continuous improvements in consumer food handling practices in past decades (Levy 2002). A comprehensive review of international food safety studies carried out by Redmond and Griffith (2003b) confirmed that a substantial proportion of foodborne disease is attributable to improper food preparation practices in consumers' homes. Food-handling mistakes such as incorrect hand washing after handling raw chicken and meat (Kendall 2002), cross contamination through chopping boards and knives (Kerslake 1995; Sammarco and Ripabelli 1997), inadequate cooking of chicken and meat (Anderson 2002), cross-contamination in the fridge and cooling food insufficiently (Kosa et al. 2007), inappropriate defrosting and cooling in room temperature (Bruhn and Schultz 1999), obtaining food from unsafe sources, serving

contaminated raw food and allowing 12 hours or more between preparation and eating (Redmond and Griffith 2003b) have been the most common mistakes identified that may cause a bacterial foodborne illness.

The World Health organization (WHO 2000) emphasises safe food handling practices by consumers to be ‘the final line of defence’ against foodborne illnesses. Within this context, pregnant women need to follow special additional precautions to protect themselves and their unborn baby from consequences of foodborne illnesses. However, information on food handling practices of particular significance during pregnancy is limited.

Despite these findings indicating a need for more public education for safe food preparation, the only public education effort to increase consumers’ knowledge of safe food handling is the National Food Safety Week which is held in November each year by the Food Safety Information Council since 1997 (FSIC 2007). A major part of the Food Safety Week campaign is to pass on simple messages to improve consumers’ knowledge of how to handle, store and cook food safely. The Council has been self evaluating the campaign since 2002 through national telephone surveys, and has concluded that safe food handling knowledge of Australians on the importance of hand washing and avoiding cross contamination through cutting boards has increased or remained high over the years of study, while refrigeration and cooking knowledge needs to be improved (FSIC 2006).

2.5.2 Pregnant women’s *Listeria* knowledge and practice

One consideration in assessing the need for education of pregnant women regarding listeriosis, whether via broad campaigns or via targeted actions within health services, is the level of current knowledge of women of this issue. If the level of women’s knowledge is already high, and their food preparation practices are deemed appropriate, further education may not be warranted. However, if knowledge levels are low or practices are not consistent with the recommendations, targeted educational initiatives

are required. Alternatively, there may be specific areas that are poorly understood or practiced and these may need targeted education initiatives.

Researchers have used both quantitative and qualitative approaches to study *Listeria* knowledge and practices among pregnant women. This section provides an overview of the studies that have investigated the issue of *Listeria* in pregnancy. Such studies have predominately used survey and focus group methods. The different methods have been used to investigate different aspects of knowledge and practice, for example quantifying the extent of knowledge or gaining more in-depth understanding of the reasons behind food safety. Thus a comprehensive review of all previous studies, whether using quantitative or qualitative methods, was essential to inform both the core idea and the methodological aspects of this research.

2.5.2.1 Quantitative studies

Studies with a quantitative approach mostly have used traditional knowledge/self-reported practice surveys to examine pregnant women's level and breadth of *Listeria* knowledge and related food safety practices. Generally speaking, lower levels of *Listeria* knowledge among pregnant women have been the common finding among these studies. For example, an outbreak of listeriosis in Queensland, Australia in late 1995, which affected two pregnant women, prompted a self-administered survey of 372 pregnant women (response rate 100%) attending the antenatal clinic of one of the major public hospitals in Brisbane metropolitan area (Stafford et al. 1998). The study found a lack of nutrition education during pregnancy with 25 percent of women having unsatisfactory *Listeria* knowledge and 17 percent continuing the consumption of HLR foods. No information is available regarding what actions were taken to address this situation.

Researchers have emphasised the public health implications of limited *Listeria* knowledge during pregnancy. Jackson and colleagues (2005) in their survey of 83 postpartum women (response rate 27%) in rural areas of Loddon-Mallee region of Victoria, Australia, found that 23 percent of women had not heard of *Listeria* and 31

percent did not know anything about the possible symptoms and outcomes of *Listeria* infection. Only 29 percent of survey respondents correctly identified that transmission could occur at any time during pregnancy. These researchers concluded that being unaware of the time of transmission may lead women to continue the consumption of HLR foods and being unaware of the symptoms prevents them from seeking medical attention.

Women in New Zealand have also been found to have a poor understanding of *Listeria*. Face-to-face structured interviews of 100 pregnant and postpartum women (response rate 100%) by Rungan and Badkar (2005) in the antenatal clinic and maternity ward of a training hospital in New Zealand indicated that only 58 percent of respondents had received information about *Listeria* during their pregnancy care and only 26 percent reported that they fully understood this information. Fifty percent of respondents stated that they consumed raw seafood and coleslaw in their pregnancy, followed by 35 percent who reported eating cold cooked chicken and deli meats and 19 percent who reported eating soft cheeses. Researchers emphasised the need for modifications in pregnancy education modules and revision of information booklets to include *Listeria* recommendation (Rungan and Badkar 2005).

The higher risk associated with lower levels of *Listeria* awareness among ethnicity groups has been reported in some studies. A multi-state survey of a random sample of 403 pregnant women in the United States by the American College of Obstetricians and Gynaecologists in collaboration with the Centre for Disease Control and Prevention (ACOG/CDC) was undertaken using face-to-face structured interviews. It found that only 18 percent of respondents had some knowledge of listeriosis and 33 and 31 percent knew listeriosis could be prevented by not eating delicatessen meats and avoiding unpasteurized dairy products, respectively (Ogunmodede et al. 2005). However, only 18 percent of respondents reported avoiding delicatessen meats and ready-to-eat foods. Food safety surveys at the state levels in Minnesota (Ogunmodede et al. 2005) and Michigan (Puder et al. 2005) also have found weaker results for women's *Listeria* knowledge and practices compared with national levels. Given the similarity of samples with regard to most socio-demographic characteristics, the authors attributed the lower

levels of *Listeria* knowledge and practice to a larger proportion of respondents from Hispanic background in Minnesota and from African-American background in Michigan, thus confirming variations in knowledge based on ethnic background.

Although many studies emphasised the role of knowledge and awareness of recommendations on food handling and consumption practices, researchers have identified other factors affecting food behaviours that should be taken into account. Redmond and Griffith (Redmond and Griffith 2003b) in their review of international studies of food safety knowledge and other cognitive components of food related practices identified that knowledge of food safety concepts did not lead to corresponding behaviours and that people tended to continue the consumption of unsafe foods despite knowing the potential consequences of their behaviour. Levy (2002), also suggested that knowledge of the particular pathogens did not translate into safe food handling practices by itself. These findings indicate that women use knowledge to assess the risk to themselves and their babies and then change their behaviours if the risk outweighs the various benefits of continuing with their existing eating practices. The issues related to perception of risk and the way this affects food related practices are discussed in the second part of this chapter.

None of the above studies provided evidence of validity and reliability of their instruments and all but one study had non-random samples, all of which affects the generalisability of the results. However, as Redmond and Griffith (2003a) point out, determination of knowledge through questionnaire is relatively straightforward and information gained is usually accurate. On the other hand, self-reported practices are subject to 'social desirability' bias which means that respondents may claim to carry out the perceived 'correct' behaviour to represent a positive image without actually performing it (Redmond and Griffith 2003a). The suboptimal level of knowledge among pregnant women and a lack of strong compliance with food safety directives may be worse than what has been reported.

No current information about the level of *Listeria* knowledge and practices among pregnant women is available in NSW. No national surveys have been undertaken and

the state level data collected in other states (Stafford et al. 1998; Torvaldsen et al. 1999; Jackson et al. 2005), is not only dated but possibly also not directly applicable to the situation in NSW. In addition, previous studies have mostly focused on pregnant women's food practices in terms of the consumption of HLR foods. Data on food handling practices with implications for *Listeria* prevention is limited and warrants further research.

2.5.2.2 Qualitative studies

Few qualitative studies reported in the literature have focused on pregnant women's food practices and their perceptions of and beliefs about risk associated with *Listeria*. The main qualitative *Listeria* studies were carried out in the United States and used focus groups to investigate acceptance of food safety recommendations and delivery mechanisms and to help the development of educational materials for population groups more at risk of *Listeria* infection (Athearn et al. 2004; Cates et al. 2004; Medeiros et al. 2004a; Hoffman et al. 2005). While the results of these studies are limited, they are pertinent to understanding women's food safety practices and hence are of relevance to this study.

Some qualitative studies have confirmed the findings of survey based studies that the lack of *Listeria* knowledge is a major factor negatively affecting behaviours. In a study to explore pregnant women's *Listeria* knowledge, practices and educational needs, Cates and associates (2004) carried out eight focus groups with 63 pregnant women from four cities in the United States (one city in each of the four Census regions). Participants had heard of the bacteria *E. coli* and *Salmonella* but were unaware of *Listeria* and did not know that pregnant women were highly susceptible to foodborne illnesses. Most participants had not made any changes in the way they handled food since becoming pregnant and nearly all participants continued to eat HLR foods such as deli meats without reheating. While the majority of these findings could have been obtained by using a survey, the qualitative aspects of the study were particularly useful in identifying how participants would like to receive *Listeria* information. Participants

were interested in receiving *Listeria* information and asked for targeted educational materials with a warning tone and detailed information on listeriosis (Cates et al. 2004).

Research has also shown that food safety knowledge needs to be constantly reinforced through education to efficiently convert into practice. The focus group study by Trepka and colleagues (2006) with women of child bearing age from a large WIC Program (Special Supplemental Nutrition Program for Women, Infants and Children) clinic in Miami, USA, had very similar findings to the Cates and colleagues' study (2004) regarding low levels of *Listeria* knowledge and awareness, except that women remembered being advised not to eat deli meats during pregnancy without knowing the reason and without being aware of the risks associated with *Listeria* infection. Women continued their high risk food practices because food safety messages were not repeated frequently enough to affect their long-established unsafe practices.

Researchers have identified that most women assume their food related practices to be safe and need thorough and convincing information to help them change their behaviour. Athearn and colleagues (2004) in a study guided by the Health Belief Model, conducted eleven focus groups with 69 women (57 pregnant and 12 less than six months postpartum) in three states of the USA to explore beliefs, motivators and barriers that affected pregnant women's compliance with food safety recommendations. Although most women reported some food handling or consumption changes since becoming pregnant, they were not following all food safety recommendation for pregnancy. Common barriers to safe food practices included lack of awareness of most recommendations, no prior illness from implicated foods and convenience. It was postulated that women failed to internalize the connection between risky food consumption during pregnancy and risk to the unborn child, and suggested that provision of valid information is necessary before any behaviour change is expected (Athearn et al. 2004).

Thus, while there have been some studies of women's approaches to food safety recommendations, more work is required to examine women's perceptions of and beliefs about risk associated with *Listeria* since in the Australian context virtually

nothing is known in this regard. Research has indicated there is poor knowledge of food safety issues during pregnancy and that food safety practices are lacking. However, existing studies are limited in number and are now becoming dated. Thus current information regarding *Listeria* prevention knowledge and practice, while present, is limited. Such information is essential to inform future education initiatives, whether broadly based in the community or targeted actions within health services.

To complement our understanding of women's knowledge and practices regarding *Listeria* prevention, it is important to detail the role of health professionals and services in educating women about *Listeria* risk. The following section reviews available information about health professionals' approach to food safety recommendations for pregnancy and *Listeria* preventive efforts in the health system.

2.6 Health promotion in antenatal care

The way a condition such as pregnancy is defined, whether it is perceived to be a normal physiological event or a medical condition, and where responsibility for it is ascribed by health professionals, are important determinants of health education and promotion interventions targeting pregnant women.

The major diseases of contemporary societies have been attributed to lifestyle and behaviour (Lupton 1995) but the responsibility for them could be construed as societal or individual. The dominant view of where responsibility for maintaining health and preventing illness lies has been explicitly defined by government and health professionals as the active responsibility of individuals (Lupton 1995). In addition, the clients of medicine are no longer simply people who are ill, but potentially everyone, as witnessed by the health education and health promotion campaigns which encourage everyone to 'look after themselves', to eat and drink 'sensibly' and to lead healthier lives (Taylor and Field 2003).

The shift in health care focus from 'sickness' to 'health' has some important implications for the role of health professionals. Taylor and Field (2003) point out that

the growth of preventive and promotional health care has resulted in increasing numbers of health professionals being involved in health promotion activities, including education about various risks and monitoring apparently healthy people for evidence of risk in their behaviour or their environment. Lay consultations with health professionals increasingly include discussions about lifestyle choices and behaviours that can potentially be a risk to a person's health (Nettleton 1995). This has particular implications for those working within antenatal practice because of the emphasis on promoting health and educating pregnant women rather than managing a disease (Taylor and Field 2003; Beldon and Crozier 2005; Ivry 2007). Antenatal care has been identified as the most prominent routine medical care provided for the purpose of health promotion (Villar and Bergsjø 2001; Kaufmann 2002).

Health promotion activities within antenatal care can be seen as a process of medical socialization, in which providers need to teach pregnant women their interpretations of the risks associated with certain behaviours, that is, what women should and should not do throughout their pregnancy to have a healthy child and the significance that should be attached to these recommendations (Sinclair 2003). As a result, much of the role of pregnancy care providers can be conceptualised as health promotion and risk communication (Beldon and Crozier 2005). McCourt (2006) asserts that this is particularly true for antenatal care provided by midwives, since midwives are mostly female and the issue of social hierarchy is less prominent in their relationship with pregnant women. This acts to facilitate their interaction with their clients and results in them having a prominent role in educating pregnant women about different aspects of pregnancy (McCourt 2006).

However, limited studies have been reported on midwives' approaches to education of women regarding different pregnancy issues. Studies of antenatal care undertaken to date have found that pregnancy care providers take different approaches to education about different types of risk such as smoking, alcohol intake and drug use (Heyes et al. 2004; Herzig et al. 2006). The main factors identified as negatively affecting professionals' approaches to different risks can be grouped into five areas: a) lack of knowledge about the biomedical issues related to each risk that leads to a lack of

confidence in communication of risk (Mulliner et al. 1995; Walsh et al. 2000), b) lack of consensus regarding the level of risk among health professionals and underestimation of risk (Heyes et al. 2004; Herzig et al. 2006), c) stereotyping patients that results in difficulty in approaching them for communication about risk (Cooper-Patrick et al. 1999; Kirkham et al. 2002; Johnson et al. 2004; Street Jr. et al. 2007), d) failure to formulate appropriate behavioural strategies to manage certain risks (Pirie et al. 2000) and, e) limited availability of resources and organized support that affects appropriate communication and prevention strategies (Dykes 2005; Gilbert et al. 2007).

How these factors relate to food safety education during pregnancy has not been determined. Since the influence of some of these factors is related to the individual characteristics of the care providers and some are functions of limitations in the antenatal setting, they may or may not be generalisable. As a result, exploration of these factors in specific antenatal settings may be of significance in identification of pitfalls associated with education addressing particular issues, such as food safety, in that setting and contributing to the identification of improvement strategies.

2.6.1 Role of antenatal services in food safety education

Maternal health centres have traditionally been responsible for informing pregnant women about practices that may present risks to them and their unborn child. Antenatal services are supposed to provide information on a number of food related hazards that may adversely affect the health of fetus (WHO 2006). It is an international recommendation that information on foodborne infections, notably listeriosis and toxoplasmosis, and chemical contaminants such as lead and methyl mercury be provided to pregnant women who attend antenatal care centres (WHO 2006).

There have been reports of food safety education being in place in maternal health services in a number of countries such as Sweden, France, England, New Zealand, and USA. Most of these educational efforts seem to have mainly focused on distributing printed materials. For example, in Sweden a poster giving dietary advice on all types of food which may be unsafe is distributed to pregnant women through maternal and child

health centres (WHO 2000). In France, a brochure outlining risks of listeriosis and toxoplasmosis, as well as of tobacco and alcohol, is distributed to pregnant women in antenatal centres (WHO 2000). However, no evaluation of the effectiveness of these measures has been reported.

In Australia almost all the 250,000 women who give birth each year receive some antenatal care (Laws and Sullivan 2004). Providing health care with the specific aim of improving the health of women and their babies in Australia dates back to the early 1900s (Hunt and Lumley 2002). National guidelines for antenatal care was published by National Health and Medical Research Council (NHMRC) in 1995 and local providers of antenatal care have developed their own protocols of care based on the national policies (Hunt and Lumley 2002).

However, considerable inconsistencies between national policies, local protocols and research-based evidence on the importance of different components of pregnancy care have been identified (Hunt and Lumley 2002). For example, although food safety educational materials specific to listeriosis at national and States' levels are now being published for some years, information on the availability and appropriate distribution of these materials through pregnancy care centres is quite limited. It is thus important to investigate whether the health system provides a supportive educational environment within which such measures can be used.

Literature indicates that both in Australia and elsewhere, the main *Listeria* prevention efforts have been concentrated within the health system for pregnancy care. However, little evidence is available of the extent or effectiveness of *Listeria* education through antenatal care. The following section briefly examines the concept of health promotion within antenatal care and looks at the role of health professionals as the major contributors of care and health/food education during pregnancy.

2.6.2 Factors affecting provision of food safety education

The importance of the role of health professionals in providing food safety education, particularly to immune-suppressed groups, has been emphasised in the literature (Medeiros et al. 2001a; Acheson and Fiore 2004; Kendall et al. 2006). However, a relatively limited number of studies have examined the approach of health care providers to food safety education for pregnant women. Hence examination of food safety education in the antenatal setting is warranted.

Drawing on literature with a focus on health communication, it has been identified that health professionals are considered as one of the most trusted sources of food/health related information for lay people (Worsley 1989; O'Keefe et al. 1998; Worsley and Lea 2003; Lewallen 2004; Redmond and Griffith 2005). In particular, past research suggests that provision of *Listeria* education within the antenatal services can have dramatic impacts on the prevention of illness (Theobald 1996; Torvaldsen et al. 1999).

However, previous studies have identified inadequacies in health professionals' communication of food related risks to their clients. For example, Buchdal and colleagues (1990) in their study of three materno-fetal listeriosis cases in one of the London hospitals found that pregnant women had received no information regarding the risk of illness from their obstetrician and all three patients had eaten foods that could potentially carry the risk of contamination with *Listeria*.

Inadequate levels of knowledge among pregnant women about food safety issues such as listeriosis (as discussed in previous section) and toxoplasmosis (Kravetz and Federman 2005b), along with deficits in knowledge about other prominent nutrition related issues such as folic acid supplementation (French et al. 2003; Watson et al. 2006), suggest that health professionals involved in the provision of pregnancy care are not effectively educating women about food and nutrition related issues. The following section reviews the available literature on the factors affecting food safety education within the antenatal care.

2.6.2.1 Knowledge of food safety issues

Knowledge and attitudes about food safety and understanding of food related risks are important among health professionals who have direct contact with susceptible groups such as pregnant women. Lack of enough knowledge about food safety issues among health professionals has been identified as one of the barriers to food safety education within the health system. Studies have investigated the food safety knowledge of both midwives and doctors, and also checked with pregnant women their views of the information competence of their health care providers.

One study has investigated the knowledge levels of midwives in relation to food safety and nutrition issues during pregnancy. Mulliner and colleagues (1995), in a mixed methods study of a random sample of 77 registered midwives in England, explored through survey and interviews their knowledge and attitudes to nutrition in pregnancy. Food safety was an area that 40 percent of midwives felt least confident to discuss with their pregnant clients. Also, 48 percent of respondents indicated that they felt unsure when discussing issues related to *Listeria* with pregnant women. Almost half of the sample received a poor score in nutrition knowledge and this was attributed by the authors to the fact that 86 per cent of midwives had received no education in nutrition following qualification.

The importance of food safety has been reported to be overlooked by doctors who are major contributors in pregnancy care. Kravetz and Federman (2005a) in a survey of 102 obstetricians, internists and family practitioners in Connecticut, USA, found that only a small proportion (15%) of internists and family practitioners identified eating undercooked meat as the primary risk factor for contracting toxoplasmosis. With regard to direct advice given to pregnant women, almost all obstetricians (98%) advised them to avoid raw meat, whereas only 64 percent of internists and family practitioners offered this advice. Overall, only half of the participants advised pregnant women to avoid unwashed vegetables to prevent toxoplasmosis.

Women's reflections on the health professionals approach to food and nutrition education during pregnancy have also been indicative of a poor level of food safety

education being provided by health practitioners. Ninety women, who were either pregnant or planning a pregnancy, participated in focus groups in a study carried out by Begley (2002) in Perth, Western Australia. Women stated that they often did not receive enough advice on good nutrient intakes for pregnancy because general practitioners, as their major source of information, lacked the necessary nutrition knowledge and did not have enough time to discuss the issue.

Although lack of perfect knowledge of food safety issues among pregnancy care providers is a recurrent finding in the literature, other factors also have been found to affect their practice. One of these factors has been the positioning of food safety issues, which is reviewed in the following section.

2.6.2.2 Positioning of food safety issues

Evidence from the literature indicates that even in the case of adequate food safety knowledge among health professionals, education can still be compromised because of the low priority of the issue in the educational agenda of pregnancy care providers. A focus group study by the International Food Information Council (2000) with a mix of physicians from specialties that treat patients at particular high risk for contracting a foodborne illness in four different states of USA showed that although physicians had a fairly accurate understanding of food risks to health, foodborne illnesses, clinical presentations and transport mechanisms for pathogens such as *E. coli*, *Listeria* and *Salmonella*, they were not forthcoming in providing advice to their clients. Major barriers to food safety education were lack of time, their intention to avoid inundating patients in health information and the belief that it was not their job to provide food safety advice. Food safety issues were low in their risk communication hierarchy and physicians believed that foodborne illness was less important than other topics such as heart health, smoking and drug/alcohol use (IFIC 2000).

Health professionals in a similar way did not consider food safety to be a health priority for women when planning a pregnancy. A survey carried out by Heyes and colleagues (2004) in Barnsley UK, also examined beliefs of preconception primary care workers on

the importance of different topics to be discussed with women planning a pregnancy. General physicians (n=117), practice nurses (n=68), midwives (n=28) and health visitors (n=58) who participated in the study agreed that advice about smoking cessation, drug/alcohol abuse, folic acid supplementation, genetic counselling, and screening for rubella, genital infections, hepatitis, HIV and cervical cytology were important in preconception care. However, they believed that advice about diet, food safety, exercise, occupational hazards and screening for nutritional status were of less importance for women planning a pregnancy.

In addition to personal notions of priority for food safety issues, external factors such as lack of resources may negatively affect the perceptions of health professionals about the priority of food safety issues. In a study to assess the opportunities and challenges for food safety education in Special Supplemental Nutrition Program for Women, Infants and Children (WIC) program in a midwestern state of the United States, Scheule (2004) examined the data from 170 professionals (dietitians and nurses) who responded to an open-ended questionnaire. Ninety percent of participants considered the food safety knowledge of their clients to be fair to very poor. However, only 52 percent of them reported offering food safety advice to their pregnant clients. Although food safety education was one of the components of WIC program, 43 percent of care providers reported a lack of handouts and instructional information to help them educate their clients and 20 percent indicated that food safety was not a priority in their job (Scheule 2004).

In order to identify the barriers to providing food-safety information Wong and associates (2004) surveyed a random sample of 1110 physicians in the USA. Although only 331 (30%) of 1110 respondents provided food-safety information to their patients, 524 (68%) of 769 who did not provide information expressed interest in doing so. Physicians were more likely to provide food-safety information to patients if they perceived foodborne disease to be a serious problem, perceived food-safety education as their role, felt that patients perceived them as a valuable resource for food-safety advice, or felt comfortable making food-safety recommendations.

Literature indicates that even in situations where food safety education is considered as a component of care it still may not be provided, since priority might not be given to the provision of some recommendations, no matter how important they are. Morales and colleagues (2004) in a qualitative study of health care providers' attitudes to food safety recommendations for pregnant women interviewed 23 pregnancy care providers including doctors, midwives, nurses, nutritionists, social workers and professionals who worked with the Special Supplemental Nutrition Program for Women, Infants and Children (WIC). They found that only one third of health professionals provided food safety information to their clients and the amount of time they spent talking about food safety with their patients ranged from zero to 15 minutes. The current food safety recommendations for pregnant women (Kendall et al. 2003) were not mentioned by any of the health care providers. However, WIC professionals, doctors, midwives and nurses tended to see it as their role to educate pregnant women about food safety, despite the fact that virtually none of them had received any formal training on food safety. It is not surprising that researchers have emphasised the need for continuing education of health professionals about food safety issues (Wallner et al. 2007).

Although studies have identified that health professionals who work with HIV positive patients (Hoffman et al. 2005) and patients with cancer (Medeiros et al. 2004a) acknowledge the importance of foodborne illnesses and are motivated to provide food safety information to their clients, findings with pregnancy care providers are controversial. Very few studies of maternity care have specifically addressed midwives' perspectives and practices on educating pregnant women regarding food safety issues. The findings of the current study can potentially contribute to the existing gap in our knowledge about midwives' perception of food related risks and their approach in provision of advice to pregnant women in this regard.

2.7 Summary

This section has described listeriosis as a disease of pregnancy and the challenges that both pregnant women and health professionals face in the prevention of this illness. This represents an important public health issue, worthy of further exploration. The

major attempts for *Listeria* prevention in Australia were reviewed and public health efforts in increasing women's *Listeria* awareness and knowledge were examined. It was noted that *Listeria* prevention at the individual level, in terms of avoiding particular types of foods and following safe food handling practices, takes place within the general context of women's knowledge of and views about food safety, as well as their normal food handling behaviours which may also include mistakes or malpractices. Review of literature on pregnancy care providers' approach to food safety education identified a number of factors as the major contributors to their practice with regard to food safety. Review of literature quite clearly indicated that there is a need for an exploration of the *Listeria* related issues from both women's and midwives' perspectives within the same setting to better inform future educational initiatives in this regard.

Part II: Conceptual framework

2.8 Introduction

The first part of this review outlined the significance of listeriosis as a public health issue during pregnancy and examined the adequacy of food safety knowledge and appropriateness of related practices of pregnant women to avoid *Listeria*. Perceptions of health professionals of the importance of foodborne illness in general and listeriosis in particular were also reviewed.

An in-depth investigation of lay and professionals' perspectives on the *Listeria* risk during pregnancy requires a broad interpretive approach based on sociological work on food related risk and the process of acquiring and evaluation of knowledge. This section explores the conceptual frameworks relevant to the current research, with a focus on the concepts of risk and knowledge.

This part commences with a review of the concept of risk in the context of pregnancy to introduce the notion of risk as defined by the biomedical scientific knowledge and to highlight the ideology of responsible motherhood as the main motive for risk aversion in antenatal period. This is followed by a review of the works that particularly deal with the notion of risk as pertaining to food and demonstrates how food has been

contextualised as a risk in post modern era and what strategies ordinary people have developed to manage their food practices with the least possible risk associated with it. It then describes the role of knowledge in lay people's understanding of risk and provides an overview of the sources of food related knowledge. Part II concludes with a review of theories of 'authoritative knowledge' and 'cognitive authority' as qualitative measures for establishing the authority and credibility of knowledge and in relation to the present thesis.

2.9 Concepts of risk

The concept of risk has multiple dimensions and is framed by various interpretations of data, use of language and other contemporary influences. To some, for example Slovic (2000), risk can be presented as the probability of or vulnerability to a disease, and also as the consequence or seriousness of a disease. In public health and health promotion, the word 'risk' can be a synonym for danger (Slovic 2000). Lupton (1999a) asserts that in lay people's language, risk tends to be used to refer to a threat, hazard, danger or harm. She argues that the term 'risk' is often conceptually used to describe a phenomenon that has the potential to do harm, whether or not the probability of this harm is estimable.

Risk also can be regarded either as a hazard which is external, over which an individual has little control (e.g. pollution, radiation) or internally imposed, as a consequence of the lifestyle choices made by an individual (e.g. using tobacco, alcohol, unsafe food), which is thus under self-control and self-management (Lupton 1999a; Bennett 2001). Risks that are believed to be internally imposed have been the target of health promotion and education efforts. Lupton (1995) notes that the main goal of these efforts has been to make people aware of the existing risks and encourage them to change their behaviour accordingly and make safer choices. A basic presumption underlying such education efforts is that all people interpret risks in a similar manner and are equally able to take action when a risk is identified (Bennett 2001).

Such concepts of risk, whether it is a threat and can do harm, and whether it is considered external or internal to self, are explored in the following sections in relation to pregnancy and to food.

2.9.1 Risk and pregnancy

Risk has become a central concept during pregnancy. A pregnant woman is no longer a single body, but one harbouring another human being that is typically represented as fragile, highly vulnerable, and susceptible to a range of threats and ills. It would be difficult for a pregnant woman not to become drawn into the discourses of risk that surround her since contemporary discourses on risk emerge from both expert and lay sources (Lupton 1999b). Within this environment of discourse on risk, it is experts who have a stronger influence since their knowledge is assumed to be based on science (Frewer et al. 1996).

Expert concepts of risk as applied to pregnancy relate to two types of risks: clinical risk and epidemiological risk. Clinical risk is based on the characteristics of case studies of individuals by experts. Epidemiological risk is calculated through the observation of patterns of disease in populations and the identification of associated risk factors. These approaches tend to describe the risks as calculable and controllable and problems that require actions (Lupton 1999b).

The notion of risk being calculable and under the control of the individual has resulted in contemporary health promotion activities becoming increasingly focussed on educating people about the risks to their personal health. Crawford (2004) asserts that such approaches to health promotion and education contribute to the 'pedagogy of danger' (pg. 508) where the main task of health professionals is not only identification of a risk, but also to communicate about the risk and ensure that such risks are taken seriously. Within this context, pregnant women are encouraged to be highly vigilant in looking after their bodies and to ensure that the health of their fetus is not compromised by their own actions. Some researchers assert that such messages can be considered to reinforce the preciousness of the pregnancy condition (Lupton 1999b).

Likewise, the maintenance of health and prevention of illness, that has been explicitly defined by health professionals as the active responsibility of individuals (Taylor and Field 2003), has to a large degree, extended into pregnancy. Maternal responsibilities have expanded from the care and nourishment of children and childhood socialization to the monitoring of childbirth, pregnancy and even into the pre-pregnancy period (Lupton 1995).

Those planning a pregnancy are advised by health professionals to prepare their bodies for motherhood. Women are encouraged to have a gynaecological check-up, maintain a good diet, exercise regularly, avoid alcohol, tobacco and other drugs, and take folic acid supplements to prevent the risk of spina bifida. After confirmation of pregnancy women are strongly advised not to smoke or drink throughout their pregnancy and avoid passive smoking, avoid having diagnostic X-rays and not to take medications and therapeutic drugs (Lupton 1999b). There are also a large number of food related recommendations that encourage women to have a good diet and maximise their vitamins (folate), minerals (iron and calcium), and omega-3 fatty acids intake, and to avoid certain types of foods to prevent the risk of infections such as listeriosis and toxoplasmosis or chemical toxics such as methyl mercury. There are also some newly emerged recommendations that invite pregnant women to limit their caffeine (coffee, tea, chocolate, and cola) and sugar substitutes intake (NSW Food Authority 2006).

It is expected that pregnant women should be self-sacrificing and obsessive on all aspects of their life to preserve the health of their baby. Lupton (1999b) argues that such proliferation of risk discourse around pregnancy and the assumption that women should take care to avoid risk as much as possible has rendered pregnancy a demanding experience for women.

The ideology of responsible motherhood is an important component to risk discourse and pregnancy and lies within the concept of risk being internal to self. In the modern model of antenatal care, pregnant women are considered as egoistic if they place their own needs and/or desires before those of the fetus, whose needs are of particularly moralistic significance (Lupton 1999b; Dodd 2003). Since a pregnant woman's choice

to engage in unsafe behaviours such as smoking or consumption of alcohol or high risk foods becomes directly associated with the health of her baby, a pregnant woman has the responsibility of monitoring her activities and imposing the least possible risk on her pregnancy. Under this discourse any defect or damage to the baby may be considered as mother's fault (Lupton 1999b; Ivry 2007) since a mother "does no harm" (Tardy and Hale 2000, pg. 456). Women have even been described as 'unnatural' and 'criminals' for allegedly endangering the health of their baby by engaging in 'at risk' behaviours (Blank 1992).

Along with the concept of motherhood, reflecting women's responsibility to avoid internal risks to their babies has been the medicalisation of reproduction over the last century. The idea that women are primarily responsible for 'producing' acceptable new members for their society has a long history in Western culture (Markens et al. 1997). What is particular to post-industrial societies is that the notion of maternal responsibility has been profoundly medicalised. Such medicalisation of reproduction has acted to intensify the idea that almost all aspects and stages in the process of reproduction should be controlled and women should deliver their bodies to medical surveillance and follow the biomedical directives and proscriptions (Ivry 2007). Medicalisation has thus, in some aspects, strengthened the notion of risk inherent in pregnancy. If a woman does not 'adhere' to appropriate, 'medically determined' procedures and practices, the risk to her baby is greater.

The 'risks' to pregnancy are thus both medically defined and yet perceived to be an internal responsibility. Women are caught in the middle of needing to take their own responsibility and at the same time needing to acknowledge and adhere to expert advice and guidance. How women navigate these tensions is important in understanding their responses to perceived risks during pregnancy. Lupton (1999b), argues that while expert advice and technologies play an important role in women's notions of risk and responsibility, women's understandings of risk are hermeneutic, established via acculturation and feeling, and are not simply rationalistic or based on cognitive assessments. This view is supported by empirical work by Markens and associates (Markens et al. 1997). Their interviews with 138 pregnant women enrolled in one of the

health maintenance organizations in California examined pregnant women's approaches to biomedical recommendations and proscriptions, from a feminist perspective. Their findings revealed that women accepted their individual (maternal) responsibility for birth outcome and were willing to accommodate the prenatal biomedical advice. However, acting within a 'complex web of intersecting demands', women pursued their dietary strategies within the constraints of time, money and an accustomed life-style.

Making fetal health a matter of maternal responsibility has mostly worked well because pregnant women, once made aware of the risks, tend to do everything in their power to minimise harm to their baby. However, women may not be expected to protect their unborn babies from risks about which they have limited understanding and skills to manage. Many of the food related recommendations may seem to be controversial, for Thus it is important to understand how food has been positioned as a potential risk during pregnancy and then to explore how women negotiate conflicting and often incomplete information about food-related risks. The following section examines the concept of food as an emerging risk and the way it is conceptualised within the works of socio-cultural studies. This examination will be used to inform the analytical framework of the study.

2.9.2 Emergence of food as a risk

Concerns about food safety are not new but framing of food as a risk is a relatively new area in social and behavioural sciences. Risk has increasingly entered debates about food since the 1980s, with food additives, salmonella in eggs, BSE (Bovine Spongiform Encephalitis or mad cow disease) in beef and genetically modified foods and has become central to 'expert' and 'lay' discourses (Shaw 2004). Media also had a major role in 'social amplification of risk' related to food (Frewer et al. 2002). A rapid expansion in academic work on risk has also occurred within sociology and related disciplines, particularly in relation to expert knowledge and lay understanding and positioning of various risks in post-modern era (Douglas and Wildavsky 1982; Beck 1992; Lupton 1999a, 2000).

A framework through which to understand the concept of risk of foodborne *Listeria* during pregnancy needs to take into consideration the many characteristics of contemporary risks. Firstly, unlike the obvious and external hazards of earlier times, risks in the contemporary world are considered to be hidden within the ordinary aspects of life. In relation to food, risks can reside in everyday foodstuffs: ‘...harmless things, wine, tea, pasta, etc. turn out to be dangerous’ (Beck 1992, pg. 51). Also characteristic of contemporary risks is the notion that lay people are unable to detect these hidden risks, and risks are only determinable through expert analysis. In relation to foodstuffs, the risks are often invisible (such as bacterial or chemical contamination) and consumers must rely on regulatory and monitoring systems for reducing and communicating about the risks (Green et al. 2003; Shaw 2004). Finally, the management of risk by the individual is often performed through complex assessment of diverse types of risks and balancing them against other sets of benefits and a background of conflicting advice, both from expert and lay sources (Green et al. 2003; Shaw 2004).

Research interest explicitly focusing on food and risk is relatively recent. In the mid 1990s a number of psychometric studies were undertaken to identify the underlying constructs and characteristics that drive individuals’ perception of food risks (Fife-Shaw and Rowe 1996; Frewer et al. 1996). Sociologists further developed such risk studies through qualitative methods to explore the broader social dynamics of food risks. They examined how people actively negotiated and constructed understandings of food risks within the social contexts and relationships of their everyday lives. For example, Macintyre and associates’ (1998) research on lay understandings of food ‘scares’, such as salmonella and BSE, suggested that health and safety concerns were balanced against other criteria in people’s food understandings and practices, such as habits, practicality and identity. Past research has identified that within the personal food systems that directs individuals’ eating routines, the issue of food safety should compete with other values in food choices such as taste, cost, time, convenience, and managing social relationships which are often of a higher priority (Connors et al. 2001). Similar findings were reported by Green and colleagues (2003) who undertook eleven focus groups with people from four key phases in life cycle (adolescents, young singles, female family

food purchasers, and older citizens). They demonstrated that while ‘risk’ and ‘safety’ were not always the primary discourses used to justify food choices, decision-making about food was presented as a routine practice, characterised by a number of ‘short cuts’ used in complex ways (Green et al. 2003). Järvelä and colleagues (2006) also reported on strategies that people adopt to simplify food choices vis-à-vis different types of food related risks. They used an Internet-based survey containing a food diary and open ended questions to investigate the notions of risk and safety and strategies to address them among 92 Finnish adults. The main risk management strategies found in this study were avoidance, vigilance, moderation, active control, relying on common sense, and being unconcerned. Researchers concluded that consumers used their food-related knowledge, based on the information they received, to create and justify these strategies (Järvelä et al. 2006).

Over the last decade, as research into food-related risks has developed, people’s routine decision-making about food choices has become more sophisticated as they accommodate increasingly complex information. Research into how lay people make sense of scientific information within their daily decision-making about food has become necessary, but to date has only been the focus of a small number of studies. Shaw (2002) interviewed individuals with varying perspectives on food and from different socio-demographic backgrounds including young people (n=6), parents with young children (n=5), older people (n=5), organic food eaters (n=6), vegetarians (n=5), and farmers/agricultural workers (n=5) regarding their understandings of genetically modified foods. She found that people’s understandings of the scientific, social and political issues surrounding genetically modified foods were complex. She found a strong link between individuals’ knowledge and their understanding of risk, where individuals illustrated the potential for ‘lay expertise’ within the context of complex and rapidly changing scientific development (Shaw 2002). In a later analysis, Shaw (2004) examined the discourses of risk, in the accounts of the same group of lay participants, of microbiological safety and BSE. She found that ideas of risk were either used interchangeably with ideas of chance, danger, safety or vulnerability, or closely linked with concepts of trust (in food products and producers), responsibility and blame (for health threats posed by food), or control and choice (in decision making about food related

risk) (Shaw 2004). The focus group study by McCarthy and colleagues (2006) in urban and rural areas of Ireland with participants from different age groups further confirmed these results. They found that among four food hazard categories (lifestyle, technological, microbiological, and farm oriented), microbiological hazards generated fewer worries. Consumers' relative familiarity with this type of risks resulted in increased confidence in ability to cope with and control them through different buying, cooking, and storage strategies in home (McCarthy et al. 2006).

Very little socio-cultural research has been conducted in Australia on how food related risks are perceived and represented. The main work has been done by Lupton (2005). The findings in her study of food risks in Australian lay discourses, through interviews with 40 people from Sydney as a metropolitan area and 30 people from Bathurst as a rural farming area, demonstrated basic differences in Australians' understandings of food risks compared with other Anglophone countries. She found that people were most concerned about dietary fat as a major risk for being overweight, and expressed their concerns in terms of 'balance', consumption of 'right' foods, importance of personal 'responsibility' for 'controlling' risk, and 'trust' in government bodies and health professionals to provide accurate information about food risks. Lupton (2005) suggested that regional, geographical, and national as well as other cultural differences should be taken into account when analysing the ways in which people understand risk and respond to it.

In summary, research into food-related risks and lay people's perceptions of food associated risks is relatively new and still evolving. The research to date indicates that research in this area needs to incorporate not only an exploration of people's knowledge levels and personal understanding of risk, but an account of regional and cultural differences. Hence the findings of the current study can make an important addition to current knowledge, which is primarily based on international studies.

2.9.3 Risks related to food during pregnancy

No socio-cultural research on the perceptions of food related risks during pregnancy has been conducted in Australia. Pregnancy has been the focus of only a few international studies addressing ‘food risk’ in public discourses. Our knowledge about pregnant women’s understandings of food-related risks, how much they view themselves and their baby susceptible to this kind of risk, and where they place it among their other health concerns, is limited. Although past research on food safety issues during pregnancy has not explicitly investigated the concept of risk, it indicates that food related risk is not a major concern for many pregnant women and they may fail to internalize the connection between risky food consumption during pregnancy and risk to the unborn child (Athearn et al. 2004).

Reports in the literature indicate that pregnant women generally tend to change their food related behaviours based on their perceptions of the risks and benefits associated with the consumption of certain foods. However, perceived risks may not always be related to scientifically defined safety issues. A number of dietary changes have been reported to be a function of women’s concerns about healthy eating and their conscious efforts to include more foods of higher nutritional value in their diet (George et al. 2005; Olson 2005; Sontrop et al. 2007). Pregnant women’s dietary practices have also been reported to be characterised by their food cravings and aversions (Bayley et al. 2002) or the cultural influences that describe certain foods as risky and lead to their exclusion from the diet during pregnancy (Andersen et al. 2003).

Changes in food behaviours based on perceptions of risk and safety have been the focus of a few studies. A survey of 148 pregnant and 130 non-pregnant women (overall response rate 67.5%) in Belgium found that a larger number of pregnant women reported avoiding foods with a risk of microbiological contamination such as raw meat, raw vegetables, raw fish and unpasteurised milk and cheese compared with non-pregnant participants (Verbeke and De Bourdeaudhuij 2007). Also, a larger proportion of pregnant women, compared with their non-pregnant counterparts, reported always washing their hands before eating, always washing their fruit and vegetables before consumption, and always preparing their meats well done. Researchers concluded that

since food safety practices during pregnancy resulted from women's concerns of avoiding risks to their pregnancy, these practices may not be long lasting since food related risks are less of a concern after the birth of the baby.

Risks associated with the consumption of certain types of foods (that are more likely to be contaminated with and allow the growth of *Listeria*) and certain food handling practices, fall within choices made by pregnant woman. Prevention of the illness caused by the bacteria can be considered to be under the woman's control and part of motherhood responsibilities. However, professional guidance and advice regarding food safety and how to avoid food related risks may also be considered an important risk management strategy and a core responsibility of health services and health care providers.

How a woman balances her decisions on avoiding food related risks with the pragmatics of her everyday life can be considered, in part, to be a function of how she processes different types of knowledge related both to food and to her pregnancy. Women's understandings of risk are based on a diverse array of information that they have processed on risks, as well as on the benefits from taking a risk within the context of their everyday life. Women receive information and form their judgements based on their past experience, communication from scientific sources and media, as well as from family, peers and other familiar groups. The following section explores different types of knowledge and the role they play in decision making about risk.

2.10 Knowledge

Knowledge, reason and rationality are highly valued in contemporary western thought and are considered as central to human well-being (Lupton 1995). Contemporary society has been described as 'knowledge society' where knowledge is power (Worsley 2002, pg. S579). In many public health theories (eg. health education / promotion theory and various models of behaviour change) knowledge is considered as central to behaviour change: if people are informed about the risks associated with certain practices, it is assumed that they would rationally use the information to weigh up the

risk and take the necessary actions to avoid it (Nutbeam and Harris 2004). Knowledge in most public health research and practice, has been considered as a major determinant of the individual's assessment and understanding of personal risk with regard to illness (Lupton 1999a). However, how people use knowledge and which knowledge they favour, may vary.

2.10.1 Role of knowledge in the understanding of risk

Several researchers have proposed that understanding of risk is based on prior knowledge. It has been suggested that risk assessment begins with some prior knowledge about the world and a judgement of what is 'probable' and what is 'unlikely', derived from scientific sources or an individual's 'common sense' or experiential sources (Fox 1999).

Johnson (1993) has suggested that there are two forms of knowledge, direct versus indirect, that affect lay people's perceptions of various types of risk in the context of their everyday life. Johnson asserted that examination of the roles of both direct and indirect knowledge is necessary to fully understand how people deal with risks. Direct knowledge is the knowledge that people acquire through their own lived experience, while indirect knowledge comes from others' experiences, including experts, social networks and media (Johnson 1993). Dibsall and colleagues (2002) in their study on the food-related experiences and beliefs of low-income English women carried out in-depth semi-structured interviews with 14 women (aged 40-60 years) and found that concerns about developing an illness were predominantly influenced by direct knowledge in terms of past personal or family experiences, and these experiences were important in shaping current dietary choices.

Other researchers have added to the idea of knowledge being based on experience, and introduced the notion that personal interest in an issue will influence knowledge seeking behaviour, knowledge accumulation and knowledge retention. Worsley (2002), for example, has argued that knowledge and interest are interrelated and that people accumulate knowledge about issues in which they are interested.

There is some evidence that women welcome, and indeed seek, health advice during pregnancy. Lazarus' (1997) ethnographic study of medical treatment of poor and working class Puerto Rican and white pregnant women in antenatal clinics revealed that women's search for knowledge embraced more than an awareness of biological processes of pregnancy. Women in Lazarus' study were interested in gaining knowledge about how to look after their pregnancy and about their options for a safe birth (Lazarus 1997). Other researchers have also suggested that pregnant women's interest in the process of pregnancy, safe development and the health of their baby may make them active information absorbers and good targets for health education (Anderson 2001; Kaiser and Allen 2002).

Education practices during pregnancy have other important roles in addition to knowledge dissemination. Increasing the confidence a woman feels in her practices during pregnancy has been found to be a function of the education practices employed. Empirical work supports the notion that new information requires explanation if it is to be assimilated. In a study to determine the important aspects of antenatal care from women's perspective to develop a woman-constructed model of antenatal care, Luyben and Fleming (2005) interviewed pregnant women who used routine antenatal care in Scotland (n=7), Netherlands (n=9), and Switzerland (n=7). They found that new information women received through antenatal care assisted them to feel confident about their practice only if they were able to understand it. To make this happen the information had to be explained so that women could take it on board and link it to the knowledge they possessed from the past (Luyben and Fleming 2005).

However, it cannot be assumed that even appropriately explained information will result in changes in behaviour (Foster and Kaferstein 1985). Previous studies have identified a range of factors affecting the way individuals act on the basis of their knowledge, determining whether knowledge affects attitudes and understandings of risk and translates into behaviour at all. There are ample of studies attempting to illuminate the ways knowledge impacts food related behaviours. However, most studies have failed to show a direct relationship between individuals' knowledge of benefits or risks associated with a certain practice and their actual performing of that practice (Worsley

2002). Neill and associates (2000) in their survey of 100 participants in Scotland found that taste and enjoyment, food habits and cost interfered with the knowledge of reasons underlying nutritional messages for healthy eating and affected the reported compliance. In another study, Clayton and colleagues (2003) investigated the factors underlying consumers' implementation of certain food safety practices in England. Observation of food handling practices of 40 consumers and determination of their food safety attitudes and knowledge using structured questionnaires revealed a lack of and/or inadequate implementation of a number of practices including hand washing, cleaning of surfaces and equipment and changing or washing utensils between use with raw and ready-to-eat foods, despite a high level of knowledge about the importance of these practices. Lack of time, laziness, and optimistic bias about their home kitchens were identified as the most important factors that faded the effect of knowledge on practice (Clayton et al. 2003).

Such researchers suggest that in order to appropriately target health education during pregnancy it is important to identify which mothers are likely or not to seek information, when is their interest greatest, and what information they seek. Szwajcer and colleagues (2005) in their in-depth interviews with 60 pregnant women or women planning a pregnancy from six different cities in Netherlands found that in each phase of pregnancy or preconception period women had specific information-seeking behaviours and different sources of information. They identified that women with a stronger sense of motherhood had a more active pattern of information seeking and used all the potential sources of information to gain a better knowledge about food related issues. However, women who did not feel like a mother during pregnancy and women in a subsequent pregnancy were more passive in their information-seeking behaviour and reported receiving their information from brochures provided by the midwife and midwife herself or relying on their common sense (Szwajcer et al. 2005).

Given the vast range of sources available for the acquisition of food related information, it is necessary to explore the influences of these sources on the construction of food safety knowledge and perceptions of food related risks.

2.10.2 Sources of food safety knowledge

Research reported in the literature indicates that consumers tend to gain their knowledge about various food safety issues from a range of different sources. Consumers' knowledge and their perceptions of food related risks seems to be constantly influenced by the stories published in the newspapers (Lupton 2004) and family and women's magazines (McVie 2006). People also gain part of their knowledge on food handling practices from the labels on food packaging (Redmond and Griffith 2005). However, the contribution of health professionals and government authorities such as environmental health officers in increasing food safety knowledge among the general public has been reported to be limited, although these sources have been reported to be considered the most trustworthy sources of information (Redmond and Griffith 2005).

The issue of trust in the source of information has been identified in the literature as an important determinant of whether information is internalised or not. Frewer and colleagues (1996) in a multi stage study using semi-structured interviews (n=35), repertory grid method (n=35) and a survey (n=888) found that trust in information about food related risks was linked to the perceived characteristics of the source of information such as accuracy and knowledge. For example, source category 'friends' tended to be trusted for information on 'lifestyle' hazards such as high fat diets and food poisoning and distrusted for information on technological hazards such as genetically modified foods and food irradiation, because of the perceived differences in the scientific knowledge of the general public in these two areas. Medical sources were also found to be viewed as 'expert' in medically related areas since this is the nature of their knowledge base. Researchers, however, asserted that belonging to the group designated as 'expert' may not automatically lead to trust and a history of distorted or wrong information may result in serious mistrust (Frewer et al. 1996).

Personal values may also influence the use and evaluation of sources of food related information. Worsley and Lea (2003) in their postal survey of a random sample of 603 adult South Australians (response rate 71%) found that personal values such as power (related to authority, wealth, social power, preserving public image), tradition (related to devout, respect for tradition, honouring of parents and elders, helpful) and security

(related to family security, inner harmony, social order and self-discipline) were strongly associated with use of and trust in a particular source of information. They also found that use of and trust in a particular source were independent entities and not necessarily related. For example, while the mass media sources were trusted most by people with high power, tradition and security values, only participants with high power values tended to use the mass media as their source of nutrition information.

Pregnant women are exposed to food related information in the same way as other members of the community. However, perhaps due to the active information seeking behaviours during pregnancy (Szwajcer et al. 2005), they have been reported to obtain their food safety knowledge from a wider range of sources including health professionals, their lay network, books and Internet (Cline and Haynes 2001; Cates et al. 2004; Lewallen 2004; Jackson et al. 2005; Ogunmodede et al. 2005). Research reported in the literature has indicated that people who were concerned about healthy eating because of an underlying condition such as weight control or disease management were particularly influenced by ‘formal’ sources of nutrition information such as health professionals (Falk et al. 2001). However, the situation may be different in pregnancy. Despite more frequent contacts of women with health professionals during pregnancy and higher levels of trust in the science based knowledge of pregnancy care providers, the reports on health professionals’ contribution to the construction of health and food related knowledge during pregnancy have been controversial (Halliday and Hogarth-Scott 2000; Woteki 2001; Schneider 2002; Erci and Ivanov 2004; Jackson et al. 2005; Ogunmodede et al. 2005; Puder et al. 2005; Erdem and Harrison-Walker 2006).

A better understanding of women’s perceptions of credibility of various sources of food safety knowledge during pregnancy, use of them, and the influence of these sources on women’s decision making processes regarding their food, is necessary to inform education initiatives at both community and health sector levels. These issues will be examined in this research.

Theories that deal with the authority of knowledge will be important to provide a framework within which to interpret the study findings. These theories can also provide qualitative cognitive criteria for investigating the perceived credibility of various sources of knowledge to which women are exposed. The next section deals with issues related to the authority of knowledge. It examines the literature on how perceptions of authority may affect decision making processes and practices as pertained to pregnancy.

2.10.3 Evaluation of knowledge

The ‘authority’ of knowledge is important in determining whether knowledge is acted upon or not. Past research indicates that lay people are active interpreters of medical knowledge. Lay people have been found to pick and choose, using and discarding information according to their own thoughts and cognitive processes as well as the social structures and environmental pressures in which they live (Browner and Press 1996; Dibsda11 et al. 2002). Similarly, pregnant women tend to acquire their knowledge about issues related to their pregnancy, including that of food safety, from a host of different sources. This makes it necessary to investigate the ways they evaluate the authority of their information sources and accept the information as trustworthy and reliable.

A number of approaches have been proposed for understanding how the authority of knowledge is evaluated or assessed by people. ‘Authoritative knowledge’ has been proposed by Jordan (1997) as the knowledge that counts in a particular situation such as pregnancy and makes women take the appropriate action, mostly to avoid a risk. ‘Cognitive authority’, described by Wilson (1983), is the basis on which an individual decides whether a particular source of knowledge is credible and trustworthy. These two approaches will be used to inform the evaluation of food safety knowledge by pregnant women in the present study and hence are examined in the next section.

2.10.3.1 Authoritative knowledge

Authoritative knowledge as defined by Jordan (1997) is “the knowledge that participants agree counts in a particular situation, on the basis of which they make

decisions and provide justifications for the courses of action. It is the knowledge that within a community is considered legitimate, consequential, official, worthy of discussion, and appropriate for justifying particular actions by people engaged in accomplishing the tasks at hand” (pg. 58). Jordan (1997) asserts that “the label ‘authoritative’ is intended to draw attention to [the status of a body of knowledge] within a particular social group and to the work it does in maintaining the group’s definition of morality and rationality. The power of authoritative knowledge is not that it is correct but that it counts” (pg. 58).

Jordan has developed the concept of ‘authoritative knowledge’ based on her study of birth in four culturally different communities (Yucatan, Netherlands, Sweden, and United States) in the mid-1970s. She described the confrontation of western highly medicalised process of birth with the indigenous women’s will for a self-control over reproduction (Jordan 1993). Since Jordan’s work, studies of authoritative knowledge have been used to clarify how social differences in power, authority, prestige, and access to resources shape pregnancy care and birthing practices.

As Jordan (1997) points out, authoritative does not necessarily mean repressive nor does it imply a lack of contradictions or a steady condition in which knowledge or norm is unchanging. Davis-Floyd and Sargent’s (1997) collection of essays that have used Jordan’s concept of ‘authoritative knowledge’, illustrates how in prenatal care and birth ‘authoritative’ is described as a set of rules on the basis of science or expert knowledge that is intended to reduce uncertainties and provide guidance (Davis-Floyd and Sargent 1997). Root and Browner (2001) note that many pregnant women have gained benefits from the presence and role of authoritative knowledge in their lives, some of which, such as information about the hazards of tobacco use during pregnancy, have yielded important advances in maternal and infant well-being.

Authoritative knowledge may also be reinforced through published materials. Chiu (1997) suggests that obstetric textbooks reinforce a construction of the birthing woman as a passive entity, in contrast to lay pregnancy books that differently construct the mother as an active agent with valid knowledge. Other studies have found that parenting

manuals present medical knowledge as more authoritative than parents' own knowledge (Marshall and Woollett 2000).

Jordan's concept of authoritative knowledge has been used in a number of studies to investigate the role of technology, as well as the role of women's intuition and their embodied knowledge, and the role of professional knowledge and medical approaches in pregnancy care and particularly in labour (Georges 1996; Hays 1996; Davis-Floyd and Sargent 1997). The number of studies that have used this concept in relation to antenatal care is, however, limited.

One of these studies was undertaken by Browner and Press (1996) who focussed on the prenatal period to examine the role lay women play in constructing a domain of authoritative knowledge as they decide which medical advice to incorporate into their own practices and which to ignore. They conducted semi-structured interviews with 158 pregnant women who were enrolled in antenatal care at one of the health maintenance organizations located in southern California, and examined the changes women made in their lives due to their pregnancy and the sources of information on which these changes were based. They identified that women evaluate information from diverse authoritative sources in a dynamic manner prior to incorporating what they consider relevant into their own self-care. They also found that women did not always accept biomedical advice as authoritative, but considered it in relation to their own experiences and life circumstances (Browner and Press 1996).

In order to understand how social processes and contexts work to negotiate authoritative knowledge, Ketler (2000) compared the social settings and teaching organisation of two differently structured childbirth education classes in Cagliari, Italy, using both observation and interview methods. In one class, instructors (midwife, paediatrician, psychologist) directed the sessions, information flowed from instructors to the participants in a formal setting and there was limited interaction between participants and instructors and among participants themselves. Conversely, the sessions in the other class were dominated by spontaneous interactions, in that women frequently interacted with each other as well as with the course instructors who were midwives. Women were

highly satisfied with the latter class since listening to the experiential knowledge reassured them about their various concerns during pregnancy and addressed their psychological needs. Ketler concluded that experiential knowledge can be considered as authoritative as biomedical knowledge since it provided women with a sense of security and agency over their pregnancy.

For the purpose of this study, biomedical authoritative knowledge is defined as food safety recommendations intended to protect the health of women and their fetus against *Listeria* infection during pregnancy.

No studies have examined how authoritative knowledge is constructed around food related issues during pregnancy and the way it affects women's decisions on which food safety directive to incorporate into their practices and which to ignore.

Authoritative knowledge can come from a variety of sources, some of which is personal experience but much is relayed from others in the form of 'second-hand knowledge'. This concept of 'second-hand knowledge' and the ways people manage to establish its authority have been developed further by Wilson in his concept of 'cognitive authority'.

2.10.3.2 Cognitive authority

Wilson (1983) developed the cognitive authority theory from social epistemology in his book, *Second-hand Knowledge: An Inquiry into Cognitive Authority*. The fundamental concept of Wilson's cognitive authority is that people construct knowledge in two different ways: based on their first-hand experience and on what they have learned second-hand from others. What people learn first-hand depends on the stock of ideas they bring to the interpretation and understanding of their encounters with the world. Thus people primarily depend on others for ideas as well as for information outside the range of direct experience. That is, much of what they think of the world is what they have gained second-hand.

Wilson (1983) argues that all people know of the world beyond the narrow range of their own lives is what others have told them. However, people do not consider all information as equally reliable; only those who are deemed to “know what they are talking about” become cognitive authorities. Wilson introduced the term cognitive authority to explain the kind of authority that influences thoughts that people would consciously recognize as being proper.

Individuals thus need to employ strategies to determine the authoritativeness of various information sources. Wilson (1983) described the outcome of this process of ranking the relative authority of information sources as ‘cognitive authority’. He identified some of the criteria that people used to determine the authority, including credibility, competence, expertise, and trustworthiness. He also described several bases on which individuals made authority decisions, including occupational or educational expertise, success in an endeavour in the field, a good reputation among others in the field, endorsement by someone else whom one considers an authority, and intrinsic plausibility, persuasiveness or personal trust.

Wilson made several points about cognitive authority. First, it involves a relationship of at least two people. No one can be an authority by himself and there has to be someone for whom he is an authority. Second, cognitive authority is a matter of degree; a little or a lot of it can be possessed. Third, cognitive authority is relative to a sphere of interest. On some questions, a person may speak with authority but on other questions with none at all. Finally, cognitive authority relates to credibility: “the authority’s influence on us is thought proper because he is thought credible, worthy of belief” (pg. 15). That is, cognitive authorities are among those regarded as credible sources of information (Wilson 1983).

Wilson suggested that it was not always individuals in whom people recognize authority. Cognitive authority could also be found in published materials, organizations and institutions (Wilson 1983). The first consideration to recognise the authoritativeness of a text is recognition of authorship. A text can be trusted if it is the work of an individual or a group of individuals whom can be trusted. The second consideration is

the cognitive authority associated with the publisher. Government bodies and scientific institutions are among those that may acquire this authority. Document type and the content of the text have also been suggested to affect the perceptions of authority (Wilson 1983).

Cognitive authority may provide a measure of quality/credibility control in information retrieval. Cognitive authority decisions can be considered to be the result of underlying cognitive processes, that is, based on the information seeker's interpretation of source characteristics, in light of a body of beliefs and attitudes that the information seeker has developed from the past. When people look for information, or are exposed to it, they interact with individuals or texts. Each information source has its own nature and aspects of authority and credibility which are not always consistent. For example, when facing a person who is talking about a particular subject, people may ask: "can one believe what this person says, or can one take it seriously?". The same is true with the texts. When people find the information, they may ask: "do I need to look further, or can I take this source as settling the matter?" (pg. 171) Only if people are convinced of the authority of the source, their question is answered and the knowledge may influence their subsequent decisions (Wilson 1983).

Authority issues have received much attention in education, information science, computer science and human-computer interaction (Rieh 2005). Application of this theory seems appropriate to investigate the information seeking process during pregnancy since women tend to consider pluralistic sources of knowledge in relation to their pregnancy. The study by McKenzie (2003) is perhaps the only investigation of information seeking during pregnancy using Wilson's cognitive authority. Using a constructivist discourse analysis of in-depth interviews with 19 women pregnant with twins, as a specific group of information seekers, McKenzie identified the context-specific discursive techniques that they used in enhancing or undermining the authority of peer and professional information sources. She found that although pregnant women used the rhetoric of risk to enhance the position of biomedical knowledge, they had broadly accepted other sources of knowledge such as their peers and their own experience as 'authoritative'. Thus experiential knowledge and biomedical knowledge

coexisted in women's discourses of pregnancy and their practices were reported to be a product of interaction between specific varieties of authoritative knowledge (McKenzie 2003).

Wilson's theory indicates that people recognise the knowledge authorities based on their cognitive judgments which are subjective, relative, and situational. However, they may not be able to describe their reasons on a quantitatively measurable scale. Hence the concept of cognitive authority may be particularly useful in the qualitative investigation of people's justifications and assessments of authority related to various sources of knowledge.

The concept of cognitive authority, therefore, may be a useful concept to assist in understanding the basis on which pregnant women decide whether a particular information source with regard to *Listeria* is authoritative or not. Using this concept in relation to sources of information regarding *Listeria*, this study will investigate the ways in which individuals' cognitive authority decisions operate within the prevailing forms of authoritative knowledge that are held as legitimate and official by participants in the context of pregnancy.

2.11 Conclusion

The second part of this chapter reviewed the relevant literature on theoretical work about risk and knowledge. It built on the first part of the chapter which highlighted the significance of knowledge and perceptions of risk by both lay women and pregnancy health care providers to minimise the risk of *Listeria* infection in the antenatal period.

Conceptual analysis and empirical research from a range of social science disciplines in the area of risk as related to food and pregnancy were examined. A number of key concepts in the literature were identified. It was noted that in the new public health era women are responsible for the outcome of their pregnancy and are expected to follow biomedical directives and proscriptions based on expert knowledge to avoid every possible risk to their baby. It was also noted that food associated risks were perceived to

be internal to the individual, a product of personal choices and practices and, as a result, under one's control. Key aspects of knowledge and its relationship to the lay understanding of risk were described. Concepts of 'authoritative knowledge' and 'cognitive authority' and their role in the evaluation of knowledge and establishing the trustworthiness of different sources of knowledge, as related to the current research, were also reviewed.

The conceptual and empirical work reviewed in this part was used to inform the present study. Socio-cultural studies of food related risks provided framework and insight for the investigation of the *Listeria* as a risk during pregnancy. The concepts of authoritative knowledge and cognitive authority were found to be useful in the evaluation of knowledge surrounding food safety and *Listeria* during pregnancy. As such, research questions were investigated within a broad sociological perspective. The methodological aspects of this research are presented in the next chapter.

3 Methodology

3.1 Introduction

The issue of food safety and *Listeria* risk during pregnancy was investigated in the present study through a mixed methods research design, using both quantitative and qualitative methods of data collection and analysis. Researchers have long debated the relative value of quantitative and qualitative inquiry. However, both methods contribute to the understanding of phenomena. While logical positivism or quantitative research uses experimental methods and quantitative measures to gather descriptive data and test generalizations, qualitative research uses a naturalistic approach that seeks to understand phenomena in context-specific settings. Each represents a fundamentally different paradigm and addresses different questions, and researcher actions are based on the underlying assumptions of each inquiry (Patton 2002). Mixed methods research, on the other hand, is a combination of quantitative and qualitative methods of research that tends to use whatever approaches that work for studying a particular problem and to make data collection and analysis more accurate and the inference more useful.

A quantitative study was performed within the mixed methods framework of the current research to assess pregnant women's food safety knowledge, food practices/preferences and opinions, and perceptions of risk with regard to *Listeria*. Because of the limited existing knowledge on what underpins women's and midwives' perceptions of food-related risks during pregnancy and considering that qualitative methods are particularly useful in studies of an exploratory nature, a qualitative approach also was used to investigate how the issue of food safety was conceived during pregnancy from women's and midwives' perspectives. The findings from the qualitative studies were aimed to inform the results of the quantitative part of research and will help in formulating appropriate food safety education strategies for this group.

This chapter will first outline the philosophical backgrounds of quantitative and qualitative paradigms as well as mixed methods inquiry. This is followed by a description of the mixed methods design and strategies selected for this study and an account of quantitative and qualitative methods of data collection and analysis that addressed research questions within the mixed methods framework.

3.2 Research paradigms

A paradigm as defined by Guba and Lincoln (1994), “may be viewed as a set of basic beliefs that deals with ultimates or first principles. It represents a worldview that defines, for its holder, the nature of the world, the individual’s place in it and the range of possible relationships to that world and its parts” (pg. 107). According to Creswell (2003) paradigms in human and social sciences help us understand phenomena. They advance assumptions about the social world, how scientific inquiry should be conducted and what constitutes legitimate problems, solutions and criteria of proof. As such, paradigms encompass both theories and methods (Creswell 2003). Social and behavioural inquiries can be carried out within a quantitative, qualitative or mixed methods paradigm (Creswell 2003). The following sections provide an overview of these research paradigms, informing the rationale behind the selection of mixed methods to carry out the current study.

3.2.1 Quantitative research

Quantitative research is framed within a positivist paradigm. Positivism is a philosophy first developed by the French philosopher August Comte in the middle of the 19th century who stated that the only authentic knowledge is scientific knowledge, and that such knowledge can only come from positive affirmation of theories through strict scientific method (Tashakkori and Teddlie 1998). The positivist approach according to Atkinson and Hammersely (1994) is the view that “social research should adopt scientific method, that this method is exemplified in the work of modern physicists, and that it consists of rigorous testing of hypotheses by means of data that take the form of quantitative measurements” (pg. 251). This philosophy has governed the ‘scientific method’ or ‘quantitative research’ during the first half of the 20th century.

The major characteristics of traditional quantitative research are a focus on deduction, confirmation, theory/hypothesis testing, explanation, prediction, standardized data collection and statistical analysis (Johnson and Onwuegbuzie 2004). Those who follow a strongly positivist approach believe that social observations should be treated as entities in much the same way that physical scientists treat physical phenomena. They also suggest that the observer is separate from the entities under research, that time- and context-free generalization is possible and the real causes of social outcomes can be determined in a reliable and valid way. According to this school of thought, quantitative researchers should eliminate their biases and test or empirically justify their stated hypotheses (Tashakkori and Teddlie 1998).

Quantitative research performed within the positivist paradigm has many strengths. The quantitative researcher may construct a situation that eliminates the confounding influences of many variables, allowing one to assess in a more credible manner cause-and-effect relationships. This kind of inquiry provides precise, numerical data with a relatively less time consuming data analysis because of the use of statistical softwares. Research findings are generalisable when they have been replicated on different populations or subpopulations and when the data are based on random samples of sufficient size. Finally, quantitative research findings may have higher credibility with many people in power such as administrators, politicians and people who fund the programs (Creswell 1994; Johnson and Onwuegbuzie 2004).

Quantitative inquiry, however, has some weaknesses as well. Data are collected out of context of real world situations, usually time-specific and strictly dependent on the questions asked. As a result, the knowledge produced may be too abstract and general for direct application to specific local situations, contexts and individuals. Also, the researcher's presumptions may not reflect local constituencies' understanding of a particular problem and researcher may inappropriately extrapolate from one set of data to a range of other populations and circumstances (Creswell 1994; Johnson and Onwuegbuzie 2004).

3.2.2 Qualitative research

The qualitative paradigm includes a wide range of philosophies from constructivist and naturalist approaches to phenomenology and post-modernism perspectives which began as a countermovement to the positivist tradition in the second half of the 20th century and constitutes the backbone of qualitative inquiry (Guba and Lincoln 1989; Guba 1992; Creswell 1994; Guba and Lincoln 1994). Central to the qualitative research paradigm is the view that “observation cannot be pure in the sense of altogether excluding the interests and values of individuals and investigations must employ empathic understanding of those being studied” Howe (1988) (pg. 11).

The major characteristics of traditional qualitative research are induction, discovery, exploration, theory/hypothesis generation and qualitative analysis. The researcher is the main ‘instrument’ of data collection in this type of research (Johnson and Onwuegbuzie 2004). Advocates of this paradigm contend that multiple-constructed realities abound, that it is impossible to differentiate fully causes and effects, that logic flows from specific to general, and that knower and known can not be separated because the subjective knower is the only source of reality (Johnson and Onwuegbuzie 2004).

Qualitative research, broadly defined, means “any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification” (Strauss and Corbin 1990, pg. 17). Where quantitative researchers seek causal determination, prediction, and generalization of findings, qualitative researchers seek instead illumination, understanding and extrapolation to similar situations. Qualitative analysis results in a different type of knowledge than does quantitative inquiry (Strauss and Corbin 1990).

Qualitative methods are particularly relevant to the new public health, given their emphasis on the need to both describe and understand people. While quantitative data are useful in statistically explaining public health issues, they may mask people’s interpretations and understandings and their interactions with others. Qualitative methods provide insight into how people make sense of their experience and allow an understanding of the context issues (Rice and Ezzy 1999).

Qualitative inquiry is a strong means for researchers who aim at describing complex phenomena and conducting cross-case comparisons and analysis. Qualitative approaches are responsive to local situations, conditions and stakeholders' needs and qualitative data in the words and categories of participants lend themselves to exploring how and why phenomena occur. However, it takes generally more time to collect the data and data analysis is often time consuming. Also, the results can be influenced by the researcher's personal biases and idiosyncrasies and knowledge produced may not be generalisable to other people or settings (Malterud 2001; Patton 2002; Johnson and Onwuegbuzie 2004).

In the past, advocates of quantitative and qualitative research have engaged in a 'paradigm war', with both sets of pursuits viewing their paradigm as the ideal for research (Howe 1988). However, more recently researchers have employed mixed methods as a rapidly developing field of social science methodology to compensate for limitations of each of these paradigms (Tashakkori and Teddlie 2003).

3.2.3 Mixed methods research

Mixed methods research as defined by Johnson and Onwuegbuzie (2004) is "the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study" (pg. 17). Pragmatism is the school of thought behind mixed methods research. Pragmatism advocates the use of mixed methods in research and acknowledges that the values of the researcher play a large role in interpretation of results (Tashakkori and Teddlie 2003). Pragmatic researcher's knowledge claims arise out of actions, situations, and consequences rather than antecedent conditions (Creswell 2003). There is a concern with applications – 'what works' – and solutions to problems (Patton 2002). Instead of methods being important, the problem is more important and researchers use all approaches to understand the problem. As a philosophical underpinning for mixed method studies, Tashakkori and Teddlie (2003) and Patton (2002) express the importance for focusing on the research problem in social science research and then using pluralistic approaches to derive knowledge about the problem.

Since pragmatism is not committed to any one methodological paradigm (Cherryholmes 1992; Creswell 2003), it provides the chance for researchers to draw from both quantitative and qualitative assumptions when they engage in their research. As a result, researchers have a freedom of choice. They are free to choose methods, techniques and procedures of research that best meet their research needs and purposes (Creswell 2003). Pragmatists look to many approaches for data collection and analysis rather than applying only one way (i.e. qualitative or quantitative) to reach a better understanding of the research problem. Mixed methods research provides the researcher with the opportunity to examine the overlapping and different facets of a problem, to find new perspectives and to add scope and breadth to the study (Creswell and Plano Clark 2007).

A mixed methods approach was adopted for the current research. The mixed methods design was selected in relation to the broad sociological framework as well as the nature and purpose of the study. A more detailed argument on research paradigm and method is provided in the following section.

3.3 Research paradigm and method

According to Patton (2002) a “paradigm of choice” that seeks “methodological appropriateness” is the primary criterion for judging methodological quality (pg. 68). This will allow for a “situational responsiveness” that strict adherence to one paradigm or another will not (Patton 2002, pg. 68). Newman and Benz (1998) also contend that the purpose of the study and research questions dictate the selection of research methods and understanding the centrality of the questions guides the researcher in all decisions during a research project.

Since the aim of this study was to gain insight into lay and professionals’ perceptions and understandings of *Listeria* as a risk during pregnancy to ultimately inform future educational initiatives for the prevention of foodborne illnesses and *Listeria* infection in pregnancy, it was essential to investigate as many aspects of the issue as possible. As a result, a mixed methods research with a pragmatic approach was deemed most appropriate.

In the present study the researcher based the inquiry on the assumption that collecting diverse types of data best provided an understanding of the positioning of *Listeria* in lay discourses of pregnancy. By using both quantitative and qualitative data the study was able to give insight into women's food safety knowledge and practices as well as the underlying socio-cultural determinants of *Listeria* risk perception among pregnant women and midwives that neither type of analysis could provide alone.

In accordance with Greene et al. (1989) the researcher's main reasons and purposes of combining methods in the current study were: (a) triangulation (i.e. seeking convergence and corroboration of results from different methods in studying the same phenomenon), (b) complementarity (i.e. seeking elaboration, enhancement, and clarification of the results from one method with results from the other method), (c) development (i.e. using the findings from one method to help inform the other method), and (d) expansion (i.e. seeking to expand the breadth and range of research by using different methods for different inquiry components) (Greene et al. 1989, pg. 258-260).

3.3.1 Research design

Mixed methods research can be carried out within four different designs. These include triangulation design, embedded design, explanatory design and exploratory design (Creswell and Plano Clark 2007). These approaches vary according to the sequence, nature and emphasis of how quantitative and qualitative techniques are employed in data gathering and analysis processes throughout the study.

A triangulation design was selected for this research. Triangulation design is probably the most familiar of four major mixed methods designs (Creswell and Plano Clark 2007). The purpose of this design is "to obtain different but complementary data on the same topic" (Morse 1991, pg. 122) to best understand the research problem. It is selected as the design when a researcher uses two different methods in an attempt to confirm, cross-validate or corroborate findings within a single study (Kelle 2006). This design generally uses separate quantitative and qualitative methods as a means to offset the weaknesses inherent within one method with the strengths of the other method.

Within this design the priority can be equal between two methods but in practical application the priority may be given to either quantitative or qualitative approach (Tashakkori and Teddlie 2003; Morse et al. 2006).

For the purpose of this study a concurrent triangulation design (Tashakkori and Teddlie 2003) was adopted, which means that the quantitative and qualitative data collections were concurrent, happening during the same time frame. This design usually integrates the results of the two methods during the interpretation phase by comparing and contrasting them (Creswell and Plano Clark 2007). The interpretation either may note the convergence of the findings as a way to strengthen the knowledge claims of the study or must explain any lack of convergence that may result (Tashakkori and Teddlie 2003; Johnson and Onwuegbuzie 2004).

Concurrent triangulation design is advantageous because it can result in well-validated and substantiated findings. In addition, the concurrent data collection results in a shorter data collection time period as compared with that of sequential designs. While this design benefits from the strengths of both quantitative and qualitative inquiries, it also has a number of limitations. It can be difficult for a single researcher to carry out, because the two approaches are expected to be used concurrently. In addition, the researcher needs to learn about multiple methods and understand how to mix them appropriately. Finally, some of the details of concurrent triangulation design, such as the problems of paradigm mixing and how to interpret conflicting results, remain to be worked out fully by research methodologists (Creswell 2003; Tashakkori and Teddlie 2003; Johnson and Onwuegbuzie 2004; Kelle 2006; Creswell and Plano Clark 2007).

Using the concurrent triangulation design, the study started with the distribution of a quantitative survey questionnaire among pregnant women while in-depth qualitative interviews were simultaneously conducted with pregnant women and midwives. The main purpose of concurrent triangulation strategy in this study was therefore to use the qualitative results to explain more clearly, to better interpret and to expand and explain the findings of the quantitative study. The steps taken in the study are presented in Figure 3.1.

Please see print copy for image



Figure 3.1 Concurrent triangulation design (Tashakkori and Teddlie 2003)

Based on this design, each part of project (quantitative and qualitative) was designed to be complete in itself and was performed in accordance with its methodological assumptions. The findings were conceptualized deductively for the quantitative component and inductively for the qualitative component. However, as Morse and colleagues (2006) contend, maintaining the theoretical drive is central to the validity of mixed methods research. Theoretical drive is the overall inductive or deductive direction of a research project that guides the use of different methods and the interpretation of results (Morse et al. 2006). Given the major role of the qualitative component of this study in exploring underlying factors that shaped women's and midwives' perceptions and positioning of *Listeria* risk within a sociological framework, the overall theoretical drive of the study remained inductive. That is, the results of the qualitative part were used to inform and provide explanations for the findings of the quantitative part (Tashakkori and Teddlie 2003; Morse et al. 2006).

3.4 Study population and sampling issues

A convenience sample of three hospitals within the geographical boundaries of the SESIAHS, NSW, was selected for this research. Study sites were selected on the basis

of providing antenatal services (antenatal clinic and/or antenatal classes) at the time of study and also having a large number of pregnant women in attendance. A cross section of hospitals was selected to maximise the generalisability of the findings. One of the hospitals was a private regional hospital and the two other ones were major public hospitals. Details of the study sites were provided in *Chapter 1*. The study population consisted of all pregnant women attending antenatal clinic and/or antenatal classes within the three hospitals and also all midwives involved in providing antenatal care in the same settings. It was not possible to select more than three hospitals due to budget and time constraints.

Mixed methods sampling strategies are combinations of, or intermediate points between, the quantitative (probability) and qualitative (purposive) sampling. Teddlie and Yu (2007) assert that in a mixed methods research the sample should be drawn in a way that addresses the research questions and focus on both depth and breadth of information across the research strands. A purposive sampling framework was selected for this study since it involved selecting participants from settings that were likely to reveal the processes being studied (Silverman 2000).

3.5 Research process

Data collection and analysis in the current research were performed within a mixed methods framework with a concurrent triangulation design. Two components of research were carried out as independent studies within quantitative and qualitative inquiries and the findings were pulled together for analysis and interpretation of results. The following section addresses the issues of sampling, data collection and analysis, rigour, and ethical considerations in the quantitative and qualitative components, respectively.

3.5.1 Quantitative study

The quantitative component of the study was conducted to provide a picture of current situation of *Listeria* awareness among pregnant women in the area and to collect information on pregnant women's knowledge, practices/preferences, opinions and

perception of risk on food-related issues with an emphasis on *Listeria*. The researcher acknowledges past studies indicating that survey data tend to illustrate a more positive picture of consumer food safety practices than data obtained from observations of actual food preparations (Anderson 2002; Kendall 2002; Redmond and Griffith 2003a). However, observation of pregnant women's food handling practices was neither feasible nor within the scope of the current study. The survey questionnaire was designed to be self-completed and anonymous to reduce the potential for social desirability bias (Redmond and Griffith 2003b).

3.5.1.1 Sampling

Though the sampling design adopted in this study was not random sampling, the researcher minimised error by statistical calculation of sample size (Utts and Heckard 2004). The sample thus, with a power of 80% and a minimum detectable difference of 0.045 (e.g. between high and low level income or education subgroups or high and low level food safety knowledge subgroups) was estimated at 500 (Utts and Heckard 2004), which meant that the analysis required data gathered from a sample of at least 500 pregnant women. To ensure that a sufficient number of completed questionnaires were returned, a total of 940 questionnaires were distributed at the study sites, and data from all 586 returned questionnaires were used for the analysis.

3.5.1.2 Recruitment

Within the purposive sampling framework, the researcher recruited the participants through initial permission and volunteering. The head of the maternity unit in each hospital was contacted in person. In the meeting to request permission to conduct the research in their units, details of data gathering procedures and ethical issues were discussed with the head of maternity unit and antenatal clinic managers and consent forms and information sheets were presented. The researcher preceded with the study after permissions were granted from the selected hospitals to approach pregnant women attending antenatal clinics/classes and midwives providing antenatal services. The specific issues related to sampling for quantitative and qualitative components of the study are discussed later in this chapter. All pregnant women attending antenatal clinic

and/or antenatal classes at the study sites over the period of April to October 2006 were approached. The overall aim of the study, although provided in the opening paragraph of the survey, was verbally explained by the researcher and women were invited to take part in the study by completing the survey questionnaire. Due to the differences in the waiting time spent before the antenatal visit, pregnant women's participation in the study differed slightly between different sites. Pregnant women in Site **A** were invited to take part in the study by completing the survey questionnaire in the clinic waiting area, because the relatively long waiting time allowed them enough time (approximately 20 minutes) to do so. They were asked to put the completed questionnaires in a sealed box provided on the reception desk. Pregnant women in Site **B** were found to not have enough time to fill out the questionnaire at the clinic because of the relatively short waiting time. As a result, they were asked to take the questionnaire home and send it back in a postage paid addressed envelope. Finally, there was no antenatal clinic present at Site **C**. Pregnant women were invited to take part in the study when they came to book for their birthing and were again asked to take the questionnaire home and return it in a postage paid addressed envelope after completing it. All three sites provided antenatal classes at the time of study. Pregnant women attending antenatal classes in all three sites were invited to participate by taking the questionnaire home and returning it in a postage paid addressed envelope. No questionnaire was received through the mail after January 2007.

Recruiting pregnant women from both public and private hospitals aimed to access a cross section of the population from different socio-economic backgrounds in order to investigate the possible effect of these variables on women's *Listeria* knowledge, practices, preferences and opinions. It also provided the chance of comparing *Listeria* knowledge and practice among women with public and private health covers, to explore the possible differences in the provision of antenatal care.

3.5.1.3 Survey instrument development

The first step in the development of survey instrument was to generate an item pool and deciding which items should be included in the instrument (Parmenter and Wardle

2000). A list of foods and practices relevant to the prevention of listeriosis was compiled based on the existing standard recommendations for pregnant women to avoid foodborne listeriosis (Kendall et al. 2003; FSANZ 2005; NSW Food Authority 2006). Knowledge, practice/preference and opinion questions were then developed based on questions used in previous studies in Australia (Stafford et al. 1998; Torvaldsen et al. 1999; Begley 2002) and overseas (Redmond and Griffith 2003b; Athearn et al. 2004; Medeiros et al. 2004b).

The survey instrument (Appendix D) was designed to be self-completed and was divided into seven parts. The opening paragraph of the questionnaire introduced the researcher and provided a general description of the study aims and confidentiality and anonymity issues. This section was followed by the first part containing questions on the source of food safety information during pregnancy, perceived trustworthiness of the source of information and ranking of the most familiar risks during pregnancy.

The second part of the questionnaire aimed to collect data on participants' knowledge of *Listeria* related issues and had two components. The first component assessed participants' understanding of appropriate food handling techniques known to be important in the prevention of foodborne illnesses, particularly listeriosis. The two last questions in this part addressed women's general knowledge on foodborne illnesses and listeriosis during pregnancy. Respondents were required to judge whether statements were 'True' or 'False' by ticking the appropriate box. A 'Don't know' option was also provided to reduce the distorting effect of guessing in case respondents were uncertain about the correct response. Responses were treated as dichotomous variables where correct responses scored 1 point, while incorrect and 'Don't know' responses scored 0 points. The last two questions were not included in the calculation of respondents' scores for this part. Scores ranged between 0 and 5 with higher scores indicating higher levels of understanding on food handling techniques.

The second component addressed women's knowledge of high *Listeria* risk (HLR) foods. Participants were required to select HLR foods from among a list of six options where one of the choices (hot take-away chicken portions) was wrong. A 'Don't know'

option was also provided, in case respondents could not distinguish any of HLR foods. Each correct response scored 1 point, giving a range of scores between 0 and 6 with higher scores indicating higher levels of knowledge about HLR foods.

The third part of the questionnaire was designed to examine participants' opinions on a number of food-related issues. This was a multidimensional scale with the purpose of exploring women's opinion on different issues that have been identified in the literature as important barriers to safe food behaviours with regard to *Listeria* (Torvaldsen et al. 1999; Begley 2002; Redmond and Griffith 2003b; Athearn et al. 2004). The scale addressed issues including the perceived importance of hygiene, women's perception of *Listeria* risk and their perceived control over the food-related risk, contradictory health messages, temptation of eating a HLR food, unawareness, and optimistic bias. These questions used a balanced Likert-type five point scale for the responses (from 'strongly agree' to 'strongly disagree'), appropriate for questions relating to attitudes (Medeiros et al. 2004b).

Data on food practices/preferences were collected in part four. Respondents were asked to report the frequency of consumption of ten food items during pregnancy (e.g. daily, 2-3 times a week, weekly, fortnightly, monthly, rarely, never). Six items from the list are considered to be HLR foods (cold deli or luncheon meats, soft cheeses, smoked fish served cold, foods containing raw fish, dips or spreads, and purchased pre-prepared vegetable salads). Cooked fish fillets/cutlets and foods containing raw egg are considered to be high risk foods with regard to high levels of mercury and salmonella infection, respectively. Hard cheeses and fresh vegetable salads are safe food choices for pregnant women. Given the focus of the current study on eating practices related to *Listeria*, only HLR foods were considered in the analysis. Participants were given a point based on the recorded frequency of consumption of individual HLR foods (0 point for a reported consumption frequency of daily / 2-3 times a week / weekly, 1 point for a reported consumption frequency of fortnightly/monthly and 2 points for a reported consumption frequency of rarely/never) and an overall food consumption score was calculated (minimum 0 and maximum 12), with higher scores indicating lower risk practices.

Part five of the questionnaire sought information on food handling practices during pregnancy. Participants were required to report the regularity of performing seven food handling procedures particularly important in the prevention of listeriosis (e.g. never, occasionally, frequently, most of the times, always). A point was given to each participant based on the regularity of performing each procedure (0 point for a reported frequency of never/occasionally, 1 point for a reported frequently, 2 points for a reported frequency of most of the time, and 3 points for always) and an overall food handling score was calculated (minimum 0 and maximum 21) with higher scores indicating lower risk practices.

The aim of part six of the questionnaire was to explore pregnant women's self-reported confidence in being able to follow the recommendations to avoid HLR foods. Women were asked to answer the questions on a five point Likert-type scale (from not confident at all=0 to quite confident=5).

The last part of the survey instrument sought women's demographic and socio-economic information including age, stage of pregnancy, marital status, parity, first language, postcode, level of education, health cover and household income, together with reporting on whether the pregnancy was planned or not.

3.5.1.3.1 Readability

To be of use, questionnaires need to be readable by the intended respondents. Since the survey questions were developed based on food safety and *Listeria* recommendations for pregnant women and previous research suggested that the educational materials targeting pregnant women on this issue were of a low readability (Shaw 1995), it was important to make sure that the survey instrument was readable and comprehensible for respondents with different educational levels. Since methods for assessing readability usually produce similar results (Oakland and Lane 2004), a reading grade level was determined using the Readability Statistics feature in the Spelling and Grammar Tools for Microsoft Word. This feature calculates a reading grade level based on the Flesch-Kincaid readability formula (Chall 1996). The questionnaire was found to have a

Flesch–Kincaid grade level of 7.6, indicating that the language used was expected to be understandable by an average student in 7th grade.

3.5.1.3.2 Validity

The content-related validity of the survey was ensured in a number of ways. As a first step, questions were compared with the list of relevant elements extracted from literature to check that previously identified issues were considered (Streiner and Norman 2003). Academic staff in the School of Health Sciences from different disciplines (including nutrition, public health and midwifery) were subsequently asked to comment on questionnaire content, interpretability, and response format and layout and to suggest modifications (Parmenter and Wardle 2000). Relevant changes to the questionnaire were made at this stage. Finally to further ensure content validity, a pilot with 10 volunteer women who had given birth in the past 24 months was conducted to determine whether the questions were understood, and to evaluate other formatting details. Adjustments were made to the survey tool following the pilot study.

3.5.1.3.3 Reliability

The alpha Cronbach test (Cronbach 1951), as a measure of internal consistency, was used to examine the reliability of questionnaire after data were collected. Although the test-retest method could potentially lead to a better evaluation of reliability of the questionnaire prior to the implementation of the study, it was found to be very difficult to recruit a group of volunteers and to administer the survey to the same group at a later date. As a result, the alpha Cronbach test was used as a model of internal consistency, based on the average inter-item correlation after the completion of survey. According to Streiner and Norman (2003) reliability is a statistical concept based on the association between scores representing the measurement obtained from the instrument when it is used with a group of individuals. It was contended that reliability coefficients can take on values from 0 to 1.0 inclusive. Conceptually, if a reliability coefficient were 0, there would be no ‘true’ component in the observed score. On the other hand, if the reliability coefficient were 1.0, the observed score would contain no error and it would consist

entirely of the ‘true’ score. While it is desirable to obtain high reliability coefficients, coefficients of 1.0 are very rare indeed (Streiner and Norman 2003).

The reliability of five components of the survey including ‘knowledge on food handling techniques’, ‘knowledge on HLR foods’, ‘food practices/preferences’, ‘food handling practices’ and ‘confidence in following the advice’ was calculated. Each of these sets of questions was meant to measure different aspects of a single attribute. Women’s ‘opinion’ (part 2 of the questionnaire) was not considered for the examination of alpha Cronbach because it was a multidimensional scale. Except for one component, the α coefficients were either equal to or greater than 0.7, which suggest the scales had good internal consistency. The alpha coefficient for ‘knowledge on food handling techniques’ was 0.60 suggesting fair internal consistency. It was concluded that the questionnaire had satisfactory internal validity, as more than half of the components had an alpha coefficient greater than 0.7 (McKinley et al. 1997; Pettersen et al. 2004). The reliability results for different components of the questionnaire are presented in Table 3.1.

Table 3.1 Cronbach’s α coefficient of five components of the survey

Scale	Cronbach’s α coefficient
Knowledge on food handling techniques ($n=549$)	0.60
Knowledge on HLR foods ($n=582$)	0.72
Food practices/preferences ($n=551$)	0.71
Food handling practices ($n=534$)	0.70
Confidence in following the advice ($n=586$)	0.93

3.5.1.4 Statistical analysis

Analysis of data was performed using Microsoft Excel 2003, Epi-Info (version 3.2.11, 2004) and the Statistical Package for the Social Sciences (SPSS version 12.0). Data gathered from the 586 questionnaires were analysed for descriptive and inferential analysis.

As the first step, frequency distributions for all variables were examined for missing, unlikely, or out-of-range values and when detected were checked against the original data source.

Inferential analysis consisted of both bivariate and multivariate analysis. Bivariate analysis, including Chi-square and Fisher exact tests, were used to investigate the association between various socio-demographic factors and women's responses to different knowledge, practice, opinion and confidence components. Analyses of knowledge and practice variables were adjusted for age group and the socioeconomic status. To adjust for confounders, logistic regression analysis was conducted. To avoid an overly complicated presentation of the results by inclusion of a large number of non-significant variables, demographic and socio-economic factors found in Chi-square test to be significantly associated ($p < 0.05$) with women's knowledge, practices and opinions were entered into the regression analysis at each step and those which remained significant were retained (Tabachnick and Fidell 1996).

Logistic regression analysis was used to identify the predictors of women's knowledge, practice, and opinions on *Listeria* related topics. Logistic regression is more flexible than other techniques. It has no assumption about the distribution of the predictors. The predictors do not have to be normally distributed, linearly related or of equal variance within each group. The predictors could be a mix of continuous, discrete and dichotomous variables (Tabachnick and Fidell 1996). The goal of logistic regression was to find the best-fitting and most reasonable model to describe the relationship between *Listeria* knowledge, practices and opinions (dependent outcome) and demographic and socio-economic variables (independent predictors).

The results of logistic regression analysis are presented as adjusted odds ratios. The odds refer to the probability of being in one of the categories of knowledge, practice or opinion by independent variables. As a measure of association an odds ratio (OR) has some special features. First it is easier to interpret. If the odds ratio is greater than one ($OR > 1$), it indicates a higher chance of the outcome occurring versus not occurring. Secondly, an odds ratio provides a measure of both magnitude and direction of the

association. Thirdly, the odds ratio accompanied by a confidence interval (CI) will provide additional information about the precision of the estimated odds ratio and a statistical test of its significance (Tabachnick and Fidell 1996). The results of these analyses are presented in the next chapter.

3.5.1.5 Ethical considerations

A number of key ethical issues were considered to protect the rights of participants in this research and to ensure that no harms happened to them as a result of their participation. The principle of ‘voluntary participation’ required that people not be coerced into participating in this research. Closely related to the notion of voluntary participation was the requirement of ‘informed consent’ which meant that research participants had to be fully informed about the procedures involved in research and give their consent to participate. Ethical standards also required the privacy of research participants to be protected. The participants’ ‘confidentiality’ had to be maintained assuring that identifying information would not be made available to anyone who was not directly involved in the study. Another standard was the principle of ‘anonymity’ which meant that the participants had to remain anonymous throughout the study.

Ethics approval for the project (including both quantitative and qualitative components) was obtained from the University of Wollongong / SESIAHS Human Research Ethics Committee on March 2, 2006 (Appendix C). The study also received approval from the Human Research Ethics Committees of the three study sites. The main ethical issues related to the quantitative component of the study were informed consent, confidentiality and anonymity.

Informed consent: Participants were considered to have consented to take part in the study if they completed and returned a questionnaire.

Confidentiality: Confidentiality of responses was assured through the anonymity of questionnaires. No identifying information was included on the questionnaires. Each questionnaire was allocated a number before being handed to participants. This number

was used only keep the record of response rate and to track the related electronic record after the data were entered into the computer. All completed questionnaires were kept in locked filing cabinets during the course of study.

3.5.2 Qualitative study

The main purpose of the concurrent triangulation design chosen for this study was to use the results from the qualitative methods to explain more clearly, to better interpret and expand the findings of the quantitative study. Pregnant women and midwives understandings of food safety issues and their views on the risk of *Listeria* during pregnancy were explored using a qualitative study. This involved in-depth semi-structured interviews with both pregnant women and midwives and an interpretive content analysis of interviews. Data collection and analysis procedures as well as issues relating to rigour and ethical considerations within this inquiry are discussed in this section.

3.5.2.1 Sampling

The qualitative part of the study was carried out on a non-probability purposive sample of pregnant women and midwives from the three hospitals. Purposive samples are samples in which the researcher uses some criterion or purpose to replace the principle of cancelled random errors. “The logic and power of purposive sampling lies in selecting information-rich cases for study in depth” (Patton 1990, pg.169). Drawing samples from a group (subpopulation) that is accessible by the researcher and volunteer to take part in the study, is one of the most commonly used purposive sampling techniques. Issues taken into consideration included accessing a wide range of views and sufficiency of the sample in terms of saturation of data, that was when no new information emerged from the interviews (Patton 2002).

By selecting both public and private hospitals at different sites, access to pregnant women from different socio-economic backgrounds was sought, assuming that those from higher socio-economic groups with the potential of having private health insurance were more likely to use the services of private hospitals. Clients at public hospitals are

likely to be drawn from a wide range of socioeconomic backgrounds, but lower socioeconomic groups tend to be in higher proportion. Including both public and private hospitals also enabled access to midwives, providing care in both settings.

It should be noted that all the interviews were carried out in English. This may have had an impact on the findings, because the SESIAHS has a significant population from NESB. Employing interpreters was however not feasible both because data analysis was based on using participants' 'own' words and costs and time involved were prohibitive.

3.5.2.2 Recruitment of pregnant women

The initial plan of action was to put A3 size posters (Appendix E) on the notice boards of antenatal clinics, birthing units, reception desks and waiting areas of study sites to invite pregnant women to take part in the interview. However, this proved to be ineffective, as no pregnant woman contacted the researcher during the first three weeks of study, and in the whole course of study only one woman volunteered for the interview by just reading the notice. This may have been due to the possible shortcomings of the poster, in terms of design and attractiveness on one hand, but also to the crowded and unappealing notice boards in the designated areas. As a result, a more active type of recruitment was adopted by handing the Participant Information Sheet (Appendix G) together with the survey questionnaire to all pregnant women who attended antenatal clinic/classes in the three study sites. This provided the opportunity for the researcher to give a brief verbal explanation of the research, and to ask them to carefully read the Information Sheet and contact the researcher if they were interested in taking part.

Volunteers contacted the researcher through email or phone. As one of the ethics requirements, the interviews had to be carried out in the hospital setting to enable any negative effect to be addressed that might have arisen as a consequence of taking part in the research. The main purpose of this precaution was that if a woman became distressed then professional staff would be available to assist. However, this did not occur. An appointment was therefore made with most of the volunteers for their next

antenatal visit, although a small number of them agreed to come for the interview at another more convenient time. All interviews took place in a private location, in the hospital's meeting room or interview room. Vacant midwife staff rooms were used in a number of cases when other spaces were not available.

3.5.2.3 Recruitment of midwives

Midwives were approached through the manager of the maternity unit. The researcher was given the opportunity to attend a number of midwives' meetings to briefly explain the aim of study. Midwife Participant Information Sheets (Appendix H) were distributed at the same occasions and midwives were asked to carefully read through it and contact the researcher if they were interested in taking part. Midwife Participant Information Sheets were also left at the manager's office to be handed to midwives who were not present in the meetings. In addition, A3 size posters were put on the notice boards of managers' offices and midwives' tea rooms, inviting midwives to participate in the interviews (Appendix F). It should be noted that midwives involved in providing antenatal care were specifically targeted for this research and midwives from other sections of the maternity unit (e.g. birthing unit and neonatal care unit) were not approached for participation. Ethical issues concerning the recruitment of midwives through their manager are discussed later in this chapter.

3.5.2.4 Interviews

Interviews are used to gather information regarding an individual's experiences and knowledge, opinions, beliefs, and feelings with questions designed to determine past or current information as well as predictions for the future (May 1991). An 'issue-focused', in-depth, semi-structured interview technique was chosen for this study as it allowed the exploration of meanings and interpretation of participants' experiences in a subjective sense from their own perspective and in their own words (Rice and Ezzy 1999; Patton 2002).

In-depth interviews involve not only asking questions, but the systematic recording and documenting of responses coupled with probing for deeper meaning and understanding

of the responses (LeCompte and Schensul 1999). The interviews with both pregnant women and midwives were carried out using a schedule of questions as a guide to assist the dialogue between the researcher and interviewee (Appendices K and L). The questions were reviewed by the research supervisors and other colleagues at the School of Health Sciences before they were used in the interviews. The interview guide was used as a reminder to ensure that the issues of interest were covered in each interview, without undue reference to the order of the questions or their specific wording. Supplementary questions were used to clarify and expand on the points raised. At times prompts were made by the researcher to further explore topics out of participants' responses. Careful consideration was given to communication and listening skills to establish appropriate relationships between the researcher and those interviewed to maximize the quality, reliability and validity of the data obtained. The researcher also made certain that those interviewed clearly understood that the researcher did not hold any preconceived notions about the topic and that her personal perspectives were not involved in the interviews.

A cover sheet was used to record factual information such as time, date, and place of the interview. Also, any special conditions or circumstances that could affect the interview were recorded. Information about the interviewees, including their age, parity, stage of pregnancy, level of education and employment for pregnant women, and age and number of years working as a midwife for midwives, also were noted on the cover sheet.

All pregnant women and midwife participants signed a consent form before the interviews (Appendices I and J). Participants' permission was sought for recording the interviews and none of the participants refused to be recorded. All interviews were recorded using an Olympus digital voice recorder (model DS-2200). Recording the interviews provided an accurate record of all the participants' responses. Recording the data also provided the researcher with the opportunity to focus on the interview itself, follow the course of responses in a reflective way and explore interesting points as they arose. Furthermore, recording gave the chance of listening to the interviews later on and to gain a better understanding of what was said. Overall, none of the participants

seemed to be concerned about recording and conversations flowed easily in individual interviews. After the interviews all participants were thanked for taking part and a brief explanation was made of what would happen next. Pregnant women received as a gift an educational package on food safety issues and *Listeria* prevention provided by the New South Wales Food Authority. As soon as possible after each interview, field notes were written down that detailed observations, feelings, interpretations and comments on that interview as well as participants' non-verbal communications.

3.5.2.5 Qualitative analysis

Qualitative analysis started with verbatim transcription of each interview at the shortest possible time after the interview was conducted. Verbatim transcription refers to the word-for-word reproduction of verbal data, where the written words are an exact replication of the audio-recorded words (Poland 1995). Poland (1995) asserts that "the very notion of accuracy of transcription is problematic given the inter-subjective nature of human communication, and transcription as an interpretative activity" (pg. 292). An accurate record of the interview has been considered to be necessary to facilitate data analysis by bringing researchers closer to their data (Poland 1995). It has also been considered beneficial for researchers to transcribe their own interview data, given that they have first-hand knowledge from their involvement in the interview process and the advantage of having participated in both verbal and nonverbal exchanges with the participants (Poland 1995). Therefore, all the recorded interviews were transcribed in full by the researcher.

A great deal of time was spent ensuring that transcripts were as complete and accurate as possible. Interviews were transcribed verbatim using Olympus Transcription Module (DSS Player Pro, version 4). This involved a straight transcription of all words, with added symbols to capture extra-linguistic information, i.e. short and long pauses, stressed words, and emotion (e.g., laugh). However, for the purpose of this thesis, participants' accounts are presented in a way that clearly show what they said and features of normal conversation (e.g. "umm" and pause) are not included because these

did not contribute to the analysis. Since all interviews were carried out and transcribed by the researcher, issues of interviewer bias were eliminated.

Analysis involved determining the meaning in the information gathered in relation to the purpose of the study and looking for themes, commonalities and patterns to make sense of the information (LeCompte and Schensul 1999). Analysis was conducted through multiple readings of the interview transcripts to identify themes using the constant comparative method. In the constant comparative method the researcher identifies a theme in the data then compares it with other themes and instances in the same document or in other documents to determine similarities and differences. Data are then grouped into categories and patterns are sought (Maykut and Morehouse 1994).

Coding of the transcripts as the first step of analysis was performed with the aid of QSR NVivo 7.0 software (QSR International Pty. Ltd. 1999-2006). This allowed the researcher to both categorise and search the data using different features of the program, in a way that would be very time consuming using card- or paper-based methods. The word document file of transcripts were imported into the program and the coded text of transcriptions were saved using the 'Nodes' feature of the program. 'Tree Nodes' were used to represent the concepts and categories in the data which were logically related, as they could be organized in a hierarchical structure (i.e. category, subcategory). 'Free Nodes' were used as containers for 'loose' ideas which were not conceptually related to other nodes in the data. As the coding progressed, some of these were moved into a logical place in the 'Tree Nodes'. Themes and categories and their relationship were developed and manipulated to build up an understanding of the relationship between categories and subcategories. The process was constantly refined to move from purely descriptive categories drawn from participants' accounts to more conceptual categories and subcategories (Gibbs 2002) to identify various layers of women's and midwives' perceptions of *Listeria* risk and the factors that affected their decision making process in this regard. List of final coding is provided in Appendix M.

3.5.2.6 Rigour

Rigour in terms of validating the findings should occur throughout the steps in the process of qualitative data collection and analysis (Patton 2002). Validity in qualitative research does not carry the same meaning as it does in quantitative inquiry and is expressed in terms such as ‘trustworthiness’ and ‘credibility’ (Creswell 2003). As a measure of credibility direct quotes of respondents as related to each theme are presented in the analysis. Examples of participants’ responses to illustrate themes assist in demonstrating the credibility of the qualitative analysis. In addition, indications of the frequency of themes or the proportion of participants who presented similar views also enhances credibility (Silverman 2000; Patton 2002). As an examination of rigour, research strategies including audio recording, transcript auditing, keeping field notes, and keeping a thematic log during interviews were adopted. Additionally, operational techniques, including purposive sampling, triangulation and referential adequacy were employed to ensure further credibility of information.

3.5.2.6.1 Research strategy

Recording of interviews. Recording aimed to counter criticism of qualitative research as ‘prone to systematic bias’ (May 1991). Recording in-depth interviews facilitated credibility and dependability of the data collection procedure.

Transcript auditing. Transcript auditing aimed to ensure accuracy. Auditing transcripts involved careful listening, reading, re-reading, and ‘preliminary thematic identification’ of the recorded and transcribed text (Miles and Huberman 1994). It was a lengthy process but it was important in getting close contact and familiarity with the data and, consequently, in gaining confidence in its overall trustworthiness (Boyatzis 1998).

Field notes. Keeping field notes contributed to the credibility and dependability of the study. Field notes are ‘analytical in themselves’ in that they contain ‘immediate and later perceptions and thoughts’ about the research participants (Rose and Webb 1998). As such, field notes became another ‘data source’ that contributed to credibility and

dependability in the context of data triangulation (Rice and Ezzy 1999) and offered a vehicle for reflection about the research process.

Thematic log. A thematic log was kept during the interviews as part of the field notes, and this added to the overall accuracy (Miles and Huberman 1994). The thematic log was used to summarise the interview, noting immediately in the field any themes that captured ideas that were credible to the participants (Miles and Huberman 1994).

3.5.2.6.2 Operational techniques

Purposeful sampling: Purposeful sampling contributed to credibility (Atkinson and Hammersley 1994) because participants were sought on the grounds that they were likely to have and share an understanding of food safety and *Listeria* related issues. Transferability was facilitated because sampling aimed to include ‘the widest possible range of information’ (Guba and Lincoln 1989) by recruiting both pregnant women and midwives.

Triangulation. Triangulation is a means of strengthening the credibility of findings by using several methods, data sources, theoretical perspectives or investigators to study the phenomena (Malterud 2001; Patton 2002). Triangulation was used in terms of using multiple perspectives to interpret a single set of information (Morse 1991), i.e. interviewing both pregnant women and midwives to gain a holistic view of the issue of food safety and perceived food-related risks during pregnancy from the perspective of different stakeholders. It was important to explore midwives’ viewpoint on food safety issues in general and *Listeria* in particular, because they are one of the main providers of care and health-related advice throughout the course of pregnancy and the literature has identified them to be one of the most trusted sources of information for pregnant women.

Referential adequacy. Referential adequacy, according to Lincoln (1995), is a process that occurs as the research progresses and involves the study of different referent groups. Literature shows that women from lower socioeconomic backgrounds are more

likely to be ambivalent about food safety directives (Sammarco and Ripabelli 1997; Redmond and Griffith 2004). Previous studies have also indicated that pregnant women at younger age groups, single mothers and those from rural areas (Stafford et al. 1998; Torvaldsen et al. 1999) as well as women from particular ethnic backgrounds (Ogunmodede et al. 2005; Puder et al. 2005) tend to have poor perceptions of the risks associated with *Listeria*. As a result, referential adequacy in this study was sought by sampling pregnant women and midwives from different settings. The main attempt was to include pregnant women and midwives from public and private hospitals, in both regional and metropolitan areas. Pregnant women from different socio-demographic backgrounds (first-time versus second and more time pregnancies, teenage versus older age pregnancies, and women with public versus private health cover) were interviewed to enable collection of rich and informative data. Also, participants were enrolled in a range of different types of antenatal care within the public and private settings. This provided the opportunity to compare and contrast the issue of food safety and *Listeria* risk from the perspective of recipients of different types of care and explore the possible variations in terms of the provision of food-related information and advice.

3.5.2.7 Ethical considerations

Ethical standards for the conduct of this research were discussed earlier in this chapter. Ethical considerations related to the qualitative component of the study are presented in this section.

Informed consent: All participants had volunteered to take part in the interview. In the case of midwives, while the manager of maternity unit in each hospital was approached to gain approval for conducting the research and introduced the researcher to the midwife staff, it was made clear to the midwives that their involvement in the study was completely voluntarily and confidential and their decision to participate or not to participate would not affect their relationship with the SESIAHS or the unit in which they were employed in any way. An information sheet explaining the purpose of project was given to each participant in both the women and midwives groups (Appendices E and F). This sheet contained the contact details of the researcher and her supervisor,

should participants feel the need to discuss any issues that would have arisen as a consequence of their participation in the interview.

Care was taken to ensure there was no detrimental effect as a result of the interview process. Participants were given enough time, prior to and following the interview, to raise any questions or concerns they might have in relation to the project and interview process. Before the interview it was reiterated to the participant that the interview was strictly anonymous, and no one other than the researcher would know who took part; the participant should try to be as open and honest as possible; there were no right or wrong answers to the questions; the participant should indicate any question they were not happy about answering, and it would be passed over; and that the participant should feel free to discontinue her participation in the study or halt the interview at any stage. All participants signed a Consent Form (Appendices G and H) before the interview.

Confidentiality and Anonymity: Confidentiality of participants' identifying information was assured in different ways. Participant's name, contact details and informed consent materials were stored in a secured filing cabinet. Electronic files of interviews were transferred to a password protected computer, and a copy of each interview file was saved in a separate folder. Word document files of transcripts were also saved in a password protected computer and in separate folders for pregnant women and midwives. Although it was not possible for the participants to remain completely anonymous because of their taking part in the interviews, the researcher insured the anonymity by replacing the participants' names in the transcripts with pseudonyms. As such, the participants would not be identified by their real name in the reporting of study findings.

3.6 Conclusion

Mixed methods inquiry with a concurrent triangulation design was chosen for this research, based on the assumption that collecting diverse types of data best provided an understanding of food safety issues in general and *Listeria* in particular from lay and professional perspectives. The study began with a broad survey of pregnant women to

investigate the current situation and explore the possible factors influencing their knowledge, practice and opinions on *Listeria* related issues. At the same time, the researcher carried out in-depth qualitative, open-ended interviews with pregnant women and midwives to collect detailed views from participants and obtain their specific language and voices about the topic. Several methods of verification were employed to ensure the validity and reliability of data collected from both surveys and interviews. The next chapters will outline the findings of quantitative and qualitative inquiries that have been developed from the research questions.

4 Survey Results

4.1 Introduction

The quantitative inquiry that was adopted for data collection and analysis within this mixed methods research aimed to elaborate on the food safety knowledge and related practices and opinions among pregnant women with an emphasis on *Listeria*. It also aimed to describe in a general way pregnant women's perception of food-related risks associated with *Listeria* and investigated the relationship between women's level of food safety knowledge and their self-reported behaviours and opinions in this regard. An examination of background socio-demographic factors associated with women's *Listeria* knowledge and practices was also important to this study because it allowed an identification of groups who may be more likely 'at risk'.

This chapter starts with an outline of data collection procedure and issues related to response rates. This is followed by a description of characteristics of pregnant women who took part in the survey and continues by information on women's sources of information about *Listeria* and perceived trustworthiness of these sources. Descriptive statistics of participants' level of knowledge of high *Listeria* risk (HLR) foods and safe food handling techniques along with their practices in terms of consumption of HLR foods and carrying out particular safe food handling practices are then provided together with an analysis of factors that affected each of them. The chapter continues with an examination of participants' perception and positioning of *Listeria* risk and concludes with an examination of pregnant women's opinions about food safety and *Listeria* risk and their confidence in being able to follow food safety recommendations to avoid *Listeria*.

4.2 Data collection

All pregnant women in the three study sites regardless of their ethnicity and other attributes were approached and invited to take part in the study. However, as the survey instrument was in English, pregnant women from non-English speaking background (NESB) with lower English literacy did not volunteer to participate. There were also English-speaking women who refused to take part in the survey. The main reasons stated for refusing to participate were 'not feeling well', 'not interested in research' and 'not involved in food handling and preparation at home'.

A total of 586 pregnant women participated in the study by returning the questionnaires. Four hundred and fifty five self-administered questionnaires were distributed in one of the public hospitals among pregnant women to be completed while they were waiting for their antenatal appointment (Site **A**). Women were asked to put the completed questionnaires in a sealed box provided on the reception desk. Four hundred and twenty questionnaires were collected from this site (response rate=92%). Of 485 women in the other public hospital (Site **B**) and the private hospital (Site **C**) who were asked to take the questionnaire home, 166 sent it back in the prepaid envelopes (response rate = 34%).

The research was found to be affected by self-selection bias because of the low response rate of participants from two out of three study sites (**B** and **C**) who sent the questionnaire back through the mail. Due to the lack of access to women's records further follow up of non-responders to increase the response rate was not possible and no information about the socio-economic and demographic characteristics of this group was available. As a result, a comparison was made between participants' characteristics in Site **A** with that of participants from Sites **B** and **C** to further explore the potential differences between the two sample groups.

It was found that women who sent questionnaires back through the mail were of an older age ($\chi^2(3df)=15.52$, $p=0.001$), higher education ($\chi^2(3df)=29.84$, $p<0.001$) and higher income ($\chi^2(2df)=38.55$, $p<0.001$) compared with women who participated in the

survey while waiting in the clinic. A greater number of women in sites **B** and **C** also reported their pregnancy to be a planned pregnancy compared with women from site **A** ($\chi^2(1df)=6.29$, $p<0.01$). It should be noted that one of the possible reasons women recruited from Site **A** were of a younger age was that one of the associate bodies of the hospital antenatal clinic specifically targeted younger pregnant women and was included in the study.

For the purpose of analysis, data from all three sites were considered collectively, since the main aim of recruiting pregnant women from three different sites within the South East Sydney and Illawarra Area Health Services (SESIAHS) was to access a cross section of the population from different demographics and socioeconomic backgrounds. It was also assumed that covering three separate sites from different locations within the SESIAHS would help to reduce the effects of non-random sampling. An attempt had also been made to include women with both public and private health insurances to further explore the possible relations between *Listeria* knowledge and practice with pregnant women's health cover. It should be noted that differences between the data from the participants who completed the survey at the clinic compared with those who returned the surveys through the mail are retained throughout the presentation of the survey results.

4.3 Sample characteristics

According to the reported postcodes 94.6 percent of participants lived in local government areas within the SESIAHS. Women, who indicated postcodes of areas out of the SESIAHS were living in local government areas close to the study sites.

Overall, most of the participants were either between 20-29 years (50.2%) or 30-39 years (42.3%) old. A small proportion of respondents (3.4%) were in their first trimester of pregnancy whereas 42.6 percent were in their second trimester and 54 percent experienced the third trimester of their pregnancy. A large proportion of participants (70.4%) reported their pregnancy to be a planned one. While this was the first pregnancy for 38.1 percent of participants, 29 percent and 32.9 percent reported second

and third/more pregnancies, respectively. Only 7.3 percent of respondents were from NESB. More than sixty percent of respondents reported a post-secondary educational level. Household income for 29 percent was \$25,000-50,000 and for 54 percent more than \$50,000 a year. However, no more than 27.5 percent of respondents reported having private health cover. Sixty percent of respondents indicated that they were mainly responsible for grocery shopping and preparation of meals in their home and 32 percent of them indicated that they shared these responsibilities with their partner.

Pregnancy related profile and socio-demographic profile of participants within the study sites (according to the mode of data collection; i.e. on site or by the mail), and a comparison of the whole study sample with the characteristics of pregnant women in the SESIAHS and NSW were made through Pearson test with continuity correction, where p values equal or less than 0.05 were considered significant. Pregnancy related profile and socio-demographic profile of participants are presented in Tables 4.1 and 4.2, respectively.

Table 4.1 Participants' pregnancy related profile [†]

Variable	Site (A) (%)	Sites (B,C) (%)	Study (all) (%)	NSW [§] (%)
Prior pregnancies	(n=396)	(n=166)*	(n=562) **	
None	36.5	41.8	38.1	41.6
One	28.9	29.4	29	} 58.4
Two and more	34.6	28.8	32.9	
Stage of pregnancy	(n=395)	(n=166)	(n=561)	
First trimester	3.7	3.3	3.5	
Second trimester	42.6	41.8	42.5	NA
Third trimester	53.7	54.9	54	
Planned pregnancy	(n=394)	(n=166)*	(n=560)	
Yes	67.4	77.7	70.4	NA
No	32.6	22.3	29.6	
Health cover	(n=386)	(n=166)*	(n=552) **	
Medicare only	85.7	38	72.5	66.6
Private health insurance	14.3	62	27.5	33.4

* Significantly different from Site A , ** Significantly different from NSW,
 NA = Not available, † Data not available for SESIAHS

[§] Source: NSW Department of Health (2007)

Table 4.2 Participants' socio-demographic profile[†]

Variable	Site (A) (%)	Sites (B,C) (%)	Study (all) (%)	NSW (%)	SESAHS (%)
Age	(n=396)	(n=166)*	(n=562)**		
Under 20 years	6.4	1.3	5.0	3.8 [§]	2.0 [§]
20-29 years	52.6	43.1	50.2	41.3	34.6
30-39 years	39.0	51.0	42.3	51.3	59
40 years and above	2.0	4.6	2.5	3.6	4.4
Education	(n=392)	(n=166)*	(n=558)**		
Some high school or less	15.8	2.6	12.3	21.6 [‡]	
High school completed	26.6	19.7	24.8	21.3	NA
TAFE	27.9	32.6	29.1	24.4	
Tertiary education	29.7	45.1	33.8	32.7	
Household income	(n=353)	(n=166)*	(n=519)		
Less than \$25,000/yr	20.8	7.4	17.1	16.5 [‡]	
\$25,000-\$50,000/yr	33.2	17.5	28.7	25.4	NA
More than 50,000/yr	46.0	75.1	54.2	58.1	
First language	(n=394)	(n=166)	(n=560)**		
English	93.5	90.2	92.7	78.4 [§]	80.5 [§]
Other	6.5	9.8	7.3	21.6	19.5

[†] NSW and SESAHS data on age and first language only relate to pregnant women. NSW data on education and household income relate to women of reproductive age having children 0-4 years of age.

* Significantly different from Site A, ** Significantly different from NSW and/or SESAHS,

NA = Not available, [§] Source: NSW Department of Health (2007), [‡] Source: Centre for Epidemiology and Research (2006).

It should be noted that the SESAHS and NSW information on age and first language only relate to pregnant women (NSW Department of Health 2007) in Table 4.2. Information on education and household income for NSW relate to women of reproductive age having children 0-4 years of age (Centre for Epidemiology and Research 2006), since this was the most relevant available information for comparison with the group of participants in this study. Education and household income information for the SESAHS was not available.

4.4 Sources of *Listeria* information

Participants were asked whether they were concerned about the safety of their food and to choose from a list all the sources from which they had received any kind of advice or information regarding their food during pregnancy. The majority of respondents (502/586; 85.6%) recognized that some foodborne illnesses were dangerous for the unborn baby. A large number (434/584; 74.3%) also indicated that they were concerned about the safety of their food during pregnancy. However, one third of participants (199/586; 33.9%) did not know that listeriosis was an illness transmitted by contaminated food. Over half of the respondents (345/586; 58.8%) indicated that they had received some kind of information on food safety issues.

The lay network was identified as the most common source of information on food safety issues during pregnancy. Participants' reports revealed that less than half of them (41.3%) had received some kind of food safety advice with regard to *Listeria* from their health care providers. Printed educational materials in the form of pamphlets were found to constitute the source of information for a relatively small proportion (27.4%) of respondents. Sources for obtaining *Listeria* related information are presented in Table 4.3. It should be noted that the percentages in Table 4.3 do not add up to 100 because of multiple sources of information reported by each participant.

Table 4.3 Channels for *Listeria* communication (N=586)

Source	n (%)
Social network (family, friends)	283 (48.3)
Health professionals (doctor, midwife)	242 (41.3)
Women's magazines	201 (34.3)
Health-related pamphlets	161 (27.4)
Internet	78 (13.3)
Pregnancy books	49 (8.3)
Antenatal classes	49 (8.3)

To determine the perceived trustworthiness of providers of health information during pregnancy, participants were asked about their likelihood of following health advice received from different sources. The median ranked value of each source is presented as the measure of central tendency in this case because the distribution of rankings provided for each source tended to be markedly skewed (Martin and Pierce 1994). Data presented in Table 4.4 indicate that pregnant women in this study were most likely to follow health related advice from health professionals, i.e. a doctor or a midwife. It was also found that printed educational materials produced by government authorities were perceived as a trusted source of information, ranking after professionals' advice given in person. Health advice provided by friends and media were ranked as least trustworthy, providing less credible information.

Table 4.4 Perceived trustworthiness of providers of food safety advice

Source of advice	N	Mean ranked value	Median ranked value	
Medical doctor	553	1.53	1	<div>Most likely to follow</div> <div>↓</div> <div>Least likely to follow</div>
Midwife	533	1.85	2	
Health pamphlets produced by government	491	3.85	4	
Family	473	3.85	4	
Health pamphlets produced by food or drug companies	465	4.80	5	
Friends	465	5.21	6	
Media (TV, radio, women's magazines)	457	6.09	7	

Participants' responses revealed that health professionals and printed materials produced by health authorities were the most credible sources of food safety knowledge

during pregnancy. However, these sources did not play a major role in educating pregnant women with regard to the safety of their food during pregnancy, as revealed by their reported sources of information.

4.5 Food related issues

Pregnant women's knowledge and practice on food safety issues most related to *Listeria* infection, and factors found to be associated with their knowledge and practice are presented in this section. Participants in some parts were asked to indicate their response to the questions on five and seven-point Likert-type scales. Given the low numbers in some groups, and as a strategy for simplifying the statistical analysis and increasing responses in cells, some of the scales were reduced by combining the most relevant and closest categories. Classifying participants into groups according to their knowledge and practice scores also allowed exploration of the model that best identified predictors of pregnant women's knowledge and practice on *Listeria* related issues. As a result binary logistic regression was conducted instead of ordinal logistic regression with no loss of information. Detailed tables of logistic regression model are presented in Appendix N.

It should be noted that the 75th percentile point in all knowledge and practice scores was used as the cut-off point for distinction between 'adequate' and 'inadequate' levels of knowledge and 'high risk' and 'low risk' food practices. Selection of this cut-off point was a decision made by the researcher based on previous research (Stafford et al. 1998; Medeiros et al. 2004b; Almanza et al. 2007) and judged to be appropriate for the purpose of analysis. These will be dealt with and explained in more detail later in each section.

4.5.1 Understanding of food safety techniques

Pregnant women's general understanding of the personal hygiene and food handling issues of particular importance for the prevention of listeriosis were explored. Findings indicated a high level of knowledge on the importance of personal hygiene, in terms of washing hands before dealing with food, among nearly all (97.6%) participants.

Women's knowledge on avoiding cross contamination through cutting boards and safe storage of cooked food was also found to be satisfactory with a small number (12.9%) of respondents providing an incorrect or 'Don't know' response. However, a greater proportion of pregnant women (27.1%) were not aware of the way raw meat should be stored in the fridge (not above the cooked food to avoid cross contamination due to dripping into other foods) and a yet larger proportion (49.1%) did not acknowledge that cooked foods stored in the fridge should be reheated before consumption. Table 4.5 presents the distribution of participants' correct answers for safe food handling techniques.

Table 4.5 Distribution of correct answers on safe food handling techniques

Item	N	Correct answer n (%)
Washing the hands with soap and warm running water before preparing food decreases the risk of food-related illness. (True)	584	570 (97.6)
It is safe to use same cutting board for raw chicken and raw vegetables if wiped off between uses. (False)	582	507 (87.1)
It is safe to keep cooked meat at room temperature for more than 4 hours. (False)	584	505 (86.4)
Raw meat and chicken should be stored on open shelves above cooked food in the refrigerator. (False)	582	424 (72.9)
It is safe to eat cooked refrigerated food without reheating it. (False)	577	294 (50.9)

The overall scores of participants for their knowledge on safe food handling techniques were calculated based on the correct responses to the related questions, leading to a minimum knowledge score of 0 and a maximum knowledge score of 5. The 75th percentile point in knowledge score (equal 4) was used as the cut-off point. Women with knowledge score less than 4 were categorised as having an 'inadequate

knowledge', whereas women with a knowledge score of 4 or 5 were categorised as having an 'adequate knowledge' on food handling issues.

More than one fourth of participants (154/585; 26.3%) had an inadequate knowledge of safe food handling techniques. Participants' understanding of safe food handling techniques increased with an increase by age ($\chi^2(3df)=44.73$, $p<0.001$), and level of education ($\chi^2(3df)=8.06$, $p<0.05$). Also, women with English as their first language had a better knowledge of food handling techniques ($\chi^2(1df)=5.25$, $p=0.01$). However, multivariate analysis using logistic regression identified language as the only predictor of women's understanding of safe food handling techniques, i.e. women from NESB were more than three times more likely to have an 'inadequate knowledge' on the issue (adjusted OR=3.41, 95% CI 1.60-7.29, $p<0.05$). No difference was found in the understanding of the personal hygiene and food handling issues between women who participated at the clinic and those who sent the questionnaires back through the mail.

4.5.2 Knowledge of high *Listeria* risk foods

To examine knowledge of high *Listeria* risk (HLR) foods, participants were asked to mark the high risk foods in a list. Soft cheeses were found to be the most known HLR foods. Nevertheless, slightly more than one fourth of participants (27.2%) did not recognize them. A large proportion of respondents (35.7%) were found to be confused about the risk of having deli meats and a yet greater proportion (50.4%) did not indicate coleslaw from a salad bar as a HLR food. Table 4.6 demonstrates the distribution of pregnant women's correct answers for HLR foods.

Table 4.6 Distribution of correct answers on HLR foods (N=586)

Item	Correct answer n (%)
Soft cheeses (e.g. brie, ricotta, camembert, feta and blue)	427 (72.8)
Hot take-away chicken portions	422 (72.0)
Chicken liver pâté	402 (68.6)
Deli meats from a delicatessen counter	377 (64.3)
Smoked salmon served cold	301 (51.3)
Coleslaw from a salad bar	291 (49.6)

Only 13.1 percent of participants (77/586) ticked all the correct boxes and not the incorrect box, while 29.4 percent (172/586) had five, 21.8 percent (128/586) had four, and 35.7 percent (209/586) had three and less correct answers, respectively. Only 10.7 percent of participants (63/586) selected the ‘Don’t know’ option.

As mentioned previously (see *Chapter 3*) the ‘Don’t know’ option was an independent option to be selected if women did not know anything about HLR foods. The results of chi-squared test showed a significant relationship between most of the socio-demographic variables and participants’ selection of the ‘Don’t know’ option. However, logistic regression identified the level of education, household income and language as the main predictors for participants’ selection of ‘Don’t know’ option. Women with lower education (high school level and lower) and lower household income (less than \$25,000 per year) were found to have greater odds for selecting the ‘Don’t know’ option (adjusted OR=7.41, 95% CI 1.99-27.51, $p=0.005$ and adjusted OR=8.87, 95% CI 3.14-25.06, $p<0.001$, respectively). Women from NESB were 12 times more likely to select the ‘don’t know’ option (adjusted OR=12.68, 95% CI 3.54-45.43, $p<0.001$). It was also found that women who had not received any kind of advice regarding the safety of their food were three times more likely to choose the ‘don’t know’ option compared with those who indicated receiving some kind of advice from different sources (adjusted OR=2.99, 95% CI 1.47-6.10, $p=0.01$). Compared with respondents with one prior

pregnancy, first-time pregnant women had nearly two times and participants with two or more prior pregnancies had more than three times bigger odds of choosing the ‘Don’t know’ option respectively, although these findings were not statistically significant.

The overall scores of participants’ knowledge of HLR foods were calculated based on the number of correctly identified items from the list of the foods, leading to a minimum knowledge score of 0 and a maximum knowledge score of 6. The 75th percentile point in knowledge score (equal 5) was used as the cut-off point. Women with knowledge scores less than 5 were categorised as having an ‘inadequate knowledge’ whereas women with knowledge scores of 5 or 6 were categorised as having an ‘adequate knowledge’ on HLR foods.

Based on the overall knowledge score more than half of participants (337/586; 57.5%) had an ‘inadequate’ knowledge of HLR foods. Chi-squared test revealed a significant association between the level of knowledge of HLR foods and women’s age ($\chi^2(3df)=28.52$, $p<0.001$), parity ($\chi^2(1df)=7.17$, $p<0.05$), planned pregnancy ($\chi^2(1df)=23.86$, $p<0.001$), level of education ($\chi^2(3df)=35.13$, $p<0.001$), household income ($\chi^2(2df)=45.44$, $p<0.001$), and first language ($\chi^2(1df)=35.16$, $p<0.001$). Interestingly although not significant, a greater proportion of women with two or more prior pregnancies (64.9%) had an inadequate knowledge of HLR foods compared with those with no (52.3%) and one (52.8%) prior pregnancy, respectively. Also, women who sent the questionnaires back through the mail had a higher knowledge score on HLR foods compared with women who completed the questionnaire at the clinic ($\chi^2(1df)=41.58$, $p<0.001$).

However, the magnitude of association differed between the adjusted and unadjusted models, and all socio-demographic associations with the exception of first language, planned pregnancy and household income lost statistical significance after adjustment. Logistic regression results indicate that respondents with English as their first language (adjusted OR=2.50, 95% CI 1.13-5.54, $p<0.05$), women with a planned pregnancy (adjusted OR=1.97, 95% CI 1.22-3.20, $p<0.001$) and participants with a household income more than \$50,000 per year (adjusted OR=2.59, 95% CI 1.18-5.70, $p<0.05$)

were more likely to have an adequate knowledge of HLR foods compared with women from NESB, and with lower income or an unplanned pregnancy. Also, women who had received some kind of advice from different sources were three times more likely to have an adequate knowledge on HLR foods than those who had not received any information (adjusted OR=3.07, 95% CI 2.06-4.59, $p<0.001$).

4.5.3 Food consumption practices / preferences

Participants were asked to report the consumption frequency of six HLR foods on a seven-point Likert-type food frequency scale. Cold deli meat was reported to be the most frequently consumed HLR food followed by pre-prepared vegetable salads. A large proportion of the participants (44.4%) reported a regular (fortnightly, weekly or more frequent) consumption of cold deli meats, with a smaller number (13.4%) indicating as frequent consumption as daily or 2-3 times a week. The consumption of raw fish and smoked fish was found to be uncommon among the majority of participants (95.1% and 94.5%, respectively). Pregnant women's reports of consumption of HLR foods during pregnancy and the association of food consumption patterns with various independent socio-demographic variables are presented in Table 4.7.

Table 4.7 Reported consumption of HLR foods during pregnancy

Food item	N	Daily	2-3 times a week	Weekly	Fortnightly	Monthly	Rarely	Never
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Foods containing raw fish (e.g. sushi).	567	0 (0.0)	1 (0.2)	5 (0.9)	8 (1.4)	14 (2.4)	51 (9.0)	488 (86.1)
Smoked fish served cold. ^{a†,b††}	570	1 (0.2)	1 (0.2)	7 (1.2)	6 (1.1)	16 (2.8)	101 (17.7)	438 (76.8)
Soft cheeses (e.g. brie, feta, ricotta, camembert, blue). ^{a***,b*,c*}	572	4 (0.7)	11 (1.9)	19 (3.3)	28 (4.9)	40 (7.1)	174 (30.4)	296 (51.7)
Dips or spreads (e.g. pâté, hummus). ^{a***(!)}	570	0 (0.0)	7 (1.2)	15 (2.6)	48 (8.4)	97 (17.0)	200 (35.1)	203 (35.7)
Vegetable salads, purchased pre-prepared (e.g. coleslaw). ^{a*,b*,c*,d††}	565	22 (3.9)	20 (3.5)	33 (5.8)	31 (5.5)	61 (10.8)	217 (38.4)	181 (32.1)
Cold deli or luncheon meats. ^{a*,b***,c*}	571	10 (1.8)	66 (11.6)	102 (17.9)	75 (13.1)	45 (7.9)	174 (30.5)	99 (17.2)

Associated with a) level of education, b) household income, c) level of knowledge on that item, d) age
 *p<0.001, **p=0.005, ***p=0.003, †p=0.015, ††p=0.001

(!) In some circumstances freshly made dips may not be considered high risk.

The overall score of participants for their food consumption practices was calculated based on the reported frequency of consumption of each food, with 0 points for a reported consumption frequency of daily / 2-3 times a week / weekly, 1 point for a reported consumption frequency of fortnightly/monthly and 2 points for a reported consumption frequency of rarely/never, leading to a minimum food consumption score of 0 and a maximum food consumption score of 12. The 75th percentile point in food consumption score (equal 9) was used as the cut-off point. Women with scores less than 9 were categorised as having a ‘high risk practice’ whereas women with scores of 9 to 12 were categorised as having a ‘low risk practice’ in their food consumption pattern.

Overall, one in four respondents (142/570; 24.9%) had a 'high risk' food practice and continued the consumption of HLR foods with a relatively high frequency during pregnancy. The practice score based on the frequency of consumption of all HLR foods indicated that women who sent the questionnaires back through the mail had a better practice compared with those who participated at clinic ($\chi^2(2df)=25.04$, $p<0.02$).

A significant association was found between participants' knowledge of HLR foods and their food consumption/practices ($\chi^2(2df)=21.40$, $p<0.001$). Level of education ($\chi^2(3df)=33.54$, $p<0.001$), household income ($\chi^2(2df)=14.36$, $p=0.001$), and planned pregnancy ($\chi^2(1df)=9.37$, $p=0.001$) were also found to be significantly associated with women's practice in consuming HLR foods. However, when considered collectively, the only factors predicting women's practice were identified to be knowledge of HLR foods, level of education and planned pregnancy. It was found that women with an adequate knowledge of HLR foods were more than two times more likely to have a low risk practice (adjusted OR= 2.42, 95% CI 1.35-4.31, $p<0.005$). Having a planned pregnancy (adjusted OR= 1.79, 95% CI 1.04-3.06, $p<0.05$) and being of a higher educational level (adjusted OR= 6.24, 95% CI 2.54-15.34, $p<0.001$) were also associated with having a low risk practice in food consumption pattern.

4.5.4 Food handling practices

Participants' behaviours with regard to seven different practices that have been identified to be important in prevention of foodborne illnesses and particularly listeriosis were investigated. The most regular reported practices were related to personal hygiene and cleanliness of kitchen utensils. The majority of participants (91.5%) reported that they always / most of the times washed the kitchen utensils, cutting boards and counter top with hot soapy water after cutting raw meat or chicken and that they (85.7%) always / most of the time washed their hands with soap and water before preparing or eating a meal. However, safe practices on different aspects of keeping food in the refrigerator and safe ways of treating the food that is taken out of the freezer or refrigerator were reported to be taken less regularly by a great proportion of respondents. For example, one third of respondents (33.4%) reported that they did

not always / most of the times put leftovers of cooked food in the refrigerator as soon as the steam was gone, and the same proportion (31.1%) reported not thoroughly reheating cooked refrigerated food until steaming hot. Also, less than half of the participants reported a safe practice in keeping cooked and raw foods in the refrigerator (43.6%), in consumption of refrigerated food within 1-2 days (48.6%) and in thawing frozen food in the refrigerator or microwave (48.0%). Table 4.8 presents the distribution of participants' reports of taking each action and the association of reported safe food handling practices with various independent socio-demographic variables.

Table 4.8 Reported safe food handling practices during pregnancy

Item	N	Never	Occasionally	Frequently	Most of the time	Always
		n (%)	n (%)	n (%)	n (%)	n (%)
Washing the kitchen utensils, cutting boards and counter top with hot soapy water after cutting raw meat or chicken.	565	0 (0.0)	15 (2.7)	33 (5.8)	88 (15.6)	429 (75.9)
Washing hands with soap and water before preparing or eating a meal.	564	1 (0.2)	33 (5.9)	46 (8.2)	148 (26.2)	336 (59.5)
Thoroughly reheating cooked refrigerated food until steaming hot. ^{a†,b††,d§}	557	45 (8.1)	67 (12.0)	61 (11.0)	117 (21.0)	267 (47.9)
Putting leftovers of cooked food in the refrigerator as soon as the steam is gone. ^{d*}	554	52 (9.4)	66 (11.9)	67 (12.1)	153 (27.6)	216 (39.0)
Keeping cooked/processed food above the raw food in the refrigerator.	552	99 (17.9)	79 (14.3)	63 (11.4)	121 (21.9)	190 (34.5)
Using cooked or ready-to-eat food, that has been stored in the refrigerator, within two days. ^{a*,b*,c**,d***}	560	101 (18.0)	109 (19.5)	62 (11.1)	115 (20.5)	173 (30.9)
Thawing frozen food in the refrigerator or microwave. ^{c§}	557	49 (8.8)	135 (24.3)	83 (14.9)	145 (26.0)	145 (26.0)

Associated with a) age, b) level of education, c) household income, d) health cover

*p<0.001, **p=0.005, ***p=0.001, †p=0.02, ††p<0.05, §p<0.01

The overall score of participants for their food handling practices was calculated based on the reported frequency of each practice, with 0 points for a reported frequency of ‘never’ or ‘occasionally’, 1 point for a reported ‘frequently’, 2 points for a reported frequency of ‘most of the time’, and 3 points for ‘always’, leading to a minimum food handling score of 0 and a maximum food handling score of 21. The 75th percentile point in food handling score (equal 16) was used as the cut-off point. Women with scores less than 16 were categorised as having a ‘high risk’ food handling practice

whereas women with scores of 16 and higher were categorised as having a ‘low risk’ practice in food handling.

Based on the overall practice score, almost a third of respondents (171/560; 30.5%) reported unsafe food handling practices that could potentially put them at risk of contracting listeriosis during pregnancy. There was no difference in food handling scores of women who sent the questionnaires back through the mail and women who participated in the study at the clinic.

Chi-squared test revealed that participants’ level of food handling practices rose with an increase in age ($\chi^2(3df)=8.47$, $p<0.05$) and income ($\chi^2(2df)=6.57$, $p<0.05$) and also with a planned pregnancy ($\chi^2(1df)=7.76$, $p=0.002$). A strong association was also found between participants’ knowledge on safe food handling techniques and their practice in this regard ($\chi^2(2df)=22.44$, $p<0.001$).

After adjusting for different variables through logistic regression, the only predictor of pregnant women’s food handling practice was found to be their knowledge of safe food handling techniques. Participants with an ‘adequate’ understanding of safe food handling techniques were found to be more than two times more likely to have a ‘low risk’ practice (adjusted OR= 2.22, 95% CI 1.44-3.43, $p<0.001$).

4.6 Perception of risk associated with *Listeria*

When asked to position *Listeria* risk in a hierarchy of seven perceived risks during pregnancy, *Listeria* infection was perceived as the third most important risk after smoking and alcohol intake. Two items in the list ‘not taking enough fruit and vegetables’ and ‘adding salt to food’, are not known to be a risk during pregnancy and were included as a means of increasing the potential spread of the responses. Because of the markedly skewed distribution of rankings provided for each risk, median ranked value is presented as the measure of central tendency (Martin and Pierce 1994) in Table 4.9.

Table 4.9 Order of perceived risks during pregnancy

Risk	N	Mean ranked value	Median ranked value	
Smoking	568	1.76	1	<div>Maximum risk</div> <div>↓</div> <div>Minimum risk</div>
Alcohol intake	564	2.15	2	
<i>Listeria</i> infection	553	3.08	3	
Not taking folic acid supplements	553	4.34	4	
Caffeine	558	4.65	5	
Not eating fresh fruits & vegetables	561	5.01	5	
Adding salt to food	550	6.07	6	

4.7 Opinions on *Listeria* related issues

Underlying barriers that may negatively affect women's practices in *Listeria* prevention were examined by asking participants 'opinion' questions on a five-point Likert-type scale. Large proportions of participants disagreed with the statements indicating the potential nutritional benefits of soft cheeses (75.9%) and luncheon meats (66.5%) during pregnancy. Two third of participants (65.5%) disagreed with the statement indicating difficulty in avoiding soft cheeses because of missing the taste. However, nearly two thirds of respondents (63.4%) agreed that they did not have much information on listeriosis, and more than one third (38.1%) of participants were not sure about the illness being a great risk to their baby. While more than one third of women (37.1%) agreed that they felt confident that they were not at risk of contracting the illness during their pregnancy, half of the participants (50.0%) reported not being sure. Findings on pregnant women's 'opinions' are presented in Table 4.10.

Table 4.10 Distribution of participants' opinions on *Listeria* related issues

Statement	N	Strongly agree n (%)	Agree n (%)	Not sure n (%)	Disagree n (%)	Strongly disagree n (%)
After cutting raw meat or chicken it is important to wash the cutting board and utensils with hot soapy water. ^{b***,c††(1)}	579	426 (73.6)	139 (24.0)	9 (1.6)	5 (0.8)	-
Washing and drying hands before handling ready-to-eat food is important to reduce the risk of <i>Listeria</i> . ⁽¹⁾	578	375 (64.9)	173 (29.9)	21 (3.6)	9 (1.6)	-
I have full control of my food safety when I prepare my food. ⁽¹⁾	577	262 (45.4)	238 (41.2)	40 (6.9)	37 (6.5)	-
Food prepared and eaten at home poses a lower risk of foodborne illness than food eaten away from home. ⁽¹⁾	578	223 (38.6)	227 (39.3)	69 (11.9)	48 (8.3)	11 (1.9)
I don't have much information on Listeriosis. ^{a*** (2)}	573	103 (18.0)	260 (45.4)	49 (8.6)	123 (21.5)	38 (6.5)
I feel confident that I am not at risk of having listeriosis during my pregnancy. ^{c** (2)}	570	43 (7.5)	169 (29.6)	285 (50.0)	60 (10.5)	13 (2.4)
I find avoiding soft cheeses difficult because I like them. ⁽²⁾	574	37 (6.4)	116 (20.2)	45 (7.8)	214 (37.4)	162 (28.2)
Listeriosis is not a great risk to my baby. ^{a*,b*,c† (2)}	570	19 (3.3)	25 (4.4)	217 (38.1)	141 (24.7)	168 (29.5)
I should eat luncheon meats during my pregnancy, as they are good sources of iron. ^{a*,b*,c* (2)}	576	12 (2.1)	39 (6.8)	142 (24.7)	201 (34.8)	182 (31.6)
It is good to eat soft cheeses during pregnancy because of their high calcium content. ^{a**,b* (2)}	578	14 (2.4)	24 (4.2)	101 (17.5)	169 (29.2)	270 (46.7)

Associated with a) level of education, b) household income, c) age

*p<0.001, **p=0.005, ***p<0.05, †p=0.001, ††p<0.02

(1) General food safety issue, (2) *Listeria* risk issue

Age, level of education and household income from among the socio-demographic variables as well as women's level of knowledge on HLR foods were found to have a significant association with women's opinions on potential underlying barriers to behaviour change. The only exception was the idea of 'temptation' as a potential barrier which was articulated in the statement 'I find avoiding soft cheeses difficult because I like them'. Chi-squared test showed no significant association between socio-demographic factors or women's knowledge with their opinion on this statement.

Logistic regression analysis found that pregnant women's knowledge of HLR foods was an important predictor of their opinion on the importance of eating soft cheeses and luncheon meats during pregnancy. Women who had an adequate knowledge of HLR foods were more likely to disagree with the statements on the importance of eating soft cheeses (adjusted OR= 15.21, 95% CI 3.48-66.47, $p<0.001$) and luncheon meats (adjusted OR= 12.88, 95% CI 3.69-44.92, $p<0.001$) during pregnancy than women with an inadequate level of knowledge. Also women with a household income less than \$25,000/year were more likely to agree with the statements on soft cheeses (adjusted OR= 4.44, 95% CI 1.50-13.08, $p=0.012$) and luncheon meats (adjusted OR= 2.93, 95% CI 1.00-8.56, $p<0.001$) than women with a household income more than \$50,000/year.

The predictors of pregnant women's opinion on the statement 'Listeriosis is not a great risk to my baby' were their knowledge of HLR foods and planning their pregnancy. Women with an inadequate knowledge (adjusted OR= 2.74, 95% CI 1.78-4.23, $p=0.01$) or an unplanned pregnancy (adjusted OR= 2.17, 95% CI 1.27-3.69, $p=0.02$) were more than two times more likely to agree with this statement than women with an adequate knowledge or a planned pregnancy.

4.8 Confidence in the ability to avoid high *Listeria* risk foods

Participants were also asked about their confidence in being able to follow the recommendations by a doctor or a government body to avoid certain types of foods to reduce the risk to their baby. The majority of women (90.3%) were quite confident of being able to avoid raw seafood but this reduced to smaller proportions for soft cheeses

(76.3%), pre-prepared vegetable salads (58.0%) and luncheon meats and cold deli salads (52.8%), respectively. Women's confidence in being able to follow the recommendations to avoid *Listeria* is presented in Table 4.11.

Table 4.11 Participants' confidence to follow the recommendations to avoid *Listeria*

Recommendation	N	0% confident n (%)	25% confident n (%)	50% confident n (%)	75% confident n (%)	100% confident n (%)
Avoid eating raw or undercooked sea food. ^{a*}	548	5 (0.9)	7 (1.3)	5 (0.9)	36 (6.6)	495 (90.3)
Avoid soft cheeses (brie, feta, camembert, blue). ^{a**}	549	11 (2.0)	8 (1.5)	32 (5.8)	79 (14.4)	419 (76.3)
Avoid pre-prepared vegetable salads and cold meals from outside. ^{a*}	548	8 (1.5)	19 (3.5)	50 (9.1)	153 (27.9)	318 (58.0)
Avoid luncheon meats or cold deli salads. ^{a***,b†}	547	10 (1.8)	30 (5.5)	78 (14.3)	140 (25.6)	289 (52.8)

Associated with a) household income, b) level of education

*p=0.005, **p<0.001, ***p=0.001, †p<0.02

Chi-squared test showed a significant association between women's household income and their confidence in avoiding all types of HLR foods. Level of education was another variable significantly associated with women's confidence in their ability to avoid cold deli meats.

4.9 Conclusion

Most of the pregnant women who participated in the survey indicated that they were concerned about the safety of their food during pregnancy. However, only half of the respondents reported that they had received some kind of information on food safety issues from different sources. Social network, including family and friends, followed by

health professionals (e.g. doctor, midwife) were identified as the main sources of information on food-related issues during pregnancy. However, an examination of participants' views on the trustworthiness of source of advice showed that pregnant women were most likely to follow advice from a doctor followed by a midwife.

Although knowledge on the importance of hygiene was good among the participants, a large number of women did not demonstrate a good knowledge on food handling techniques. Participants' reports on food handling practices that are particularly important in the prevention of listeriosis indicated that principles of keeping food in the refrigerator and precautions that should take place before consumption of food out of refrigerator and freezer were not met by a large proportion of participants.

A large number of participants failed to recognize different HLR foods and reported frequent consumption of these foods throughout their pregnancy. Cold deli meats and pre-prepared vegetable salads were identified as the two most problematic HLR foods, in terms of inadequate knowledge and high risk consumption pattern among the participants. Nearly half of the participants did not feel quite confident to be able to avoid cold deli meats and pre-prepared vegetable salads even if recommended to do so by a reliable source.

Although participants allocated a high rank to listeriosis among a range of risks during pregnancy, less than one third of them believed that they have enough information about the illness. Investigating participants' opinions revealed that lack of enough information about the illness was the most prominent barrier to behaviour change to reduce the risk of *Listeria* infection.

A more in-depth analysis of pregnant women's understandings and practices with regard to *Listeria* is provided in the following chapter which presents the results of semi-structured interviews with pregnant women in the study sites.

5 Women's Perspectives on *Listeria* Risk

5.1 Introduction

The focus of this chapter is an exploration of the processes through which pregnant women dealt with food safety directives for the prevention of listeriosis in the course of their everyday lives. While the survey sought to chart the level of knowledge and the extent of compliance with specific messages on *Listeria* prevention, in this chapter the decision making processes of pregnant women in relation to these messages are contextualized.

In order to better explain pregnant women's practices in the prevention of listeriosis, women's strategies to achieve behaviour change in both eating habits and food handling are analysed by examining their processes of decision making. The analysis looks at women's system of categorization of foods based on their perception of safety. This is continued by an exploration of influences on their categorization system of the food safety directives for pregnancy, as well as food choices and how women managed to incorporate the directives within the context of their eating routines. Women's reports on their food handling practices are then discussed, together with their views on the significance of these practices in the prevention of foodborne illnesses. This chapter emphasises pregnant women's experiences and life circumstances to clearly illustrate the importance of understanding the context within which women make decisions with regard to the safety of their food during pregnancy.

Although the focus of the interviews was on women's current pregnancy, women who had experienced more than one pregnancy inevitably made comparisons between different pregnancies and even those in their first pregnancy compared their experiences with those of relatives and friends. Since the emphasis was on exploring women's

processes of decision making, all women's accounts of these lived experiences were incorporated in the analysis to further enrich the findings.

5.2 Participants

As mentioned in *Chapter 3*, a purposive sample of pregnant women attending antenatal clinics/classes in the three study sites was recruited for interview. The aim was to interview up to 30 pregnant women, which was thought in the initial study proposal to be sufficient to access a wide range of views and to identify important themes and categories. However, the determining factor on when to stop interviewing was when there appeared to be no new themes emerging from the interviews. Guba and Lincoln (1994) and Patton (2002) assert that it is appropriate to cease interviewing when categories become saturated or information becomes repetitive. Data saturation in the current study happened after 26 interviews with pregnant women and interviews were ceased at this point.

A summary of interview participants' characteristics is presented in Table 5.1. All 26 pregnant women who volunteered to participate in the face to face interview had already taken part in the survey. One of the interview participants contacted the researcher in response to the notice put on the notice board of the study sites. The majority of participants (n=23) were aged 30 years or more and had a university degree (n=21). A large number of women were in their third trimester of pregnancy (n=18) and were employed (n=17) at the time of interview. Ten women stated that they were privately insured. The interviews with pregnant women lasted from 22 to 66 minutes (mean \pm std: 42.2 \pm 10.7 minutes).

Table 5.1 Demographic profile of participants in the interview (N=26)

Characteristic	n
Age	
Less than 20 years	1
20-29 years	2
30 years and more	23
Parity	
1 st pregnancy	11
2 nd pregnancy	7
3 rd pregnancy and more	8
Stage of pregnancy	
2 nd trimester	8
3 rd trimester	18
Education	
Some high school	1
High school completed	4
Tertiary	21
Employed	
Yes	17
No	9
Health cover	
Medicare only	16
Privately insured	10

The pregnant women interviewed therefore were well educated and their first language, except for one, was English. The participants can be described generally as a group who were informed, literate and articulate. Although the majority of pregnant participants had uncomplicated pregnancies, there were a number of cases who needed more medical attention. Two women had developed gestational diabetes during their current pregnancy. Two women were classified as having a high risk pregnancy: one of them because of her obesity and the other one because of an 'incompetent cervix'. One pregnant woman had a restricted diet because of an underlying disease and another one was managing her high blood cholesterol through diet. Three women reported a

miscarriage in a previous pregnancy, but they were not aware of the possible reason for their miscarriage.

All women interviewed gave a high priority to being healthy. Eating healthy foods, looking after themselves and moderating or ceasing alcohol and caffeine were all important considerations. Cigarette smoking, which was reported by only one of the women, was similarly avoided.

5.3 Food safety as an issue during pregnancy

Recommendations to reduce the risk of *Listeria* infection during pregnancy, while perhaps considered as normal standards for food hygiene to prevent foodborne illnesses in general, require pregnant women to be responsible for making correct food choices and strictly following certain food handling procedures to ensure the safety of their baby. Thus, the focus of analysis in the following section is on exploring the meaning of food safety to pregnant women to gain a better understanding of their strategies to comply with the *Listeria* recommendations.

5.3.1 Classifying food: safe versus unsafe

It became apparent during the interviews that generally food safety issues were not of central importance to most women. Half of the participants stated that they did not think about food safety issues on a regular basis and believed that their decision regarding the safety of foods was something that happened ‘*subconsciously*’:

“I don’t think I’ve really thought about that, I suppose if there’s something put down in front of me to eat, I probably subconsciously think of all the things that people have actually told me over the years of what to and not to eat but I don’t think I really make too many decisions or anything.” (Harriet, 1st pregnancy)

However, the question ‘what does a safe food mean?’ resulted in a range of answers that revealed pregnant women’s main processes in deciding about the safety of their food. A universal process for the participants was the use of classification for foods as a means of organizing their food selections. Food classification was organized in terms of a

value scale, ranging from foods that were close to ideal in meeting safety values to others that were far from this ideal. Safe and unsafe were identified as frequently occurring food classification categories for everyday food choices. Participants used classification of foods as safe and unsafe to take these complex, conceptual definitions and break them up into meaningful pieces that they could apply to their everyday eating.

Women's classification of safety emerged from experiential and informational sources in the context of eating on a daily basis. In the accounts pregnant women gave of how they divided food into safe and unsafe categories, four major rules of thumb were identified that were utilised to describe how decisions were made. Participants were found to judge the safety of foods based on the 'nature' of food itself at the first level and the 'organoleptic characteristics' of food, followed by 'practices' through which foods were handled and 'location' where the food was purchased or eaten.

At the first level of this classification system women judged the safety on the basis of food itself. Although a range of different issues including pesticides in plant products and antibiotics, hormones, and heavy metal residues were mentioned by participants as the factors that made their food potentially unsafe, the main concern among the majority of respondents was found to be foodborne bacteria. Generally, lack of contamination of food with bacteria was perceived as the main criteria in women's perception of a safe food:

"a safe food certainly is something that's not going to make me sick, I guess something that's not going to have odd bacteria and anything like that." (Natasha, 1st pregnancy)

The first level of classification of foods into safe and unsafe was formed in this context where women put fruits and vegetables in the safe category as opposed to animal products which were classified as being inherently unsafe. Fruits and vegetables were considered safe foods because they were perceived to be 'fresh' and 'straight from the nature' and as a consequence to have less 'capacity to do harm':

"... something fresh, fruit, vegetables, ... because it's food that is free from the capacity to do harm." (Sara, 1st pregnancy)

"I would probably think of fruit and vegetables, I don't know why but that would probably be my first instant ... food that's you know straight from the nature." (Janice, 3rd pregnancy)

Meanwhile, foods from animal origin, particularly different types of meat, chicken and fish, were classified as unsafe, as they were perceived to 'harbour bacteria' and to require vigilant preparation and storage procedures to prevent them from becoming contaminated:

"... because not only can they harbour bacteria and that sort of thing, it's just the way you prepare them that can be a bit dodgy if you don't get them to the right temperature or if they've been exposed to the air for too long." (Karen, 2nd pregnancy)

Organoleptic characteristics of food entered women's classification system to help them distinguish a safe food from an unsafe one. Women brought into play the sensory properties of food such as 'smell', 'taste', 'colour' and 'appearance' as indicators of food safety. Women's reliance on their senses meant that, if they were unable to detect any faults, food was classified as safe. Use of organoleptic characteristics to judge the safety of food was perceived as 'common sense' among the majority of the participants:

"Just common sense I think more than anything ... whether it smells, if it looks good, that would be probably it. Because otherwise you can't tell something's off. It's going to have funny colour and smell." (Natalie, 1st pregnancy)

Participants viewed procedures of food handling and preparation as one of the most important factors in determining the safety of food: that is safety was considered to be under the individual's control:

"I suppose any food could be a risk depending on how it is looked after you know, or prepared or stored ... not the food itself ... I would give any food that point." (Cassandra, 1st pregnancy)

Cassandra's remarks demonstrate how individuals' practices came into play to form another level of classification where safety of food was judged according to the way it was handled. Women's accounts revealed how within their system of classification, appropriate handling of foods in terms of washing, cooking and storing could convert a potentially unsafe food to a safe one:

“Chicken and any sort of meat are really risky and you need to make sure that they’re washed properly, cooked properly, and then not left sitting out of the fridge for too long period of time.”
(Ashlea, 3rd pregnancy)

The notion of control entered the classification system to highlight the importance of handling practices in women's judgements about safety of their food, and was coupled with the notion of trust to form the next level of classification, where the safety of food was judged on the basis of location where it was eaten. Great similarity was found in the views of respondents concerning the level of risk associated with foods eaten at home as compared with outside the home. All women favoured home cooked over pre-prepared and take away meals or meals eaten out of home. In this context, unsafe foods became safe if prepared at home. Women felt confident that they had control over the safety of food that was prepared in home by themselves or by someone whom they trusted and there remained little to be *‘too concerned’* about at home because everything was perceived to be done in the right way:

“In preparing the food at home probably nothing is out of control because the food that we eat is usually bought fresh and then well cooked and then I don’t eat it the next day ... in my house I don’t feel that there’s any area for me to be too concerned.” (Clara, 1st pregnancy)

Women's concerns about the safety of the food eaten outside were found to be mostly related to their lack of trust in the outside providers of food, in terms of their *‘hygiene standards’*, rather than the type of food they served. In this context the food that was perceived to be safe if prepared at home could turn to be unsafe if prepared outside. In most cases, eating outside meant taking *‘a greater risk’* because it was *‘a lot harder to know’* what was happening to their food:

“at a restaurant it’s a lot harder to know, because you don’t know what their hygiene standards are like, and the kitchen, so you do probably take a greater risk I guess, when eating out as opposed to be at home.” (Natasha, 1st pregnancy)

Participants' accounts revealed that although women were not consciously thinking about the safety of their food, there was a system of classifications that ruled their decision making processes. The notions of control and trust were found to affect

women's approach regarding the safety of their food, with the food prepared by themselves or in their home perceived as most likely to be safe. However, some degrees of reliance on common sense were also found to enter the classification system to make the selection of safe food easier for women.

5.3.1.1 Classifying food with regard to pregnancy

Although the general safety of food did not seem to be a concern among participants in this study, women were found to be quite alert to the risks associated with the consumption of HLR foods during pregnancy. Women had further refined their general system of classifications about safe and unsafe food when they became pregnant, adding a dimension into it as pertained to their baby:

“I guess it [safe food] would be something that certainly wouldn't be harmful towards the baby.” (Natasha, 1st pregnancy)

Listeria infection was found to be the most familiar food related risk during pregnancy. However, three interviewees had not heard about the illness and one of them was not aware of the foods that should be avoided during pregnancy. It should be noted that all participants had already taken part in the survey. As a result it could be expected that they were oriented and aware of the particular importance of *Listeria* in the context of food safety issues. Three interviewees out of 26 pointed out the risk of high mercury levels in deep water fish and only one woman brought up the issue of toxoplasmosis and the risks associated with gardening and handling of pets during pregnancy.

Women's classification system on safe and unsafe foods seemed to have become blurred by recommendations to avoid *Listeria*. A change in the category, where previously safe foods became unsafe, together with the mixed messages that pregnant women received from different sources were found to be the sources of ambiguity with regard to HLR foods.

Soft cheeses, deli meats and sea food were the general broad categories of foods that most women stated as unsafe with regard to *Listeria*. However, it was found that nearly one third of participants were confused about the risk associated with the consumption

of certain types of foods within each category. Other foods such as chicken liver pâté and soft-serve ice cream were mentioned by only four women.

Pregnant women had different approaches with regard to HLR foods. Sometimes it was difficult to ascertain if a food was in the unsafe category. For example, nearly all of the participants talked about soft cheeses as HLR foods but some of them were confused about what constituted a soft cheese. Although the majority of respondents clearly mentioned avoiding brie and camembert, a small number of them were not sure about feta cheese:

“I wasn’t sure about feta and couldn’t find anything on feta because I know like all your bries and all your camemberts that are cultured [should be avoided] but I wasn’t sure about feta.”
(Pamela, 2nd pregnancy)

Pamela’s remarks show that the lack of safety of some soft cheeses such as brie and camembert was related to being ‘cultured’. However, feta cheese was trusted to be a safer choice within the general classification system because less handling practices were considered to be involved in its production.

The same problem was identified with deli meats. Although nearly all women talked about ‘salami’ as an ‘unsafe’ deli meat to be avoided during pregnancy, interview data revealed that a group of participants experienced difficulties in accepting ‘ham’ as an unsafe food. While women reported they were aware of the potential risks of eating ham, they seemed to be reluctant to avoid it completely and sought a way to make it a safe choice. Within the general classification system women were able to convert an unsafe food to a safe one through their control over handling and preparation procedures. Consequently, they perceived ham to be a safe choice if they took it out of a ‘sealed pack’ or ‘cooked’ it:

“it’s more salamis and that sort of things that I’ve avoided. I’ve been a bit confused about my ‘ham sandwich’ ... if I get a sealed pack of ham which then I take the expiry date and I know that I’ve opened it just then, would that be ok [to eat that ham]?”
(Catherine, 1st pregnancy)

“Sometimes I make home-made pizzas and I sometimes put processed meat on those like ham ... this is something that somebody else told me who's not a health professional or anything 'as long as you cook it, it's ok' ... so I figure it's probably going to be pretty safe, but I'm not sure.” (Rebecca, 3rd pregnancy)

Receiving mixed messages from different sources was also found to create ‘grey areas’ that affected women’s decision making process with regard to HLR foods, because in most cases they did not know who to trust:

“like feta cheese is a big thing to me, some people said I can eat it and some said I couldn't, and I had been eating it and then I read that I shouldn't, so then I stopped, you know, so there is a few sort of grey areas I guess...” (Natasha, 1st pregnancy)

In most cases, the ‘vagueness’ seemed to be due to a lack of expert knowledge backing up the message, with the information mainly originating from non-expert ‘someone’:

“and someone said smoked salmon is ok, but I steered away from all the smoked stuff anyway and I was a bit surprised about smoked salmon if that would be ok.” (Tina, 2nd pregnancy)

Participants were found to follow the strategy of ‘better safe than sorry’ in these cases. If women were not sure about the level of safety of a certain food and the information they received did not help in reducing their confusion, they preferred to be ‘completely cautious on everything’ to minimize the risk to their baby:

“it's hard to know, because you read so much about and you hear so many different opinions on what food you should eat, what food you shouldn't eat, what foods harm the baby that I guess you're completely cautious on everything, yeah, better safe than sorry!” (Georgia, 1st pregnancy)

Overall, the interviews showed that while women were generally aware of the categories of HLR foods, they had difficulties fitting the new pregnancy-related definitions into their existing pattern of ‘safe’ and ‘unsafe’ foods. They seemed to be willing to avoid unsafe foods to protect the safety of their baby, but barriers prevented them from fully complying with recommendations on HLR foods. The next section seeks to better explain pregnant women’s practices by examining the decision making

processes and strategies they applied to incorporate food safety advice with regard to HLR foods within their eating routines.

5.3.2 Strategies towards safe eating

Nearly all participants in this study, speaking generally about their diet, perceived themselves as healthy eaters who did not eat anything ‘bad’ and as a result did not need to make major changes in their diet for a healthy pregnancy.

“I haven’t changed my food particularly too much because I don’t really eat anything bad ... there’s obviously a few things that I don’t eat because you’re not meant to eat during your pregnancy but generally my diet has not changed greatly.”
(Karen, 2nd pregnancy)

However, it was found that women in most cases had added another layer to their eating strategies to ensure the safety of their baby. Almost all participants mentioned making some kind of modification in their food choices since becoming pregnant in order to reduce the risk of *Listeria* infection, although the details of dietary changes varied among the women. Women negotiated their pregnancy diets by employing different types of strategies which were not necessarily exclusive. The main approaches to food choices in relation to pregnancy were found to be elimination, reduction and moderation. The next sections deal with each strategy in more detail.

5.3.2.1 Elimination or cutting out

One of the main strategies to address the risk of *Listeria* was found to be eliminating the intake of HLR foods. Applying the elimination strategy was a function of rigorous adherence to the proscriptions with regard to HLR foods. All participants reported ‘cutting out’ at least some types of the HLR foods from their diet since becoming pregnant. Elimination was applied at both ‘buying’ and ‘eating’ levels:

“I’m careful not to buy pre-packed salads and things like that ... whereas normally I would probably buy something like that.”
(Jasmine, 3rd pregnancy)

"I like feta cheese but of course I don't eat now that I'm pregnant ... if we have a pizza then we get one without salami and I try just to be very careful." (Janice, 3rd pregnancy)

Elimination of an item often happened when the food was not a 'favourite' or regularly consumed item and as a result its exclusion from their diet did not make a major change in women's 'lifestyle', that is it caused less conflict with women's preferences and routines and control over its consumption was easier:

"I don't eat ham anymore ... it's just not really my favourite food." (Charlie, 1st pregnancy)

"I just don't use them ... I really didn't buy deli meats that often anyway so there's not that much of the lifestyle that I've changed for me." (Ashlea, 3rd pregnancy)

Meanwhile, women's remarks demonstrated that they were willing to cut some favourite foods out, despite their 'frustration', because the change was perceived to be required 'temporarily':

"I love cold seafood I love wine, I love soft cheeses, these are all my favourite things so that's been frustrating ... but yeah, that's all right, that's only temporarily." (Catherine, 1st pregnancy)

Overall, the majority of pregnant women who participated in the interview were found to be compliant with the *Listeria* prevention messages in terms of completely avoiding a range of HLR foods. However, not all pregnant women avoided all HLR foods in the same manner. There were situations in which women reported a less compliant approach which they believed was justifiable as well.

5.3.2.2 Reduction or cutting down

'Cutting down' was a common practice among nearly one third of participants and was considered easier than elimination of a customary food. Following the reduction strategy allowed a more flexible approach towards food safety directives put forward by biomedical authorities and showed the ways women endeavoured to manage their food choices within the context of the routines of their lives. In 'cutting down', pregnant women seemed to be complying with food safety proscriptions by accepting

responsibility for ensuring a healthy baby, but they were doing so in a way which made sense in terms of their food preferences. This strategy entailed reducing the consumption of a particular food that was still used on a regular basis:

“I find that I most probably do have things that I think I shouldn't have, but I make sure I just don't have them frequently or all the time. I may have them once a month where I had them, you know, at least twice a week before.” (Ruth, 2nd pregnancy)

The strategy of changes in the degree of intake could include the irregular and reduced consumption of a particular food that prior to pregnancy would have been used more often. For instance, Cassandra's remarks illustrated how she felt that it was not necessary for her to cut out her ham consumption, because she did not use it 'usually':

“I don't really have a lot of that [cold meat] to begin with. I didn't really need to cut that out or be wary of that. I don't often have it anyway. But I've probably had a ham salad sandwich sometimes, I'm sure. But it wasn't anything that I had to cut out. Because I don't have it usually, do you know what I mean?” (Cassandra, 1st pregnancy)

Another strategy that helped women to better comply with health promotion directives on avoidance of certain foods was to reduce the consumption of the HLR food by substituting certain safe foods with them. Louise, for instance, reported how she managed to reduce her cold meat intake to once a month, by substituting other fillings for her sandwiches:

“I have had ham like for sandwiches but not very often. Mostly I just have them without any meat like with a lot of avocado and tomato most of the time. Or I have tinned tuna but not like cold pressed meats, not very much. I guess I probably have that once a month or something like that.” (Louise, 3rd pregnancy)

The strategy of balancing or negating the high risk foods by increasing the consumption of other foods was one of the coping strategies that helped women better deal with the food safety advice.

5.3.2.3 Safe food handling practices

As already noted, recommendations for the prevention of *Listeria* include some food handling, preparation and storage practices that women are required to follow more stringently during pregnancy. These practices were viewed as standard routine behaviours for all participants that helped them maintain the safety of their food within their classification system. However, the approach of pregnant women in a subsequent pregnancy, who already experienced having children and cooking for a family, seemed to be different from those who were pregnant for the first time.

All women in a subsequent pregnancy insisted that they were conscious of their own and their family's health. These women were found to be happy with their capabilities in safe handling of their food and continuing the pattern that they felt confident about being safe anyway. They stated that they carried out food handling tasks in certain ways, based on their common sense, to prevent any food related hazards. Safe food handling practices were perceived as general practice that had '*extended into pregnancy*' from the past rather than a change specifically made after becoming pregnant. There were frequent comments demonstrating that safe food handling practices were viewed as part of the general hygiene related behaviours that a mindful and responsible mother would normally take note of '*pregnant or not*':

"that's just general practice, pregnant or not, so I'm kind of happy with those practices any way. That's just kind of extended into pregnancy as well." (Tina, 2nd pregnancy)

A high degree of compliance with safe food handling guidelines was expressed by women, particularly those with younger children at home. They viewed it as a moral value to undertake whatever action that was necessary to keep their children safe and away from foodborne illnesses:

"I'm quite religious about cleaning up the kitchen and making sure everything's clean and tidy and plus having a 2.5 year-old as well ... always you're quite meticulous when it comes to food hygiene, well I am. So, it's getting prepared for that again." (Pamela, 2nd pregnancy)

Implicit in Pamela's statements about how '*religious*' and '*meticulous*' she was when it came to food hygiene was to show how perfectly she adhered to the guidelines and followed the food safety rules.

However, women's accounts revealed that they were particularly more diligent in dealing with leftover foods during pregnancy as a means of *Listeria* prevention. Participants reported putting leftover foods in the refrigerator straightaway, not keeping cooked food on the bench for a too long period of time and heating leftovers to steaming hot before eating them:

"making sure I'm getting things in the fridge pretty soon after serving them when I want to keep leftovers." (Danielle, 3rd pregnancy)

"I think that I've got the same way of preparing but I'm more careful about how long I store the stuff in the fridge for. That's the only thing." (Dorothy, 3rd pregnancy)

"I wouldn't worry about whether leftover foods were hot before eating and I'd just eat them but now I'm very careful about that sort of thing." (Janice, 3rd pregnancy)

For the women in their first pregnancy, however, food hygiene and safe food handling practices were something they could remember having gained knowledge of recently. Although the notion of 'common sense' was not absent in their remarks, most women in this group explained how they had consciously made positive changes in their food handling practices since becoming pregnant. The change was perceived a life style change and as part of awareness about the new responsibilities which came along entering motherhood. Women's accounts showed how pregnancy had turned them from '*off hand*' and '*lazy*' to '*intense*' and '*pedantic*' with regard to the safety of their food:

"I more thoroughly wash all my fresh fruit and vegetables now than I did before, I used to be very off hand about it." (Melissa, 1st pregnancy)

"I think I've probably been a bit more conscious about the chopping boards ... I used to just rinse them if I was changing between say meat and vegetables ... because I was too lazy to get another one." (Cassandra, 1st pregnancy)

“You don’t tend to be as intense about your food [before you become pregnant] ... I was never this pedantic, like we would never use three chopping boards to make a salad!” (Natalie, 1st pregnancy)

Safe treatment of leftover foods was again found to be one of the most prominent changes women made after becoming pregnant. The majority of these women stated that their practice has been ‘different’ after becoming pregnant because they ‘never realized the risk’ before:

“we don’t leave leftovers out, like we never used to put them straight in the fridge because we never realized the risk of it. And probably heating it the following day if you want leftovers, we never heated them thoroughly, they used to be lukewarm but now it’s different.” (Harriet, 1st pregnancy)

It can be concluded that although women had a reasonable level of awareness about *Listeria*, their process of decision making and their preferred behaviours did not result in strict adherence to food safety recommendations. The next section explores the underlying factors affecting women’s decision making processes with regard to food safety directives to avoid listeriosis.

5.4 Influences on food safety practice

As previously mentioned, interviews revealed that although women were not uninformed and unreflective about the health promotion directives for the prevention of listeriosis, they had not completely accommodated all aspects of biomedical knowledge in avoiding HLR foods into their pregnancy. This indicates that factors other than knowledge of medical proscriptions came into play to explain pregnant women’s food choices. The focus of this section is to explore the factors that shaped women’s decisions with regard to food safety directives and influenced the way they endeavoured to manage the risk of *Listeria* during their pregnancy.

The analysis in this section starts with the concept of maternal responsibility as a means of explaining the women’s patterns of compliance with food safety directives for the prevention of *Listeria*. The notion of ‘sacrifice’ within the context of responsibility is

also examined. The section then explores women's views about *Listeria* prevention from a 'risk' perspective. The focus of this part is to examine participants' perception of *Listeria* risk within the context of food related risks during pregnancy. The influence of knowledge on women's perception of risk and how their choices were affected by the judgements about this kind of risk is also explored. Finally the impact of life circumstances is examined to provide further insight into decisions behind women's food practices

5.4.1 Maternal responsibility

Acting to guarantee the health of the baby was a common concern in the minds of the women interviewed. Nearly all of them had accepted the responsibility of the outcome of their pregnancy and were prepared to make the necessary changes in their lifestyle and way of eating. Having a strong sense of individual responsibility for the health of their baby was linked with the women's patterns of compliance with food safety directive. Responsibilities of motherhood were believed to begin with and as inherent in the process of pregnancy:

"You have to be careful in whatever context because you are responsible for the life of this little person, as a pregnant mum. You are responsible for that child in utero and you are responsible for that child once it's born." (Karen, 2nd pregnancy)

Most women viewed their baby as 'vulnerable' and believed that they were responsible to protect it from any harm:

"The baby in utero is sort of vulnerable, I'm responsible I suppose for keeping it healthy." (Georgia, 1st pregnancy)

The threat of *Listeria* encapsulated a risk that could be personally controlled. As a result it was perceived as the normative and instinctive responsibility of the pregnant woman to protect her baby against it. No 'excuse' for exposure to *Listeria* was therefore acceptable:

"I don't think there is any excuse for exposure to something that can harm [the baby]. I mean sometimes there are things that are out of our control but I think as best as one can, one has to make sure to do the right things for the right reasons." (Karen, 2nd pregnancy)

Vulnerability of the baby and the idea that it was potentially exposed to damage that was under their control, caused women to try to safeguard their baby through mindful food choices and practices. The universal belief among the participants was that their baby required constant protection on their part and that they needed to be more conscious of what they did in general and what they ate in particular, in the course of their pregnancy:

“you do become a bit obsessed with yourself because you know whatever you’re consuming or whatever you’re breathing in or whatever, is going to affect your baby.” (Pamela, 3rd pregnancy)

Women’s accounts revealed that they viewed their pregnancy as a precious experience and they were happy to do their best in ‘keeping’ it:

“I mean most people don’t want to lose their baby. They want to be pregnant or if they found out they’re pregnant they want to keep it and if they know the things aren’t safe then they won’t eat them.” (Ashlea, 3rd pregnancy)

Women often stated that they were more likely to stringently follow the food safety guidelines to ensure the health of their baby rather than themselves. This type of concern generated a common rationale for the dietary practices women described. Acceptance of maternal responsibility meant that most pregnant women tailored their diet to place the baby’s needs above their own desires and to be less ‘selfish’:

“just knowing that the consequences are far greater when you’re pregnant you tend to be a little bit less selfish.” (Ruth, 1st pregnancy)

In many cases women felt responsible enough to remove an important food item from their diet because of the potential risk that it might pose to their unborn child. This could either be a favourite food, in which case avoiding it was perceived to be ‘soft torture’, or a regularly consumed food, in which case finding an appropriate substitute for it was perceived to be a challenge:

“I probably would [serve soft cheeses]...but I just wouldn’t eat them myself ... which is like soft torture really, isn’t it? Because I love that blue Castello cheese, oh god that’s just heaven!” (Pamela, 2nd pregnancy)

“Ham’s been the hardest stuff just because I used to eat a lot of ham. That was a big part of my diet. Yeah, having to take that out and finding things that I like to replace it was quite hard.”
(Susan, 3rd pregnancy)

Dietary change in these cases happened despite the conflict it caused with women’s own preference for a food due either to its taste or its convenience. However, participants stated that they were happy to sacrifice their own desires and abide the hardship of a choice to ensure the health of their baby.

5.4.2 Perception of risk

As mentioned in the previous section, the majority of women in this study perceived food related risks to be distant and stated that they were not particularly concerned about this kind of risk during their pregnancy:

“food doesn’t really worry me that much because it doesn’t seem like anything’s happening ... I’m just worried about other stuff.”
(Charlie, 1st pregnancy)

The reason why food safety did not dominate women’s concerns was, at least to some extent, their trust in the hygiene standards and food regulations in Australia. Australia’s secure food system had resulted in women placing a high level of trust in the current food environment, thereby reducing their apprehension of food related risks:

“I’ve never had any food poisoning or any illness from food in Australia so I tend not to think of it as a big concern.” (Clara, 1st pregnancy)

This is, however, not to say that none of the participants had never had an experience of foodborne illnesses. Two thirds of interviewees reported suffering from food poisoning, or what they called ‘gastro bugs’, sometime in their life and mostly as a result of ‘travelling internationally’:

“I’ve suffered from gastro bugs but mostly travel internationally has been the time in which I’ve experienced that more than anything. I remember once I had something in the Philippines ... and that caused a stomach upset. So there’s been a few times but mostly overseas.” (Karen, 2nd pregnancy)

Even so, previous experience of food poisoning did not mean that the respondents perceived the illness to be a serious risk to their health. The main notion among the participants was that foodborne illnesses generally did not need ‘*medical attention*’ and one was able to ‘*work it out in the system*’:

“I’ve never had anything bad, not that required medical attention. So it’s something that you just work it out in the system and stay home from work generally if you have to, if it’s bad enough ... I haven’t had anything bad enough that made me sick enough to seek medical attention.” (Melissa, 1st pregnancy)

In response to the question on their health concerns and worries during pregnancy, few women mentioned that they were particularly anxious about their food. Women were generally less likely to worry about health hazards over which they perceived to have some personal control compared with hazards they felt were outside their control. Many of the pregnant women in this study appeared to be more concerned about the risks over which they felt they had no or little control, such as ‘*unexpected genetic issues*’:

“I guess my main concern would be the unexpected genetic issues that may arise that are uncontrollable, which are more not environmental but perhaps just within yourself and the baby.” (Ruth, 2nd pregnancy)

Only pregnant women with underlying conditions that were potentially related to their food and had to be managed through modifications in their diet talked about food as a concern. However, in these cases food was a concern because of a reason other than safety:

“I don’t want to put on any extra weight. I don’t actually think it’s for safety ... I think ... I shouldn’t eat that piece of cake because how am I going to fit into this dress next time more than I probably shouldn’t eat that because what could it do to me.” (Harriet, 1st pregnancy)

“I suppose I’ve been much more conscious of my refined foods for me because I am more focused on managing the gestational diabetes.” (Susan, 3rd pregnancy)

Meanwhile, women were interested in receiving the information regarding different potential risks to their pregnancy, including the risks associated with food, within their

role as 'good mother'. However, as Danielle commented they did not want to 'terrify' themselves and 'live in fear all the time':

"I feel that you don't want to totally terrify yourself the whole way through your pregnancy ... I think it's important [to know what the risks are] but then ... you don't want to live in fear all the time." (Danielle, 3rd pregnancy)

This meant that women sought to relieve themselves from concern about potential risks, in many cases by underestimating the risk. This was particularly true with regard to *Listeria*.

5.4.2.1 Positioning the risk of *Listeria*

Risk of *Listeria* within the context of food safety in general, was considered to be remote. It was the weighing up of the probabilities that determined women's construction of *Listeria* risk in one third of cases. Samantha, who viewed the risk of *Listeria* in this perspective, noted that it was just one of many potential dangers to the pregnancy and suggested 'walking across the street' or 'having a hot shower' as greater potential threats to the pregnancy than *Listeria*:

"actually in some ways you've got more risk of being run over walking across the street and that's going to have a more serious health effect on your baby than getting listeriosis ... may be having a shower that's too hot is very worse than that or even travelling on plane is very more unsafe than that." (Samantha, 3rd pregnancy)

Many women found it difficult to believe that the risk of *Listeria* was associated with the consumption of certain foods because they used to consume them on a regular basis and in some cases even in previous pregnancies and they were convinced that it was safe to eat them since 'nothing happened' before:

"like for instance soft served ice cream, when I first heard I thought 'it's not true, I've been eating that and nothing happened to me' you know." (Ashlea, 3rd pregnancy)

This may explain why more than one third of participants stated that they were not particularly anxious about *Listeria* risk. These women questioned the expert opinion on the *Listeria* risk in many ways. Clara for instance, associated undue concerns about food

safety as a modern attribute that was not considered to be a threat for previous generations 'twenty or thirty years ago' or in other parts of the world where HLR foods made up 'their everyday diet'. She expressed her ambivalence by stating that the risk associated with *Listeria* was not a 'huge risk':

"you know twenty or thirty years ago or in countries like the Mediterranean area where this sort of food makes up their everyday diet, I think it's probably a small risk ... I don't necessarily think it's a huge risk." (Clara, 1st pregnancy)

For more than half of the participants, perception of risk with regard to *Listeria* infection was constructed around their subjective assessment of probabilities associated with the consumption of HLR foods. This group, typically represented by Janice, believed that the expert opinion over the risk of *Listeria* did not mean that the harm 'will' definitely happen:

"it's all about risks, it's not about that this WILL happen. You could go through your whole pregnancy and you could eat all of those things and nothing could ever happen to you because you just happen to eat those ones that haven't got any problems, which is probably what happens most of the time." (Janice, 3rd pregnancy)

Implicit in Janice's account is her underestimation of risk and discounting of expert knowledge, since she believed that in most cases the foods introduced as high risk did not have 'any problems'.

For a number of pregnant women an underestimation of risk led to a more flexible approach towards consumption of HLR foods, described previously as 'moderation'. By expressing their behaviours as 'moderation' women challenged the expert knowledge in terms of food safety advice. They acknowledged that there existed some level of risk and rules for prevention of *Listeria* but as part of their underestimation of the risk they did not consider it necessary to strictly follow the rules. They were found to make negative comments about other people who strictly adhered to the recommendations because they believed that the risk of *Listeria* was not an immediate risk to their pregnancy. Melissa for example, was one of the well informed participants who reported having some processed meats and soft cheeses in her diet 'every now and

again'. She believed that moderation was '*better applied*' in this case and criticized the practices of a friend whom she perceived as '*more extreme*':

"She was probably more extreme ... She avoided completely soft cheeses, cold meats, deli meats, reheated food, everything ... while moderation is better applied here." (Melissa, 1st pregnancy)

Ruth had similar anecdotes about a friend who was seen as extreme in her concern over HLR foods and viewed her friend's perception of risk as an '*overkill*' and believed that it was possible to '*indulge sometimes*':

"I thought that it may have been a bit of an overkill, because I thought surely you can indulge sometimes ..." (Ruth, 2nd pregnancy)

More than half of the participants related the magnitude of risk to the amount of the food and the frequency of its consumption and concluded that having HLR foods '*in small amounts*' and on a '*rare occasion*' would not be a great risk:

"it seems that I'm obsessed with cheese, I'm not really, but you only eat it in small amount and on a rare occasion anyway. It's more of a social party type of food, isn't it really in a way? It's not like that you having it weekly or anything like that." (Pamela, 2nd pregnancy)

The idea of personal choice and whether one decides to take the risk was also put forward by a few women, especially among women in a subsequent pregnancy.

"I think really it's more been a thing that I've chosen to ignore, chosen to ignore certain things or chosen to conveniently forget certain things because it can be easier ... I mean it's all choice." (Samantha, 3rd pregnancy)

It should be noted that most of the women in a subsequent pregnancy stated that they felt more '*confident*', '*relaxed*', '*blasé*', and even '*slack*' in their food choices with this pregnancy, because of an easy and uncomplicated experience with the previous ones. This may explain why a number of women in this group denied the moral obligation of following the proscriptions suggested by biomedical authorities and chose to '*conveniently forget certain things*'. There were situations in which women were aware of the risk of *Listeria* and even acknowledged the inadequacy of preparation procedures

to make the food a safe choice, however, they insisted on continuing the consumption of it and neglecting the potential risks:

“say you have a toasted ham and cheese sandwich, I think well it’s been cooked, it’s been heated, I can probably eat that, but actually really it probably hasn’t been heated enough to kill any bacteria that it might have had beforehand but you still think ‘oh, it’s been cooked, I’ll eat it’ .” (Jasmine, 3rd pregnancy)

For these women the strict directives of the *Listeria* prevention messages were not realistically incorporated into their routines. While they were familiar with the messages about *Listeria* prevention, they tended to sometimes voluntarily ignore the potential risks in consideration of their own preferences. Denial of harm and entertainment of risk seemed to be the main features of women’s behaviour in these cases, where the risk was perceived small and negligible compared with the enjoyment of eating particular foods.

5.4.2.2 Knowledge and risk

Lack of enough knowledge about listeriosis and its negative consequences for the baby throughout the course of pregnancy was found in nearly half of the interviews, regardless of whether it was a first or a subsequent pregnancy. Most women did not have a clear understanding of the symptoms of illness and ramifications on the pregnancy outcome:

“I don’t really know whether the risk is food poisoning that would then cause loss of the baby or food poisoning that would cause damage to the baby. I don’t really know what would be the worry.” (Cassandra, 1st pregnancy)

Lack of knowledge led in some cases to confusion and an underestimation of risk. Participants’ narratives showed that the perception of *Listeria* risk was to some extent associated with the level of knowledge women had regarding the onset of illness and its consequences. Some of the interviewees assumed that *Listeria* could be a risk to their baby only at the early stages of their pregnancy. This may have been an unconscious generalization of the consequences of other infections such as rubella and Cytomegalovirus or dietary inadequacies such as folic acid deficiency early in pregnancy, and the idea that the fetus is more susceptible to illnesses at the early stages

of development. One of the participants, for instance, described the advice that she had received from a pregnant friend:

“... and she like ‘you really need to stop eating this, this and this before you start [your pregnancy] because of the Listeria factor, that affects you like really early in pregnancy, probably more than later in your pregnancy.’” (Natalie, 1st pregnancy)

However, another participant perceived the second trimester to be worse due to a higher ‘placental impact’:

“You know as far as I’m aware of, the second trimester is worse for the fetus because it’s got so much placental impact whereas before that you are not sure if your pregnancy’s going to be viable. You don’t have so much blood flow going through your fetus system developing.” (Cynthia, 4th pregnancy)

Lack of enough knowledge about the potential consequences of listeriosis at different stages of pregnancy led in some cases to an underestimation of risk towards the end of pregnancy. Dorothy’s remarks showed how her unawareness of the potential negative outcomes of *Listeria* infection, had caused her to comfortably have soft cheeses in her previous pregnancy, while she was obviously conscious of risk and caring by stating she remembered ‘*thinking about that*’:

“in my last pregnancy ... I was 37 weeks and I was somewhere and I had soft cheese like brie and camembert and I did eat it because I thought ‘well, I’m going to have a miscarriage now, it’s going to be ok.’ I remember thinking about that. But I had it because of the stage of pregnancy I was at.” (Dorothy, 3rd pregnancy)

Women’s perception of risk associated with certain types of food was found to be influenced by the extent of communication about negative consequences of listeriosis in the broader media. This was particularly true for women in a subsequent pregnancy, who were generally found to be more relaxed about different pregnancy related issues. Rebecca’s remarks is a good example of how more than half of participants in this study believed that *Listeria* infection could not be associated with the consumption of ham, because they had never heard it to be ‘*publicized*’ in the media:

“I would buy ham, sliced ham and sometimes you know sliced turkey, but I wouldn’t eat salami, isn’t that silly? Because ... there’s been a lot of highly publicized episodes of large groups of

people getting quite ill from eating those kinds of small goods. But there's not been much publicized about people getting anything from ham, you know, deli ham kind of thing." (Rebecca, 3rd pregnancy)

Women's rationalisation that the illness was not prevalent enough to warrant behaviour change or that insufficient evidence was available to convince them that HLR foods could cause damage to their baby's health, functioned to justify the legitimacy of their relaxed behaviour.

5.4.3 External factors

Women's social relationships and life circumstances were found to have both negative and positive effects on their management of *Listeria* risk. Although most women believed that there was '*no extenuating circumstances*' that would require them not to change their behaviour to reduce the risk of *Listeria*, a number of circumstances were identified to have major impacts on women's decisions in following food safety advice.

5.4.3.1 Social relationships

Women in some cases faced situations where they required accommodating the needs of other people in their social circles. Melissa for example, stated how she had to reduce the amount of the soft cheeses and deli meats she consumed instead of cutting them out of her diet because of the 'pressure' she received from her family:

"family pressure has played a big part ... my family background is an Italian family and they all grew up eating soft cheeses and drinking lots of wine and eating all the meats and they say to me 'we all have healthy children, don't worry about that'... so instead of cutting them [HLR foods] out I've cut right back and I still have them a little bit here and there." (Melissa, 1st pregnancy)

However, social environment was not always seen as a barrier to behaviour change. There were circumstances where women benefited from social support that made safely eating easier for them. Some women stated receiving support from their partners, which was provided as part of their mutual interest in the pregnancy outcome:

“my partner’s very supportive of what I eat and makes sure that I don’t eat any thing that could be harmful towards the baby.”
(Natasha, 1st pregnancy)

Women’s accounts in many cases illustrated the support that they received from their friends. Friends’ attitude in supporting the avoidance of HLR foods by their pregnant counterparts was attributed to a ‘*general awareness*’ of food related risks among the peers:

“people do seem to be aware that you have to eat differently when you’re pregnant like my friends who aren’t parents yet get a bit nervous ‘oh, what can you eat?’ They are more paranoid than I am ... I think now there is a general awareness about food safety and things.” (Catherine, 1st pregnancy)

These findings emphasise the potential constructive impact that receiving support and care from the social network could have on women’s compliance with food safety directives to avoid listeriosis during pregnancy. The other aspects of support within the context of social network will be discussed in the next chapter.

5.4.3.2 Life circumstances

There were situations in which strategies used to address certain life circumstances were in conflict with values related to the safety of food. In one instance, time and convenience were of a higher priority compared with food safety. Aisha’s accounts showed how she had lost her agency over her high risk practices in food preparation and consumption because of the temporal pressures of a highly demanding job. She stated that she defrosted the frozen food over night in the sink instead of in the refrigerator and she cooked once for the whole week and kept the cooked food in the refrigerator and did not reheat the food to steaming hot before eating it. However, she had found some means to content herself and relieve the feeling of guilt associated with her high risk food practices by appealing to the hearer that she had ‘*no other way of doing that*’ and acknowledging that what she did was ‘*not a good thing to do*’:

“I have only weekends to do my grocery [shopping] and to cook ... and usually I cook for a week and I keep it in the fridge for six days nearly. I have no other way of doing that ... I’m not eating too hot meals, I mean I know it should be [hot], but I can’t. I just

give the microwave a slow heat ... which is again not a good thing to do.” (Aisha, 2nd pregnancy)

Feelings of guilt were, however, much stronger in Natasha's accounts when she talked about her 'horrible feeling' after having a deli sandwich one night on her way back home because she was starving:

“I knew it was like crap, you know horrible food, it wasn't good food for me anyway, and that's not something that I would probably normally eat very often, if I wasn't pregnant anyway, and eating it when I was pregnant was just kind of a horrible feeling, I apologize to the baby for doing that.” (Natasha, 1st pregnancy)

While these women's dynamic reasoning process may be simplistically regarded as excuses for their behaviour, the element of guilt that dominates their narratives diminishes the degree of resistance that such an act might otherwise suggest. The residual guilt experienced by these women suggests that while they resisted in practice, they felt that they should be complying and experienced guilt when they failed. Disconnection between knowledge and behaviour in these cases shows the importance of assessing both knowledge and practice as separate but yet related processes. A disciplinary principle, such as the biomedical guideline that unsafe food behaviours can cause harm to the baby, may thus shape the thinking of pregnant women without altering their behaviour.

5.5 Conclusion

The analysis of pregnant women's decision making processes to avoid *Listeria* infection during pregnancy showed that these processes were formed within the context of an existing classification system that helped women judge the safety of their food in their eating routines. This classification system worked based on women's perceptions of the safety of foods according to the nature of food and its organoleptic characteristics at the first place. However, women's notions of control and trust were found to influence the classification system by bringing into play factors such as quality of food handling practices and location of preparation together as important determinants of the safety of food. Women had added the specific food safety directives relating to pregnancy to their

existing categorizations of safe and unsafe foods. They applied different strategies to modify the amount of HLR foods in their diet and changed some of their food handling practices to reduce the risk of contracting listeriosis.

A number of factors were identified that influenced women's decisions on food behaviour change to avoid *Listeria*. Women viewed it as within their maternal responsibility to do whatever needed to keep their baby healthy. However, food related risks were perceived to be remote and many women did not consider a special effort to be required to avoid them. Poor knowledge about the ramifications of *Listeria* infection during pregnancy caused some women to view food safety directives an undue burden on their eating routines. Women's reliance on their past pregnancy experiences led to some degrees of mistrust on scientific knowledge and a tendency to manage the *Listeria* risk within their normal food preferences. Women's social network and life circumstances also occasionally had an inhibitive influence on their food related practices with regard to *Listeria*.

The next chapter examines women's accounts on the various sources of food safety information available to them and explores the role of these sources in the construction of *Listeria* knowledge and women's decision making processes to avoid the *Listeria* risk during pregnancy.

6 Women's Perspectives on Sources of *Listeria* Knowledge

6.1 Introduction

Pregnant women's descriptions of how they tailored biomedical guidelines with regard to food safety and *Listeria* prevention to their everyday life routines, as described in the previous chapter, revealed the weight that authoritative biomedical knowledge often had in influencing women's perceptions of the issue and decision making processes. To understand how pregnant women viewed food safety directives on *Listeria* prevention, it is necessary to explore different avenues from which women gathered their meanings for safe eating, as well as how they organised this information in meaningful ways that shaped their food choices.

This chapter offers insight into the range of considerations that pregnant women took into account when seeking to evaluate a variety of information sources and make use of specific food safety recommendations. The chapter first examines the role of women's lay network on the acquisition of food related information and considers the concept of trust as one of the most important issues influencing pregnant women's decisions with regard to advice from their counterparts. The chapter then explores the women's views on the role of health professionals in the construction of their food safety knowledge and investigates the gaps and inconsistencies in this regard. Also included is a comparison of the monitoring versus the informative role of antenatal care from women's point of view, how they were expected to be proactive in seeking advice, and again a comparison of professionals' approach in the provision of advice to first-time pregnant women versus those in a subsequent pregnancy. Finally, the chapter investigates the influence of different published sources of information on women's understandings of *Listeria*.

6.2 Sources of food safety knowledge in pregnancy

Analysis of interview data showed that food safety knowledge guided many of the women's decisions about their eating practices to prevent *Listeria* infection in their pregnancy. Pregnant women's narratives showed that different streams of authoritative knowledge yielded a variety of pregnancy decisions that entered the course of women's daily routines. Jordan's concept of 'authoritative knowledge' (1997) and Wilson's concept of 'cognitive authority' (1983) were used as a framework for the analysis of women's decision making processes with regard to different sources of food safety information and whether women considered a particular information source as authoritative or not. The analysis takes into account factors such as credibility, competence, and trustworthiness of the source of information as described by women's perception of source expertise or personal trust. An attempt has been made in this chapter to examine separately the different sources of *Listeria* knowledge during pregnancy. However, it was difficult to undertake an independent analysis of each stream of knowledge because women used a number of sources of information at the same time and their authority decisions on the trustworthiness of each source was based on a variety of individual factors including their experiences and priorities.

6.2.1 Lay network

The circle of non-professional informational sources including relatives, friends and acquaintances comprised a 'lay network' that provided the pregnant women with a context for social support and information exchange. The following section considers the role of lay network in pregnant women's decision making and processes that influence their behaviour with regard to food safety practices and *Listeria* prevention. It examines the ways food safety and *Listeria* advice were conveyed to pregnant women within their lay network and explores their strategies to establish the 'authority' of information and how it influenced their decision making processes.

6.2.1.1 Provision of advice as part of social support

More than two thirds of participants reported receiving food safety advice from a range of people in their lay network, including their relatives, friends and colleagues who were either pregnant or had recently given birth. The element of helping, sharing, or giving useful input to others was frequently found in women's accounts of their lay network. The women reported an exchange of reading materials as a first step in providing social support and communicating pregnancy related information:

"I gave them [books/pamphlets] all to my sister-in-law because she's just fallen pregnant with her first baby." (Susan, 3rd pregnancy)

Food safety advice from the lay network was mostly focused on information on HLR foods and warnings on avoidance of these foods to prevent *Listeria* infection. It should be noted that the majority of participants who reported relying on their lay network as their main source of information were first-time pregnant women for whom the experience of pregnancy was, as Catherine commented, a '*whole new kettle of fish*'. Many pregnant women in this group stated that they had received the information on HLR foods from their peers far earlier than from their health care providers. Clara, who at the time of interview was eighteen weeks pregnant, was one of the women who had not yet been given any advice on which foods to avoid by any of her care providers, but was well informed on the issue by her sister:

"my sister has just had her second child. She said to me you can't have this and you can't have that, so I didn't really do any research myself. I'm going on the things that she told me. So that helped me." (Clara, 1st pregnancy)

Women's accounts showed that many of them shifted easily into the advisory role normally played by health professionals who hold a high level of authority in biomedical knowledge. Natalie, who had received all her information on *Listeria* from another friend, described how she was eager to communicate the risk to other pregnant women:

"I was talking to a girl at a BBQ and she had only just found out she was pregnant and I said to her 'make sure you don't eat' and I gave her that list and she went 'all that?' and I [said] 'yeah' ... she knew only about the cheeses." (Natalie, 1st pregnancy)

Lay network was also found to be an important source of information for women who had become pregnant after a long time following their previous pregnancy, as they either had not received any information on *Listeria* prevention in their prior pregnancies or had simply forgotten that information. Having her second child after nearly ten years, Ruth had learned a lot of things from her colleague. She stated that with neither of her pregnancies she had been given advice from a health professional on avoiding HLR foods:

“the lady I worked with, she was of a similar age and she discussed with me about her pregnancy. So there was a lot of things that she imparted about what to eat and what not to eat.”
(Ruth, 2nd pregnancy)

There were also others for whom advice from lay network was perceived as a reminder:

*“when I had my daughter another friend of mine also was pregnant at the same time and she reminded me of it [*Listeria*] because I had forgotten.”* (Rebecca, 3rd pregnancy)

The lay network thus largely contributed to the women's repertoire of *Listeria* knowledge and had an important role in filling the gap of expert knowledge and advice regarding *Listeria* during pregnancy.

6.2.1.2 Authority of lay knowledge

Along with the prominent role of lay network in the construction of women's knowledge about the risk of *Listeria* during pregnancy, the issue of authority of the information was investigated in the interviewees' accounts. Women employed several cognitive criteria to build up or undermine the authority of different sources in their lay network. It was found that in most cases what reinforced the credibility of one source and worked to present advice as solid and factual and authoritative was whether the advice originated from science based knowledge. Clara, for example, perceived her sister's advice to be authoritative because she saw her as very 'researched', 'organised' and 'knowledgeable' which are all attributes of scientific endeavour:

“My older sister is like an encyclopaedia of knowledge so I usually trust what she says as fairly reliable and broad because she is one of those people who are very researched, very

organised, very knowledgeable. So she says this and I tend to believe her.” (Clara, 1st pregnancy)

This emphasis on the authority of the source of information and the discourse of scientific trustworthiness meant that most women in this study did not uncritically accept the advice within the context of their lay network. In cases where the sources of advice were outsider ‘people’ holding an unknown level of scientific authority, the advice was perceived as a less reliable ‘myth’ and women preferred to verify its credibility by ‘looking it up’ for themselves and cross referencing it to ‘current research’:

“I tend to hear what people have to say and then try to look it up for myself and find what current research is saying about that, because there are so many myths out there. I don’t want to be cutting out deli meats if I don’t have to cut out deli meats.” (Sara, 1st pregnancy)

A number of participants described an information source as credible, based on authority derived from membership in a particular group, such as ‘health professional’ or ‘mother’. However, the power relations between the authoritative knowledge and lay knowledge appeared to be in flux. Analytic distinction between different forms of knowledge could not in some cases be mapped onto specific social positions because social positions were not fixed, for example a mother or a friend may be a health professional. The following quotes reveal how women established the authority of a source by shifting between the discourses of lay and expert knowledge. While the credibility of members within women’s lay network were judged based on their life time experiences as ‘book of knowledge’ and mother of ‘four kids’, their expert credibility was recognized by stating that they were ‘nurse’ or had a ‘medical background’:

“my mom she is a nurse but she also just knows heaps of stuff about everything ... book of knowledge, you know... so I probably would still ask my mom about the safety of a food, yeah, even if she wasn’t a nurse.” (Catherine, 1st pregnancy)

“I’ve got a friend who is a nurse and I ask her questions about what’s safe to eat while I’m pregnant or can I have this when I’m breast feeding ... because I know that she sort of got a medical

background and she's got four kids, so she's an expert." (Louise, 3rd pregnancy)

In spite of high credibility assigned to peers, some women did not find the older generation sufficiently entitled to claim authority about food safety issues and this caused limited transferability of past generation's knowledge to current pregnancy situations. A number of women who had received some kind of advice on their food from older relatives seemed to not only privilege the biomedical scientific knowledge, but also to actively downgrade the older lay knowledge to non-credible '*old wives tales*':

"they [mother and mother-in-law] can't be trusted because there's too many old wives tales getting mixed up with knowledge and everything's a little bit topsy-turvy." (Ashlea, 3rd pregnancy)

The speed with which biomedical knowledge on health risks during pregnancy has changed made some women sceptical about the validity of information provided by women of an older age since they believed that the latter '*were not aware of all this information*' when they had their children:

"they [mother and aunty] probably, they are lot older and I suppose it's been a while since they've gone through all of that ... may be back when they had children they probably were not aware of all this information." (Harriet, 1st pregnancy)

Generally speaking, the lay network was identified as a valuable source of information for pregnant women. Pregnant women were particularly interested in exchanging experience with other women who were or had recently been pregnant, for comparison, reassurance and advice and information exchange seemed to be an ongoing process among pregnant women and their peers. However, pregnant women were conscious of the authority of the lay knowledge. Advice from lay network was influential on current food safety practices if it was perceived to be purportedly backed by scientific knowledge. The emerging nature of *Listeria* as a risk during pregnancy had resulted non-professional sources of knowledge to be perceived as authoritative only if they eventually had the characteristics of scientific endeavour. This may, at least to some extent, explain the high positioning of expert knowledge among the interviewees and their expectations from health professionals as the most credible sources of food safety

and other health related information during pregnancy which is the focus of the following section.

6.2.2 Health professionals

Pregnant women in the current study received their antenatal care from a range of health professionals, from obstetricians to GPs and midwives. An analysis of women's views on their interaction with their care providers on food safety and *Listeria* related issues is provided in this section.

6.2.2.1 Monitoring versus provision of advice

Interview data showed how there was a contrast between the medical approach of care providers which had an emphasis on antenatal monitoring and the women's expressed desire for information as the most important function of antenatal care. More than two thirds of participants stated that their antenatal visits were limited to biomedical surveillance in terms of physical check-ups and tests and measurements, where they only received '*proddings*' and their bodies were '*processed*', but they were provided with little advice on how to look after themselves and their pregnancy. Women's accounts showed how they perceived their care providers not to be '*forthcoming*' in giving advice:

"there's not been anything other than tests and proddings, there was really nothing and I was only there to get processed ... no advice was really coming toward me." (Ruth, 2nd pregnancy)

"they check my fundal height and they check my blood pressure and they check the baby's heartbeat ... but I don't feel that they're forthcoming in giving advice necessarily on different areas in pregnancy." (Georgia, 1st pregnancy)

The narratives showed how for many participants the informational function of antenatal care was highly valued. Ruth's comment is a good example of how women preferred to be '*forewarned*' about the *Listeria* risk by their care providers. This was perceived as an important means of empowerment for women to help them better

‘control’ their ‘choices’ and minimise the risks so that they are not the ‘martyr at the end’ due to their unawareness:

“I think it [antenatal care] should make you more informed and with more control of yourself and the choices that you can make, you know, rather than being the martyr at the end who says ‘well, I never knew about it’. You know I’d rather be forewarned, and just aware of things.” (Ruth, 2nd pregnancy)

Inadequacies in *Listeria* communication within the antenatal practice was a continuous problem, where many women, even in a subsequent pregnancy, stated that they had never received any *Listeria* advice ‘out of the mouth of a health professional’:

“I am sure that definitely in my last two pregnancies it’s never been mentioned and I actually don’t think it was ever mentioned with the first one. I don’t think I actually heard about Listeria or anything like that personally out of the mouth of a health professional.” (Danielle, 3rd pregnancy)

The significance that pregnant women in the current study attached to the scientific knowledge may explain why many of them felt disappointed when they received what they considered scant biomedical advice regarding food safety and *Listeria* from their health care providers.

6.2.2.2 Active seeking of advice

Nearly all of the participants, however, acknowledged that although verbal food safety advice was not forthcoming in their antenatal visits, health professionals were willing to provide the advice if they asked for it. By accepting that the onus was on them to ‘ask for information’, and their argument on the importance of safe food for their baby, pregnant women transformed active seeking of biomedical knowledge into a norm:

“I don’t think there was really anything on what I should do. [It] was more just if I wanted to know anything ... like you mainly get asked if you’ve got any questions and if you don’t, everything’s fine then, you don’t get that feedback.” (Harriet, 1st pregnancy)

Although many women had positive views on having the opportunity to ask questions from their care providers, there were others who perceived this kind of approach to be ‘frustrating’ and of limited help:

"I feel that unless you ask specifically you don't get the information. And that's been frustrating ... I hope I've asked all the right questions." (Catherine, 1st pregnancy)

As Catherine's remark shows, the main problem with expecting women to ask for the information was their uncertainty about what comprised the 'right questions'. This was not only the case with first-time pregnant women but for women in a subsequent pregnancy who viewed a reasonable level of understanding and experience on the issue as essential for 'understanding the relevance' and knowing 'what you need to ask':

"I think the blanket question of 'is there anything that you want to ask' is pointless. It is absolutely pointless. Because if you haven't been a mother you don't know what you need to ask. Even a second or third time mom, there can be things that you don't understand the relevance." (Susan, 3rd pregnancy)

Some women believed that the 'power difference' between clients and care providers could potentially hinder the communication between them, leaving women hesitant in asking questions they may have because they would not 'dare' to ask:

"but then what happens if you aren't the type of person that WILL ask questions? I'm sure there are people out there that wouldn't dare to ask a doctor questions you know, because of the power difference sometimes." (Pamela, 2nd pregnancy)

One fourth of participants put forward the idea that important questions could be missed because of the time interval between women's facing the problem and the time they attend their next antenatal visit:

"if you're reading it [now] by the time you go to see them again it would be too late ... you'd think 'I don't know what was that about, two weeks ago I read that, I don't remember what it was like that I was going to ask.'" (Harriet, 1st pregnancy)

Another factor mentioned by nearly one third of participants that negatively affected their approach in seeking information from their care providers was the time constraints that women felt during their antenatal visits. Pregnant women found it frustrating that their health care provider, whether doctor or midwife, seemed to have so little time to discuss issues with them. They felt disconnected from the process and articulated this as frustration. This experience did not seem to vary whether the pregnant women were

privately insured or not. In the private health system, although women may have had the advantage of choosing their own obstetrician, there still did not appear to be much time for discussion. Pregnant women frequently mentioned the difficulty in thinking about and asking questions of their care providers when they knew they were 'so busy' and had to 'get people in and out as soon as they can':

"I suppose they're so busy as well. Like last Wednesday when I met you I was sitting there for 2 hours waiting to get in and so I think they probably don't have time to talk about it. May be they need to get people in and out as soon as they can." (Danielle, 3rd pregnancy)

Being unable to connect on a personal level with their health care provider meant that women receiving shared care or private care did not have the kind of long-term interaction that fostered feelings of involvement in the process. Confidence building and discussion of different issues, including *Listeria* education, appeared to be more common among midwives, who as Cynthia commented, 'cared about things holistically':

"And it wasn't seen as being a GP's issue or anything else, and unless you're speaking to a midwife who cares about things holistically then you're not going to get the advice." (Cynthia, 4th pregnancy)

A further attempt into exploring pregnant women's priorities when seeking advice from a health professional, however, demonstrated that this had little to do with their food in general and much less with the safety of their food. Women criticised their care providers' way of dealing with antenatal care, in terms of being more engaged in monitoring the physical process of pregnancy rather than spending time on educating women to improve their lifestyle and reduce the risks associated with their behaviours. However, the women's remarks demonstrated that they were themselves more interested in the process of pregnancy and child birth rather than different aspects of maintaining healthy behaviours. More than two third of participants stated that the growth and development of their fetus and/or the issues associated with birthing comprised their major concerns and the higher priority matters that they would prefer to raise during their antenatal visits:

“often you see a doctor for 5 minutes and so you’re focusing more on other things that are more important to pregnancy than what you already know. So I don’t talk about food with my doctor because I’d rather spend that 5 minutes talking about the size of the baby, is that growing properly, is that developing to the point, yeah.” (Catherine, 1st pregnancy)

Catherine’s account of food as ‘*what you already know*’ is again an emphasis on her perception of food related issues as common sense and something that does not merit attention and time during her short visits with her doctor. Charlie was another example of a first-time young pregnant woman whose only concern seemed to be events around birth:

“it was more me asking questions about what I wanted to know ... ‘is that going to hurt?’ ... ‘how do you know it’s not just fake contraction?’ those sort of questions ... the pain part is more than the food part.” (Clara, 1st pregnancy)

Less than one third of participants mentioned that they had solicited some kind of dietary advice from their care providers during pregnancy. However, most diet consultations were on how to control a medical condition such as gestational diabetes or obesity through their diet, rather than issues related to food safety.

6.2.2.3 Provision of advice: first-time versus subsequent pregnancies

More than half of participants reported that their care providers had given them some verbal advice on different health issues, including food safety recommendations to prevent listeriosis. A closer examination of data showed that the majority of women in this group were first-time pregnant women who stated they had received the information from their GP and/or midwife. Half of the women in this group reported receiving *Listeria* advice when they first went to their GP to confirm their pregnancy and the rest of them had received the advice in their booking session with the midwife:

“I guess initially [I got some advice] just from the GP, and he pretty much outlined, you know, foods to steer away from, like the soft cheeses, and the deli meats and all that sort of stuff, ehm... and then [it was] probably a little bit more reinforced by the midwife.” (Natasha, 1st pregnancy)

However, women in a subsequent pregnancy stated that they had received very limited food safety advice from health practitioners. These women believed that their care providers assumed that they already knew everything about HLR foods and did not need any further reinforcement. Susan, for example, recounted how she had been ‘*treated quite differently*’ in her two subsequent pregnancies compared with her first one, and how she felt her care providers ‘*took it for granted*’ that she knew all the pregnancy related issues, including that of *Listeria*:

“I feel that sometimes second and more time moms don’t get the same [advice] because I know that I was spoken to and treated quite differently in my first pregnancy than I was this time. They just sort of take it for granted that you know.” (Susan, 3rd pregnancy)

Meanwhile, as mentioned in previous chapter, it was found that women in a subsequent pregnancy were more confident in their knowledge about pregnancy related issues and did not see the lack of provision of advice from their care providers as a problem. The majority of them perceived the advice as mainly a reiteration of what they already knew. It seemed to be important for them to emphasize their awareness of the issue from the previous pregnancies, perhaps to reassure themselves and others about their role as responsible mothers for their preceding children as well. Rebecca, for instance, reported how her doctor had ‘*reminded*’ her ‘*pretty briefly*’ about the advice regarding *Listeria*. She seemed to be happy with her doctor’s approach because she believed that she ‘*knew anyway*’:

“He just reminded me because he knew that I would have known. He just mentioned pretty briefly what you shouldn’t be eating. But may be if it was your first pregnancy he’d probably speak more about it. But I knew anyway.” (Rebecca, 3rd pregnancy)

However, implicit in the comments of some women in a subsequent pregnancy was the fact that they saw their antenatal care as providing important reassurance on what they believed they knew about *Listeria* prevention from the past. Although most of them agreed that they were aware of the issue ‘*deep down*’, they valued the communication from their care providers to make sure it was ‘*correct information*’:

“you know, you may have all the knowledge in the world but when you’re actually through pregnancy you feel that you don’t know anything ... even though you do really know it deep down.”

You sort of want to be told anyway just to kind of check that it is correct information.” (Pamela, 2nd pregnancy)

Health professionals' approach in the provision of verbal advice about *Listeria* was also found to have an impact on women's perception of the importance of the issue. Samantha's narrative offers insight into the way routine provision of biomedical directives was perceived by a number of women:

“I'm thinking that when I saw the midwife first time around she probably had a perfunctory list of [advice], she probably said you know 'you're not supposed to have this and this and this' and ticked that off on that list and that was probably it.” (Samantha, 3rd pregnancy)

Samantha's making use of the word '*perfunctory*' reveals her cynical feeling about the way in which the midwife had provided her with the verbal advice on *Listeria* prevention.

6.2.2.4 Gaps and inconsistencies in the professional advice

It became apparent throughout the analysis that there were some gaps and inconsistencies in *Listeria* messages presented to pregnant women in the antenatal practice. Although women who had received some advice from their care providers about *Listeria* were more or less aware of the foods that were to be avoided during pregnancy, most of them had a vague idea about the ramifications of the consumption of HLR foods. Some women complained about the insufficiency of information, mainly in terms of the consequences of non-compliance with food safety directives on pregnancy outcome:

“they don't talk about why you're not meant to eat soft cheeses ... well you kind of know why, because of Listeria, but what is that exactly?” (Pamela, 2nd pregnancy)

Many of those who had received verbal advice on *Listeria* prevention did not have a clear understanding of the implications of the advice. Women's adherence to food safety counsel appeared to be almost entirely a function of the authoritative role that health professionals played rather than how well women understood the scientific origins of the advice:

"I don't really know much about that far into it. I just know what you should eat and what you shouldn't but I don't know anything else. I don't know. I just told them 'alright then, I won't [eat those foods]'. (Charlie, 1st pregnancy)

However, it was found that women expected their antenatal care providers to offer accurate information not only about food related issues during pregnancy, but also about the underlying reasons of each directive and consequences of not complying with the recommendations. Women's accounts revealed that many of them were not happy to just '*blindly*' follow food proscriptions. As Sara commented, having enough knowledge about the risks associated with the consumption of HLR foods was highly valued, since it enabled her to control the risk through an '*informed decision*':

"I think that would be nicer if you could have an informed decision and try and manage that risk yourself instead of you know, just blindly follow them." (Sara, 1st pregnancy)

It was, however, noted that women constantly checked the authority of *Listeria* knowledge, even when it was imparted by a so-called expert. Pregnant women did not always uncritically accept the validity of food safety advice from one source but rather weighed it against information from other credible sources or even their common sense. Even when faced with significant authorities in biomedical knowledge, whether obstetricians, GPs or midwives, pregnant women were likely to accept some of the recommendations and reject others, based on the knowledge that they had previously gained. Sara, who was well-informed on various health issues related to pregnancy, reported how she lost her trust on her GP when his advice contrasted what she had learned from books and Internet. It was not acceptable for her to eat whatever she wanted to eat because she had '*good hygiene*':

"he [the GP] just basically said 'well if you've got good hygiene, eat what you want to eat', 'it's not alright then, thanks!' [I] didn't get back to that doctor again." (Sara, 1st pregnancy)

Meanwhile, some women preferred to follow their routines and, in case of inconsistencies in *Listeria* information, comply with the advice that was more in line with the regular practices of their everyday life. Tina for example reported that she had

comfortably ignored the information that she had read in the *Listeria* pamphlet and preferred to follow the midwife's advice:

"the midwife, when I first came to book in [to the hospital], told me 'you can have ham but make sure that it's fresh' ... and it wasn't in there [pamphlet]...so I still have it [ham] every now and again." (Tina, 2nd pregnancy)

Findings from the interviews thus showed that many women perceived *Listeria* advice provided in antenatal care as inadequate, vague and sometimes contradictory.

6.2.3 Published sources of information

Interview data indicated that published materials had a significant role in the construction of women's knowledge about *Listeria* over the course of their pregnancy. Women were found to obtain their information from a range of different published sources, including handouts given to them by their care providers, pregnancy books and women's magazines that they bought themselves or received within their social network, and materials that they looked up in the Internet. This section will look at the way women made use of different sources of knowledge to inform themselves about *Listeria* and their perception of trustworthiness of each of these sources.

6.2.3.1 Handouts offered at the antenatal visits

Participants' reports in previous sections revealed that health professionals heavily relied on written materials for educating women about different issues with regard to their pregnancy. Many women reported that pamphlets given to them at their antenatal visits were the main source of their information:

"I did [receive] no verbal [advice]. Probably just from the pamphlets that I got. So if I didn't read the pamphlets I probably wouldn't receive that information." (Louise, 3rd pregnancy)

Printed educational materials in the form of pamphlets were basically available from a range of different sources including government health authorities and commercial companies, or have been independently produced by health professionals (doctor or midwife) involved in providing antenatal care in each site.

6.2.3.1.1 Handouts produced by government bodies/health professionals

Participants tended to receive the educational materials produced by government bodies and/or health professionals from various care providers in different stages of their pregnancy. Two thirds of participants reported that they received handouts on a number of health related issues either from their GP upon the confirmation of their pregnancy or from the doctors and midwives during their antenatal visits in the hospital. If women did not receive any educational materials from their GP at the beginning of their pregnancy, this could be delayed for a long time until they attended the hospital to commence their care.

Pregnant women who had received the educational materials from their care providers perceived it in different ways. Most women, particularly those with their first pregnancy, appeared to be good information absorbers and were happy to 'immerse' themselves in the information:

"I think I did read through it, leaflet by leaflet, there is a lot of information there and I think I just sort of immersed myself in that when I got it ... I probably got a lot of information and what I have put to the memory probably did come from that anyway."
(Sara, 1st pregnancy)

However, there were others who believed that women could be 'overwhelmed' by the information overload at the beginning of their pregnancy and fail to absorb all the necessary information. Catherine's remark on 'and you're only seven weeks' reveals that she had found a number of printed materials given to her irrelevant at that early stage of pregnancy. Her account when she said 'a brochure could get lost' demonstrated her preference for a timely schedule for receiving relevant information during the course of pregnancy:

"you right there get the bag and you're quite overwhelmed by information when you're pregnant ... and you're only 7 weeks ... It's too much information overload at once and I think the risk is that ... a brochure could get lost in that because there's so much to read about when you start." (Catherine, 1st pregnancy)

More than half of the participants who had received some pregnancy related handouts from their care provider stated that the pamphlets they received contained no information about food in general and *Listeria* particular:

“[the pamphlets had] nothing to do with food, I got one on breast feeding. I got one on the child birth education classes. I got one on visiting times in the hospital ... also one on immunization and one on vitamin K ... so there was information but there wasn't anything to do with food.” (Clara, 1st pregnancy)

Women's accounts of the printed materials produced by their doctor or midwife revealed some degrees of uncertainty. While women did not question the responsibility, knowledge, and concern of their care providers regarding their health, the accuracy of the information seemed to be a concern. Janice's accounts for example revealed how she perceived the materials produced by 'in-house educators' as less 'comprehensive' while she preferred to receive a 'detailed list' of HLR foods:

“there's usually a whole pile of photocopied handouts made up by in-house educators ... I don't think they are very comprehensive. I probably would need more information, detailed list of foods that you shouldn't eat ... I don't think that a lot of women are aware of that.” (Samantha, 3rd pregnancy)

Another factor that seemed to be of significance in shaping pregnant women's views on the printed materials produced by their care providers was the appearance of these materials and the way they were presented. Most of these materials were, as Samantha described, 'photocopied handouts'. Charlie's description of these materials as 'a piece of paper' reveals how the presentation features influenced women's views on the importance of the content of these materials:

“they give you a piece of paper that just says like exercise and stuff that you should and shouldn't do and just like is it safe to have sex while you're pregnant, or is it safe to have this food and stuff like that.” (Charlie, 1st pregnancy)

Women's accounts revealed a preference for educational materials produced by 'official' health authorities involved in food safety, as regulatory and responsible bodies, over the materials that had been produced by commercial companies and even by individual health professionals such as their doctor or midwife:

"I probably, if it was from New South Wales, might take that a bit more seriously ... I think if it came from something a bit more official I'd take it more seriously. I don't know." (Janice, 3rd pregnancy)

At the time of study, food safety pamphlets on 'Listeria and food' (FSANZ 2004a) and 'Mercury in Fish' (FSANZ 2004b) were the only food safety materials available from a government body (i.e. Food Standards Australia New Zealand) in only one of the study sites. Participants who had gained some knowledge on food safety and listeriosis through these educational materials seemed to be satisfied with the information and stated that they found the handouts helpful. The comments a few women had on the whole range of printed materials on listeriosis were that they found these materials 'very basic' and 'in point form' but 'informative':

"It's usually in point form. It's very basic. It gives you an answer but doesn't necessarily tell you why ... but it was fairly informative so that was fine." (Cynthia, 4th pregnancy)

However, most women believed that there was too much 'emphasis' on printed materials for educating women on different issues in the pregnancy care system. Most participants stated that if women did not 'read the stuff' they could potentially fail to benefit from the information. They believed that communication should not be limited to handing the printed materials and it was important for health professionals to 'follow up' the advice:

"I guess there is too much emphasis on the written material ... I think that could be effective if women go home and read that stuff, but if they don't, then it's very important to follow up with messages from a doctor or a professional as well which I don't know if that's really followed through." (Tina, 2nd pregnancy)

This was found to be particularly true for second and more time pregnant women who felt more confident of their knowledge and skills and assumed that they were aware of most of the necessary precautions to ensure a safe pregnancy:

"to be honest, in this pregnancy, I have not read through the material because I knew all that, [I assumed] nothing has vastly changed between my last pregnancy and this one." (Karen, 2nd pregnancy)

Due to the limited availability in the study sites of educational materials on food safety produced by government authorities, very few of the pregnant women interviewed reported they had been exposed to them. As a result, the chance of investigating women's views and providing a holistic perspective on the perceived quality of these materials was limited.

6.2.3.1.2 Handouts produced by commercial companies

Materials produced by food or pharmaceutical companies were generally presented in a free 'show bag' containing advertisements and samples of different baby products. In the public hospitals, women generally received the bags when they attended the hospital for the first time to book in and start their care, and once again when their baby was born. It should be noted that, according to the midwives, the content of show bags frequently changed and there was no guarantee that educational materials on all the important issues for a safe pregnancy, including *Listeria*, were present at any point in time.

Pregnant women were found to be interested in the show bag they received in their first antenatal visit at the hospital. It can be argued that the free sample baby products offered in these bags were the main reason for the attractiveness of this commercial tool for pregnant women and in fact many women's accounts confirmed that this was the case:

"I think the show bag was really helpful actually, was full of little samples of nappy creams and pixy photos and all sorts of stuff and pamphlets on everything." (Rebecca, 3rd pregnancy)

However, in nearly one third of cases pamphlets and other printed materials presented in the bags were the only educational materials pregnant women received in the whole course of their pregnancy. As a result, receiving information in the show bag was perceived as an advantage for some of the participants, because they stated that they would not have received any information if they did not get the show bag:

"the bag they give you, they call it 'baby show bag', it's got heaps of information in it ... and I've got no other information than what I've read in the bag." (Ashlea, 3rd pregnancy)

Pregnant women with private health insurance, who were looked after by an obstetrician, were found to be more dependent on the show bags for receiving information on different health issues, because most of them did not receive any handouts from their doctor. Meanwhile, the show bag was only offered to them when they went to the ward to book for their child birth and if they had not already received any information from other sources it could be 'too late':

"you don't usually get the package until you book into the ward, like a lot of information and lots of pamphlets about all sorts of issues... but I didn't get that until February while I was pregnant in August and it could be too late." (Georgia, 1st pregnancy)

A number of pregnant women, however, questioned the 'authority' of commercial companies in providing food safety information and were sceptical about the knowledge and accuracy that these sources held in presenting comprehensive information, where information could potentially be 'left out'. Although it was acknowledged that 'due to the legal reasons they can't provide incorrect information', some women seemed to be ambivalent about the information provided, since industry was not considered to be particularly concerned with or responsible for public health issues:

"it's got a whole lot of pamphlets in it from either drug companies or vitamin companies ... about what you're supposed to do and not supposed to do in pregnancy and you wonder what authority they've got to be presenting that information ... and what they may be left out." (Samantha, 3rd pregnancy)

On the other hand, the fact that midwives were involved in giving the show bag to pregnant women and sometimes encouraged them to read the information that was provided in there, appeared to grant some credibility to the educational materials offered in the promotional packs:

"I met one [midwife] at the clinic when I first booked in there. She briefly went through what I couldn't eat and said that there was more information in the bag and I got the bag." (Ashlea, 3rd pregnancy)

Another positive aspect regarding the food safety information provided in the show bags was related to the nature of information that was put forward, i.e. recommendations on avoiding certain types of foods to avoid listeriosis. This kind of

information was perceived as reliable because it was not an ‘*advertising thing*’ and the companies providing educational materials on it were not regarded to have a vested interest in promoting food safety directives for *Listeria* prevention:

“because it’s not an advertising thing I probably take it serious ... like if there was something that was just sent to me or given to me when I bought something I could take it like just an opinion, but that’s not the case.” (Danielle, 3rd pregnancy)

Investigation of the availability and content of *Listeria* information provided in commercial show bags was out of the scope of this study. However, because of their wide distribution within the antenatal practice, show bags were identified as a potential means of dispensing *Listeria* knowledge to a large proportion of pregnant women.

6.2.3.2 Pregnancy books and women’s magazines

More than half of participants stated that they had sourced their information about food safety and *Listeria* from pregnancy related books and/or women’s magazines. Nearly half of women in this group received books and magazines from their lay network as part of their social support, while others reported buying books and magazines as part of their proactive information seeking attempts during pregnancy. Tina, for example, had received a book about pregnancy as a ‘*Christmas gift*’ and Ruth reported that she had bought a book ‘*to get serious*’ about food in her second pregnancy:

“a book was given to me when I was leaving work this time, it was Christmas actually, as a Christmas gift and there was something about food.” (Tina, 2nd pregnancy)

“because it has been a long time between pregnancies ... I was looking in the bookshops about to try and purchase a book, to get serious about it in this pregnancy.” (Ruth, 2nd pregnancy)

Although books and magazines were not the sole source of food related information for pregnant women, sometimes they offered a starting point to begin to think about food related issues in the absence of professional advice:

“If I hadn’t have had that book given to me ... I probably wouldn’t have known what exactly I shouldn’t be eating ... I don’t think too much information was given in the beginning.” (Melissa, 1st pregnancy)

Women's accounts revealed that food safety information in pregnancy books and magazines was limited to advice about avoiding certain types of foods to prevent foodborne illnesses, including *Listeria*, and little information about other aspects of food safety such as handling practices or ramifications of illness were provided in these sources:

"there was like a little chart in a magazine that just said don't eat these foods. They sort of said in brackets Listeria, Salmonella, etc. but they didn't kind of say what Listeria was." (Janice, 3rd pregnancy)

"and it [the book] had a big article on what you shouldn't eat and what you should eat and it reminded me again of what not to have." (Tina, 2nd pregnancy)

Participants frequently reported that they sought to verify the authority of the source of information in books and magazines. However, women who had come across the *Listeria* advice for the first time in magazines were happy to, sometimes even 'blindly', follow the advice since it was difficult to establish the credibility of the source of information as a 'valid source':

"I think I probably just blindly took the advice that I read in that pregnancy magazine because I don't often know who's written it to know whether it's a valid source or not." (Georgia, 1st pregnancy)

It was easier to establish the credibility of pregnancy books. Generally, 'Australian' books were more comfortably accepted. Women were also able to decide about the expertise of the authors as these were more recognizable than those who appeared in the magazines. Books written by 'medical staff' and based on scientific knowledge were perceived to contain the most trustworthy materials:

"when I came across this Australian book, I just looked at who had written it and it was two medical staff, one was a midwife and one was a doctor ... so it came from having practical hands on side of it, plus having the theory to back it up." (Ruth, 2nd pregnancy)

However, there existed some degrees of scepticism about some of the pregnancy books. Samantha, for instance, believed that the author of one of the most popular pregnancy

books was a ‘comedian’ and wondered what ‘authority’ she had got to provide the information based on her own experiences, which were not necessarily backed up with scientific knowledge. Nevertheless, Samantha admitted that women were still keen to read it and ‘absorb it’:

“pregnancy books are written by comedians sometimes, there’s one book that I can’t remember the name of it and [the author] she’s comedian! You know, she presents information and advice for pregnant women and I wonder what authority she’s got ... but you still read that and still absorb it.” (Samantha, 3rd pregnancy)

Most women agreed that there was an abundance of information with respect to pregnancy in books and magazines. However, as with the educational materials handed in to women at their antenatal visits, they believed that women should not be left alone to read the information by themselves and emphasised the role of care providers in the reinforcement of advice:

“there’s lots of information around with that stuff like most pregnancy magazines and you know pregnancy books, but I think it just depends on whether you’re going to go and read it that kind of stuff ... and if not then there should be someone telling you.” (Danielle, 3rd pregnancy)

Women’s magazines and particularly pregnancy books were generally perceived to contain useful information on food related issues during pregnancy including that of *Listeria*. Their value, however, was affected by the voluntary nature of search for knowledge within these sources and the fact that many women may not choose to read them.

6.2.3.3 Internet

Nearly one third of participants stated that they obtained their *Listeria* information from various websites in the Internet. The majority of them were first-time pregnant women who in most cases came across information about *Listeria* in the Internet as part of a general search about pregnancy:

“I wanted to learn what baby was doing at 12 weeks and if there was any pictures ... that’s where I found the thing about the bacteria and foods that you should avoid.” (Cassandra, 1st pregnancy)

The Internet was considered to be the preferred source of information for these participants, because of the easy accessibility of materials. It also constituted one of the first sources of information for them in the early stages of their pregnancy and before they started their antenatal visits:

"I found out about that [Listeria] in the Internet ... that was the big part of it, because it was the easiest source instead of going to the library and that was sort of in the early days before I needed to see a doctor." (Melissa, 1st pregnancy)

However, some of the women's accounts of searching for food related issues in the Internet revealed feelings of confusion and uncertainty, expressed as being 'hazy' and 'ambiguous'. This was found to be particularly true for the material coming up in the non-Australian websites, since women perceived some of them to be 'not totally relevant' and communicating in a 'culturally' different way:

"on the internet sometimes I get a bit hazy ... they can become a little bit ambiguous when they are from different countries. They may be not totally relevant to us in Australia. Or it's hard to draw a parallel, or even the style in which they communicate may be just culturally a little bit different." (Ruth, 2nd pregnancy)

As with the other published materials, authority of the source of information affected women's perception of the credibility of the information they found in the Internet. Women preferred to obtain the information from trusted sources such as 'government-authorised' websites:

"I know that there's websites that you can work out, like the Food Authority website and there's a few ones that are either, you know, government-authorised or ones that are run by community organizations that you can trust." (Sara, 1st pregnancy)

Women were also found to prefer to establish the credibility of the information they accessed through the Internet by making reference to the health professionals, since they perceived the information on the net to be of a 'very broad spectrum':

"I think the internet is a bit of a very broad spectrum and they do give too much information ... you really need professional help probably in that respect." (Natalie, 1st pregnancy)

However, none of the women in this study mentioned being advised by a health professional to look for health and food related issues of pregnancy in the Internet or other published sources of information from outside the antenatal practice.

6.3 Conclusion

Women's reports of their sources of information showed that they drew from different streams of knowledge, biomedical and other, as they crafted their food practices. Women evaluated the authoritativeness of different information sources based on their perception of source expertise and their personal trust. The lay network was one of the most influential sources of information, with many women receiving their knowledge about food safety and *Listeria* from their lay network far earlier than any advice from health professionals. Health care providers were still perceived to be the most trustworthy source of information. However, physical examinations of pregnancy and monitoring of the development of the fetus were reported to dominate the antenatal visits, leaving limited time for the provision of food safety advice. While women were given an opportunity to enquire about their concerns, many of them were not sure what to ask. Thus, broader educational aspects of antenatal care were heavily dependent on printed educational materials which were not consistently provided and did not necessarily cover all the important issues relevant to pregnancy. Women agreed that there was a wealth of information on *Listeria* available through different published materials outside the health system. However, care providers' reinforcement of the important health issues such as *Listeria* was still highly valued among the participants.

The following chapter reports on the results of semi-structured interviews with the midwives as one of the pregnancy care providers within the antenatal practice. Midwives were interviewed to gain an in-depth understanding of the importance they attached to the food safety issues and *Listeria* in pregnancy and to explore the underlying factors that shaped their practices in the provision of *Listeria* education and advice to their pregnant clients.

7 Midwives' Perspectives on *Listeria* Risk

7.1 Introduction

The preceding presentation of survey results revealed that health professionals, including midwives, were perceived as the most trusted source of food related information for women participating in this study. Women's reflections on their experiences with food safety advice received from their health care providers provided an overview of the provision of advice from the women's perspective.

This chapter reports the findings of the in-depth semi structured interviews with midwives who provided antenatal care and education to pregnant women at the study sites. The chapter first examines midwives' accounts of antenatal practice, to offer a better understanding of the context in which food safety education and *Listeria* advice were provided. The chapter then explores the state of *Listeria* education in the context of antenatal practice. Included in this discussion are consideration of midwives' approaches to the provision of *Listeria* advice and investigation of the content of advice in terms of what they told their pregnant clients regarding food safety issues, i.e. safe food handling and eating practices. Finally, the chapter examines the factors that influenced midwives' practice. The influences which were identified to be particularly important to midwives' practice included their perception of *Listeria* risk and the system constraints. The examination of these factors throws light on how midwives' perceived the risks associated with food and what importance they attached to the appropriate risk communication about food safety issues with an emphasis on listeriosis. It also identifies the potential barriers to effective *Listeria* education that were imposed by institutional circumstances.

7.2 Participants

All midwives who were directly involved in providing antenatal care in the study sites were approached to participate in this study. Overall, ten midwives out of a total of 57 working midwives at the study sites agreed to participate in the study. Nine out of the ten midwives interviewed were permanent full-time or part-time employees of the South Eastern Sydney and Illawarra Area Health Services (SESAHS) and one of them was a casual employee at the time of the study. Four of the midwives worked at Site **A**, four at Site **B** and two at Site **C** (see *Chapter 1*). Midwife participants in the study were 30 to 53 years old (mean \pm std = 44.3 \pm 8.1) and the length of time they had worked with pregnant women ranged from 4.5 to 16 years (mean \pm std = 9.0 \pm 3.8). Two midwife participants were pregnant at the time of the study.

Despite the strong attempt and persistence of the researcher to encourage more midwives to take part in the study, no more midwives consented to be interviewed. The main reasons for refusing to participate were 'not having enough time', 'being tired of talking all the time', and 'not being interested in research'. However, data saturation was achieved for the major themes and key ideas. The interviews with midwives lasted from 27 to 50 minutes (mean \pm std = 36.1 \pm 8.8).

7.3 Antenatal visits: understanding the context

Since *Listeria* risk communication, along with education on other pregnancy related issues, should ideally take place during the antenatal visits, it was important to gain an understanding of the context of pregnant women's antenatal visits with their midwives. Midwives' reports indicated that a substantial component of their activity in the antenatal clinics centred upon performance of routine procedures and the standard antenatal observations and examinations. The appointments ranged from a '*booking history*' to a '*subsequent check up*' visit. Nearly all midwife participants stated that their booking session was a lengthy appointment that happened mostly at the early stages of pregnancy. Midwives appeared to focus their attempts in the booking session on collecting background information from the women, performing physical examinations and taking height and weight measurements:

“the booking history is an hour appointment where we do a full medical history, social history, screening for domestic violence and other things that [are] happening at the time. We also do a routine physical examination and take their weight and height.”
(Belinda)

Most midwives stated that they offered information about different models of care and educated pregnant women on a number of issues including diet, *Listeria* and exercise at the booking visit. However, there were midwives such as Alice who believed that women being in their early stages of pregnancy, did not have ‘*much idea*’ about pregnancy requirements and this was perceived as a potential barrier to effective communication of information during the booking sessions:

“[it] just depends on their gestation ... we try not to give them too much information on first visit because they’re normally around 10-12 weeks so they don’t actually have much idea. So if we give them too much information they’re overloaded with information, they just go away and forget everything.” (Alice)

Alice’s remarks illustrate how some midwives rationed the information provided to women at this stage to avoid confusion and enhance compliance. Midwives’ views and practices regarding *Listeria* education will be separately presented in the next section.

The subsequent visits dealt almost entirely with biomedical surveillance of the progress of pregnancy and as Mary commented, what happened there was ‘*probably not a whole lot of routine other than those clinical things*’. The following remarks by Diana typically demonstrate how midwives were mainly preoccupied with ‘*physical*’ and ‘*clinical*’ aspects of pregnancy during their check up visits with women:

“the care involves usual sort of clinical things ... taking their blood pressure, urinalysis, and then we actually do a physical examination, palpate the abdomen to feel the position of the baby, the presentation, and we also measure the fundal height to make sure the baby’s growing and we listen to the baby’s heartbeat.” (Diana)

Although midwives’ accounts encompassed the idea that biomedical surveillance of pregnancy dominated their routine antenatal visits, they also provided a certain amount of advice and counselling on different issues:

"[there is] a discussion about what to expect in pregnancy, answering questions on discomfort or things that happen, education about pregnancy, labour and delivery, a few parenting skills and linking them in with other services as necessary."
(Judy)

Midwives generally displayed a central preoccupation with completing tasks and ticking boxes in their checklist for each antenatal visit. It seemed that their function in performing general clinical check ups and providing information to pregnant women were affected by the routine procedures that they were required to follow, rather than their conscious weighing up of the importance of different issues:

"yeah, we basically do all sort of things. We have a list. We don't have to go by the list but it's just like a guideline and we see what we actually do." (Alice)

On the other hand, it was found that midwife participants in this study relied also on the pregnant women's own judgments about what was important to be discussed in their visits and tried to address their concerns or, as Margaret commented, tried to get the 'impression' from them:

"a lot of the times it's an impression from them and what they are experiencing, so they come and ask us is that normal or that's not normal ..." (Margaret)

Most midwives therefore judged their medicalised and fetocentric approach towards their pregnant clients to be a product of the women's own concerns. Midwives remarks revealed that they saw the majority of their women, particularly the first-time pregnant ones, to be focused on the process of pregnancy, where all they wanted to know revolved around their baby and all they were worried about was how to go through labour and birth:

"for the average everyday person, they're looking at 'what's my baby doing at the moment?', 'how big is it?', 'how is it growing?', [they're] really interested to feel which way the baby's lying, where the head is, where the back is ... their focus is on the baby, and everything else fades into insignificance."
(Caroline)

"they do actually want to talk the birth, the birth, the birth and the pain and how they will cope and what they should do ... and people get very fixated on that and they don't get past that until"

they have the baby ... so I think other issues get overshadowed.”
(Amanda)

These accounts demonstrate how in the eyes of midwife participants in this study, women's approaches to their pregnancy and their interest in acquiring more knowledge on certain topics, particularly that of birthing, caused other matters, including food related issues, to '*fade into insignificance*' and '*get overshadowed*'.

7.4 Food safety and *Listeria* education within the antenatal practice

Listeria education was found to be mainly delivered in the first antenatal visit with pregnant women and in the context of the importance of diet during pregnancy. All midwife participants were found to deal with food related issues to some extent as part of routine provision of advice according to their pregnancy surveillance checklist:

“This is where I'm really easy. What I tend to do, it comes down to the checklist and we need to talk about diet and exercise.”
(Mary)

Midwives appeared to cover a whole range of different food and diet related issues that they perceived were important to be considered during pregnancy. However, most of them indicated that they did not '*spend a great deal of time on diet*' and their attention to food and diet related issues in the antenatal visits depended mainly on the individual woman, her problems and issues that she could potentially bring up for discussion:

“We don't spend a great deal of time on diet. We get a general overview of her diet in the booking history and discuss things that she might be able to change during pregnancy or ways of dealing with [food related] problems in pregnancy. If she has a lot of problems, like if she is a very strict vegetarian or she has lot of digestive problems or if she is really obese, then we send a referral through to a dietitian.” (Judy)

The only food safety education reported by the midwives in the study sites to be provided relatively routinely was on listeriosis. *Listeria* education was reported to be provided mostly in the 'booking' session, together with other information regarding food and healthy diet in pregnancy. Midwives' approaches in delivering *Listeria* information to pregnant women are discussed in the following sections.

7.4.1 Midwives' approach to the provision of *Listeria* education

Midwife participants reported a range of different approaches toward food safety advice with regard to listeriosis during their antenatal visits with pregnant women. A small number of midwives' were found to be committed to the provision of *Listeria* advice and reported that they were actively involved in educating women about *Listeria* through both verbal advice and written materials. However, more than two thirds of the midwife participants were more passive in their approach to the issue of *Listeria* education, relying mostly on the educational materials rather than verbal advice. The midwives' accounts of their approaches in the provision of *Listeria* advice are presented more fully in the following sections.

7.4.1.1 Active approach

Three midwives out of ten reported having a fairly active approach to the provision of *Listeria* information to their pregnant clients. They said that they always provided their pregnant clients verbal advice on the major high *Listeria* risk (HLR) foods and in case women were not already aware of the risk or needed more explanation, discussed the issue with them and also gave them handouts, if available, to take home:

"I do talk about Listeria. I always mention that when I'm booking because this is early pregnancy and normally I give them a pamphlet on Listeria and explain to them what they should be watching for..." (Alice)

The following remarks from Alice demonstrate how she felt that it was indispensable to talk to women about *Listeria* and provide them with verbal advice before handing them the pamphlet. She assumed that women themselves might not fully understand the importance of the safety of their food during pregnancy. Implicit in her remarks was the notion of common sense that she believed most women attached to food safety issues since she rarely found them asking for food safety information. Alice also considered the chance for the advice to be lost if only passed on through the written materials:

"if you just try to hand them something when they haven't asked for it, they're likely to throw the piece of paper out. So when you're talking about diet, you're giving something they haven't asked for, so you have to actually talk about it." (Alice)

Judy was also one of the midwives who stated that she always gave women the information sheet and discussed the issue as well:

“... and I ask if she’s heard about Listeria ... and the foods that she needs to be aware of, that she needs to be more careful with or avoid for the rest of her pregnancy and I’ll talk to her about that.” (Judy)

Judy believed that the only way of making pregnant women effectively understand the importance of the advice that could potentially influence their behaviour was through direct discussion of the issue and verbally educating them on HLR foods. Demonstrating her perception of the authoritativeness of biomedical knowledge, Judy believed that only by making the information ‘sink into’ women’s head could health professionals anticipate better compliance with biomedical advice, which was supposedly the ‘right thing’:

“once you get into the discussion then something sinks into their head and they remember part of them [recommendations] and they’re much more likely to comply and do them, do the right thing.” (Judy)

Caroline was another midwife who stated that she provided verbal advice on *Listeria* prevention and backed it up with written materials. Her suggestion for pregnant women to stick the list of HLR foods on their refrigerator reveals the importance that she attached to this issue and her attempt to offer a practical way to enhance women’s remembering, hence their compliance with the advice:

“we have the pamphlet and I talk about the types of foods and I go into detail with the types of foods ... and what you can eat and what you can’t eat ... I actually sit down and go through it verbally and then give them the handout and there’s a table on the back, and I say ‘stick it on the fridge’.” (Caroline)

The following remarks from Caroline demonstrate how she criticized their institutional way of handing out too many pamphlets and providing too much instruction to pregnant women at once. She also seemed to be sceptical about lay understanding of the significance of biomedical information that was generally provided in antenatal practice through written materials. That is why she felt impelled in giving verbal advice and discussing the issue of *Listeria* with her pregnant clients:

“[people generally] would understand if they were going to read. But unfortunately we give out a whole stack of pamphlets and a whole stack of information and people often just file them in the drawer or throw them in the bin and don’t read them. So I think you really do need to talk to them about anything you think is particularly important.” (Caroline)

These midwives’ approach to the provision of *Listeria* advice seemed to be a function of their personal commitment and perceived responsibility to make sure that women gain a good understanding of the important issues for a healthy pregnancy in their antenatal visits.

7.4.1.2 Passive approach

Two midwife participants stated that they just quickly listed the major HLR foods and encouraged women to read more in the handouts:

“I talk a little bit about Listeria ... I don’t always go through it specifically ... but I do tend to point out the obvious things like the soft cheeses ... and if there’s a brochure available I give it to them.” (Amanda)

Another four midwives said that they relied mostly on women’s own interest in knowing about particular issues regarding their pregnancy and in some cases did not talk about *Listeria* in their visits unless it came up in the conversation. They stated, however, that they made sure that women received the pamphlet on listeriosis if it was available:

“I’d be telling fibs if we went into it in any great detail, we don’t ... but we do give them a pamphlet on Listeria that they get that right at the start when they come for their first visit.” (Belinda)

Belinda’s account typically demonstrates how this group of midwives dealt with *Listeria* education in a rather passive way, solely by handing pregnant women pamphlets, when available. Belinda’s confessional tone, however, reveals the feeling of guilt inherent in her judgment about her practice, where she tried to compensate by stating that they make sure pregnant women receive the information through the pamphlets ‘right at the start’.

However, other midwives in this group looked at the issue from a different angle:

“we’ve got a pamphlet which makes it easier for them because there’s a list of things that you shouldn’t have and why and so makes it a lot easier than us just sitting there and going through it all.” (Nancy)

Nancy’s account of her reliance on written materials as the principal means of providing information on *Listeria* could be interpreted as an attempt to make the job ‘a lot easier’ for both provider and recipient of advice and minimise the risk of any important information to be missed out in the conversation.

Mary and Margaret, however, appeared to be convinced that merely handing out pamphlets would be enough for conveying the message with regard to *Listeria*, since they perceived it to be a familiar issue for most pregnant women:

“mostly [I] just give it [the pamphlet] to them, I must admit. More often than not, when I give it to them, they say ‘ah yes, I’ve got that.’ They get information off the web and that kind of stuff. I do tend to just give it to them.” (Mary)

“they might come in and tell you just little tales that they’ve heard about the things they need to eat and they can’t eat ...so then you give them the leaflet to just make them more aware of what to eat and what not to eat.” (Margaret)

For Mary and Margaret provision of verbal advice seemed to have lost meaning and importance because they perceived most of their pregnant clients to be already aware of the risk of *Listeria* and familiar with HLR foods by stating that women ‘get information off the web’ or ‘tell you little tales that they’ve heard’. Implicit in their remarks is the perception of a fading role for health professionals versus an increasingly prominent role for other sources of information for the communication of biomedical knowledge in pregnancy.

Only one of the midwife participants stated that she did not provide any information or education on *Listeria* prevention to her clients, nor did she give them any handouts in this regard:

“I have to admit I don’t even really talk about that, because they probably wouldn’t, I don’t know, they wouldn’t take much notice

of that anyway ... because as much as I give them advice and tell them they still tend to overall do what they want to do anyway, just go ahead and do it.” (Diana)

Diana, who mainly worked with pregnant women of younger age, provided a good example of midwives categorizing their pregnant clients based on presumption. Diana's judgement appeared to spring from her frustration as a result of dealing with younger pregnant women who were more likely to be resistant to behaviour change. This evaluation demonstrated Diana's perception of the unreasonableness of her clients and their lack of attention to the sound arguments put forward by biomedical knowledge. However, Diana was not alone in stereotyping her pregnant clients and some other midwife participants in this study were also found to do the same at some stage in their antenatal visits, particularly when they were involved in providing the advice. This will be dealt with in more detail later.

7.4.2 Content of the advice

Listeria advice, as recommended by health authorities, comprises a range of recommendations for pregnant women to avoid certain types of foods and to pursue safe food handling practices. However, there is no information available on the content of *Listeria* advice that is conveyed to pregnant women in the antenatal practice. The focus of this section is therefore to explore the specific components of *Listeria* advice provided by the midwife participants at the study sites and to identify items that were either less discussed, or totally ignored during the consultation.

7.4.2.1 HLR food education

Nearly all of the midwives reported providing verbal advice on HLR foods to their pregnant clients. However, they were found to be focusing on the main HLR foods such as soft cheeses and raw seafood. Midwives used general terms to talk about the groups of HLR foods (e.g. soft cheese) in their instructions rather than going into any further detail about what comprised the HLR foods in each group:

"I do talk a bit about food during pregnancy, and it is the main ones, that they [should be] looking at, your soft cheeses and your seafood." (Moira)

Although other foods such as pâté, soft-serve ice cream, take-away food and pre-packaged salads have also been categorised as HLR foods (Kendall et al. 2003; FSANZ 2004a; NSW Food Authority 2005b), none of the midwives reported talking to pregnant women about these types of foods. Belinda's account of her practice in providing verbal advice on the most familiar HLR foods and relying on '*people's common sense*' represents the idea put forward by many other midwives:

"I tend to point out the obvious things, the soft cheeses and that sort of things ... I might be missing something you know, but nobody's asked about other things ... and I tend to rely on people's common sense." (Belinda)

It should be noted that midwife participants in this study were not too concerned about different types of deli meats since only three of them mentioned that they verbally advised women not to eat deli meats during their pregnancy. The advice, however, was again very general. Nancy, for example, considered basic advice on '*main*' deli foods to be sufficient for the general public because she believed that most people did not consume '*fancy*' types of deli foods on a regular basis. Inherent in her account was the presumption that women who had these types of food in their diet were from privileged groups whose perhaps higher social background allowed them to be '*more aware*' of what they should be doing:

"Because other than the main ones, I guess not many of us eat many fancy deli foods. Those who do are probably more aware about what you can and can't have anyway." (Nancy)

Midwives seemed to be aware of the nature of *Listeria* information that they provided through antenatal practice. Many midwife participants such as Margaret considered their advice on *Listeria* prevention as rather '*basic*' and admitted that they did not communicate about the risks and consequences of non compliance:

"It's basic information. It's not going into 'ok, if you eat this thing you could get an infection and that can kill your baby.' We don't sort of get that directly said, [we just say] 'these are the things that you should avoid and that's what the information is

out there.' ... [we are] not going into the risks and what can happen or not and those sort of things." (Margaret)

One third of midwives reported that they did not include details of the complications that *Listeria* infection could cause during pregnancy to avoid '*distressing*' their clients. Nancy, for instance, was one of the midwives who stated that although including the ramifications of *Listeria* infection within the antenatal advice could be more effective in terms of encouraging women to have a better compliance with the advice, she did not provide any issues other than tips on HLR foods during her antenatal visits:

"we don't talk specifically about implications on there. In some ways that could have more of an affect but I guess it could also be distressing too." (Nancy)

Overall, midwives were satisfied with their approach in providing *Listeria* education to their pregnant clients. Most of them, like Moira and Mary, believed that the advice should be '*practical*', '*concise*', '*clear*' and '*straightforward*'. Moira viewed her practice to be sufficient by acknowledging the overload of information that women were faced with during their pregnancy and emphasising that they were not going to '*retain all the details*'. As a result, going into any detail other than listing for women the HLR foods was perceived to be futile. This provided a justification for limiting interaction with women and saving time and effort in educating them. Moira, for instance, believed that the information she provided was the only thing women actually '*needed to know*':

"people, especially when they're pregnant, get bombarded with lots and lots of information, and they're not going to retain all the details. It is best to give something that's practical, clear, concise and not too much in detail. I'd say 'these are the things that you should avoid because they can make you and your baby sick' and that's all they need to know." (Moira)

Some midwives had an even more maternalistic approach. Amanda for example considered the advice she provided on *Listeria* prevention to be fairly '*good*' and '*easy*' because it was all about forbidding women from eating foods that could harm their baby. Her account illustrates that she was convinced that women needed to follow the recommendation put forward by biomedical authorities without necessarily knowing its scientific origins and believed that it left people with no '*compromise*':

“I think the information is fairly good. I mean a lot of it is just ‘avoid it’ and ‘don’t do it’. It’s fairly easy once said. I guess it doesn’t leave any compromise for people ... if you like soft cheese and it’s advisable that you don’t have it then you just can’t have it, that would be the only thing that people may need to know...”
(Amanda)

Midwives’ perception of the importance of advice on HLR foods and their focus on communication about this particular issue seemed to be informed, at least to some extent, by their experience of women’s reaction to the advice. Some midwives stated that women tended to seek information about important topics for their pregnancy, including that of *Listeria*, independently and outside the health system. These women were seen as knowledgeable about HLR foods and as a result the advice conveyed to them was mostly a confirmation of what they already knew:

“the women that I deal with tend to be more educated and they do have some idea of the things that they should avoid. They might not know the actual reason, but they have been told ‘you should avoid certain foods while you are pregnant’ and I just confirm what they’ve already learnt.” (Moir)

However, many midwives believed that there were still a lot of women who knew nothing about the risks associated with certain types of foods. These midwives believed that the most urgent educational need of these women was to know what foods to avoid and said that pregnant women were ‘shocked’ upon receiving advice to stop eating certain types of foods:

“As for the types of food you should and shouldn’t eat in pregnancy, I think that’s a bit quiet ... they know you should have a healthy diet, don’t eat too much junk, but I think that they’re a bit shocked quite often that there are foods that they should not have touched in the first place.” (Caroline)

Overall, midwife participants in this study were happy with their approach in providing *Listeria* education to their pregnant clients. They did not see anything to be ‘particularly lacking’ in their advice and, as Mary suggested, they found it to be women’s own responsibility to seek more information from external sources if they really needed it:

“there’s lots of information out there, there are magazines all over the place and we give them pamphlets where available... I

don't know if there's anything particularly lacking that I can think of. I think Listeria is being addressed." (Mary)

7.4.2.2 Food hygiene and handling education

The interviews with midwives revealed that verbal *Listeria* education was focused on informing women about different types of HLR foods with limited additional information provided on food hygiene and handling practices. Only two out of ten midwife participants stated that they advised their pregnant clients to be careful when buying food or eating outside:

"... [I say that] they have to watch where they buy their cold meat and the deli, because you don't know how long they've been there. [I] often say to them 'whatever you cook obviously you know, but what you don't cook you don't know how long it's been there' so they should really be careful when eating outside." (Alice)

All of the midwives stated that they did not provide women with any specific advice or instruction on food handling, preparation and storage issues with implications for *Listeria* prevention. For most of the midwife participants, safe food handling issues carried a strong notion of common sense and were perceived to be such an obvious matter that they had not '*even thought about it*':

"are you talking about reheating food and that kind of stuff? ... I never talk to them about it. [I] never talk to them other than those things they can't eat. I've never even thought about it." (Caroline)

Generally, midwives appeared to strongly believe in contemporary women's knowledge and skills on safe food handling practices:

"I think these days most women know about having their fridges at the right temperatures and storing meat and not using you know slicing boards that haven't been cleaned properly and those sort of things ... they are very knowledgeable about hygiene and stuff ... " (Nancy)

Most midwife participants said that they took it '*for granted*' that pregnant women would know all the necessary things about food hygiene and safe food handling practices because they were not '*children*'. Midwives' accounts showed that in most

cases they ‘presumed’ that their clients automatically knew everything they should know about safe food handling practices just because ‘they have been cooking for a while’. As a result, it could have been ‘insulting’ to talk to them about hygiene in general and food hygiene in particular:

“I take it for granted that people should know. I mean they’re not children, ok. The majority are adults and they have been cooking for a while. Obviously they know ... I don’t actually talk about that. I mean it could be insulting to talk to them about their food hygiene, you know I presume they know.” (Alice)

The interviews showed that most midwife participants had a simplistic approach in their evaluation of pregnant women’s knowledge about safe food handling practices, where they deliberately made use of categorization to explain their rationale. The following accounts demonstrate how the group of midwives in this study viewed their pregnant clients as being less exposed to the risks associated with inappropriate food handling practices simply because of their socio-economic background or their appearance:

“You know I look at the person and I think ‘ok, she looks good, she is clean’ you know like their appearance and it seems they are well educated, then I see no reason to educate them on that [food hygiene]. I just don’t.” (Mary)

However, there were also midwives who did not see it as their ‘job’ to educate pregnant women on safe food handling practices to prevent listeriosis. It was perceived to be women’s own responsibility to seek this kind of information independently, since an abundance of information was perceived to be available to everyone through different means:

“I don’t feel that it’s my job to tell them how to cook and prepare the food that they’re going to eat. I think that people need to take a little bit of responsibility on themselves for those types of things as well. They can’t come back and say ‘nobody ever told me’ sort of thing, because there is lots of information out there.” (Moira)

Lack of communication on safe food handling practices was found to result, at least to some extent, from not being on the midwives’ agenda for educating pregnant women. Half of the midwife participants admitted that they had never thought about the importance of educating pregnant women on safe food handling practices and stated that they would think about it now that it was ‘brought up’ by this research. Nancy for

example, acknowledged that although she had always taken it for granted that women knew everything they should know about safe food handling practices, there could be some women who lacked that knowledge and needed to be educated:

“it’s not something I could say I’ve ever thought of until now, you’ve brought it up ... I’ve taken it for granted that most people would know this, but I’m sure if we would start asking women a lot of them may not. So this is something we probably need to look at and address.” (Nancy)

To sum up, a high level of consistency was found with regard to the content of *Listeria* advice among the midwife participants in this study. Although a general advice about the main categories of HLR foods was provided, a more detailed education on the ramifications of illness and safe food handling practices was absent. Most midwives were rather ambivalent about the provision of food safety advice and their practice was found to be based on presumptions about their clients. They were satisfied with the level of education they generally provided about *Listeria* and viewed women to be responsible for seeking information about the health issues of interest to their pregnancy.

7.5 Influences on practice

The preceding analysis of midwives' accounts showed a range of views on the significance of food safety issues with regard to *Listeria* infection during pregnancy. The challenge in the following section is to identify the underlying factors that potentially affected midwives' practices with regard to *Listeria* education in the study sites. Midwives' perception of *Listeria* risk and system constraints were identified to be particularly influential and are discussed in the following section.

7.5.1 Midwives' perception of *Listeria* risk

Most midwives agreed that food safety precautions to prevent listeriosis were a topic that had to be addressed through antenatal practice because of the serious effects that the infection could exert on the pregnancy outcome. However, not all of them attached the same level of importance to it.

7.5.1.1 Positioning the risk of *Listeria*

More than half of the midwife participants did not think that the issue of food safety was any more significant for pregnant women than other healthy individuals, except for special risks such as listeriosis:

“Generally, I think it [food safety] is as important as it is for anybody else, not just for women who are pregnant (laughs). I don’t think there’s particularly any special needs other than realizing that they can be more likely, with Listeria for instance, to have problems.” (Alice)

Three midwives out of ten thought that *Listeria* did not pose a great risk to their clients and as a result believed that it was among the subjects of a lower priority to be discussed with pregnant women in their antenatal consultation:

“I put it [food safety] probably somewhere at the bottom. Yeah, I know I shouldn’t say that, but I’m being honest, probably somewhere closer to the lower third than the upper two thirds.” (Belinda)

These midwives’ further explanations revealed that their perception of lower priority associated with food safety issues could be caused by their several observations of women’s high level of knowledge about this particular issue. Categorisation again came into play where midwives believed that most women they took care of were well educated and tended to read a lot and to search for different pregnancy related topics in the Internet and as a result were at a minor risk of contracting listeriosis in their pregnancy. Belinda for instance, stated that she did not attach a high level of significance to the risk of *Listeria* because she believed that most of her clients were even more knowledgeable about food related risks than what she as a midwife was, and consequently she did not see it a priority to discuss the issue with them:

“Women who have made that choice to go with their own midwife sometimes come to us with more knowledge than we have.” (Belinda)

Mary had the same judgement about the level of *Listeria* awareness among her clients and stated that women gained a wealth of knowledge about different pregnancy issues

through their own reading and came to ‘challenge’ the midwives in their antenatal visits:

“basically we have a lot of well educated people. They do a lot of reading and come and challenge us. I have to go back and read my books.” (Mary)

Most midwives also inevitably compared the risk of food related *Listeria* infection with that of alcohol and tobacco use during pregnancy:

“I would say that alcohol and tobacco would well be more urgent but I wouldn’t say they are any more important than food, for sure.” (Alice)

Further expressing her idea on the difference she perceived between the risks incurred by alcohol and tobacco and risks associated with food, Alice went on with the following statement that clearly illustrates how she relied on her own as well as on her clients’ common sense to judge the significance of different risks:

“... only because alcohol and tobacco come up more importantly to the people who come to the clinic, [but] it [food] is not something they raise, and it’s not something that comes to mind all the time.” (Alice)

The low positioning of *Listeria* risk was therefore common among the midwife participants as a result of their general perception of remoteness of the risk and a high level of reliance on their pregnant clients’ awareness of food related issues as common sense.

7.5.1.2 Past experience

Perception of *Listeria* risk among the midwives seemed to be very much informed by their previous encounter with the cases of illness over the course of their work as a midwife. Judy, who was one of the midwives who reported to be actively involved in *Listeria* education for pregnant women, had observed the complications associated with listeriosis in a couple of pregnant patients in the past:

“I looked after a couple of women being very sick that have gone into premature labour because of it and have had a sick baby because of it. So I’m very concerned about listeriosis.” (Judy)

There were, however, a number of midwives who, perhaps reflecting their '*lack of exposure*' to the cases of illness, did not believe that the issue of listeriosis was a main concern during pregnancy. Belinda for instance, did not consider the food related risks, including that of *Listeria*, to be a high priority to be addressed during pregnancy. She used her own experience of the low incidence of the illness, as a justification for her judgement:

"I'm big on alcohol and cigarette smoking ... but not talking about Listeria and stuff. Probably because it's never been an issue, as I've never come across somebody who's had Listeria poisoning or whatever or been even sick because of food ... so I guess that's just lack of exposure to it, may be if every other person came in sick I would probably be more alert to it."
(Belinda)

Nancy was also one of the midwives who did not think of *Listeria* as a '*big issue*'. Although she perceived the risk of *Listeria* infection as one of the '*possibilities*' that women might face during their pregnancy, she appeared to be minimising the risk in an attempt to avoid a '*mess*':

"knock on the wood I've never heard of a woman actually getting Listeria during pregnancy, so I'm thinking we always try to be on the side of caution because it's not worth taking the risk ... but it's not one of those big issues ... it's there and there's a possibility but if we worry about every possibility, I think it would be a mess." (Nancy)

Another midwife presented some degree of optimistic bias towards the risk of listeriosis by stating that she did not know any case of illness happening in their hospital:

"I know that in the last couple of months in a Sydney hospital two babies died from mothers having Listeria, one of those things that happened one after the other ... but I don't think it has ever happened here, or I don't know any in our hospital but I know that it does happen and that it is important." (Moir)

Midwives, who did not have any lived experience with infected pregnant women and had only heard about the cases, seemed to be rather ambivalent about the risk. Interestingly, both pregnant midwives in the current study were among this group. Their accounts demonstrated how they attempted to convince themselves that the risk of *Listeria* was fairly remote.

7.5.1.3 Trust in scientific knowledge

Midwives' accounts revealed that some of them questioned the credibility of scientific knowledge on the significance of food related risks during pregnancy. Margaret, who was also pregnant at the time of interview, seemed to be somewhat sceptical about the judgement put forward by scientific knowledge in blaming pregnant women for getting infected by *Listeria* because of having certain types of foods. She had heard about a few listeriosis cases and even named what she thought was the exact types of foods that had been identified as the source of illness among the victims (although this has been quite a challenge for both food specialists and public health authorities because of a highly variable incubation period before clinical symptoms appear and the unavailability of food samples for analysis at the time of onset (Donnelly 2001)). However, Margaret seemed to be cynical about the real cause of miscarriage by stating that health professionals intended to find some reason to 'blame' the negative consequences on:

"I think it's really important because I've heard of women having still birth after eating mussels and scallops and I've heard of a Greek woman too with the feta as well, because they eat quite a lot of feta... but with miscarriage it's difficult to know and I suppose they want to identify something to just blame it on."
(Margaret)

Margaret's remarks show that she herself had not completely internalised the biomedical advice on the avoidance of certain types of foods to prevent listeriosis and did not believe in the risks associated with partial compliance. Interestingly, both midwife participants who were pregnant at the time of study stated that they still had 'ham' on their sandwiches, although their tone revealed that they were to some extent concerned about the safety of their practice:

"I eat ham but I try to make sure that wherever I go it's safe, like [I ask] when it's been brought and [if] it's been refrigerated properly and things like that. I do ask about it but I don't know, hopefully it's ok." (Margaret)

"I have to say that yes I still eat meat and ham from the deli on the sandwiches sort of thing ... but when at home, I toast it to make it hot sort of thing to say that now it's safe." (Moirá)

Two other midwives also believed that it was alright to eat deli meats during pregnancy if women could make sure that the meat was '*freshly cut for them*' and not sitting in the delicatessen refrigerator for a while:

"... not saying that they're not allowed to eat it at all, but you know they should be really careful because Listeria could be a problem, so it should be freshly cut for them." (Alice)

Lack of trust in scientific knowledge about the role of certain foods in *Listeria* infection was therefore important in determining midwives' approach to food safety directives. This in some cases led to an underestimation of risk and personal interpretations of food safety recommendations to relieve the hardship of following the advice.

7.5.1.4 Food safety knowledge

Nearly all midwife participants in the current study agreed that they needed more information about food safety issues to be able to efficiently educate their pregnant clients. Midwives' accounts revealed that their underestimation of *Listeria* risk could, at least to some degree, be attributed to the limited knowledge of food safety issues transferred to them through academic midwifery education and during their professional practice. Midwives' remarks illustrated how an official education on the significance of food safety issues during pregnancy through '*lectures*' and '*textbooks*' together with '*updated information*' on the risks were lacking and would be appreciated:

"I've got no idea about what the risks are in Australia ... there's not a lot of education even with midwives about Listeria ... you know we don't have updated information on it that is current and evidence based and I'm not sure of the risks involved." (Margaret)

"We don't get any education on diet things, you know all through my being a midwife years nobody's never ever given us lectures or talks on what foods are good or bad in pregnancy ... I can't remember ever reading in the textbooks about food safety in pregnancy ... So it's all sort of what we've picked up ourselves and learned." (Belinda)

The midwives' accounts showed that their perception of risk associated with foodborne *Listeria* was a function of multiple internal factors ranging from positioning the risk of

Listeria in the hierarchy of other risks in pregnancy to their level of understanding about *Listeria* based on both academic/scientific knowledge and their personal past experience with the cases of illness. The external factors identified to affect midwives' practices with regard to *Listeria* education are presented in the following section.

7.5.2 System constraints

A number of constraints within the system in which midwives were working were found to both directly and indirectly influence their practices with regard to *Listeria* education. The most prominent system constraints which were identified from the interviews with midwives included temporal pressure, limited availability of educational materials, low level of motivation and low adherence to *Listeria* recommendations within the health system.

7.5.2.1 Temporal pressure

One of the issues put forward by three midwives out of ten was the temporal pressure on them during their antenatal visits which they believed negatively affected their practice in the provision of health education, including the *Listeria* advice. The approach of these midwives to the provision of *Listeria* advice was classified as 'passive' in the previous section, since they reported being less involved in the verbal education about *Listeria* and stated they relied mostly on the written materials for getting the message conveyed to their pregnant clients. Belinda, for instance, tried to legitimise her disconnected communication by mentioning how temporal pressure made the midwives manage their antenatal visits in an often rushed and didactic way:

"we only get half hour sessions ... and we have to do introductions: hello, how are you? how's your mother and the cat and the dog? We have to do an examination and history and all that sort of stuff. The half hour goes pretty quickly ... and then: 'this is some advice we can give you' and we follow it up with a pamphlet that they can take away and digest at home."
(Belinda)

Temporal pressure coupled with other factors such as midwives' positioning of the risk of *Listeria* seemed to be influential on their less active approach to the provision of

Listeria advice where dealing with other more important issues related to pregnancy was perceived to be of a higher priority.

7.5.2.2 Limited availability of educational materials

Midwives' reliance on written materials for educating their clients about *Listeria* was found to be another dilemma. Midwives reported that they had a whole stack of pamphlets available for all the topics that they '*could possibly come up with*' in pregnancy:

"we've got pamphlets for everything that we could possibly come up with in pregnancy, smoking, alcohol intake, ligament pain ... just thinking of the common ones ... heart burn, back pain, you know all those sort of things, and we've got pamphlets on iron as well." (Nancy)

However, midwives' accounts revealed that limited educational materials about diet/food during pregnancy existed at the study sites, and in most cases *Listeria* was the only food related topic on which pamphlets were available:

"I think that diet is one of the things that we have never had anything on, and Listeria being the only thing probably that we have anything on." (Mary)

Availability of educational materials on a particular issue was perceived as a reflection of the importance of the issue. Moira for example suggested that they did not provide education on any '*food safety tip*' other than *Listeria* because it was the only issue on which handouts were available:

"it [Listeria] probably is the only food safety tip that's covered here. Because there are no other handouts. They come from the department of health." (Caroline)

Midwives at the two other sites complained of the limited availability of handouts at their sites:

"if we've got the actual original pamphlets we'll use them. But quite often we don't have anything." (Mary)

This group of midwives attempted to balance the lack of original pamphlets with the '*reprinted*' handouts that they produced themselves:

“with the Listeria one we usually have to reprint it ourselves, it’s not available easily from the department of health or whatever it is ... so we actually typed that up ourselves so that we could run it through the photocopy machines.” (Belinda)

However, they perceived the original pamphlets to be more effective in educating pregnant women compared with their home made handouts. Midwives attached some degree of importance to the design characteristics of pamphlet and believed that their reprinted material did not ‘look important’ because of its unattractive appearance. Amanda, comparing their reprinted handout with the original one, commented:

“It [the original] was a little bit more eye catching [for women] to actually pick it up and read it, but the sheets we’ve got is [sic] just plain black and white. It doesn’t look very interesting. It doesn’t look important. It doesn’t have pictures of a woman and a baby ...” (Amanda)

Availability of handouts as relevant to different topics during pregnancy was therefore perceived as an indication of the importance of the issue and a good means of communication about the topic in an attractive and professional manner, balancing the potential shortcomings of verbal advice.

7.5.2.3 Timing of advice

Almost all midwife participants thought that by the time they reached their pregnant clients in their ‘booking session’ it was ‘a bit late’ to communicate the message about *Listeria*. They believed that women did not tend to start having their antenatal visits until early or mid second trimester, while they needed to be informed about the risks associated with the consumption of HLR foods much earlier in their pregnancy. Most of them believed that probably GPs should become more actively involved in the provision of *Listeria* advice to pregnant women:

“they don’t come to the antenatal clinic until sometime between I don’t know 14 and 20[weeks]and then they could eat whatever they want earlier, like you know what I mean? ... so it’s a bit late. They should really have been informed about these things earlier on. So I don’t know whether like their GP should be covering like Listeria or not.” (Margaret)

Midwives stated that they could not make use of antenatal classes for *Listeria* education because again they felt that it was '*too late*' to educate women towards the end of their pregnancy about what they should and should not have eaten earlier in the pregnancy. Belinda believed that by the time women attended antenatal classes based on the current program '*the horse had bolted*' and suggested '*preconception classes*' to be organised to cover health issues that are important for women to know even before becoming pregnant:

"if we were going to go down that track, we need to do that early in the piece because, you know, the horse has bolted by the time you get to 35-36 weeks ... so I think we should have preconception classes for women. That's where I think all those should be done." (Belinda)

Caroline, too, talked about her own experience with her first child some fifteen years ago when hospitals used to run what was called '*early parenting classes*' for women at around week twelve of pregnancy in which they provided information about different issues with regard to diet and exercise:

" they don't exist any more ... maybe going back to [the] idea of having 'early parenting classes' we can actually get at people at a much earlier gestation to give them that knowledge and power ... so it's not too far down the track before they find out what they should and shouldn't be doing. I think that would help." (Caroline)

Overall, antenatal classes were perceived to be a good medium for *Listeria* communication. However, scheduling the classes only for first-time pregnant women and towards the last weeks of pregnancy were identified as barriers to their use for effective food safety education.

7.5.2.4 Low adherence to *Listeria* recommendations within the system

Earlier in this chapter it was noted that the midwives' underestimation of risk resulted in a somewhat relaxed behaviour with regard to the consumption of HLR foods among two pregnant midwives who participated in the study. Interestingly, partial adherence to the food safety recommendations for pregnancy was not limited to individual midwives and was found to be a common practice even within the health system. Moira reported

how she felt embarrassed when she realised that pregnant women in their hospital were served with different types of deli sandwiches during their antenatal classes:

"I'm not so sure, you know they say you should avoid those sandwiches made from the deli but when our kitchen comes up with our pre-cut sandwiches there is ham and roast beef and all those deli meats on them and someone brought it up and said 'you're supposed to avoid those pre-cut meats' and I said 'oh, ok, then. Looks like we're not so strict on that one sort of thing'."
(Moir)

This approach appeared to be in line with midwives' own practices as well as their ways of providing pregnant women with advice regarding HLR foods and as a result reflected a range of health professionals' perspectives on food safety issues during pregnancy. It also indicates the limited incorporation of food safety initiatives within the health system and signifies the wrong message that could potentially be conveyed to pregnant women through practices that are not in line with food safety directives and recommendations for pregnancy.

7.6 Conclusion

Interviews with the midwives showed that *Listeria* risk communication and education had to take place in a competitive environment within the antenatal practice. Midwives reported that they devoted most of their time in the antenatal visits to the physical examination and monitoring of pregnancy and development of the baby rather than educating pregnant women on different issues.

Listeria was the only topic related to food safety that midwives reported to discuss with their clients. However, various approaches to *Listeria* education were identified that ranged from active involvement in education with provision of both verbal advice and written materials to a rather passive involvement with a high reliance on written materials and in one case lack of provision of advice. *Listeria* education was limited to listing of HLR foods with general hygiene and safe food handling practices taken for granted and not discussed at all. Midwives' interaction with pregnant women about *Listeria* was a function of their personal perception of food related risks during pregnancy. *Listeria* was found to be of a lower priority in midwives' hierarchy of risks

during pregnancy because of a number of internal factors that affected their understanding of *Listeria* risk.

Most midwives had not ever seen a case of listeriosis, were not completely convinced about the risks associated with the consumption of certain types of foods and did not have enough knowledge about the mechanisms involved in the onset of illness. These factors, coupled with the external constraints in the system of antenatal care including lack of resources such as time and educational materials, compromised midwives' practices in the provision of *Listeria* advice.

Midwives' accounts revealed that the overall mode of practice in the antenatal care was not in favour of appropriate food safety and *Listeria* communication. This was witnessed by the case of antenatal classes that were not only a lost opportunity for *Listeria* education because of their late start, but also a counter-message to food safety recommendations to avoid *Listeria* by serving the wrong foods.

The following chapter will draw together the findings from both quantitative (pregnant women's survey) and qualitative (semi-structured interviews with pregnant women and midwives) components of this research. The discussion will position the findings within the existing body of knowledge and will highlight the new insights that have been gained in this study.

8 Discussion

8.1 Introduction

The aim of this study was to explore pregnant women's and midwives' perspectives in relation to food related risks during pregnancy with an emphasis on the risk of *Listeria*. Using a mixed methods approach, the study attempted to provide an assessment of the level of *Listeria* knowledge and safe food handling practices among pregnant women, as well as an in-depth analysis of women's and midwives' views and their perception of *Listeria* risk within the South Eastern Sydney and Illawarra Area Health Services (SESAHS), New South Wales. The current research benefited from using both quantitative and qualitative data: the quantitative method provided an overview of the current situation with regard to *Listeria* knowledge and practices among pregnant women and described it on a macro-level, whereas the qualitative method was used to gain access to a contextual understanding of what shaped pregnant women's perspectives in food safety area. In other words, the results of statistical analyses showed what kind of actions women typically performed while the analysis of qualitative data helped to answer 'why' questions.

Discussion of the findings in relation to pregnant women's and midwives' perspectives on *Listeria* risk highlights the importance of positioning the focus of the current study, food safety during pregnancy, within the broader framework of antenatal care. The findings provided in previous chapters indicated that different types of knowledge, scientific and experiential, and the accuracy and extent of scientific knowledge may be important factors influencing both pregnant women's and midwives' perceptions of the *Listeria* risk. The findings also provided detailed information on how women and midwives acted and interacted to influence the management of *Listeria* risk during pregnancy. By exploring both pregnant women's and midwives' approaches to the

prevention of *Listeria* in the same setting, this study provides an opportunity to identify the possible shortcomings that affect the provision of food safety advice within the antenatal care.

This chapter synthesises the findings of the women's survey and data from interviews with pregnant women and midwives and is organised in four sections. In the first section women's perception of *Listeria* risk and the impact of positioning of risk and different types of knowledge on their perception of risk is discussed. The second part deals with the ways in which women attempted to manage food related risks, including that of *Listeria*, in terms of food handling practices and consumption of high *Listeria* risk (HLR) foods and looks at the concept of maternal responsibility as a strong motivator for adherence to biomedical directives of pregnancy. This is followed by a discussion on various *Listeria* risk communication avenues both outside and within the health system and their role in shaping women's decision making processes to follow food safety directives as pertained to their pregnancy. Finally midwives' approaches to *Listeria* risk communication is discussed to shed light on their practices in the provision of *Listeria* advice and provide a better understanding of the underlying determinants of their current practices, including midwives' perception of *Listeria* risk.

8.2 Women's perception of *Listeria* risk

Findings of the current research indicated that women's perception of *Listeria* risk was a major element affecting their preventive behaviours in terms of food choices and food handling practices. Two main determinants of women's perception of *Listeria* risk were their positioning of *Listeria* risk and their knowledge about the risk. A discussion of the role of each of these and their components is provided in this section.

It was mentioned earlier in *Chapter 4* that the survey of pregnant women was affected by different modes of data collection in the three study sites. Pregnant women in Site **A** participated in the survey while waiting at the clinic and pregnant women in sites **B** and **C** sent the questionnaires back through the mail. It was found that women who sent questionnaires back through the mail were of an older age, higher education and higher

income and a greater number of them reported their pregnancy to be a planned pregnancy compared with women who participated in the survey while waiting at the clinic. Follow up of the non-respondents in sites **B** and **C** was not possible due to ethical issues.

The characteristics of respondents to the survey in the current study were similar to the general characteristics of those reported in the literature to respond to the health related surveys. Previous studies have shown that there are differences in the socio-economic and demographic status as well as the health behaviours of respondents and non-respondents to surveys. Generally, respondents have been found more often to be older, have a higher socio-economic background, better health status and better health behaviours compared with their non-responding counterparts (Eaker et al. 1998; Goyder et al. 2002; Tolonen et al. 2006). Studies specifically targeting pregnant women have also shown the same pattern among respondents (Keeping et al. 1989; Torvaldsen et al. 1999). The results obtained in this study indicate that in future studies, researchers should attempt to collect the data directly from pregnant women rather than rely on the participants to mail back a completed survey form, as the characteristics of the respondents is more likely to correspond with women who are at lower risk of health problems.

It should be noted that the survey data discussed throughout this chapter refers to the collective analysis of all questionnaires regardless of the mode of gathering the data, as the aim was to gain a broad understanding of pregnant women's perceptions of food related risks.

8.2.1 Positioning *Listeria* risk

A high percentage of participants in the survey (74.3%) indicated that they were concerned about the safety of their food during pregnancy. However, for the majority of women in the interview group food safety was not a particular concern. This controversy might be, at least to some extent, due to the influence of different questioning used in the different methods. While participants in the survey were directly

asked if they were concerned about the safety of their food and to rank the risk of *Listeria* among other risks during pregnancy, they could freely talk about all their health concerns in the interview and express their priorities over their food in a real life situation. Survey results showed that women positioned the risk of *Listeria* at the third place after the risks of smoking and alcohol intake. However, the risk of *Listeria* in the eyes of the majority of interviewees was remote and not considered as a big threat to their pregnancy. This difference between survey and interview results could be because of the survey participants' tendency to tailor responses to give a socially desirable answer (that they care about their food) to a questionnaire than when faced with an interviewer keen to probe (Anderson 2002; Redmond and Griffith 2003b). Meanwhile, the fact that many interviewees had made some kind of change in their eating practices since becoming pregnant suggests that they were intrinsically concerned about the safety of their food but it may not have been uppermost in their minds when answering the questions.

Interviewees were generally confident in the safety of the food environment in Australia. Pregnant women were not concerned about other food related risks, such as hormones, pesticide residues and genetically modified foods, as has been reported in the literature to be important issues for consumers in other countries, particularly in England (Shaw 2002; Green et al. 2003). These results are similar to those of Lupton (2005), who argued that the common lack of concern among Australians regarding food related risks is a result of the geographical, economic and political context in which the Australians live. Food in Australia is mostly produced within the country and people generally trust government as a regulatory body and as a source of information about food related risks. Lupton (2005) has suggested that consumers' trust in the food system resulted in a general lack of concern about food related risks among Australians as compared with English consumers. This observation would be consistent with a recent Dutch study indicating that trust in regulators and actors in the food chain, compared with other elements such as recall of food safety incidents and perceptions of risk associated with particular product groups, is a powerful determinant of consumer confidence in the safety of food (de Jonge et al. 2007).

It is, however, important to note the similarities found in the perceptions of food related risks between this group of Australian pregnant women and their American counterparts. Studies conducted with pregnant women in the United States have also reported the same lack of concern about food safety among their participants (Athearn et al. 2004; Cates et al. 2004; Trepka et al. 2006). However, some levels of concern about microbiological hazards, as found in the current study, have been reported previously in both Australia (Smith and Riethmuller 1999) and the United States (Bruhn and Schultz 1999). A recent study in the United States has also shown that consumers who perceived their food to be ‘very safe’ and ‘not a concern’ still had some levels of concern about ‘microbiological issues’ (Brewer and Rojas 2008). This may have been due to an elevated level of awareness among the general public due to media coverage of food poisoning outbreaks. Confirmation of this interpretation through concurrent analysis of media was beyond the scope of this research.

Interview data revealed that most women believed that they were more prone to infections (e.g. flu and cold) due to their pregnancy. However, women did not necessarily think that the same was true with foodborne illnesses, which is consistent with a common perception among the general public found in other studies (Athearn et al. 2004; Trepka et al. 2006).

Given the importance of perceived susceptibility and severity in relation to undertaking preventive health behaviours (Janz and Becker 1984), it is problematic that participants neither perceived foodborne illness as an important problem nor were aware of the higher susceptibility of women to this illness during pregnancy. The general perception among the interviewees about higher susceptibility of women to different illnesses, including *Listeria* infection, in their first trimester of pregnancy and their subsequent relaxed practices towards the end of pregnancy is not consistent with actual risk profile. Epidemiological studies have most frequently documented listeriosis during the third trimester of pregnancy, probably as a function of major decline in cell-mediated immunity that occurs at 26 to 30 weeks of gestation (Szekeres-Bartho 1992).

The study identified that notions of food associated risks were largely regarded as internal to the individual and under personal control. Women viewed the risks associated with food, including that of *Listeria*, as within their personal sphere of influence, because these risks were regarded as a product of choices made by the individual. Risk of *Listeria* therefore was seen under the individual's control through in-home risk reduction strategies and food choices, and as suggested by previous studies (Bennett 2001; Redmond and Griffith 2004; McCarthy et al. 2006), generated few worries.

The underestimation of *Listeria* risk was a common observation among the interviewees. Interview data showed that while women had heard about *Listeria* and stated that they were happy to follow food safety directives to avoid the risk, they were not particularly worried about the potential risk nor did they express strong concern about possible wrong food choices and the effect of those on their unborn child. This approach towards the risk of *Listeria* is different to the findings by Begley (2002) who reported listeriosis as a major concern for pregnant women and women planning a pregnancy in Western Australia. This could be attributed to the strong public education program concerning the risk of *Listeria* in 1995 (Theobald 1996) as the awareness and perception of *Listeria* risk was subsequently, until 1999, documented to be high among women of child bearing age in Western Australia (Torvaldsen et al. 1999). Similar to the findings by Thirlaway and Heggs (2005) in their study of women's responses to risk communication about alcohol intake and breast cancer, interview data in the current study revealed that many women attempted to quantify the risk and came to the conclusion that small amounts of HLR foods or consumption of these foods on a rare occasion would not expose them to the risk of listeriosis.

Overall, positioning of *Listeria* risk was determined not only by women's ranking of *Listeria* risk among their other health concerns but also by their perception of safety of food environment in Australia and their understanding of susceptibility to foodborne illnesses during pregnancy.

8.2.2 *Listeria* knowledge

Further analysis of women's accounts in conjunction with data from the survey revealed that participants' lower level of knowledge about different aspects of *Listeria* infection during pregnancy may have influenced their underestimation of *Listeria* risk. Previous studies have identified that knowledge is a major component in the assessment and perception of health-related risks among the general public (Johnson 1993; Lupton 1995, 1999a, 2000). This can be understood through analysing the types of knowledge people draw on to assess risks. Lupton (1999) has taken this analysis further and asserts that lay perceptions of a particular risk depend on their assessment of risk based on some prior experiential knowledge about the world and their judgement of the probability and seriousness of a phenomenon based on scientific knowledge. Thus the perception of risk is relative and in some extent derived from different types of knowledge, either scientific or experiential (Lupton 1999a). In other words, if knowledge, whether scientific or experiential, is perceived to be 'authoritative' it may affect the perceptions of risk and ultimately the decisions, since authoritative knowledge is the knowledge that counts (Jordan 1997). For the purpose of this study authoritative knowledge was defined as food safety recommendations intended to protect the health of women and their fetus against *Listeria* infection during pregnancy. The following section discusses the role of different forms of authoritative knowledge in shaping women's perception of *Listeria* risk.

8.2.2.1 Scientific knowledge

Different aspects of *Listeria* knowledge and the impact of knowledge on women's perception of risks associated with the consumption of HLR foods were explored through the survey and face to face interviews. Survey data showed that one third of participants did not know that listeriosis was an illness transmitted by contaminated food and two thirds of them believed that they did not have enough information about the illness. Women in the interview generally knew about *Listeria*, as all but two of them had heard of *Listeria*, and were aware that it was transmitted by contaminated food. However, they did not have a clear idea of the ramifications of contracting the illness during pregnancy. Women found it unacceptable to receive advice on avoidance

of certain foods without being informed of what the consequences of non-compliance would be. This finding is consistent with that of previous research (Begley 2002; Athearn et al. 2004; Cates et al. 2004) indicating that women's awareness of the serious consequences of listeriosis may be one of the important determinants in their perception of risk and compliance with the advice.

Survey results in this study showed that women were well informed about safe food handling techniques in general. Nearly all of the participants in the survey (97.6%) were aware of the importance of washing their hands before preparing food, which is comparable to the findings from previous research both in Australia (Jay et al. 1999a) and elsewhere (Redmond and Griffith 2003b). Survey results also indicated that a high proportion of participants (87.1%) were aware of the importance of cleaning cutting boards after cutting raw chicken and before using them for raw vegetables, and that women (72.9%) were knowledgeable about the appropriate way of storage of cooked and raw foods in the refrigerator. The women in this study were more knowledgeable about these food safety practices compared with results from other studies (Kerslake 1995; Sammarco and Ripabelli 1997; Anderson 2002; Redmond and Griffith 2003b). However, half of the participants believed that it was safe to eat cooked refrigerated food without reheating it, a practice that can potentially put the women at risk of listeriosis.

It was found in the survey that more than half of the participants had an inadequate knowledge of HLR foods and a big proportion was not able to identify some of the best known HLR foods such as deli meats and coleslaw. Previous studies in Australia (Stafford et al. 1998), New Zealand (Rungan and Badkar 2005) and the United States (Athearn et al. 2004; Cates et al. 2004; Ogunmodede et al. 2005) assessing women's knowledge about HLR foods, within the normal pregnancy educational milieu, have also reported low levels of knowledge among this group. The only exception was a study in the Western Australia (Torvaldsen et al. 1999) which showed high levels of *Listeria* awareness among recent mothers within two years after a public *Listeria* awareness campaign in 1995. However, the high level of knowledge could be attributed to the long term educational outcomes of a large scale campaign which included

television and radio commercials, posters on buses, a *Listeria* pamphlet and production of display stands with backdrop posters to hold the pamphlets (Theobald 1996).

Survey findings on knowledge of individual foods showed that some women did not have a clear idea of what constituted a HLR food. Some participants were particularly confused about ham and pre-prepared vegetable salads and did not recognise the risks of having these foods. This is consistent with research from Western Australia which found that sandwiches made with ham and foods such as soft-serve ice cream, cold prawns and mussels were considered safe to eat during pregnancy (Torvaldsen et al. 1999).

Research on food related behaviours has suggested that individuals make rational decisions about such behaviours when they are aware of and have some knowledge about the associated health problems (McIntosh et al. 1994). However, researchers argue that the acquisition of food safety knowledge alone does not automatically produce the corresponding behaviour, nor will it necessarily lead to appropriate practice (Anderson 2002; Kendall 2002; Clayton et al. 2003). Consistent with the view that knowledge does not necessarily directly result in behaviour change is Worsley's perspective that knowledge affects the 'decision points' in the dynamic process of behaviours (Worsley 2002). Redmond and Griffith (2003b) support this position and suggest that knowledge allows people to make informed choices regarding their actions. This interpretation that knowledge is used to assess the need or desirability to change behaviour implies that the accuracy and extent of a person's food safety knowledge can be of major significance in bringing about changes in behaviours.

Findings of this study highlight the gaps in the existing *Listeria* education initiatives for pregnant women. This study identified that there was a lack of concern about the consumption of a number of HLR foods and continued poor practices with regard to some food handling techniques that are of particular importance in the prevention of listeriosis. These should particularly be taken into consideration in food safety educational attempts that target pregnant women and be more emphasised.

8.2.2.2 Previous experience

In the current study, women's previous experiences of 'food poisoning' led to an underestimation of risks associated with foodborne illnesses since these were mostly seen as unimportant events that were restored to health with no need of medical attention and no consequences. This is consistent with past research that indicates that women develop meanings and beliefs that shape their eating behaviours during pregnancy from the variety of experiences they encounter in the course of their life (Browner and Press 1996). It has also been suggested that new knowledge is constructed by observing events through the organising frameworks of concepts women already possess (Devine and Olson 1992).

One of the important findings of the current research was identification of women in a subsequent pregnancy as those who need more attention with regard to *Listeria* education. Although in Western Australian study (Torvaldsen et al. 1999) primiparous women were reported to have a lower *Listeria* knowledge, the same relationship was not found in the current study. In fact, interview data in the current study revealed that first-time pregnant women were conscious of different issues relevant to their pregnancy and actively sought health related information, including information related to *Listeria*, from various sources. Analysis of survey data showed that, although not statistically significant, pregnant women more than 40 years of age and those in a subsequent (3rd time or more) pregnancy were more likely to have an inadequate knowledge of HLR foods and continue the consumption of these foods throughout their pregnancy. Interview data also reported a related theme, that women with a prior pregnancy were more likely to be blasé about their current pregnancy and to rely on their own experience as common sense about pregnancy-related issues, and were less likely to seek health-related information from their care providers or from other sources of information. These women were generally more relaxed and confident that *Listeria* was not a risk to their baby. In some cases previous pregnancies had occurred prior to current scientific concerns regarding listeriosis being published. Prior experience of no negative consequence following the unknowing consumption of HLR foods in previous pregnancies also contributed to some women's ambivalence about food proscriptions.

The findings warrant further investigation, as this group may need to be specifically targeted for education on the risks associated with consumption of HLR foods.

Regardless of whether women in the current study followed the food safety advice, they were generally aware of what they should ‘not’ be eating in biomedical terms. The interviews revealed that although women were not uninformed and unreflective about the food safety directives for the prevention of listeriosis, they had only to some extent internalized the norms of food safety knowledge with regard to their pregnancy. This is consistent with the previous literature suggesting that knowledge of food proscriptions does not explain everything people choose to eat or not to eat (Markens et al. 1997; Worsley 2002; Dodd 2003).

Authoritative scientific knowledge in conjunction with women’s own experiences and what constituted their common sense were often used to make decisions about what to eat and what to avoid. In other words, while food safety recommendations were perceived to be authoritative for many of the women, they could not ignore their experiential knowledge which in some cases was perceived to be equally authoritative. A number of elements were recognised in pregnant women’s discourses about the way they endeavoured to manage the risk of *Listeria* during their pregnancy and these are discussed in the following section.

8.3 Women’s management of the *Listeria* risk

Listeria risk management in the current study was a product of both relative risk perception and contradictory pressures that sometimes served to interrupt pregnant women’s food practices. This finding is consistent with past research which has also identified pregnancy as a time when food-related recommendations could potentially bring value conflicts that may lead to temporary disruptions in women’s personal food choices and preferences (Connors et al. 2001). This section provides a discussion of the major components of women’s management of *Listeria* risk including their perceptions of maternal responsibility, their general rules for eating safe, their consumption /

preference for HLR foods and their approach to particular food handling safety practices to avoid the risk of *Listeria*.

8.3.1 Maternal responsibility

Maternal responsibility in the current study was identified as the strongest driver of women's risk management attempts with regard to *Listeria*. Findings of this study revealed that women had accepted this responsibility and tried to modify their way of life and eating for the benefit of their baby.

A responsible mother was seen, by the majority of participants, as someone who did her best in the protection of her baby and made less selfish choices for her own sake. There were limits though to which a woman would sacrifice. By weighing up the risk versus the effort and hardship required to control the risk, a few women made the choice to consciously ignore the food safety directives and indulge sometimes.

Women's accounts showed that once they were informed of food proscriptions to avoid *Listeria*, they could not refuse it neutrally because refusal could be constructed as a lack of responsibility. Other studies also have shown that adherence to routines of scientifically based antenatal care and related advice, is women's only approved means of reassuring themselves, and others, that they are doing all that can be done to ensure a healthy pregnancy (Browner and Press 1996; Tardy and Hale 2000).

Meanwhile, the discourse of guilt came into play when pregnant women found themselves in situations where they had to intentionally ignore the food safety directives to avoid *Listeria*. In these situations women attempted to justify or rationalize their behaviour to themselves and others while simultaneously being aware that responsible decision-making was not present. The moral struggle between women's perceived responsibility to keep their baby healthy and the denial of their agency as an explanation for their unsafe behaviour has been a common finding in the studies dealing with women's responses to various risks during pregnancy (Tardy and Hale 2000; Baxter et al. 2004). However, the feeling of guilt experienced by pregnant women, under the

discourse of maternal responsibility, was not sufficient to make them perfectly comply with biomedically-derived food safety norms of pregnancy. It can be concluded that the efficacy of maternal responsibility in this case depends on the individual's willingness and ability to evaluate the relevance of food safety directives for practice in the everyday life.

8.3.2 Eating safe as a general rule

Women's personal food descriptions in the current study revealed that they generally relied on their common sense as the most powerful means of deciding about the safety of their food. Researchers in the UK (Draper and Green 2002; Green et al. 2003) and Finland (Järvelä et al. 2006) have similarly found that in general lay people tend to rely on their personal experience and common sense to judge the safety of their food. Lupton (2005) also reported that when assessing food risks, Australians were more likely to rely on their own personal judgements. According to Sallerberg (1991, cited in Lupton 2005) lay people tend to rely on their belief systems or conceptual 'strategies of confidence' when they have to make decisions about their food.

In this study, pregnant women's making use of a classification system to describe their food as either safe or unsafe was similar to what has been reported in previous research as 'binary oppositions' (Lupton 1996, 2000, 2005) or 'rules of thumb' (Draper and Green 2002; Green et al. 2003). These rules operated to allow women to make practical decisions about food choice in the context of information about food safety. Many of these rules consisted of dichotomies of safe versus unsafe foods. The important meanings that ruled women's food distinctions in this study were plant versus animal origin, acceptable versus unacceptable sensory characteristics, handled (cleaned, cooked, stored) properly versus improperly and prepared in home versus outside. The latter two rules, that is the role of food handling practices and the location of consumption, are reflective of women's ideas about food risks being organised around the notions of control and trust. The idea that food prepared and eaten in the home is risk free is indicative of the ways that perceived trust and control over food related practices in domestic kitchens overshadow the risks inherent in some types of food and

some food handling malpractices and needs particular attention in the food safety educational efforts.

Personal food safety classifications in this study were relatively stable, but subject to modification by adapting rules and routines to fit the ‘new’ situation of pregnancy. Griffith (1992) states that women in western countries are more likely to heavily invest in pregnancy as a ‘peak’ experience because pregnancy happens less often than in the past and many are ‘wanted’ and ‘planned’. Women in the current study also insisted on the preciousness of their pregnancy and both survey and interview data revealed that participants had made at least some changes in their food related practices to minimize the risk of *Listeria*. The main strategies included elimination, reduction or moderation of consumption of HLR foods and to a smaller extent, a more cautious approach in food handling practices.

8.3.3 Consumption of HLR foods

This study indicated that if pregnant women have a good knowledge of foods that they should avoid, most of them do their best to comply. Based on the findings from the survey, a strong association was found between women’s knowledge and their practice regarding HLR foods. This resonates with the findings of previous studies and suggests that women who receive food safety information during pregnancy have safer dietary practices (Stafford et al. 1998; Torvaldsen et al. 1999). In addition, the findings suggest that besides knowledge, socio-economic status and eating habits have important roles in determining the consumption pattern of certain HLR foods and should be taken into consideration. Women of higher socio-economic status were found to have a higher level of compliance with *Listeria* prevention directives which may be due to a better coping ability with health promotion advice (Iversen and Kraft 2006; McCarthy et al. 2006).

The study investigated the effects of major Australian food habits on women’s interpretations of and compliance with food safety recommendations to avoid *Listeria*. Survey results indicated that although a great proportion of women (48.7%) did not

consider cold smoked salmon as a HLR food, in practice only a small number of them reported eating cold smoked salmon during pregnancy. Findings from interviews clarified that smoked salmon was not a common food in women's eating routines and most of them stated that they did not eat it 'anyway'. As the interviewees seemed to be of a higher socio-economic background, thus perhaps also more likely to consume a luxury food such as smoked salmon, pregnant women's consumption of this item is probably quite low and hence not a significant *Listeria* risk.

Interview data showed that although nearly all participants had heard of soft cheeses and cold meats as the major HLR foods, many were unsure which cheeses were 'soft' (e.g. women made inquiries about feta cheese) and which luncheon meats were to be avoided (deli meats or packaged meats). A large proportion of women (35.7%) in the current study did not judge deli meats (particularly ham) and pre-packaged salads (50.4%) as HLR foods and reported the consumption of these foods on a regular basis (44.3% and 18.7%, respectively).

Ham was identified in the interviews as a popular food among the participants and many women sought to maintain it in their diet through various strategies such as 'cutting down' the frequency of consumption or 'heating' it before consumption. These findings are consistent with previous research (Stafford et al. 1998; Torvaldsen et al. 1999; Athearn et al. 2004; Ogunmodede et al. 2005; Rungan and Badkar 2005) which indicated that recommendations to avoid cold deli meats and pre-packaged salads were among the most poorly received *Listeria* recommendations during pregnancy. This is of a particular significance, because up to 4.7 percent of all ready-to-eat foods may be contaminated with *Listeria* (Gombas et al. 2003).

While the women reported that their the key concern was the 'health of baby', they also discussed other less important concerns, such as food preferences and social relationships that were in conflict with their ideal for food practices. For example, some of the HLR foods comprised women's favourite foods and a number of them found resisting the appeal difficult. Knowles (1977) suggests that the habits people 'enjoy' are

preferred over those that ‘require special effort’ and people’s health status is a product of their self-control and the degree to which temptation can be resisted.

In this study, social relationships mostly affected the women with a north European background who had more difficulties in following the recommendations to avoid deli meats and soft cheeses, due to what they perceived a ‘family pressure’. Given the regularity of the consumption of soft cheeses and deli meats in daily routines of older generations of families with a north European background and the perception of minimal risk attached to this eating habit, some pregnant women felt pressured about having some of the HLR foods when dining with their family. Athearn and colleagues (2004) also identified the same barrier to following the *Listeria* advice among their participants with a Hispanic/Latino background. Maintaining their social relationships in this case, as suggested by Connor and colleagues (2001) seemed to have a role in de-emphasizing women’s evaluations of the riskiness of some HLR foods. This finding also supports Draper and Green (2002) who suggest that people are not passive ‘objects’ for food safety education, but rational consumers who make individual choices framed by their cultural, social and material circumstances.

Findings of the study emphasise the importance of relevance of food safety advice and a need to tailor the recommendations for different target groups according to their eating habits.

8.3.4 Safe food handling practices

An important finding of the current research was the identification of gaps in pregnant women’s knowledge and skills about food handling practices that have implications for *Listeria* education. Survey results showed that the level of reported implementation of safe food handling practices was lower than the level of awareness of these practices among women. Participants’ reports in the survey indicated that substantial proportions of them had unsafe food handling practices. Washing the kitchen utensils and cutting boards after handling raw meat or chicken (75.9%) and washing hands before preparation and eating a meal (59.6%) at all times, were the most commonly reported

safe practices. However, only half of the participants reported thoroughly reheating refrigerated food at all times and just over one third of them stored the cooked/processed food above the raw food in the refrigerator. While findings from the current study are similar to the findings of Jay and colleagues (1999a) on self-reported food handling practices among a national sample of Australians, it should be noted that the level of actual safe food handling practices happening in the domestic kitchens might be much lower than reported. In a video study of Australians' food handling practices in home, Jay and co-workers (1999b) showed that a much larger proportion of participants failed to wash their hands or used an inadequate procedure for doing so, did not wash utensils between preparation of raw foods and other foods and failed to clean the preparation surfaces before handling ready-to-eat foods.

The disparities observed between the level of knowledge of safe food handling practices and women's reports of implementing them have been previously reported in the literature. Overall, surveys examining knowledge and self-reported practice have found that people who are aware of a food safety concept do not necessarily use the corresponding safe procedure when handling their food in home (Jay et al. 1999b; Anderson 2002; Clayton et al. 2003; Redmond and Griffith 2003b). An effort to understand the disparities between women's knowledge and their practice in food safety domain through exploration of the issue in the interviews, however, failed to discover any underlying internal (e.g. laziness) or external (e.g. time constraints) barriers to safe behaviour as have been found in previous studies (Clayton et al. 2003). Most women believed that they were already conscious of their practices. The concept of 'common sense', as in previous research (Athearn et al. 2004; Lewallen 2004; Lupton 2005), seemed to be the main basis for food related behaviours. A number of women stated that they had made an attempt to overcome some barriers to safe food handling practices after becoming pregnant. However, it was not possible to determine the extent to which this successfully occurred.

Findings of the interviews are consistent with results from the limited studies that have reported the food handling practices with particular importance for the prevention of *Listeria* (Athearn et al. 2004; Cates et al. 2004). Nearly all women in the current study

expressed confidence regarding their food handling practices based on the rationale that the food prepared at home had rarely made them sick. Women perceived it to be common sense to carry out certain practices while preparing food at home. Given the low levels of knowledge about the significance of some food handling precautions (e.g. heating leftover foods to steaming hot) in the prevention of listeriosis, women's confidence about their self-efficacy with their food handling practices may be a product of their lower levels of awareness rather than an optimistic bias.

While most women in a subsequent pregnancy believed that their sanitation basics and safe food handling practices had extended into this pregnancy from the past and particularly from their prior pregnancies, some first-time pregnant women stated that they had consciously made some changes to their previously relaxed food handling practices in terms of general cleanliness and heating procedures. It is important to note that many of the food handling practices that were reported to be carried out 'anyway' were in fact influenced by some type of authoritative knowledge, based on what women had unconsciously learned in the past. However, survey results indicated that women's knowledge was not inclusive of all safe food handling techniques. These findings emphasise the importance of including safe food handling education during pregnancy, since there was evidence that women were motivated and willing to adopt safe practices and maintain them over long term.

Sources of *Listeria* knowledge during pregnancy and the influence of perceived 'authority' of these sources on women's decisions with regard to *Listeria* prevention are discussed in the following section.

8.4 *Listeria* risk communication avenues

Women in this study reported being exposed to a vast and sometimes confusing array of information. Food safety directives were conveyed to pregnant women either outside the health system by women's lay network and media, or within the health system by doctors, midwives and printed educational materials. This section explores the strategies that pregnant women employed when evaluating the 'authority' of different sources of

Listeria information, and how these information sources influenced women's decision making processes with regard to *Listeria* prevention. The concept of 'cognitive authority' provided a framework for better understanding pregnant women's evaluations of various sources of food safety knowledge and the ways these sources affected their decision making processes to prevent *Listeria*.

8.4.1 *Listeria* risk communication avenues outside the health system

Survey results showed that only half of the participants had received some type of information about food safety issues during their current pregnancy, with avenues outside the health system having a major role in the construction of food safety knowledge among the participants.

8.4.1.1 Lay network

The lay network was identified as a major source of *Listeria* knowledge for pregnant women in the current study. The lay network was the source of information for a large proportion (48.3%) of women in the survey. However, women's ranking of the position of friends in the survey as one of the least trusted sources of information appears contradictory to the finding from the interviews that indicated friends were a major source of pregnancy-related information. This may be a bias due to the general wording of the question (friends) in the survey. Another type of phrasing that made the question specifically relevant to women's situation (e.g. 'pregnant friends' or 'friends with young children') could have led to other results.

The lay network was identified as the most common source of food safety knowledge for participants in the interviews, particularly for primiparas. Schneider (2002) suggests that since life events such as pregnancy often place women in situations that are unfamiliar to them, informational support from their lay network, particularly for the first-time pregnant women, is regarded as crucial and highly valued (Schneider 2002). However, in this study, women in a subsequent pregnancy were also found to enjoy the *Listeria* information communicated to them through their lay network, since some of

them had not received the advice in their previous pregnancies or had simply forgotten the advice.

More than two thirds of interview participants had received some type of information about *Listeria* from their lay network. The lay network comprised family members, friends and acquaintances, mostly with a recent history of pregnancy. This finding is consistent with the previous literature (Browner and Press 1996; Root and Browner 2001; Szwajcer et al. 2005) that indicate pregnant women are particularly interested in exchanging experiences with other women who are or have recently been pregnant, for comparison, reassurance and advice.

Information exchange was reported by the interview participants to be an ongoing process among pregnant women and their peers. Some women in a subsequent pregnancy reported that they had given their books and educational materials to other, mostly first-time pregnant, women within their family or friends circle. Past research suggests that communicating with other pregnant women provides social support and access to new information and gives women the opportunity to compare their ideas and feelings with people in a similar situation and to evaluate if they are doing the right thing (Sarason and Sarason 1985; Szwajcer et al. 2005).

Based on Wilson's concept of cognitive authority, *Listeria* advice on food safety provided to pregnant women by their non-expert relatives and friends, compared with advice from an expert, was perceived to be equally authoritative. The perception of authority attached to lay sources was found to be a result of pregnant women's trust in these sources. In most cases, lay sources were perceived to be trustworthy because they 'knew what they were talking about'. This is consistent with the work of others who reported that demographic forms of similarity and group membership enhance the receiver's trust in a source of information (Kreuter and McClure 2004). Ketler (2000) suggests that pregnant women's trust in known women similar to themselves is because they speak with "the voice of 'lifeworld', which is reassuring due to its continuity with the context of women's daily lives and social experiences" (pg. 152). This, however, contrasts with positions of some researchers who consider the information from lay sources as subordinate to scientific authoritative knowledge (Duden 1993; Root and

Browner 2001). It should be noted that many of the interviewees in the current research were conscious of the scientific credibility of the lay source. In other words, *Listeria* advice from a non-expert source was more likely to be accepted as authoritative if women understood that information was purportedly backed by scientific knowledge, for example being provided by a friend with professional training, such as a nurse.

Findings of this study do not support the results of previous studies (Lewallen 2004; Torres 2005) that identified mothers and women of older age as important sources for food related information during pregnancy. Women's perception of the changing nature of medical knowledge in this study caused them not to trust their older relatives (e.g. mother) as a source of advice on *Listeria*, since the latter were perceived not to be knowledgeable enough about such a newly emerged health risk during pregnancy. However, women's views on other nutrition related issues could have been different and were not investigated in this study.

8.4.1.2 Other sources

A number of other sources of knowledge were identified in the current study as contributing to women's understanding of *Listeria*. Some women, as active information absorbers, sought more information with regard to their pregnancy from other sources. However, the main aim was to learn more about the process of pregnancy and child development rather than accessing information about food safety. Nonetheless, if women came across food safety and *Listeria* information, they tended to cross-reference the information depending on the availability of other sources of biomedical knowledge and their perceived trustworthiness.

Some interview participants, who were more proactive in seeking pregnancy related information tended to source this information from pregnancy books, women's magazines and the Internet. However, survey results indicated that small proportions of participants received their information on *Listeria* from these sources. The disparity between survey and interview results may be due to the higher education levels among interviewees. Women with higher levels of education have been reported in past

research to more independently seek health related information from different sources (Iversen and Kraft 2006). This study found that women in most cases sought to establish the ‘authority’ of the published sources of *Listeria* information. Women, in the same way as suggested by Wilson (1983), stated that they were conscious of the credibility of the author and indicated that they would prefer food safety and other information in books and magazines to be supported by scientific evidence. However, McVie (2006) found that information presented in the popular women’s magazines in Australia is rarely supported by expert knowledge.

The Internet was a more common source of information for younger women who preferred to look up the information published by trusted sources such as health authorities and government bodies (Cline and Haynes 2001; Lupton 2005). This study, similar to a recent study by Sillence and colleagues (2007), found that most women searching the Internet subsequently checked the information with their lay network and other offline sources of information, as well as their care providers, for credibility of the information and more guidance on their behaviour. Given the role of published materials in the construction of food safety and *Listeria* knowledge during pregnancy, content analysis of food safety messages published through these avenues is warranted to identify the possible inconsistencies and inadequacies in the information provided.

Although survey results, in accordance with previous literature (Frewer et al. 1996; Macintyre et al. 1998; Lupton 2004), revealed that the media was perceived as the least trusted source of food related information, it was interesting to note how the stories of foodborne outbreaks in the media came into play to shape women’s perception of *Listeria* risk. Although Lupton (2005) has identified media reports to be a rather unreliable source of information about food-related risks for the group of Australians she interviewed, some pregnant women in this study evaluated the food safety recommendations to avoid listeriosis based on what they learned from media. For example, while salami was comfortably perceived as a HLR food because of the previous reports in the media about people contracting listeriosis as a result of eating salami, women were reluctant to accept ham as a potential threat to their pregnancy,

because they had not heard of any stories in the media attributing listeriosis to the consumption of ham.

Generally, pregnant women in this study demonstrated a high level of reliance on informational sources outside the health system. This would appear to be, at least to some extent, an attempt to fill the gap of health professionals' contribution in the provision of *Listeria* advice during pregnancy.

8.4.2 *Listeria* risk communication avenues within the health system

Browner and Press (1996) suggest that pregnancy care today is fundamentally about getting and giving information. Much of the antenatal care can be seen as a process of medical socialization, in which care providers teach pregnant women their interpretations of what women should and should not do throughout their pregnancy to have a healthy child and the significance that should be attached to their recommendations (Browner and Press 1996). While most of the antenatal recommendations, such as those addressing the issues of smoking, alcohol intake, food safety, diet and exercise are aimed at decreasing the risks associated with women's behaviours (Jones-Webb et al. 1999; Morales et al. 2004), not all of these recommendations receive the same level of attention within the antenatal practice (Herzig et al. 2006).

8.4.2.1 Health professionals

Women in this study received their antenatal care from a range of health professionals including midwives, doctors and obstetricians. Pregnant women in the interviews reported that they were generally satisfied with the antenatal care they received. However, the temporal pressure they felt in both public and private practice, together with a lower concern about food related risks, hindered them from building a relationship with their care provider that could lead to a better construction of food safety knowledge. Luyben and Fleming (2005) in a study of women's expectations from antenatal care in three European countries found that listening, time and 'establishing a sharing trust relationship' allowed women to feel confident through the knowledge they

gained. The absence of these factors in the antenatal practice reported by women in this study may account for the limited satisfaction they felt with the education they received and the limited exchange and/or retention of food safety information during antenatal visits.

Survey results showed that more than half of the participants had not received any advice regarding food-related issues and *Listeria* from their care providers, whether obstetrician, GP or midwife. Women's accounts showed how for many participants the informational function of antenatal care was highly valued. Most women's accounts showed that their goals when they sought antenatal care was to have the process of their pregnancy monitored as well as to learn about how their care providers thought they should care for themselves and act during pregnancy. Women, however, criticized the main focus of antenatal practice to be on the technological quality and monitoring aspect of care rather than presenting more information and reassurance.

The interview data showed similar findings to the survey. Many women stated in the interviews that they had not received any advice with regard to *Listeria* from their care provider. Many of those who had heard about *Listeria* prevention directives from their care providers did not have a clear understanding of the implications of advice and ramifications of non-compliance and stated that being aware of these would help them better comply. Similar findings have been reported in focus groups with pregnant women (Athearn et al. 2004) as well as with other high risk groups such as HIV/AIDS patients (Hoffman et al. 2005) and patients with cancer (Medeiros et al. 2004a). The literature provides guidance regarding such situations. Luyben and Fleming (2005) have suggested that to assist pregnant women feel confident about the understanding they gain on an issue, information has to be explained so that it could be linked to the knowledge women already possess and enable them to incorporate it into their practice. It is in this situation that mis-communication and difficulties in assessing what information clients want more are most likely to be found (Taylor and Field 2003). Such discussion also provides validation of the coping strategies and combines emphasis on the particular points with a supportive interaction and suggestions for positive behaviours (Sarason and Sarason 1985).

Findings from interviews indicated that pregnant women in a subsequent pregnancy were more likely not to receive any *Listeria* advice from their care provider. A negative relationship between women's satisfaction with the antenatal care and number of their children have also been reported by Erci and Ivanov (2004). Women in this study stated that their care providers tended to 'ration' the information provided to them based on the presumption that they would already know. However, as noted before, findings showed that multiparous women in this study, as compared with primiparas, were more likely to have an inadequate knowledge of HLR foods and to continue the consumption of these foods throughout their pregnancy. As a result, health professionals' choosing not to give them the information took the choice away from these women and thereby disempowered them. Such maternalistic categorization of health care clients has been described in the literature as 'oversimplification or untrue generalization of a social group' (van Krieken et al. 2006) and it would appear that the practice needs to be revisited.

It is interesting to note that pregnant women in this study were convinced that the onus was on them to seek the information. Lupton (2005) argues that this reflects the continuing focus placed on public forums in Australia of the importance of personal responsibility for controlling risk. This is also consistent with other studies such as Browner and Press (1996) who suggest that women consider being informed as primary to the responsibilities conferred by pregnancy. Although the study found that active seeking of advice has become a norm within antenatal practice and welcomed, it was debilitating for women who either did not understand the relevance of a particular issue (such as food safety) or left the clinic with a list of questions they forgot to ask. Literature confirms that often in medical encounters clients do not get enough information and the communication process is handled in such a way that patients are not often at ease in asking questions (Audit Commission 1993; Erdem and Harrison-Walker 2006). Previous research (Halliday and Hogarth-Scott 2000) supports the findings of the current study that revealed part of women's disappointment with the informational component of antenatal care was due to the fairly routinised nature of the service for care providers, while for women themselves the experience of pregnancy was unique and a significant life event.

Findings from both the survey and interviews indicate that health professionals (doctors followed by midwives) were considered the most trusted source of food related information, which is a common finding in the literature (Frewer et al. 1996; van Dillen et al. 2003; Athearn et al. 2004; Cates et al. 2004; Lupton 2005; Redmond and Griffith 2005; Torres 2005). Consistent with Wilson's framework of 'cognitive authority' it was found that women attributed high levels of authority to health professionals because of their perceived credibility and professional competence. Literature confirms that higher levels of trust in health professionals are due to their expertise and their perceived knowledge, accuracy and concern about public welfare that leads to the expectation that they provide an objective view on the topic and are willing to help clients (Frewer et al. 1996; Redmond and Griffith 2005). Also, the focus on risk as an element of any pregnancy enhances the authority of medical professionals as information sources (Browner and Press 1996). Women are therefore more likely to accept food-related information from health professionals than from sources perceived to be less authoritative such as their acquaintances (Wilson 1983; Worsley and Lea 2003). Past literature confirms that although health professionals are not frequently involved in the communication of health related risks to their clients, they are still one of the most trusted sources of information for the general public (Worsley and Lea 2003). On the other hand, because of the privileged position of scientific knowledge, pregnant women, even if they were ambivalent about the value of advice they received, did not tend to reject it. Information produced by science was highly valued and recommendations by doctors and midwives usually had great power. An investigation of doctors' (GPs and obstetricians) perceptions of food related risks and their approaches to food safety and *Listeria* education during pregnancy was beyond the scope of this research. However, given the important role of these health professionals in the provision of pregnancy care, this seems to be necessary and warrants further research.

Women's interest as reported in the current study, in being informed of the risks associated with listeriosis, the reasons behind the *Listeria* recommendations, and the potential ramifications of non-compliance with the directives is similar to women's views reported in previous studies (Athearn et al. 2004; Cates et al. 2004) and contradicts the views of doctors in a previous study (IFIC 2000) and midwives in the

current study who believed that detailed information may overwhelm women or make them anxious about their pregnancy.

8.4.2.2 *Listeria* pamphlets

An under-utilization of printed educational materials as a source of *Listeria* information was identified in the current study. Only a quarter of participants in the survey reported the receipt of *Listeria* pamphlets. Women's accounts in the interviews revealed that while some of them were overwhelmed by the handouts on a vast range of pregnancy related issues, a large number of them had not received any written materials on *Listeria*. This was mostly because of the organisational limitations and lack of availability of handouts at some points in time. Women under private health cover were even more at risk of being deprived of information, since the provision of printed *Listeria* materials was highly dependent on their obstetrician and none of them indicated receiving it.

Previous studies suggest that health professionals' interaction with their clients would be more effective in improving lay performance and behaviour change if the biomedical advice is backed by printed materials (Birmingham et al. 2004; Gal and Prigat 2005; Krewski et al. 2006). The Royal Australian College of General Practitioners encourages general physicians and other allied health practitioners to provide clients with health promotion information and to reinforce it through the use of written materials and resources (RACGP 2005).

While *Listeria* educational materials were generally perceived to be trusted sources of information, women seemed to prefer materials produced by the 'authoritative' sources of food safety knowledge over other sources. This aligns with Wilson's (1985) criteria of cognitive authority for written materials. Consistent with previous research (Frewer et al. 1996; Lupton 2005; Redmond and Griffith 2005) women's accounts in this study showed that *Listeria* materials produced by 'official' health authorities, as regulatory and responsible bodies, were preferred over the materials that had been produced by

commercial companies and even by individual health professionals such as doctors or midwives.

Most women did not want to be simply passive recipients of information within antenatal care. Women's accounts indicated that many care providers perceived it to be sufficient to merely hand clients the pamphlet without any further explanation. Women reported that they preferred to have an active role in the process of health care work and information exchange which is a common finding in the literature (Nettleton 1995; Lee and Garvin 2003; Luyben and Fleming 2005). Pregnant women, similar to prior studies (Shaw 1995; Athearn et al. 2004; Cates et al. 2004), preferred the information handed to them in the form of *Listeria* pamphlets to be backed by verbal advice from their care provider. Women felt that they would find the opportunity to ask their questions and discuss their concerns if the *Listeria* information was provided in this way. The 'active' engagement of health workers in the provision of health advice has also been identified as more effective in communicating information in previous studies. Previous work by Flight and colleagues (2001, cited in Worsley and Lea 2003) showed that socially interactive sources such as doctors and midwives were far more effective in influencing pregnant women's decisions about folic acid supplements than passive information sources such as leaflets.

8.5 Midwives' approaches to the *Listeria* risk communication

Investigation of the role of midwives and their approach to food safety and *Listeria* education in pregnancy comprised an important part of this research. Limited studies have addressed the approach of health professionals in the provision of food safety advice and there was no information available about the situation in Australia. Given the central role of care providers in the dissemination of knowledge about different health related risks during pregnancy, it was necessary to examine the communication of food safety information from both pregnant women's and midwives' perspectives. Since pregnant women tend to have regular antenatal contacts with midwives within the public health system and the educational part of care under private health care is also conducted by midwives, findings of this part may be of particular importance for

professional practice. This section discusses the midwife participants' approach to the provision of *Listeria* advice and their perception and positioning of risk associated with *Listeria* during pregnancy.

8.5.1 Midwives' provision of *Listeria* advice

Midwives in the current study had a range of different approaches to the provision of *Listeria* advice to their pregnant clients. Information about all different pregnancy related issues was introduced during the 'booking' session, leading to a rapid education about a vast range of topics. However, midwives in the current study, similar to the research by Halliday (2000), found a large amount of information sometimes quite overwhelming right at the beginning of pregnancy care. Midwives' accounts illustrated that communication about food in most cases was initiated with asking about women's quality of food (do you eat well?) and a very general talk about healthy eating during pregnancy (you really need to eat well!).

Listeria was the only food safety topic reported to be introduced by the midwives to their clients. In most cases the discussion was a result of midwives' adherence to a predetermined list of tasks and topics to be covered, rather than the importance they attached to the topic. The midwives reported that once introduced, the checklist was marked and they provided no further follow up or reminder until the end of pregnancy. Considerable variation existed between midwives reported approaches to the provision of *Listeria* advice. Their practice appeared to be influenced by their own subjective view of how communication should be carried out and the importance they attached to a particular topic. Some midwives' approaches were more authoritative and didactic while some of them had a more facilitative approach. Although comprehensive verbal advice was not always provided, an over-reliance on written published materials was identified. As a result, irregular availability of educational materials potentially put some women at risk of delayed or non receipt of *Listeria* information.

Although most midwives in this study reported providing *Listeria* advice, their accounts demonstrated that their education efforts were not comprehensive. They mainly focused

on informing pregnant women about major groups of HLR foods rather than providing comprehensive education incorporating a detailed list of foods to be avoided, *Listeria* prevention through food handling precautions, and the risks associated with *Listeria* infection. Interviews with the midwives revealed that limited recognition or acknowledgement was given to the agency of pregnant women in relation to making decisions based on the general *Listeria* advice that midwives provided. Such an important aspect of food safety communication and education warrants further investigation in order to maximise the effectiveness of this process.

Pregnancy care providers have been reported to exercise different levels of engagement in providing food safety education, and advice about safe food handling practices has been reported in the literature as the most neglected area (IFIC 2000; Woteki et al. 2001; Morales et al. 2004). The main reasons that prevented midwives in the current study from including food handling advice in their consultations was an underestimation of prevalence of unsafe food practices and the perception of the issue as common sense. Stereotyping was also part of the communication procedure where midwives judged their pregnant clients to be less at risk of food handling mistakes because of their socio-economic status or simply their appearance. Previous research confirms that value judgments often enter into medical encounters and make health professionals vary the amount of information they give according to the patient's characteristics including class, personal characteristics, and communicative style (Cooper-Patrick et al. 1999; Johnson et al. 2004; Dykes 2005; Street Jr. et al. 2007). The underlying assumptions on which midwives based this type of functional relationship were, however, questionable. Most midwives stated that their main goal was not to offend the pregnant women and to maintain their relationship with their client. However, midwives' account also revealed that talking about food safety issues with a pregnant woman might challenge their own level of food safety knowledge and practices. In this case, as Kirkham and colleagues (2002) point out, stereotyping was a protective strategy for midwives to prevent situations in which they might feel impoverished.

Another important factor affecting the provision of *Listeria* advice within midwife-woman relationship in this study was midwives' perception of their clients as mostly

knowledgeable women who actively sought the information relevant to their pregnancy elsewhere and the perception that there was little need to inform women again within the antenatal practice. In fact, some midwives stated that they were embarrassed by their clients who were aware of many pregnancy related issues, even more than what they as health professionals were. This supports Nettleton's (1995) argument stating that traditional asymmetric health professional-lay relationship has been challenged in recent years with lay people who may have more knowledge about their condition than medical practitioners. The dominance of traditional sources such as health professionals has been challenged by easier public access to information and competing ideas about health and illness through media and Internet (Cline and Haynes 2001). This seems to be particularly true during pregnancy when, as Worsley (2002) suggests, many women accumulate expertise about their situation because of their particular interest and come to have a special knowledge of what should and should not be done during pregnancy.

Other issues such as time constraints, lack of resources, and feeling that it was not their job to provide a comprehensive food safety education to their pregnant clients, were also identified in midwives' accounts as factors affecting their practice regarding *Listeria* risk communication. These elements have already been documented in the literature as negatively influencing antenatal care practice (IFIC 2000; Stapleton et al. 2002; Morales et al. 2004; Dykes 2005; Herzig et al. 2006; Gilbert et al. 2007). Among other factors, however, midwives' own perception of the risk of *Listeria* was found to have a particular impact on the quality of care provided in this regard.

A particularly significant finding of this study was the inconsistency between midwives' and pregnant women's perception of the 'authority' of sources of knowledge with regard to food safety issues during pregnancy. While pregnant women perceived the health professionals as the most 'authoritative' sources of *Listeria* advice, midwives did not necessarily perceive themselves to be authorities in food safety knowledge and considered other sources outside the health system, including different published materials and even women's experiential knowledge and common sense, as influential sources that could be relied upon during pregnancy. Strengthening the perception of authority among pregnancy care providers on issues other than surveillance of

pregnancy in antenatal care, may have positive outcomes for the educational and informational aspects of antenatal care practice.

8.5.2 Midwives' perception of *Listeria* risk

The findings of this study indicate that midwives' interaction with pregnant women about food safety issues appeared to be a product of mutual lack of concern about hazards associated with food and an underestimation of *Listeria* risk. Midwives, similar to women, and as part of the Australian community (Lupton 2005), were confident about the safety of the food environment and did not consider food safety a major concern even in pregnancy. Risks associated with food had a low position in midwives' hierarchy of health issues during pregnancy, which has previously been reported in the literature (IFIC 2000; Heyes et al. 2004; Morales et al. 2004).

An examination of midwives' level of knowledge about food safety issues and *Listeria* was not performed in the current study. Given the influence of knowledge on the perceptions of risk and further practices, this needs to be done in future research. However, midwives' accounts in the interviews indicated that many of them had an inaccurate view of the *Listeria* risk, due may be to lower levels of knowledge of scientific details about the illness. For example their comments regarding antenatal classes being 'too late' to be useful in informing pregnant women about *Listeria* risk indicated that they did not have a correct understanding about the risk, since most cases of listeriosis have been reported in the third trimester of pregnancy. Thus food safety education, had women not learned about it earlier, can still be useful even at later stages of pregnancy and can help reinforce the importance of avoiding the *Listeria* risk towards the end of pregnancy.

Interestingly, the perception of *Listeria* risk among midwives, as experts, was under the influence of both their scientific and experiential knowledge, in a similar way as for lay people. Interviews with two pregnant midwives showed that their response to the risk of *Listeria* was comparable to other ordinary women who did not have any medical background. Both these midwives, similar to their non-professional counterparts, were

uncertain of the risk of *Listeria*, perceived it to be remote and continued the consumption of some HLR foods such as ham throughout their pregnancy. This is consistent with Johnson's argument about off-duty professionals, who similarly to lay people, cope with possible hazards simply as aspects of life rather than as 'risks' (Johnson 1993).

Midwives in this study, therefore, followed a 'heuristic' model of communication to deal with the *Listeria* advice, where as suggested by Bennett (2001), their own perception of risk and way of thinking allowed a rapid and simple communication of extensive biomedical knowledge in the form of routine information packages. However, this approach can be biased and under the influence of personal experiences with risk, because this is the way the experts themselves understand the risk, through individual interpretations and sometimes misunderstanding of available information (Fuller 2004).

One of the underlying reasons for an underestimation of *Listeria* risk was a lack of official training about food related risks, which has also been identified in previous studies (Buchdahl et al. 1990; Mulliner et al. 1995; IFIC 2000; Woteki et al. 2001; Morales et al. 2004; Kravetz and Federman 2005a). Reports in the literature indicate that only health professionals with a nutrition or dietetics background tend to have a good knowledge of food safety issues and provide their clients with appropriate education (Scheule 2004). Given the low levels of nutritionists' and dietitians' involvement in the provision of antenatal care, it is crucial that health professionals who are main providers of pregnancy care receive adequate training in food related issues including food safety. Midwives in this study stated that food safety issues have never been included in their subject materials for midwifery education, raised within the antenatal practice, or included in their in-service training.

The scarcity of educational materials on diet and food safety issues during pregnancy, where handouts on many other issues such as smoking, alcohol intake, drug use and domestic violence were constantly available, suggested that the topic of food may not be at the top of the agenda for health authorities. Controversies within the health system and lack of adherence to food safety recommendations in the organisational setting,

where despite the food safety directives pregnant women were served with cold deli sandwiches during their antenatal classes, also contributed to midwives' scepticism about the real value of dietary proscriptions for the prevention of listeriosis. Midwives also identified antenatal classes as a lost opportunity for food safety education because of commencement of classes in late pregnancy and covering only first-time pregnant women.

8.6 Conclusion

This chapter discussed the main findings that emerged from studying pregnant women and midwives' perspectives on the risk of *Listeria* during pregnancy.

Women's accounts indicated that although they were aware of the practices that were considered problematic with regard to *Listeria* and did attempt to modify the amount of the HLR foods they consumed, they did not always achieve the 'perfect' diet from a food safety point of view. Yet, by altering the amount and type of food consumed, women actively and consciously made an effort to balance their own needs and what they perceived to be important for the health and safety of their baby. Findings showed that while from a professional perspective, strict adherence to the correct information is the only safe practice during pregnancy, for the women themselves, moderating and considering both their own and the baby's needs made the management of their pregnancy workable.

An underestimation of risk and reliance on non-expert knowledge was identified in women's accounts in this study as a potential underlying cause for varied levels of compliance with the food safety directives on *Listeria* prevention. Yet, the fact that most pregnant women modified their diets in some way for the baby indicates the degree to which they accepted responsibility for the outcome of pregnancy and health of their baby.

Overall, high levels of reliance on information sources outside health system, and sometimes as the sole source of information, made it clear that authorities in the health

system had a compromised and limited role in providing women with biomedical knowledge about food related risks, including that of *Listeria*. Pregnant women were therefore pressed to either rely on their own (or on other women's) knowledge and experiences about food safety, or seek out diverse external sources of information. The main objective was to determine what they were and were not allowed to eat and to form a conscious knowledge-directed eating strategy. Although some scepticism existed among participants about the trustworthiness of some of their information sources, and such expertise was questionable compared with authoritative sources of knowledge within the health system, women were willing to follow whatever advice they received to keep their baby healthy. Among the various sources outside the health system, the lay network was identified as a powerful and dynamic source of *Listeria* risk communication where women could easily access food safety information in a self-generating way.

Finally, midwives' practice with regard to the provision of *Listeria* advice was discussed. Midwives, in a similar way to women, had an underestimation of the *Listeria* risk based on both their scientific and experiential knowledge. Midwives' practice was influenced by both the low priority of food related issues within their hierarchy of perceived health concerns during pregnancy, and other organisational constraints suppressing food safety education within the health system.

The following and final chapter of this thesis will present the concluding remarks of this study. Limitations of the research, implication of findings for food safety education and promotion within the public health practice, and suggestions for further research will be discussed.

9 Conclusion

9.1 Introduction

Food safety recommendations for pregnancy have grown out of concerns by food and nutrition experts about the emerging foodborne illnesses that may have serious consequences for the health of the fetus and pregnancy outcome. This study provided new information and insights regarding pregnant women's and midwives' perspectives about risks associated with *Listeria* as a foodborne pathogen. Gaining a clear idea of pregnant women's understandings of food related risks within their social and cultural context, their level of knowledge and practices in this regard, and their main sources of food risk information, provides an important contribution to public health through identification of gaps in educational initiatives and orienting them to reinforce safe food practices. By identifying the ways pregnancy health care providers perceive the *Listeria* risk and position it among other health concerns during pregnancy, this study has an important contribution to the professional practice and may be a basis for understanding how (if at all) food related risks are addressed and relevant information is conveyed within the antenatal services.

The study sought the views of pregnant women attending antenatal clinics and/or classes in one private and two major public hospitals in the South Eastern Sydney and Illawarra Area Health Services (SESAHS), and also those of midwives providing antenatal care and teaching the classes within the same hospitals. A mixed methods research approach with a sociological perspective was employed for systematic and rigorous data collection and analysis. Making use of quantitative and qualitative methods at the same time allowed an exploration of *Listeria* related issues both broadly and in depth. Pregnant women's knowledge, practices and opinions about the risk of *Listeria* were investigated through a survey, and pregnant women's and midwives'

understandings, perceptions and experiences were examined through in-depth face-to-face interviews.

9.2 Achievement of aims of the research

This study achieved its overall aim of *gaining insight into the understanding and positioning of food safety issues, with an emphasis on the risk of Listeria, from pregnant women's and midwives' perspectives.*

As its first specific objective, the study explored pregnant women's knowledge and awareness about the risk of *Listeria*. Some degrees of *Listeria* awareness was identified among pregnant women in this study. However, women's knowledge of specific recommendation to avoid the illness in terms of both avoidance of high *Listeria* risk (HLR) foods and particular precautions in food handling practices was found to be inadequate. In addition, although pregnant women had a routine system of classification of foods as safe and unsafe, recommendations to avoid HLR foods acted to blur this classification system since such foods were generally considered to be safe for healthy adults. Such blurring of the classification system may have contributed to the women's inconsistent adherence to the food safety recommendations to avoid HLR foods.

The second specific objective of this study was to explore the ways pregnant women perceived the risk of *Listeria*. This study found that women's understanding of the *Listeria* risk was shaped within the context of their lack of concern about food safety issues in general and their high level of confidence in the safety of the food supply in Australia. Their understanding of the risk of *Listeria* was informed by scientific knowledge they acquired about food risks as related to their pregnancy and their ability to link that knowledge to their past experiences and existing knowledge about food safety issues. Lack of scientific knowledge about the ramifications of *Listeria* infection during pregnancy, together with a lack of experiential knowledge indicating serious consequences for foodborne illnesses resulted in an underestimation of *Listeria* risk among pregnant women in this study.

The study, as its third specific objective, explored the ways pregnant women managed the risk of *Listeria* within the context of their everyday eating practices. The notion of responsibility for the health of their baby was prominent and led women to make some degree of change to their food related routines to protect their unborn child from *Listeria*. However, this happened within the social and cultural context of their lives and a range of other considerations and concerns. Pregnant women acknowledged the risk of *Listeria*, but were not convinced about the significance of risk for their pregnancy, and this affected their compliance with food safety advice. The necessity to reclassify the food system to avoid HLR foods created a tension that resulted in downgrading the risk and indulging in eating practices. In addition, pregnant women were generally satisfied with the ‘cleanliness’ of their food handling practices and hardly considered change to be necessary for pregnancy.

Investigation of different avenues of communication about the risk of *Listeria* as another specific objective of this research showed that sources outside the health system had a major influence on women’s understanding of the risk of *Listeria*. Advice and information from lay networks and published materials outside the health system were perceived to be authoritative because of the scientific knowledge that was assumed to back the information. However, pregnant women expressed a preference for receiving food related information from their care providers. Doctors and midwives were considered the most trusted sources of knowledge about pregnancy issues and their advice was highly valued and acted upon. It is, therefore, disturbing to note that less than half of the participants in this study had received some information about *Listeria* from their health care providers. Meanwhile, some of those who had received an advice regarding the risk of *Listeria* from their care provider, whether doctor or midwife, expressed frustration over the contradictory messages and the vague explanation of what they exactly needed to do to avoid the risk.

The last specific objective of this study was to explore midwives’ approaches in regard to the communication of the risk of *Listeria* within the antenatal practice. The findings showed that midwives’ understanding of the risk of *Listeria* was informed by both scientific knowledge and their common sense and past experience, in much the same

way as pregnant women. Most midwives considered food safety to be of a lower priority among health concerns during pregnancy and assumed that their clients had enough knowledge and skills for safe handling of their food. None of the midwives reported they had received any instruction about food related issues within their formal training to become a midwife or after receiving their qualification. Midwives had no specific protocol to follow on food safety education and their practice was based on their individual evaluations and presumptions about their client and their perceptions of the significance of *Listeria* risk. Common constraints such as lack of time and particularly of resources, in terms of educational materials, were also found to be affecting midwives' practices with regard to food safety education. Both pregnant women and midwives agreed that antenatal classes were a lost opportunity for food safety education because they were held only for first-time pregnant women and towards the end of their pregnancy when it was considered to be 'too late' for any food/dietary advice. Provision of food safety advice was compromised by a lack of concern from both parties: midwives were not forthcoming in the provision of advice and women did not ask for it.

9.3 Limitations of the study

The researcher acknowledges that there have been some limitations affecting the findings of both quantitative and qualitative parts of this study.

There were a number of limitations arising out of the sampling method related to the survey. The survey was not statistically representative of all pregnant women in the SESIAHS since participants were not randomly selected. However, the sample size was calculated to minimise the effects of non-random sampling and an attempt was made to select the study sites in a way that included different geographic locations and women from different socio-economic backgrounds within the SESIAHS.

Another limitation affecting the survey was a low response rate from the group of pregnant women who sent their questionnaires back through the mail. Follow up of participants to increase the response rate among this group was not possible, as

women's contact details were not available. The selection bias inherent in the low responder group was a limitation since women who sent the questionnaires back through the mail were found to have a higher level of education, income, and knowledge of HLR foods as compared with women who completed the survey in the clinic. The full survey data were pooled to provide a more comprehensive view of the current *Listeria* knowledge and practice among pregnant women. However, results from the smaller group were also reported separately to preserve any differences that may have been present.

Women from non-English speaking backgrounds (NESB) are also under- represented in this study since they were not able to effectively communicate in English and may have had difficulty in understanding the survey. As a result, those who spoke no English or limited English did not volunteer to participate. This, however, indicates that these women could potentially be at risk of receiving even less information on *Listeria*, based on their limited English literacy.

Investigating pregnant women's practices through the survey may have been a limitation. Although assessing knowledge through the questionnaire was relatively straight forward, women's self-reported practices on the frequency of implementation of food handling practices and consumption of HLR foods might have been affected by some degrees of recall bias. Self-reported practices also might not have been accurate indicators of pregnant women's implementation of safe food handling practices. It is acknowledged that some respondents might have overestimated the frequency with which they carried out 'good' food safety practices. However, making use of other methods of data collection, such as observation, was impractical in the current research and outside the ethical boundaries defined for it.

The qualitative part of the study had some limitations as well. The interview participants were self selected and thus were vulnerable to volunteer bias. The majority of pregnant women who consented to be interviewed were well-educated and their views may not be representative of the broader population from which they were drawn. Participants lived in one geographical area of New South Wales (NSW) which may

limit generalisation outside of this area. An attempt was made to recruit women from different ethnic groups. Women from NESB are likely to be among the most in need for food safety information and education. However, all but one participant spoke English as their first language. There is a significant population of NESB residing in the SESIAHS and this study was not able to include their views.

It can be argued that pregnant women and midwives who volunteered to participate in the interviews were more confident about *Listeria* related issues. However, interview data showed that pregnant women were not completely knowledgeable about all aspects of *Listeria* prevention and expressed this quite openly. The possibility of ‘social desirability bias’ was a limitation, particularly with midwife participants. Midwives might have provided answers considered to be ‘acceptable’ responses to the interviewer. If this were the case, the expressed views might be expected to be more in line with the role of midwives as one of the main health promoters and educators during pregnancy, with midwives expressing their enthusiasm in providing food safety advice to all their clients. However, this was not observed and midwives felt free to talk about their less than perfect practice in the communication of *Listeria* risk to their pregnant clients.

9.4 Implications for practice

Understanding pregnant women’s views and practices with regard to food safety and midwives’ perceptions of their role in and their approach to the provision of food safety advice have important implications for food safety and *Listeria* education during pregnancy.

Although the prominent perception is that the ultimate responsibility in pregnancy and childbirth lies with the mother, pregnant women still look to their health care providers for guidance. There are many factors that boost health professionals’ role in the provision of food safety advice during pregnancy. Firstly, women are good information absorbers during pregnancy and willing to do their best to ensure the safety of their baby. Secondly, pregnant women have a positive approach to change with regard to food related practices, where a higher level of food safety knowledge may lead them to

a safer practice. Finally, health professionals are perceived as one of the most trusted sources of information during pregnancy and women are more likely to comply with their directives.

Antenatal care is unique in providing the opportunity to reach large numbers of women with the potential to influence their food practices. The educational aims of antenatal services have been apparent since the early days of their inception and are still frequently considered with respect to areas ranging from diet to contraception. For many women, antenatal staff may be the first trained staff to inform, advise or reinforce health messages about nutrition and other lifestyle considerations.

It is essential that midwives, as well as other pregnancy care providers, have the appropriate level of knowledge to provide women with sufficient and accurate advice on *Listeria* and be able to answer their questions with confidence. Midwives' accounts in this study revealed that there is a gap in the midwifery training with regard to food related issues, where midwives do not acquire the necessary knowledge to cover many of the relevant topics in their practice. Even for those midwives who received nutrition education during their basic training, the very nature of the topic is dynamic and food and nutrition knowledge may have to be frequently modified or updated.

Antenatal care providers should particularly be aware of the common mistakes in food handling practices within domestic kitchens and discuss these with their clients. It is acknowledged that many of the food related behaviours reported by women in this study were ones that would be considered appropriate by health professionals. This demonstrates that women are to some degree aware of safe food behaviours and are practicing them, whether or not they receive adequate food related education as part of their antenatal care. Pregnancy care providers, however, need to enquire about these practices, acknowledge and support the safe ones, and make an attempt to improve the ones that could potentially put women at risk of listeriosis.

Targeted food safety education by midwives and other health professionals during pregnancy is needed. The main purpose of conveying *Listeria* risk information is to allow informed decision-making and to encourage behaviour changes that will limit exposure to adverse events. The manner in which this risk is presented influences women's perceptions of the risk. Overall, there exists a need to disseminate food safety information to pregnant women in a way that will attract attention among the huge amount of information available throughout pregnancy. Food safety information should address the motivators and barriers to following key food safety recommendations so that future behaviours and food preferences will reflect safe food choices.

Midwives and other health professionals in antenatal settings need to re-examine their work patterns to include more time for food safety education in clinic routines. Given their frequent contacts with women in antenatal settings, midwives have a unique opportunity to provide support and education to pregnant women. Providing appropriate education on various health issues, including food safety, should not be overlooked in the antenatal care.

A re-evaluation of *Listeria* risk communication strategies would result in a more personalised approach to discussing *Listeria* risk. This would be more likely to influence behaviour change than general one-fit-all *Listeria* risk information. It is important that women receive *Listeria* advice that is relevant to their food and eating habits within their social and cultural contexts. This may not only increase the women's repertoire of safe food practices, but may also encourage them to further enquire about confusing messages.

There is a clear need for antenatal services to provide, in a more systematic manner, access to appropriate materials on *Listeria* for pregnant women. Overall, there was a general lack of educational materials produced by authorised bodies (such as NSW Food Authority and Food Standards Australia New Zealand) in the antenatal settings. Given that the electronic and paper versions of materials containing *Listeria* information for pregnant women were already in place at the time of the study, it seems that the efforts of authorised bodies have mostly concentrated on producing these

resources rather than appropriately distributing them and ensuring that they are used. A relatively small proportion of women in this study reported using the Internet for health related information and none of the pregnant women mentioned being referred to on-line resources by a health professional. This indicates that merely providing the information on the website would be of limited value. It is therefore crucial that hard copy of materials be available at the sites where pregnant women attend for their antenatal care. Alternatively, health services could commit effort to collating appropriate information for pregnancy at a health service website that could be routinely promoted to their clients.

The study also revealed that **resources within the antenatal practice need to be used in a more efficient way.** Women spend their antenatal care visits waiting for some time at the clinic to be seen, while their actual interaction with their care provider is restricted to a quick examination and perhaps a short lecture about how to manage their pregnancy. Waiting room time could be used to reinforce healthy behaviours and teach new ones through educational materials. Also, antenatal classes, despite some limitations, provide a good opportunity for health education during pregnancy and need to be used more effectively for the provision of food safety information and advice.

There is a need to include food safety directives in pregnancy care protocols. No protocol was found in this study to inform midwives' practice with regard to food safety advice. Since knowledge is advancing rapidly, guidelines and protocols need to be reviewed at the same pace to embrace emerging topics. This is difficult to achieve, however, and requires skilled support as well as a desire to reflect on practice with the intention to instigate change.

Perhaps awareness on the part of health professionals of the intensity and unexpectedness of women's experiences of pregnancy and their lack of necessary food safety knowledge and related skills, may dispose them to review the *Listeria* information they provide at antenatal visits and the information they impart at antenatal classes.

Health education efforts should be expanded to also include the broader community who comprise family members and friends of childbearing women, to better echo the message and reach a higher proportion of the population. Many women in this study were found to rely heavily on their lay network for *Listeria* information and a broad education strategy would act to provide more comprehensive and supportive messages via such contacts.

9.5 Further research

Based on the results of this study several recommendations for future research can be made.

1. Midwives' levels of knowledge of food related risks during pregnancy need to be investigated in future research. This study indicated that in some cases lack of enough knowledge about different aspects of *Listeria* risk resulted in an underestimation of risk or lack of enough confidence to communicate about it. Identification of the gaps in midwives' knowledge may assist better orientation of both academic and in-service training of health professionals to include food safety issues as an important component of pregnancy care.
2. Exploration of food safety approaches and perceptions of *Listeria* risk among doctors involved in the provision of antenatal care, including general physicians and obstetricians, is warranted. Women's accounts in the current study revealed that in most cases general practitioners were the first medical contact for a woman who sought confirmation of her pregnancy. Doctors, therefore, can have a significant contribution to food safety and *Listeria* education early in pregnancy.
3. A comprehensive content analysis of food safety information within a range of published sources, such as lay pregnancy books, women's and baby's magazines and Internet, as well as information provided by commercial companies is warranted. This study found that pregnant women obtained a considerable amount of their information regarding food safety and pregnancy related issues from published materials. A review

of food safety information currently available will assist in the identification of conflicting messages and prevention of further confusion in this area.

4. Discourse analysis of the main food and nutrition messages presented by health professionals and among pregnant women also merits attention. Discourse analysis would allow researchers to gain insight into the manner in which information is presented and how this information is perceived by pregnant women.

Overall, it seems that the general lack of concern about food-related risks, including that of *Listeria*, among both pregnant women and midwives in this study, may not correspond to the actual risk profile. This suggests that the scope for misinformation associated with *Listeria* and other food safety issues might be substantial. The findings of this study have many important implications for the practice of public health professionals who are involved in the antenatal care. Individual practitioners and authorised bodies will benefit from insights provided by these findings. It is also important that training institutions and authorised government bodies reflect on the findings of this study if a comprehensive health education is to be retained as part of pregnancy care practice.

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Appendix A – Food safety recommendation by NSW Food Authority (2004a)

Safer eating during pregnancy

Red = Don't eat. Purple = Eat with caution. Blue = OK to eat.

Food	Examples	What to do
MEAT, POULTRY & SEAFOOD		
Processed meats	Ham, salami, luncheon, chicken meat etc.	DON'T EAT
Raw meat	Any raw meat, raw chicken or other poultry, beef, pork etc.	DON'T EAT
Poultry	Cold chicken or turkey e.g. used in sandwich bars	DON'T EAT
	Hot take-away chicken	Purchase freshly cooked, use immediately, store leftovers in fridge and use within a day of cooking
	Home cooked	Ensure chicken is cooked thoroughly, use immediately – store any leftovers in fridge and use within a day of cooking
Pâté	Refrigerated pâté or meat spreads	DON'T EAT
Seafood	Raw seafood	DON'T EAT
	Ready-to-eat chilled peeled prawns	DON'T EAT
	Smoked fish and seafood	DON'T EAT
	Cooked fish and seafood	Cook until steaming hot, eat while hot, store leftovers in the fridge and use within a day of cooking
Sushi	Store-bought	DON'T EAT
	Home-made	Don't use raw meat or seafood, eat immediately
Cooked meats	Beef, pork, chicken, mince	Cook thoroughly, eat while hot
DAIRY & EGGS		
Cheese	Soft and semi-soft cheese e.g. brie, camembert, ricotta, fetta, blue etc.	DON'T EAT unless in a fully cooked dish e.g. spinach and ricotta cannelloni
	Processed cheese, cheese spreads, cottage cheese, cream cheese etc.	Store in the fridge, eat within two days of opening pack
	Hard cheese e.g. cheddar, tasty cheese	Store in the fridge
Ice cream	Soft serve	DON'T EAT
	Packaged frozen ice cream	Keep and eat frozen

Food	Examples	What to do
Milk	Unpasteurised (raw)	DON'T DRINK OR USE
	Pasteurised	Keep refrigerated, drink within use-by-date
Other dairy	Cream, yoghurt	Check use-by-date, keep refrigerated
	Custard	Don't eat unless heated until steaming hot
Eggs		Cook thoroughly
VEGETABLES & FRUIT		
Salads	Pre-prepared or pre-packaged salads e.g. from salad bars, smorgasbords	DON'T EAT
	Home-made	Wash and dry salad ingredients well just before making and eating salads, store any leftover salads in fridge and use within a day of preparation
Fruit	All fresh fruits	Wash and dry well before eating
Vegetables	All fresh vegetables	Wash and dry well just before eating raw or wash before cooking
	Frozen vegetables	Cook; don't eat uncooked
Parsley	Home-grown and store bought	Don't eat raw; can use in cooked dishes
Bean sprouts	Alfalfa sprouts, broccoli sprouts, onion sprouts, sunflower sprouts, clover sprouts, radish sprouts, snowpea sprouts, mung beans and soybeans.	DON'T EAT either raw or cooked
OTHER FOODS		
Leftovers	Cooked foods	Store leftovers covered in the fridge, eat within a day and always reheat until steaming hot
Canned foods	Tinned fruit, vegetables, fish etc.	Store unused portions in the fridge in clean, sealed containers and use within a day
Stuffing	Stuffing from chicken or poultry	Don't eat unless cooked separately and eat hot
Hummus	Store-bought or home-made	Store in fridge, eat within 2 days of opening/making

Appendix B – Food safety recommendations by Food Standards Australia New Zealand (FSANZ 2004)

ADVICE FOR PEOPLE AT RISK

Listeria and food



FOOD STANDARDS AUSTRALIA NEW ZEALAND

Food Standards Australia New Zealand (FSANZ) ensures safe food by developing effective food standards for Australia and New Zealand.

We are an integral part of a strong food regulatory system operating between governments at all levels in Australia and New Zealand.

We develop food standards with advice from other government agencies, input from stakeholders and food regulatory policies endorsed by the Australia New Zealand Food Regulation Ministerial Council.

FSANZ and the food industry work together to ensure our food is safe.

Our decisions are open and accountable, based on the rigorous scientific assessment of risk to public health and safety.

In Australia, we develop food standards for the entire food supply chain, from primary production through to manufactured food and retail outlets.

Food Standards Australia New Zealand

Australia

PO Box 7185, Canberra BC ACT 2610

Tel +61 2 6271 2222 Fax +61 2 6271 2278

Email: info@foodstandards.gov.au Website: www.foodstandards.gov.au

or contact the Food Safety area of your State or Territory Government.



MAKING SAFER FOOD CHOICES

Listeria is managed by hygienic preparation, storage and handling of food. Avoid consuming higher risk foods, especially if you are unsure that hygienic practices have been followed. These tables list some examples of higher risk foods and safer alternatives.

EXAMPLES OF SOME HIGHER RISK FOODS

FOOD TYPE	EXAMPLES
Cold meats	Unpackaged ready-to-eat from delicatessen counters, sandwich bars, etc. Packaged, sliced ready-to-eat
Cold cooked chicken	Purchased (whole, portions, or sliced) ready-to-eat
Pate	Refrigerated pate or meat spreads
Salads (Fruit and vegetables)	Pre-prepared or pre-packaged salads e.g. in salad bars, smorgasbords, etc
Chilled seafood	Raw (e.g. oysters, sashimi or sushi) Smoked ready-to-eat Ready-to-eat peeled prawns (cooked) e.g. in prawn cocktails, sandwich fillings, and prawn salads
Cheese	Soft, semi soft and surface ripened cheeses (pre-packaged and delicatessen) e.g. brie, camembert, ricotta, feta and blue
Ice cream	Soft serve
Other dairy products	Unpasteurised dairy products (e.g. raw goats milk)

SAFER ALTERNATIVES

FOOD TYPE	SAFE	PRECAUTIONS
Cold meats	Home cooked	Store in fridge and use within a day of cooking
Chicken	Home cooked Hot take-away chicken (whole, portions)	Ensure chicken is cooked thoroughly, use immediately - store any leftovers in fridge and use within a day of cooking Use immediately or store any leftovers in fridge and use within a day of purchase
Salads	Freshly prepared salads - home made	Wash all vegetables and fruit thoroughly. Store any leftover prepared salads in fridge, use within a day of preparation
Seafood	All freshly cooked seafood	Use immediately - store any leftovers in fridge and use within a day of cooking
Cheese	Hard cheese (e.g. cheddar, brie) Processed cheese, cheese spreads, plain cream cheese, plain cottage cheese	Store in fridge Purchase cheeses packaged by the manufacturer. Store in the fridge
Other dairy products	Pasteurised dairy products (e.g. pasteurised milk, yoghurt, custard, dairy dessert) Packaged frozen ice cream	Store in fridge Maintain the ice cream frozen
Canned and similarly packaged foods	All	Store unused portions in fridge in clean, sealed containers and use within a day

Appendix C – Ethics approval

University of Wollongong



INITIAL APPLICATION APPROVAL

In reply please quote: **HE06/015**

Further Enquiries Phone: 4221 4457

2 March 2006

**Ms Dolly Bondarianzadeh
Graduate School of Public Health
University of Wollongong NSW 2522**

Dear Mrs Bondarianzadeh,

I am pleased to advise that the Human Research Ethics application referred to below has been **approved**. The University of Wollongong/SE Sydney and Illawarra Area Health Service Health and Medical HREC is constituted and functions in accordance with the NHMRC *National Statement on the Ethical Conduct in Research Involving Humans*.

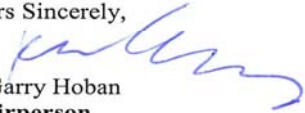
Ethics Number:	HE06/015
Project Title:	Food safety during pregnancy: an exploration of lay and professional perspectives
Name of Researchers:	Ms DollyBondarianzadeh
Approval Date:	2 March 2006
Expiry Date:	1 March 2007

This certificate relates to the research protocol submitted in your original application as modified in your letter of **27 February 2006**. As a condition of approval, the Human Research Ethics Committee requires that researchers immediately report:

- proposed changes to the protocol including changes to investigators involved
- serious or unexpected adverse effects on participants
- unforeseen events that might affect continued ethical acceptability of the project.

You are also required to complete monitoring reports annually and at the end of your project. These reports are sent out approximately 6 weeks prior to the date your ethics approval expires. The reports must be completed, signed by the appropriate Head of School, and returned to the Research Services Office prior to the expiry date.

Yours Sincerely,


Dr Garry Hoban
Chairperson
Human Research Ethics Committee

cc: (Heather Yeatman)

Appendix D – Survey instrument

Graduate School of Public Health Food Safety Survey

My name is Dolly Bondarianzadeh and I am doing this research for the degree of PhD in Public Health at the University of Wollongong. The aim of this survey is to learn more about what influences pregnant women's practices in food preparation and consumption. The survey will ask you about your knowledge on some food-related issues and your current practices and takes you around 15-20 minutes to complete. The information you provide will be treated as confidential and the questionnaire will be anonymous, so please don't put your name on it. By completing the survey you agree to take part in the study, but please remember that you are free to stop your participation at any time, if you wish. Please put the completed form in the sealed box provided in the office for this purpose. Thank you very much for considering this research.

PART 1. Questions in this part address what you know about food safety issues:

1. Are you concerned about the safety of food you eat during pregnancy? Yes ☐ No ☐

2. Have you ever suffered from a foodborne illness (food poisoning, upset stomach, diarrhea, etc.)? Yes ☐ No ☐

3. Have you received any information on *Listeria* (how to prepare and keep your food safe) during pregnancy? Yes ☐ No ☐ (please go to question 5)

4. What has been the source of your information about food safety (*Listeria*) in pregnancy?
 - ☐ Consultation with a health professional (Doctor / Midwife / Nurse)
 - ☐ Family or friends
 - ☐ Antenatal classes
 - ☐ Women's magazines
 - ☐ Health related pamphlets
 - ☐ Health related websites (e.g. FSANZ, NSW Food Authority)
 - ☐ Other (please specify)

5. Whose food safety advice are you more likely to follow?
(Rank in order of priority where 1= most likely to follow; and 7= least likely to follow)
 - ☐ A friend
 - ☐ A family member (e.g. mother, partner)
 - ☐ A doctor
 - ☐ A midwife / nurse / nutrition consultant
 - ☐ Health related pamphlets produced by government

- ☐ Health related pamphlets produced by a food or pharmaceutical company
- ☐ Media (TV, radio, women's magazines, newspapers)
- ☐ Other (please specify)

6. Rank the following issues according to the risk you think they pose to the unborn baby.

(From 1= maximum risk to 7=minimum risk)

- ☐ Not taking folic acid supplements
- ☐ Smoking
- ☐ Foodborne illnesses (such as listeriosis)
- ☐ Alcohol
- ☐ Adding salt to food
- ☐ Caffeine
- ☐ Not eating enough fresh fruit and vegetable
- ☐ Other (please specify)

PART 2. Which of the following statements do you think are True and which are False?

	True	False	Don't know
1. Washing the hands with soap and warm running water before preparing food decreases the risk of food poisoning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. It is safe to use same cutting board for raw chicken and raw vegetables if wiped off between uses.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. It is safe to eat cooked refrigerated food without reheating it.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. It is safe to keep cooked meat at room temperature for more than 4 hours.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Raw meat and chicken should be stored on open shelves above cooked food in the refrigerator.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Temperature of refrigerator should be kept between 0-4° C.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Listeriosis is an illness transmitted by contaminated food.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Tick any of the following foods you think should be avoided during pregnancy.

(You may choose more than one option).

- ☐ Soft cheeses (e.g. brie, ricotta, camembert, feta and blue)
- ☐ Coleslaw from a salad bar
- ☐ Hot take-away chicken portions
- ☐ Deli meats from a delicatessen counter
- ☐ Chicken liver pâté
- ☐ Smoked salmon served cold.
- ☐ Don't know

PART 3. Please tick the box which best describes your opinion on each statement:

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1. Washing and drying hands before handling ready-to-eat foods is important to reduce the risk of foodborne illness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. After cutting raw meat or chicken, it is important to wash the cutting board, knife, and counter top with hot soapy water before continuing cooking.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Food prepared and eaten at home poses a lower risk of foodborne illness than food eaten away from home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I have full control of my food safety when I prepare my own food.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. It is good to eat soft cheeses during pregnancy because of their high calcium content.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I should eat luncheon meats during my pregnancy, as they are good sources of iron.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I find avoiding soft cheeses difficult because I like them.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I don't have much information on Listeriosis.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Listeriosis is not a great risk to my baby.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I feel confident that I am not at risk of having Listeriosis during my pregnancy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 4. The following questions are about your food choices. Tick the most appropriate box on how often you eat the following during pregnancy:

	Daily	2-3 times a week	Weekly	Fortnightly	Monthly	Rarely	Never
1. Cold deli or luncheon meats.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Soft cheeses (e.g. brie, feta, ricotta, camembert, blue).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Hard cheeses (e.g. edam, cheddar).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Smoked fish served cold.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Raw fish or foods containing raw fish (e.g. sushi).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Cooked fish fillets/cutlets (from shark or swordfish).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Dips or spreads (e.g. pâté, hummus).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Vegetable salads, purchased pre-prepared (e.g. coleslaw).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Fresh vegetable salads prepared at home.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Foods containing raw egg (e.g. biscuit dough).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PART 5. During your pregnancy, how often do you take the following actions when preparing food at home?

	Never	Occasionally	Frequently	Most of the time	Always
1. Washing your hands with soap and water before preparing or eating a meal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Washing the kitchen utensils, cutting boards and counter top with hot soapy water after cutting raw meat or chicken.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Keeping cooked/processed food above the raw food in the refrigerator.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Using cooked or ready-to-eat food, that has been stored in the refrigerator, within two days.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Thoroughly reheating cooked refrigerated food until steaming hot.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Putting leftovers of cooked food in the refrigerator as soon as the steam is gone.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Thawing frozen food in the refrigerator or microwave.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Who is mainly responsible for grocery shopping in your home?

- ☐ Self
 ☐ Husband / Partner
☐ Shared equally- self + others
 ☐ Other (please specify)

9. Who is mainly responsible for preparation of meals in your home?

- ☐ Self
 ☐ Husband / Partner
☐ Shared equally- self + others
 ☐ Other (please specify)

PART 6. If your doctor or a relevant government department advise you to avoid some foods to reduce the risk to your baby, how confident would you be to be able to follow the recommendations? (Please circle your choice.)

1. Avoid eating raw or undercooked seafood.

(not confident at all) 0% – 25% – 50% – 75% – 100% (quite confident)

2. Avoid soft cheeses (brie, camembert, feta, blue).

(not confident at all) 0% – 25% – 50% – 75% – 100% (quite confident)

3. Avoid luncheon meats or cold deli salads.

(not confident at all) 0% – 25% – 50% – 75% – 100% (quite confident)

4. Avoid pre-prepared vegetable salads and cold meals from outside.

(not confident at all) 0% – 25% – 50% – 75% – 100% (quite confident)

PART 7. The following questions ask demographic information about you:

1. What is your age?

- ☐ Under 20 years
- ☐ 20 – 29 years
- ☐ 30 – 39 years
- ☐ 40 + years

2. What is your stage of pregnancy?

- ☐ First trimester (up to 12 wks)
- ☐ Second trimester (13 - 27 wks)
- ☐ Third trimester (28 wks and above)

3. Is this a planned pregnancy? Yes ☐ No ☐

4. What is your marital status?

- | | |
|---|--|
| <input type="checkbox"/> Single | <input type="checkbox"/> Married / Defacto |
| <input type="checkbox"/> Separated / Divorced | <input type="checkbox"/> Widowed |

5. Who are the other adults in your household?

- ☐ Self – no other adults
- ☐ Husband / Partner
- ☐ Adult relatives
- ☐ Husband / Partner + adult relatives
- ☐ Adult friends
- ☐ Other (please specify)

6. How many prior pregnancies have you had?

- ☐ None
- ☐ One
- ☐ Two and more

7. What is your postcode? _____

8. Is English your first language?

Yes ☐

No ☐ If not which language is?

9. Which of the following best describes your level of education?

- ☐ Primary school
- ☐ Some high school
- ☐ High school completed
- ☐ TAFE or similar qualification
- ☐ Tertiary education

10. Which health cover do you have? Medicare only ☐ Private health insurance ☐

11. What is your household income?

- ☐ Less than \$25000 a year
- ☐ Between \$25001 and \$50000 a year
- ☐ More than \$50000 a year

Thank you very much for your participation.

PREGNANT WOMEN INVITED TO PARTICIPATE IN INTERVIEW

We would like to talk to pregnant women to learn more about what you believe is good for you to do and to eat to have a safe pregnancy and a healthy and strong baby.

Please share your opinions and views with us. Your participation will be greatly appreciated and highly beneficial to the broader women's community and will help health providers to better focus on your needs.

The interview should take no longer than an hour of your time and will be held here at the hospital.

For more information you can have a look at our information sheet available from the desk. You can also contact me on the email address: dolly@uow.edu.au or give me a call on: 4221 5747.

Thank you for your attention,

Dolly Bondarianzadeh,

PhD candidate, University of Wollongong

MIDWIVES INVITED TO PARTICIPATE IN INTERVIEW

We would like to talk to midwives about what you believe is good for pregnant women to do and to eat to have a safe pregnancy and a healthy child and learn more about your experiences and your practice.



Please share your experience and opinions with us. Your participation will be greatly appreciated and highly beneficial to the broader women's community and will help the health decision makers better focus on educational needs of pregnant women.

The interview should take no more than an hour of your time and will be held here at the hospital.

For more information you can have a look at the information sheet available at the office. You can also contact me on the email address: dolly@uow.edu.au or give me a call on: 4221 5747.

Thank you for your attention,

**Dolly Bondarianzadeh
PhD Candidate, University of Wollongong**

Appendix G – Pregnant participant information sheet

Participant Information Sheet

My name is Dolly Bondarianzadeh and I am undertaking this research for the degree of Doctor of Philosophy (PhD) in public health at the University of Wollongong. My background in nutrition and dietetics has led to a special interest in food safety practice during pregnancy which is the focus of this research.

Title of this research project is “Food safety during pregnancy: an exploration of lay and professional perspectives” and it aims to provide a better understanding of what shapes pregnant women’s practices with regard to preparation and consumption of food and explore their educational needs in this area. Your participation in this research will therefore be highly appreciated.

If you agree to participate you will need to provide your demographic information and to take part in an interview on food-related issues which will take approximately one hour. Interview will be audio-tape recorded with your permission and transcribed later. All measures will be taken to assure your privacy. Anything you say during the interview will be kept confidential and your name will not be revealed to anyone. Tape recordings and subsequent transcripts will be coded to ensure anonymity and confidentiality. No personal identifying information will be used during any stage of data processing and reporting. In writing my thesis and any other academic publications I will discuss the information from your interview anonymously and as part of a collection of such information gathered from all the pregnant women in this study.

Participation in this research is voluntary; you are free to withdraw from the research at any time, and there is no penalty for refusal to participate. Should you elect to withdraw from this research before completion, any information that you may have contributed to the study will be destroyed and your name will be completely removed from the records. Your refusal to participate or withdrawal of consent will not affect your treatment and the service provided to you or your relationship with the University of Wollongong in any way.

Should you have any enquiries about the research, please contact me or my supervisor, Associate Professor Heather Yeatman, and we will gladly help you with any queries or concerns you may have in relation to this research.

Dolly Bondarianzadeh on (02) 4221 5747 or e-mail: dolly@uow.edu.au

Heather Yeatman on (02) 4221 3463 or e-mail: hyeatman@uow.edu.au

If you have any concerns or complaints regarding the way this research is or has been conducted, you can contact the Ethics Officer, Human Research Ethics Committee, University of Wollongong on (02) 4221 4457.

Looking forward to your participation in this research,
Dolly Bondarianzadeh

Appendix H – Midwife participant information sheet

Midwife Participant Information Sheet

My name is Dolly Bondarianzadeh and I am undertaking a research for the degree of Doctor of Philosophy (PhD) in public health at the University of Wollongong. My background in nutrition and dietetics has led to a special interest in food safety practice during pregnancy which is the focus of this research.

Title of this research project is “Food safety during pregnancy: an exploration of lay and professional perspectives” and it aims to provide a better understanding of what shapes pregnant women’s practices with regard to preparation and consumption of food and explore their educational needs in this area. Your participation in this research will be highly appreciated as this is an area that has received much less attention than it deserves.

If you agree to participate you will need to participate in an interview about food safety which will take approximately one hour altogether. Interview will be audio-tape recorded with your permission and transcribed later. . Anything you say during the interview will be kept confidential and your name will not be revealed to anyone. Tape recordings and subsequent transcripts will be coded to ensure anonymity and confidentiality. No personal identifying information will be used during any stage of data processing or reporting. In writing my thesis and any other academic publications I will discuss the information from your interview anonymously and as part of a collection of such information gathered from all the professionals in this study.

Participation in this research is voluntary; you are free to withdraw from the research at any time, and there is no penalty for refusal to participate. Should you elect to withdraw from this research before completion, any information that you may have contributed to the study will be destroyed and your name will be completely removed from the records. Your refusal to participate or withdrawal of consent will not affect your relationship with the University of Wollongong or your relationship with the Area Health Service in which you are employed in any way.

Should you have any questions about the research, please feel free to contact me and/or my supervisor, Associate Professor Heather Yeatman, and we will gladly help you with any queries or concerns you may have in relation to this research.

Dolly Bondarianzadeh on (02) 4221 5747 or e-mail: dolly@uow.edu.au

Heather Yeatman on (02) 4221 3463 or e-mail: hyeatman@uow.edu.au

If you have any concerns or complaints regarding the way this research is or has been conducted, you can contact the Ethics Officer, Human Research Ethics Committee, University of Wollongong on (02) 4221 4457.

Looking forward to your participation in this research,
Dolly Bondarianzadeh

Appendix I – Pregnant participant consent form

Participant Consent Form

Title of project: Food safety during pregnancy: an exploration of lay and professional perspectives

Researcher: Dolly Bondarianzadeh (Phone: 4221 5747; email: dolly@uow.edu.au)

Supervisor: Associate Professor Heather Yeatman (Phone: 4221 3463);
email: hyeatman@uow.edu.au)

Department: Graduate School of Public Health

I have been given information about the proposed study and have discussed the research project “Food safety during pregnancy: an exploration of lay and professional perspectives” with Dolly Bondarianzadeh. I understand that this research is being done for the degree of Doctor of Philosophy (PhD) in Public Health in the Graduate School of Public Health, University of Wollongong.

By signing this consent form I understand that:

I need to provide my demographic information and take part in an interview about food-related issues during pregnancy which will take me about one hour. The interview will be tape recorded with my permission. I have been assured that confidentiality and anonymity will be maintained throughout the research and reporting processes.

My taking part in this research is voluntary which means that I am free to refuse to participate and withdraw the permission of using my interview data at any time. My refusal to participate or withdrawal of consent will not affect my treatment and the service provided to me or my relationship with the University of Wollongong in any way.

If I have any inquiries about the research, I can contact Dolly Bondarianzadeh or A/Prof. Heather Yeatman (contact details above) for further information. If I have any concerns or complaints regarding the way the research is or has been done I can contact the Ethics Officer, Human Research Ethics Committee, University of Wollongong on (02) 4221 4457.

The information collected from my participation will be used for the production of a thesis, journal publications and presentations at scientific meetings and I consent to this. The project has been described in the information sheet and I will be given a copy of this consent form.

Signature: _____ Date: / /

Appendix J – Midwife participant consent form

Midwife Participant Consent Form

Title of project: Food safety during pregnancy: an exploration of lay and professional perspectives.

Researcher: Dolly Bondarianzadeh (Phone: 4221 5747; email: dolly@uow.edu.au)

Supervisor: Associate Professor Heather Yeatman (Phone: 4221 3463);
email: hyeatman@uow.edu.au)

Department: Graduate School of Public Health

I have been given information about the proposed study and have discussed the research project “Food safety during pregnancy: an exploration of lay and professional perspectives” with Dolly Bondarianzadeh. I understand that this research is being done for the degree of Doctor of Philosophy (PhD) in Public Health in the Graduate School of Public Health, University of Wollongong.

By signing this consent form I understand that:

I need to take part in an interview about food-related issues during pregnancy and this will take me about one hour altogether. The interview will be tape recorded with my permission. I have been assured that confidentiality and anonymity will be maintained throughout the research and reporting processes.

My taking part in this research is voluntary which means that I am free to refuse to participate and withdraw the permission of using my interview data at any time. My refusal to participate or withdrawal of consent will not affect my relationship with the University of Wollongong or my relationship with the area health service in which I am employed in any way.

If I have any inquiries about the research, I can contact Dolly Bondarianzadeh or A/Prof. Heather Yeatman (contact details above) for further information. If I have any concerns or complaints regarding the way the research is or has been done I can contact the Ethics Officer, Human Research Ethics Committee, University of Wollongong on (02) 4221 4457.

The information collected from my participation will be used for the production of a thesis, journal publications and presentations at scientific meetings and I consent to this. The project has been described in the information sheet and I will be given a copy of this consent form.

Signature: _____ Date: / /

Appendix K – Pregnant women’s interview guide

Pregnant women’s interview guide

Brief introduction to participants:

- Aim of the study
- How the interview will run
- Audiotape recording and transcribing
- Right to withdraw at any time
- Information sheet
- Signature on consent form
- Demographic information gathered

1. First of all, I would like to know how you are managing your pregnancy.

- To you what are the major health risks during pregnancy? What are the risks that you should avoid?
- What are your health concerns in this pregnancy?
- What changes have you made in your way of life since becoming pregnant? Why have you decided to make this change?
- What about your food? Have you changed what you eat or the way you handle and prepare your food in this pregnancy? (What are the changes? Why have you decided to change? What helped you change? (Explore)
- Has there been anything relating to your diet or food you eat that you would like to change for your pregnancy and you haven’t been able to? What prevented (made it difficult for) you from changing?
- What health advices have you received in this pregnancy? What was the source?
- Have you received any food-related recommendations in this pregnancy? What were they? Where did they come from? Do you find the advice clear? What is your understanding about it? What was wrong with it? Do you find yourself able to follow the advice? (how? Why not?)
- Have you ever heard about any particular foods to avoid in pregnancy? Who said that? Why is it recommended to do so? Have you done that? (Explore)

2. To you what does a safe food mean?

- What do you know about foodborne illnesses? (Explore) what do you think makes a food risky? What are the risks associated with food?
- Now that you are pregnant, do you feel more concerned about the safety of your food than before? Why (not)?
- How much information do you think you have on food safety issues? (to be able to keep your food safe)?
- How do you decide about the safety of a food before eating it? What matters? (Explore)

- How do you feel about the safety of food you prepare at home? How do you feel about your skills? In which areas do you feel that you need more help (clarification, explanation, reminder)?
- Have you ever suffered from a foodborne illness? What was it? What did you do? Who do you feel should be blamed for that?
- How do you feel about getting sick from your food while you are pregnant?

3. Let's talk about foodborne illnesses.

- Have you ever heard of the bacteria that cause foodborne illness or food poisoning? What are they?
- Have you ever heard of *Listeria*? From who? (What are the signs? Who is most at risk? Can it be dangerous? What may be the consequences?)
- What food safety recommendations for the prevention of *Listeria* have you received? What do you think about these recommendations? Do you find them understandable and practical? (why, why not?)

4. How do you prefer to get food safety information?

- From where/who?
- Where do you seek information on food-related issues if you feel the need to do so?
- What do you think about midwives' and doctors' approach to food related issues during pregnancy?

5. Is there anything else you would like to add?

Thank you very much for your time and your participation in this study.

Appendix L – Midwives' interview guide

Midwives' interview guide

Brief introduction to participants:

- Aim of the study
- How the interview will run
- Audiotape recording and transcribing
- Right to withdraw at any time
- Information sheet
- Signature on consent form

1. What do you generally do during your visit with pregnant women?
2. What do you think are the most important issues that should be considered during pregnancy? What do you do about these issues?
3. What health advice do you give to pregnant women? How do you try to make it clear? What is women's approach? Are they interested? What is their major concern? What are they interested in knowing more? Do you follow their behaviour change? (Explore).
4. What do you personally think is the importance of food during pregnancy? What aspects of food consumption do you find to be more important for pregnant women? What advice regarding food do you provide to pregnant women? What about food safety? What food safety issues do you discuss with pregnant women? Why these issues? Why not? (Explore the barriers).
5. Do you talk about the risk of *Listeria* during your visits? Why (not)? What do you think about the *Listeria* risk during pregnancy? What do you think about food safety recommendations for the prevention of *Listeria*? (Explore).
6. What are the issues covered in the antenatal classes? How do you find it in general? What food-related issues are discussed?
7. What issues in food-related area do you think need more attention (during pregnancy)? Why do you think so?
8. Is there anything else you would like to add?

Thank you very much for your time and your participation in this study.

Appendix M – Coding list as per NVivo printout

















Tree Nodes

Name	Sources	References
barriers to change	21	55
family pressure	5	7
forgetting	4	7
negligence after 1st pregnancy	11	34
solutions	0	0
being organized	1	2
not serving others	7	7
planned pregnancy	4	7
support	6	10
husband-partner	10	13
temptation	5	9
change	14	31
food related	0	0
caffeine	13	16
food safety behaviour	25	131
continuity of behaviour	21	65
eating behaviour	25	138
food handling practices	18	32
supplements	11	13
non-food related	0	0
alcohol-smoking	21	37
exercise	11	11
more rest	4	5
pregnancy as a time to change	1	1
foodborne illness	14	28
control-confidence	15	31
past experience	18	32
Health advices	12	36
food-related advice	20	40
health concerns during pregnancy	21	37
additional need	3	5
easy pregnancy	10	16
illness	7	10
nutrition-weight	9	16
pre-existing condition	4	11
pregnancy-related conditions	3	10
smoking-alcohol	6	11
Information	25	130
relevance	2	3

Tree Nodes

Name	Sources	References
source of information	5	8
antenatal classes	11	18
health professionals	22	66
doctor-midwife approach	24	80
assumption-judgement	8	18
Internet	8	19
lay network	23	70
other	17	36
pamphlet	16	38
pregnancy books	18	39
previous job experience	4	4
previous pregnancy	11	16
show bag	16	35
women's magazines	10	18
trust	21	53
perception of risk	23	100
better safe than sorry	10	22
control	6	9
inadequate knowledge	10	22
risks other than food	5	8
risky food	19	48
responsible mother	21	62
blame-guilt	15	21
choice	6	10
sacrifice	14	26
vulnerable baby	6	7
safe food	24	58
confusion	13	21
control	22	48
pragmatics	5	9
self-confidence	24	52
trust in food safety in Australia	8	14
where to seek information	13	25
Health professionals	19	29
Internet	14	24

Free Nodes

	Name	Sources	References
	eating habits	4	10
	Business-trust	5	7
	Business-information	3	3
	views on recommendations	16	31
	cooking practices	8	10
	feeling about getting sick from food	19	32
	best way of giving information to pregnant wome	18	36
	family (and others') attitudes	15	29
	women's approach towards health professionals	11	16
	high risk women	4	5
	others' food practices	15	30
	views on care	15	47
	mother-baby relation	7	9
	views on others' approach	9	15
	healthy eating	12	18
	priorities	3	5
	risks other than food	5	8

Appendix N – Tables of logistic regression

Table 1. Multivariate logistic regression model predicting knowledge of *Listeria* related issues*

Variables	Adequate knowledge of HLR foods			Inadequate knowledge of HLR techniques		
	N= 577			N= 577		
	adjusted OR	95% - CI	P	adjusted OR	95% - CI	P
Age						
Under 29 years	1.00			1.00		
30-39 years	1.81	0.53 – 6.17		0.47	0.19 – 1.07	
40 years and above	2.52	0.70 – 9.13	NS	1.07	0.66 – 1.74	NS
Education						
High school	1.00			1.00		
TAFE	0.79	0.36 – 1.72		0.75	0.42 – 1.33	
Tertiary education	1.05	0.48 – 2.30		0.60	0.27 – 1.36	NS
Household income						
Less than\$25,000/yr	1.00					
\$25,000-\$50,000/yr	2.05	0.93 – 4.51				
More than 50,000/yr	2.59	1.18 – 5.70	<.05			
First language						
English	2.50	1.13 – 5.45	<.05	1.00		
Other	1.00			3.41	1.60 – 7.29	<.05
Planned pregnancy						
Yes	1.97	1.22 – 3.20	<.001			
No	1.00					
Received food safety advice						
Yes	3.07	2.06 – 4.59	<.001			
No	1.00					

NS: Not significant

* Hosmer- Lemeshow goodness-of-fit statistics were used to assess model fit at p=0.45.

Table 2. Multivariate logistic regression model predicting practice of *Listeria* related issues*

Variables	Low risk practice about HLR foods			Low risk practice about HLR techniques		
	N= 565			N= 552		
	adjusted OR	95% - CI	P	adjusted OR	95% - CI	P
Age						
Under 29 years				1.00		
30-39 years				1.15	0.46 – 2.86	
40 years and above				1.18	0.76 – 1.82	NS
Education						
High school	1.00					
TAFE	3.59	1.65 – 7.78	<.01			
Tertiary education	6.24	2.54 – 15.34	<.001			
Household income						
Less than\$25,000/yr	1.00			1.00		
\$25,000-\$50,000/yr	1.37	0.73 – 2.57		0.84	0.52 – 1.36	
More than 50,000/yr	0.89	0.40 – 1.93	NS	0.71	0.36 – 1.41	NS
Planned pregnancy						
Yes	1.79	1.04 – 3.06	<.05	1.52	0.98 – 2.37	NS
No	1.00			1.00		
Knowledge of HLR issues						
Adequate	2.42	1.35 – 4.31	<.005	2.22	1.44 – 3.43	<.001
Inadequate	1.00			1.00		

NS: Not significant

* Hosmer- Lemeshow goodness-of-fit statistics were used to assess model fit at p=0.45.