Reducing Childhood Obesity:
Opportunities to influence transitional infant feeding

Michelle Susan Harrison
B Sc, Grad Dip Dietetics, MPH

A thesis submitted for the degree of Doctor of Philosophy at
The University of Queensland in 2017
Faculty of Medicine
Abstract

Background

Obesity is a global issue with its origins deep in the early years of life and tracking throughout the lifecycle. The challenges of changing established behaviour and the limited impact of childhood obesity interventions support the current preventative investment in addressing obesogenic factors within the first years of life. While existing early childhood obesity prevention interventions are grounded in responding to infant’s cues of hunger and satiety, they fail to fully appreciate the context in which feeding behaviours develop. A better understanding of the factors that govern family life and maternal food provisioning would strengthen efforts to support a healthy eating environment.

Research design

A three phase sequential mixed methods approach was used to investigate the determinants of maternal infant feeding in transitioning from milk feeds to family foods and their relationship to infant dietary intake and weight. Phase 1 comprised of in-depth interviews with key Australian and New Zealand researchers involved in early prevention of obesity in childhood (n=5) to provide information about infant feeding influences, support strategies and knowledge gaps to inform subsequent research phases. Phase 2 surveyed 290 mothers of infants aged between 5 and 13 months about infant feeding and growth. A subset of phase 2 mothers (n=15) were interviewed in phase 3 to validate the survey results and understand the dynamics behind infant feeding decisions. The ecological framework, the new health paradigm and the ideology of motherhood guided this research.

Results

Support during the transitional infant feeding period was found to be inadequate. Mothers were unsure of what to feed their infants, reflected in a lack of iron-rich first foods in over half the sample; and insufficient fruit and vegetable intake, regular intake of high energy takeaway foods and sweetened drinks identified in some infants’ diets. Mothers struggled to identify the best approach to transitioning from milk feeds to family foods with decisions built on ensuring adequate infant intake, growth and sleep. Mothers did not know what normal infant behavior or feeding cues were, with interpretation influenced by professional and lay expectations alongside what is thought to be “good mothering”.

ii
Mothers were found to misinterpreted normal infant weight, overstating underweight and not recognising overweight. Maternal concern for infant becoming underweight resulted in the early introduction of solids, pressure-to-eat and formula top-ups, specifically in mothers dissatisfied with infant intake or weight. Satisfying infants’ immediate needs were prioritised over recommendations, with concern for underweight influencing feeding practices early and concern for overweight only translating to monitoring of infant intake.

Maternal infant feeding guideline knowledge had limited impact on infant feeding whereas maternal self-efficacy was associated with improved infant fruit and vegetable intake, responsive parenting style and less controlling feeding practices. The relationship between feeding and maternity identity was profound and needs to be considered by health practitioners in their approach to supporting new families. Mothers felt judged about their infant feeding decisions which impacted on their engagement with professional services. Many mothers used website platforms and virtual mothers groups for information and support.

**Conclusion**

An appreciation of all the factors upon which infant feeding is built will provide researchers and practitioners with the essential ingredients to support healthy family eating environments. The results in this study support early strategies which nurture the knowledge and skills of mothers around healthy infant food intake and responsive feeding based on the infant feeding cues of hunger and satiety, and not their temperament or weight. Health practitioners need to factor in the emotional decision making influences faced by mothers when providing support in this feeding window. Further research into the delivery of this support using of both traditional and newer modalities of communication is recommended.
Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

I have clearly stated the contribution of others to my thesis as a whole, including statistical assistance, survey design, data analysis, significant technical procedures, professional editorial advice, and any other original research work used or reported in my thesis. The content of my thesis is the result of work I have carried out since the commencement of my research higher degree candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution. I have clearly stated which parts of my thesis, if any, have been submitted to qualify for another award.

I acknowledge that an electronic copy of my thesis must be lodged with the University Library and, subject to the policy and procedures of The University of Queensland, the thesis be made available for research and study in accordance with the Copyright Act 1968 unless a period of embargo has been approved by the Dean of the Graduate School.

I acknowledge that copyright of all material contained in my thesis resides with the copyright holder(s) of that material. Where appropriate I have obtained copyright permission from the copyright holder to reproduce material in this thesis.
Publications during candidature

Peer Reviewed Publications

Conference abstracts
1. Harrison M, Hepworth J, Davies PSW, Brodribb W. Are health professionals helping or hindering transitional infant feeding practices and healthy weight? Oral presentation accepted for the 2017 Primary Health Care Research Conference, Brisbane, Australia.


4. Harrison M, Brodribb W, Davies PSW, Hepworth J. Don't judge me, support me! Opportunities to influence parental infant feeding practices to reduce childhood obesity. Oral presentation at the 2016 3 Minute Thesis (3MT) competition, School of Medicine, UQ, Brisbane, Australia.


6. Harrison M. Healthy lifestyle choices for women planning to become pregnant. Oral presentation at the 2016 Preconception Nutrition Symposium, Children’s Health Queensland, Brisbane, Australia.


Publications in this thesis


In Chapter 3

<table>
<thead>
<tr>
<th>Contributor</th>
<th>Statement of contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michelle Harrison (Candidate)</td>
<td>Conducted search strategy (90%)</td>
</tr>
<tr>
<td></td>
<td>Designed the paper (100%)</td>
</tr>
<tr>
<td></td>
<td>Data analysis and interpretation (90%)</td>
</tr>
<tr>
<td></td>
<td>Wrote the paper (80%)</td>
</tr>
<tr>
<td>Wendy Brodribb</td>
<td>Conducted search strategy (10%)</td>
</tr>
<tr>
<td></td>
<td>Data analysis and interpretation (5%)</td>
</tr>
<tr>
<td></td>
<td>Wrote and edited paper (10%)</td>
</tr>
<tr>
<td>Julie Hepworth</td>
<td>Data analysis and interpretation (5%)</td>
</tr>
<tr>
<td></td>
<td>Wrote and edited the paper (10%)</td>
</tr>
</tbody>
</table>
Contributions by others to the thesis

Wendy Brodribb supervised the study and provided guidance with the design of the overall research plan. Wendy critically reviewed, edited and approved all the submitted manuscripts.

Peter Davies assisted with identification of the phase 2 sample size and assessment of the phase 2 outcome data. Peter reviewed and approved manuscripts 2 and 3.

Julie Hepworth provided guidance with the qualitative phase framework and interpretation of the systematic review and phase 1 and phase 3 data. Julie critically reviewed, edited and approved all the submitted manuscripts.

Statement of parts of the thesis submitted to qualify for the award of another degree

“None”
Acknowledgements

First and foremost I would like to thank Honorary Associate Professor Wendy Brodribb. Thank you for taking me on as a PhD student, assisting me to clarify my research topic and for providing ongoing timely support and valuable feedback throughout. Thank you to Professor Peter Davies for helping me interpret my quantitative data and supporting me to believe in myself. And a special thank you to Professor Julie Hepworth for providing the ‘big picture’ overview of the PhD journey, for guiding a novice through the challenges of qualitative research, and for continuing to nurture the individual behind the PhD candidate. I would like to also acknowledge and thank Professor Maria Zadoroznyj for her guidance in the analysis of the interviews with mothers and the valuable insight into additional theories to ground this analysis. Thanks to the Australian Postgraduate Award Scholarship for funding this thesis.

I would like to thank Lars Eriksson, librarian from the Herston UQ library for his assistance in developing and verifying my systematic review search strategy and answering my ongoing referencing queries. Thank you to Dr Bin Dong for providing guidance in analysing and interpretation of my quantitative data, and to Nargess Saiepour and Dr Michael David for providing statistical advice. Thank you to the past and present fellow PhD students who shared their knowledge and experiences including Dr Glenda Hawley, Dr Laura Deckx, Dr Jenny Zhang, Dr Letitia Burridge, Dr Geoff Spurling, Dr Helen Vidgen and Dr Susan de Jersey. A special thank you to Professor Geoffrey Mitchell for critically reviewing my quantitative papers and providing support in the later stage of my PhD, and to David Miles for his invaluable editing expertise. And a warm thank you to both Marianne Zangari and Heather McMaster for taking the time to read and provide feedback on this thesis.

I would like to acknowledge and thank all the mothers who participated in the Feeding A Baby (FAB) Study and the numerous organisations who assisted me to access these mums. Thank you to Playgroup Queensland, Caboolture Early Years Centre, Browns Plains Early Years Centre, the Salvation Army Communities for Children Logan, the Wesley Mission Beenleigh Family Centre, the Nundah Neighbourhood Centre Young Parent Program and the Coorparoo Young Mothers for Young Women: Micah Projects.

This thesis arose from my prior role as a public health nutritionist within the Queensland Government State Health Department, overseeing the nutrition-related statewide policy
and strategic investment within the priority area of maternal and young child health. Statewide infant feeding survey data along with maternal and child health service delivery suggested a gap in fully appreciating the needs of mothers when feeding their infants during the first year. To that I owe my thanks to the maternal and child health staff from both within and outside Queensland Health who provided guidance before and during my research. I hope the findings of this thesis will provide valuable information to assist you to support new mothers and their infants.

I thank my life partner, Stephen, and our two girls, Poppy and Ruby, for giving me the space and support to complete this thesis. My experiences as a mother equipped me with the empathy to relate to the feeding journeys uncovered in the research. In pondering my own early parenting experiences, I now appreciate the challenges of feeding and raising a child. And for that I leave the final thanks to my parents, Margaret and John. Thank you for the sacrifices you have made to ensure the best for your children, thank you for allowing us to make our own parenting decisions and thank you for your ongoing, unconditional love and support. And now that I am soon to be a Doctor, does the sports car offer still stand Dad?
Keywords
Infant feeding, dietary intake, transitional feeding decisions, feeding practices, parenting styles, early childhood, weight concern, obesity, self-efficacy, mother

Australian and New Zealand Standard Research Classifications (ANZSRC)
ANZSRC code: 111104, Public Nutrition Intervention, 30%
ANZSRC code: 111717, Primary Health Care, 40%
ANZSRC code: 111704, Community Child Health, 30%

Fields of Research (FoR) Classification
FoR code: 1111, Nutrition and Dietetics, 30%
FoR code: 1117 Public Health and Health Services, 70%
# CONTENTS

Contents ........................................................................................................................................... xii

List of Tables ....................................................................................................................................... xviii

List of Figures ...................................................................................................................................... xix

Chapter 1: Introduction ......................................................................................................................... 1

1.1 Background .................................................................................................................................... 1

1.2 Research aim and questions ........................................................................................................... 3

1.2.1 Aim ........................................................................................................................................... 3

1.2.2 Objectives ................................................................................................................................. 3

1.2.3 Research Questions ................................................................................................................... 3

1.3 Research Purpose & Scope ............................................................................................................ 4

1.4 Thesis outline ............................................................................................................................... 5

Chapter 2: Literature Review .................................................................................................................. 9

2.1 Introduction .................................................................................................................................... 9

2.2 Obesity and Obesity Rates ............................................................................................................. 9

2.3 Implications of Obesity .................................................................................................................. 10

2.4 Etiology of Obesity ....................................................................................................................... 11

2.4.1 Genetics .................................................................................................................................... 12

2.4.2 Environment ............................................................................................................................ 12

2.5 Infant Feeding Recommendations and Surveillance ....................................................................... 14

2.5.1 Guidelines ............................................................................................................................... 14

2.5.2 Monitoring .............................................................................................................................. 15
Chapter 8: Maternal Transitional Infant Feeding Experiences ................................. 115

8.1 Introduction ......................................................................................................... 115

8.2 Phase 3: Maternal Semi-structured Interviews ................................................... 115

8.2.1 Results ......................................................................................................... 115

8.2.2 Discussion .................................................................................................... 130

8.2.3 Conclusion ................................................................................................... 132

8.3 Summary ............................................................................................................ 133

Chapter 9: Overview of Findings ............................................................................ 135

9.1 Introduction ......................................................................................................... 135

9.1.1 Infant diet ..................................................................................................... 137

9.1.2 Maternal infant weight concerns ................................................................... 138

9.1.3 Infant behaviour ........................................................................................... 139

9.1.4 Knowledge and self-efficacy ......................................................................... 140

9.1.5 Synopsis of findings ..................................................................................... 141

9.2 Summary ............................................................................................................ 142

Chapter 10: Recommendations & Conclusions ....................................................... 143

10.1 Introduction ...................................................................................................... 143

10.1.1 Recommendations .................................................................................... 143

10.1.2 Strengths and limitations .......................................................................... 145

10.1.3 Implications for research .......................................................................... 146

10.1.4 Implications for practice .......................................................................... 147

10.2 Conclusion ....................................................................................................... 148

Chapter 11: References ............................................................................................ 149

Chapter 12: Appendices .......................................................................................... 165
Appendix 1: Researcher interview information sheet and consent form ....................... 166
Appendix 2: Maternal questionnaire information sheet ................................................ 168
Appendix 3: Maternal interview information sheet and consent form ....................... 169
Appendix 4: Researcher interview guide ...................................................................... 171
Appendix 5: Maternal survey ........................................................................................ 173
Appendix 6: Maternal interview guide .......................................................................... 186
Appendix 7: Ethics Approval ........................................................................................ 188
Table 3.1: Search terms used in the systematic literature review search .................31
Table 3.2: Study details of the journal papers used in the systematic literature review .....45
Table 3.3: Study reporting assessment based on COREQ checklist .........................48
Table 4.1: Phase 2 questionnaire measures, questions, response scales and management of data analysis .................................................................62
Table 4.2: Variable relationships investigated ..........................................................67
Table 6.1: Demographic and anthropometric characteristics of mothers and infants......94
Table 6.2: Maternal infant feeding practices and parenting style descriptive statistics ......95
Table 6.3: Logistical regression between feeding practices, infant weight concern, weight and infant dietary intake .................................................................96
Table 6.4: Correlation coefficients between feeding practices, feeding styles, weight concern and weight .................................................................97
Table 7.1: Demographic characteristics of mothers ..................................................110
Table 7.2: Logistic regression relationships between maternal Guidelines knowledge, feeding confidence, parenting self-efficacy and infant dietary intake ......................111
Table 7.3: Sources of information about introducing solids and bivariate logistic regression relationships (n = 251) .................................................................112
Table 7.4: Maternal infant feeding practices and parenting style descriptive statistics ....113
Table 7.5: Correlation coefficients between maternal Guidelines knowledge, feeding confidence, self-efficacy, feeding practices and parenting styles ........................................113
Table 8.1: Characteristics of 15 mothers interviewed ..............................................116
LIST OF FIGURES

Figure 1.1: Three phase mixed methods research .............................................................. 5

Figure 1.2: Diagram of thesis overview ................................................................................ 7

Figure 2.1: Etiology of childhood obesity based on Birch & Ventura's ecological model..... 11

Figure 3.1: PRISMA flow diagram for study selection ........................................................ 33

Figure 3.2: Systematic review themes and sub-themes relationships ................................ 35

Figure 4.1: Three phase mixed methods research design ................................................. 52

Figure 7.1: Etiology of childhood obesity based on Birch & Ventura's ecological model... 102

Figure 8.1: Inductive themes and subthemes ................................................................. 117

Figure 9.1: Conceptual model of influences on maternal transitional infant feeding ...... 136
CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

The first 1000 days of life, from conception to 2 years of age, provides an opportunity to set the foundations to support healthy growth and development through optimal nutrition. This period has been identified in the World Health Organization’s (WHO) report on ending childhood obesity,¹ emphasizing the importance of prevention in this early period and acknowledging the pivotal role of nutrition in the early years. Modifiable obesity risk factors during this window, including the timely introduction of solids, provide the basis for primary prevention.²

Obesity is a global transgenerational problem with both physical and psychosocial consequences for children and adults. Worldwide the proportion of children under the age of 5 years who are overweight (6.1%) is approaching that of those suffering from wasting (7.5%), leading to a call to end all forms of malnutrition through strategies that focus on both insufficient and excess nutrition.³ In Australia one in five 2-4 year old children are overweight or obese.⁴ The challenge to change established eating behaviours, even in children,⁵ has driven the current early obesity prevention agenda that focuses on infants and children aged less than 2 years of age.⁶

The transitional diet of the infant from milk feeds to family foods offers an opportunity to establish lifelong healthy eating behaviours, with early food habits shown to form the basis for eating patterns in later life.⁷,⁸ The Australian Infant Feeding Guidelines⁹ (hereafter, Guidelines), consistent with international recommendations, provide direction about when to introduce solids and which foods to introduce. However, it is argued that they fail to provide adequate authoritative advice regarding how foods should be given, including guidance around feeding practices parents use to alter the amount of food their children eat.

Some practices that are used to provide food to children have emerged as significant pathways to poor childhood growth through their impact on dietary intake. Restrictive practices used to reduce the intake of food have been found to be associated with eating in the absence of hunger¹⁰ and overweight in children,¹¹⁻¹³ while pressuring to eat, has been associated with food fussiness¹⁴ and lower weight status.¹⁵,¹⁶ Interestingly these practices, termed as controlling feeding practices,¹⁷,¹⁸ result in outcomes that contradict parental aims of decreasing or increasing consumption of the target food. Moreover,
studies involving infants highlight the use of these controlling feeding practices during the transitional feeding period in response to perceived infant size.\textsuperscript{19}

The use of controlling feeding practices has been identified as undermining child self-regulation of energy intake.\textsuperscript{20} Satter’s “division of responsibility” in feeding identifies food provision as a parental role and food consumption a child’s responsibility.\textsuperscript{21} She contends parents need to trust their child’s ability to eat to their internal cues of hunger and satiety by creating a supportive, healthy eating environment.

It is also suggested that the effectiveness of these feeding practices is altered by parenting styles, which are defined by the parental domains of responsiveness or warmth and demandingness or control, and identified as potential obesity agents.\textsuperscript{22} How these feeding practices and styles develop and upon what premise is debated in the literature, though there are few studies during infancy.\textsuperscript{22,23}

So what is the evidence base upon which early prevention of obesity efforts are made? In the Australian context, not dissimilar to other countries, there is no national collection of dietary intake or body weight for children less than 2 years of age,\textsuperscript{24} despite nationwide dietary guidelines\textsuperscript{9} and a commitment to address childhood obesity.\textsuperscript{25} Current early childhood obesity prevention interventions are founded on these dietary guidelines and grounded in responsive feeding approaches.\textsuperscript{26} While the rational for targeting parents early appears to be strong, the formative evidence is constrained by the use of cross-sectional studies based on unvalidated tools for assessing early feeding practices and non-standardised early feeding and parenting definitions, all of which lack cultural sensitivities.\textsuperscript{23,27} While longitudinal studies are increasing, intervention retention and outcomes would suggest possible limitations in sample size, intervention length and program delivery.\textsuperscript{28-30}

While acknowledgement of the current childhood obesity dilemma has received political support for action and the growth of obesity prevention activity in the early years, further evidence is required to guide future investment. This evidence should inform both policy development and health professional practices to nurture early childhood settings supportive of healthy lifestyle behaviours. Importantly, the appreciation of maternal needs in this space requires active involvement in an assets based bottom-up development approach.
In particular, recognition of the sociocultural contexts of childhood obesity is vital to ensure relevant, nonjudgmental support. In the early formative years the family environment is fundamental in shaping a child’s eating behaviour, with mothers identified as being central to food provision and feeding decisions. Maternal knowledge, perceptions and beliefs are guiding pillars influencing infant feeding choices. Achieving a better understanding of the factors that influence maternal feeding decisions will enhance obesity prevention efforts. Therefore, this thesis focuses on understanding why mothers do what they do when transitioning their infant from milk feeding to family foods – The Feeding A Baby (FAB) Study.

1.2 RESEARCH AIM AND QUESTIONS

1.2.1 AIM:
To develop recommendations to improve maternal transitional infant feeding to assist in the reduction of childhood obesity.

1.2.2 OBJECTIVES:
1. To identify infant feeding knowledge and current infant feeding practices of mothers living in Queensland.
2. To explore mothers (living in Queensland) concerns about childhood obesity and their rationale for infant feeding practices.
3. To identify the resources that guide infant feeding practices of mothers living in Queensland.
4. To determine the key elements of early childhood obesity prevention interventions and services.

1.2.3 RESEARCH QUESTIONS:
1. What are the issues and knowledge gaps of current early childhood obesity prevention interventions?
2. Do parental concerns about infant weight influence infant feeding practices, infant dietary intake and body weight?
3. What resources do mothers living in Queensland use to inform their infant feeding knowledge and practices?
4. What influences mothers when making decisions about transitional feeding?
5. What are the optimal components of early childhood obesity prevention interventions and services?

1.3 RESEARCH PURPOSE & SCOPE

The research aims to fill the gaps in the literature by establishing what early childhood obesity prevention researchers know about transitional feeding and what they would like to know, what the transitional practices of mothers are, and the reasons behind the decisions mothers made.

The study involves both qualitative and quantitative assessment techniques as a three phase sequential mixed methods study with each phase informing subsequent phases as illustrated in Figure 1.1. To inform the scope of the enquiry into maternal transitional infant feeding approaches, a review of the literature was undertaken to determine the modifiable nutrition factors for healthy infant growth and development, as well as identifying researchers involved in key early prevention of obesity in childhood (EPOCH) interventions in Australia. Phase 1 of the research involved semi-structured interviews with consenting EPOCH researchers to understand the current EPOCH agenda and knowledge around parental infant feeding decisions.

These findings were used to inform phase 2 data collection on infant feeding and growth from mothers through a self-administered questionnaire. Mothers living in Queensland were targeted for this quantitative phase with the investigator drawing on established early childhood network relationships and new connections with parenting support organisations in close proximity of the university to assist in the recruitment of more vulnerable mothers, such as younger and/or lower socioeconomic status women. These services were either located in lower socioeconomic locations, or provided dedicated parenting services for vulnerable mothers (e.g. parenting groups for young mothers).

The infant feeding practices and food intake data generated through the quantitative phase of this research was not intended to provide a comprehensive picture of transitional feeding. However, the data did provide measures of compliance with infant feeding recommendations, using nationally recognised and reportable indicators. Relationships were examined and unpacked through follow-up semi-structured interviews with mothers to understand the underlying reasons for the infant feeding decisions made.
1.4 THESIS OUTLINE

This chapter briefly outlines the importance of infant feeding and childhood obesity, the study aims and objectives as well as the thesis outline. To set the scene for the research, Chapter 2 reviews the literature relating to early childhood growth and the etiology of childhood obesity with respect to the genetic predisposing factors and the environmental conditions in which these are expressed. Chapter 2 also describes current infant feeding recommendations and primary prevention interventions addressing early childhood obesity. Chapter 3 provides clarity on the maternal rationale of transitional infant feeding practices through a systematic review of the qualitative literature.

Chapter 4 outlines the quantitative and qualitative approaches to this mixed methods study along with the guiding theoretical frameworks underpinning the research.

Chapter 5 provides insights from the phase 1 interviews with researchers involved in early prevention of obesity in childhood (EPOCH) interventions in Australia.

Chapters 6 and 7 incorporate the manuscripts from the phase 2 maternal survey. Chapter 6 investigates the relationships between maternal concern for their child’s weight and infant feeding practices, infant dietary intake and body weight. Chapter 7 examines the relationships of maternal infant feeding guideline knowledge, self-efficacy and information sources on infant feeding practices.
Chapter 8 captures the thoughts and feelings behind the infant feeding practices of a subset of phase 2 mothers, selected based on their concerns about their child’s weight. This third and final phase of the study constructs meaning to the survey responses and provides context to the feeding decisions made. Chapter 9 links across all phases of the study and provides an overview of the findings reflecting on the current evidence base. Chapter 10 provides the thesis conclusion and formulates recommendations for both researchers and practitioners in supporting early healthy family eating environments, along with identifying future research priorities. The thesis concludes with a bibliography and appendices that contain the tools used to support the data collection for this research. Figure 1.2 provides an overview of the thesis.
Chapter 1: Introduction

• Chapter 1: Introduction
• Chapter 2: Literature review
• Chapter 3: Maternal transitional infant feeding rationale\(^p\)
• Chapter 4: Research methodology

Results: phase 1

• Chapter 5: Insights of early childhood nutrition researchers

Results: phase 2

• Chapter 6: Maternal concerns about infant weight\(^p\)
• Chapter 7: Maternal knowledge, self-efficacy & information sources\(^p\)

Results: phase 3

• Chapter 8: Maternal transitional infant feeding experiences

Outcomes

• Chapter 9: Overview of findings
• Chapter 10 Recommendations and conclusions

\(^p\) = Publication

Figure 1.2: Diagram of thesis overview
CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

By denying scientific principles, one may maintain any paradox.

Galileo Galilei, Italian Scientist and Scholar

Chapter 1 indicated that the roots of establishing lifelong healthy eating patterns and weight lie in the early years of life. In the current obesogenic environment it is important to understand the factors that influence maternal infant feeding decisions, including their concerns about their child’s body weight, to guide early childhood obesity prevention efforts. The purpose of this chapter is to review the current literature to:

- Understand the implications of obesity and its early childhood origins
- Examine infant feeding recommendations and the dietary patterns of infants
- Examine the bidirectional influences of the mother and the infant on the transitional feeding process
- Examine the Early Prevention of Obesity in Childhood (EPOCH) interventions

2.2 OBESITY AND OBESITY RATES

Obesity is a chronic disease whereby excessive body fat impacts negatively on health.\(^1\) The Body Mass Index (BMI) uses weight (wt) and height (ht) (wt / [ht]^2) to provide a population level guide to overweight (BMI ≥ 25) and obesity (BMI ≥ 30) for adults.\(^2\) In children, growth charts are used to describe overweight (>85\(^{th}\) percentile for age and gender) and obesity (>95\(^{th}\) percentile for age and gender).\(^3\) Internationally, the redefining of normal growth by the 2006 WHO child growth standards (based on how breastfed infants should grow) and the move away from using the older Center for Disease Control (CDC) 2000 growth charts (based on cross sectional data of mainly formula fed infants) will increase the identification of overweight and obesity.\(^4\)\(^5\)

The current global obesity epidemic is a relatively recent phenomenon with obesity rates more than doubling since 1980. In 2014, WHO identified 1.9 billion adults as overweight (39%) and of these 600 million were obese (13%).\(^6\) In children under the age of 5 years, 41 million were found to be overweight or obese in 2014.\(^6\)
While the prevalence of early childhood (<5 years) overweight and obesity is higher in developed countries, the overall number of affected children is higher and increasing at a higher rate in developing countries. In Australia, the 2014/15 Australian Health Survey found 20.0% of children aged 2-4 years were overweight or obese. The same survey found that 27.4% of older children (5-17 years) and 63.4% of adults (18 years+) were overweight or obese, rising from 20.9% and 56.3% respectively since 1995. Given that weight has been shown to track over time, the risk of higher levels of obesity in the future is of concern unless action at a population level is taken now.

### 2.3 IMPLICATIONS OF OBESITY

Obesity has physical, social and economic costs evident at both the individual and population level. Health problems associated with obesity include cardiovascular disease, type 2 diabetes, some cancers and musculoskeletal conditions, leading to increased morbidity and mortality. As childhood obesity rates increase, these problems are developing earlier, with type 2 diabetes now a well-established preventable childhood disease.

The social stigma associated with obesity is evident from an early age. While the “chubby baby, healthy baby” perception persists, parents of overweight infants and toddlers may be labeled as bad role models or neglectful parents in cases of severe obesity. For the child, obesity not only limits his or her physical ability, it can also result in peer bullying and social exclusion. These psychosocial isolating effects can carry through to adulthood, limiting employment and relationship opportunities.

Preventative measures to tackle obesity early would result in substantial health, psychosocial and economic benefits to individuals and the broader community. In 2015 the total cost of obesity in Queensland was estimated at around $11.2 billion. Nationally this cost was assessed at $58 billion, based on the financial cost of obesity ($8.6 billion) and the impact of loss of wellbeing and early death ($47.4). A 2014 United States (US) literature review estimated a lifetime direct medical cost of an obese child relative to a normal weight child to be US$19,000. In Australia, the annual direct costs to the healthcare system of children with obesity aged 2-4 years in 2016 were estimated at around $17 million.
2.4 ETIOLOGY OF OBESITY

Obesity is multi-factorial in origin. While 30-77% of the risk of obesity is thought to have an underlying genetic predisposition, the recent surge in obesity rates suggests that environmental factors also play significant roles in the expression of this predisposition. While energy balance is influenced by both energy intake and expenditure, diet (energy intake) has been implicated as a key factor associated with childhood overweight and obesity. Figure 2.1 summarises the key nutrition related influences on childhood weight based on Birch and Ventura’s ecological model that describes the etiology of childhood obesity.

![Figure 2.1: Etiology of childhood obesity based on Birch & Ventura's ecological model](image)
2.4.1 GENETICS

The concept that obesity runs in families is supported by twin studies where the risk of obesity is similar for identical twins despite being exposed to different environments and lifestyle choices.\textsuperscript{55} Obesity is more common in young children of mothers who have a high BMI,\textsuperscript{62,63} higher antenatal BMI and excessive gestational weight gain.\textsuperscript{64,65} Data from the Raines study suggests that both parental birth weight and BMI are strong influences on child BMI indicating a heritable genetic-environmental susceptibility.\textsuperscript{62} Obesity in children has also been shown to persist into adulthood,\textsuperscript{40} setting up a generational perpetuation of the problem.\textsuperscript{66}

While parents provide the genetic potential for obesity susceptibility, they also provide the context in which this is expressed.\textsuperscript{67} It is argued that the relative recent rise in obesity rates is attributable to the interaction of genetic factors and the current obesogenic environment.\textsuperscript{68} The relative importance of each in the etiology of obesity is yet to be defined.

2.4.2 ENVIRONMENT

There is clear evidence that the antenatal environment can have lifelong health consequences. Intrauterine nutrient deficit and surplus influences birth weight and subsequent growth, and along with the toxins associated with smoking, increases obesity risks.\textsuperscript{64,69} Nonetheless, the obesogenic postnatal environment has been argued to be more influential in the development of obesity than programming effect during the foetal environment.\textsuperscript{67,70-72} The strong association between rapid growth in infancy and obesity in later life supports this argument.\textsuperscript{73,74}

Breastfeeding has been shown to be mildly protective against obesity.\textsuperscript{68,69,75} The strength of this relationship may be partially explained by confounding factors such as birth weight, maternal weight, education, socioeconomic status, age and healthier lifestyle practices.\textsuperscript{76} Evidence suggests that breastfeeding supports self-regulation of infant intake and mothers’ responsiveness to their infant’s feeding cues to better match energy requirements with energy expenditure.\textsuperscript{76} This concept is reinforced by the fact that infants fed breastmilk by bottle gain more weight than those fed at the breast only, implicating the controlling influence of bottle feeding as a mitigating factor.\textsuperscript{77} Furthermore, the unique properties of breastmilk, such as the fat and hormone content of hindmilk, assist infant
The lower protein content of breastmilk compared to formula also promotes slower infant growth.\textsuperscript{78}

Infants fed infant formula are able to regulate intake when left to self-direct feeding behaviour.\textsuperscript{76} Unfortunately these infants are more susceptible to overconsumption due to parental initiated feed scheduling and bottle emptying, which is associated with excessive weight gain and subsequent obesity risk.\textsuperscript{79,80} Furthermore, not all infants can readjust intake to meet their metabolic needs following parental feeding (breastmilk or formula) interventions, with this differing self-regulation capacity attributed to genetic differences.\textsuperscript{76}

Formula-fed infants are also more likely to be introduced to solids early,\textsuperscript{81-84} without a corresponding reduction in formula intake,\textsuperscript{85} which is associated with increased weight.\textsuperscript{61,86,87} Huh et al\textsuperscript{84} found a six-fold increase in odds of obesity at 3 years for formula-fed infants introduced to solids before 4 months (versus at 5-6 months) independent of rapid early growth, but no association for infants breastfed for at least 4 months who were introduced to solids before 4 months. This difference may be due to the higher energy intake associated with solids introduction in formula-fed infants compared with breastfed infants who reduce breastmilk consumption as solids are introduced.\textsuperscript{84} Likewise, in comparison to breastfeeding mothers, mothers who formula feed display more controlling feeding practices that are less responsive to infant feeding cues, both during infancy and early childhood.\textsuperscript{76,88} Further research is needed to determine if this controlling behaviour is in response to a heavier formula fed infant or a direct result of the feeding experience.

The transition onto family foods brings with it further obesogenic implications. Beyond the linkages between the early introduction of solids at or before 4 months of age and childhood obesity,\textsuperscript{87,89} there are dietary considerations. Pearce and Langley-Evans’ review of the literature found high intakes of energy and protein (specifically milk protein) during infancy were associated with higher BMI in childhood, while adherence to the dietary guidelines during weaning was associated with a higher lean mass.\textsuperscript{90} The review found no impact of specific foods given during the transitional feeding period, and adherence to the dietary guidelines during weaning was recommended.

A comparison between dietary patterns (healthy versus unhealthy) of infants at 6 and 12 months and their mothers, found that dietary patterns tracked over the second half of infancy and were consistent with their mothers’ diets at both time points.\textsuperscript{91} In this large sample from the Southampton Women’s Survey, infants born first or to mothers’ of higher education status were more likely to have a healthy diet consistent with dietary
recommendations and had a higher lean body mass at 4 years compared to other infants.92

Despite the current investment in early prevention of obesity in childhood, there remains a scarcity of literature around the transitional diet of infants and its long-term impact on later health, particularly in longitudinal studies.93 It is suggested that research focused on whole-of-infant-diet relationships with health as opposed to individual nutrients will provide stronger evidence around diet quality.93 Furthermore, the combination of milk feeding and solids is deemed to be more predictive of obesity risk than milk feeding alone.84,94,95 This is reflected in Rose et al’s study94 where mothers who were feeding a mixture of breastmilk and formula had a lower probability of feeding sufficient fruit and vegetables, a higher probability of feeding energy dense foods and had infants more likely to be overweight at 1 year, compare to infants fed either breastmilk or formula formula.

2.5 INFANT FEEDING RECOMMENDATIONS AND SURVEILLANCE

2.5.1 GUIDELINES

2.5.1.1 NATIONAL INFANT FEEDING GUIDELINES

The Australian Infant Feeding Guidelines released in 20129 are evidence based recommendations developed to support optimum infant nutrition. While the overarching message of breastfeeding to at least 12 months and introducing solids at around 6 months has not changed since the previous 2003 version,96 when the introduction of solids was changed to be consistent with global recommendations, there have been clear changes regarding the transitional feeding process:

- First foods should be iron-rich
- New foods can be introduced in any order or any number (i.e. no need to introduce one food at a time)
- New foods can be introduced at a rate that suits the infant (i.e. no need to wait between the introduction of new foods)
- Potentially allergenic foods should not be delayed beyond 6 months (i.e. no need to wait until 12 months)
The 2012 Infant Feeding Guidelines are based on the Foundation Diets incorporated in the new Food Modelling System\textsuperscript{97} to meet the nutritional requirements of infants as outlined in the Nutrient Reference Values for Australia and New Zealand.\textsuperscript{98} The Guidelines recommend that infants should be offered a variety of nutritious foods based on the five food groups,\textsuperscript{99} with food texture matched to the developmental needs of the infant, progressing from pureed to family foods by 12 months.

### 2.5.1.2 INTERNATIONAL INFANT FEEDING GUIDELINES

Since 2001, WHO has recommended exclusive breastfeeding for the first 6 months of life, with the introduction of solids at 6 months together with breastfeeding to at least 2 years of age.\textsuperscript{100} Prior to 2001 WHO had recommended introducing solids between 4-6 months.

The WHO infant feeding recommendations for the introduction of solids are currently supported globally, including in Canada,\textsuperscript{101} the European Union,\textsuperscript{102} New Zealand,\textsuperscript{103} Northern Island,\textsuperscript{104} the United Kingdom\textsuperscript{105} and the United States.\textsuperscript{106} There now appears to be general consensus on the timing of solids at/around 6 months, the importance of iron-rich first foods and the progression of variety and texture from 6-12 months.

### 2.5.2 MONITORING

The Australian Health Survey (AHS)\textsuperscript{4} is the largest national systematic monitoring system reporting on health conditions and health risk factors of Australians. It provides information on rates of overweight and obesity and dietary intake (fruit, vegetables and milk type) in children from the age of 2 years. It also provides information on breastfeeding rates and the timing of introduction of solids. However, despite national dietary guidelines for all age groups there are no surveillance systems in place to monitor their implementation and impact.

Only two national nutrition surveys have been carried out in Australia (1995\textsuperscript{107} and 2011-12\textsuperscript{108}) and only in children from the age of 2 years. The nutrition data for these surveys were collected face-to-face based on usual intake questions and 24 hour dietary recall. The interviews were completed by a parent for children aged 2-8 and directly with children aged 9-17. The Australian National Infant Feeding Survey (ANIFS),\textsuperscript{109} completed in 2010, provided baseline data on national breastfeeding indicators.\textsuperscript{110} This mail-based survey also provided information regarding the timing of solids but no information about what solids were introduced. Similar infant feeding studies have been undertaken statewide in
Queensland\textsuperscript{81,111} and New South Wales using computer-assisted telephone interviewing (CATI) to collect feeding practices.\textsuperscript{112}

Given high rates of overweight and obesity in young children,\textsuperscript{4} there is a need to better understand the feeding patterns of children less than 2 years of age. This need has been partially met by three NHMRC funded Australian studies, Healthy Beginnings,\textsuperscript{113} NOURISH\textsuperscript{114} and Infant Feeding Activity and Nutrition Trial (INFANT).\textsuperscript{115} Results from these studies, together with the New Zealand Prevention of Overweight in Infancy (POI.nz) study,\textsuperscript{116} have been pooled under the Early Prevention of Obesity in Children (EPOCH) Collaboration\textsuperscript{117} to provide meaningful data on the impact of these obesity prevention trials.\textsuperscript{30} The combined results suggest the interventions were effective at prolonging breastfeeding duration, reducing TV viewing time, and moderately reducing BMI z-scores at 18-24 months. Further discussion about these studies can be found under the Obesity Prevention Interventions section of this chapter.

A lack of national nutrition surveillance systems are not confined to Australia, with similar limitations experienced internationally. The only large scale surveys in children less than 2 years of age are the Feeding Infants and Toddlers Study in the United States (FITS 2002 [n=2,884],\textsuperscript{118} FITS 2008 [n=1,596]\textsuperscript{119}) and the Diet and Nutrition Survey of Infants and Young Children (DNSIYC) in the United Kingdom (2011 [n=2683]).\textsuperscript{120} The FITS used telephone based interviews to collect feeding practices and 1-2 x 24 hour dietary recalls, with oversampling in the 4-6 months and 9-11 months age groups where significant transition in feeding is typically experienced. The DNSIYC used face-to-face interviews to collect feeding practices and food consumption based on a four day food diary in four age groups: 4-6 months, 7-9 months, 10-11 months and 12-18 months. The National Health and Nutrition Examination Survey (NHANES) data, collected since 1999 in the United States, also provides some useful nutrition information on children from birth to 2 years.\textsuperscript{121} The NHANES used a combination of face-to-face and telephone interviews to collect feeding practices and food intake based on 2 x 24 hour dietary recalls for the following age groups: 0-5.9 months, 6-11.9 months and 12-23.9 months.

The FITS 2008 data showed positive changes to the infant diet since 2002, however there is still room for improvement.\textsuperscript{122,123} While 79.5% initiated breastfeeding, only 49.4% of infants were still breastfed at 6 months and 24.2% at 12 months, with 10% receiving solid foods before 4 months. Cow’s milk was being consumed by up to 17% of infants less than 12 months and iron-rich infant cereal consumption (50.4%) was significantly lower than in
2002. The daily consumption of any fruit and vegetables in infants aged between 6-11.9 months ranged from 64.5-80.6% for fruit and 62.8-72.3% for vegetables, showed a substantial proportion of infants not eating fruit and vegetables. Despite a reduction in sweetened food and drink consumption since 2002, intake in infants aged 6-11.9 months still ranged from 17-43%.

The DNSIYC 2011 data\textsuperscript{120,124} showed that 78% of mothers initiated breastfeeding with only 29% still breastfeeding between 4-6 months and 8% between 12-18 months. Solids were introduced before 3 months in 10%, before 4 months in 43% and before 5 months in 75% of infants. Seventy-five percent of boys and 76% of girls exceeded their estimated energy requirements, and mean protein intake also exceeded reference nutrient intake in all age groups. Cow’s milk was being consumed by 15% of infants at 4-6 months. Infant rice cereal was the most common first food (65%) followed by pureed fruit or vegetable (21%). The mean daily fruit and vegetable consumption ranged from 100g (48g fruit, 52g vegetables) for infants 4-6 month to 170g (96g fruit, 74g vegetables) for those aged 12-18 months.

The ANIFS 2010 data\textsuperscript{109} showed that 96% of mothers initiated breastfeeding and around 60% of infants were still receiving some breastmilk at 6 months. Mothers fed non-human milk or infant formula to 55% of infants at 6 months, increasing to nearly 80% of children aged 12 months. Solid food was introduced to 33.7% of infants aged ≤ 4 months. The AHS 2014-15 Queensland data\textsuperscript{4} found that the adequate consumption of fruit and vegetables in children aged 2-3 years to 14-18 years ranged from 94.8 to 43.4% for fruit and 18.0 to 4.4% for vegetables, showed a substantial drop in consumption of both fruit and vegetables over childhood, and an alarming overall poor intake of vegetables across all age groups for children. Fruit and vegetable intake for the oldest children (14-18) were similar to adults (51.2% and 91.9%).

Due to differences in methodologies and reporting, direct comparison across studies is difficult. Nevertheless, it is clear that infant diets are inconsistent with infant feeding recommendations and contain excess energy related to poor duration of breastfeeding, high rates of formula use, early introduction of solids, insufficient fruit and vegetable intake and high use of sugar sweetened beverages and energy-dense foods.\textsuperscript{109,122-124}
2.6 INFANT FEEDING KNOWLEDGE, BELIEFS AND ATTITUDES

Strategies to change feeding practices require an understanding of parental awareness and acceptance of infant feeding recommendations, their rationale for current food choices and behaviours, and perceptions of potential threats to child health from non-compliance.

Current data on infant feeding patterns as described in the previous section would suggest that parental infant feeding knowledge is poor. However, the relationship between knowledge and behaviour\(^{125}\) is ambiguous, with studies of parents with good healthy eating knowledge not found to predict quality of child’s diet.\(^{47,126,127}\) In the Australian context, Berry et al\(^{128}\) found that despite good nutritional knowledge parents’ awareness of infant feeding guidelines was low and Zehle et al\(^{127}\) questioned the importance and communication of these guidelines to parents where low compliance was found.

Despite this deficit, changes in the international infant feeding recommendations after 2003 to delay introducing solids from 4-6 months to around 6 months resulted in significantly higher rates of exclusive breastfeeding before six months and the later timing of solids introduction in both Australia\(^{41,129}\) and the United Kingdom\(^{130}\) suggesting that feeding messages are getting through. Parents less likely to adhere to these guidelines were younger, less educated mothers from lower socioeconomic backgrounds.\(^{109,130}\)

So what else influences parental feeding of young children? Duncanson et al’s\(^{47}\) study of parents of children aged 2-4 years found that parental feeding practices were more influenced by peers than dietary guidelines, with suboptimal feeding practices rationalised by the belief that their child’s intake was superior to their peer group. Conforming to subjective norms (i.e. social pressure), as outlined in the Theory of Planned Behaviour (TPB) has also been described in feeding studies of infants.\(^{131,132}\)

The literature also suggests that parental infant feeding practices are heavily influenced by the belief that food can modify infant behavior such as infant waking and fussiness.\(^{43,131}\) The use of food to soothe has been associated with child temperamental negativity and heavier weight status.\(^{133,134}\)

Preference for a heavier infant has been well documented to impact on feeding strategies. This may be due to the belief of many parents that infants cannot be overfed and genes rather than nutrition primarily determined growth.\(^{135}\) In fact, many parents fail to recognize that their child has a weight problem, with heavier weight perceived as a sign of good health.\(^{136,137}\) Indeed parental acceptance of growth charts is variable, and infant weight
concerns generally only arise if a weight-related medical problem exists. The lack of parental knowledge around infant feeding and adverse long term health outcomes further supports the case for early childhood obesity prevention.

2.7 BIDIRECTIONAL INFANT FEEDING INFLUENCES

2.7.1 INFANT

In utero, the infant’s gustatory and olfactory systems which govern taste and flavor perceptions and drive food preferences develop. Infants are predisposed to food preferences, having an innate liking for sweet and salty tastes and a disliking for sour and bitter tastes, allowing them to identify nutrient-rich, safe foods to eat. Their neophobic tendency to reject new foods, viewed as an early protective mechanism against unfamiliar and potentially harmful food, has been associated with reduced preferences for everyday food, particularly vegetables, in young children. Longitudinal evidence suggests that food preferences are formed as early as 2 years and can track over time. Furthermore, Skinner’s study showed that new foods are more likely to be accepted earlier in life, with mothers’ food preferences influencing those of their children by limiting foods they dislike.

The good news is that food preferences and acceptance are traits which are modifiable by experience, a reflection of the food familiarity. While the maternal diet during the antenatal period and during breastfeeding can moderate infant food acceptance due to repetitive and varied flavour exposure, infant formula has limited impact on shaping food preferences due to its fixed composition. Experimental evidence supports the notion that children must ‘learn-to-like’ new food through repeated exposure to new foods, involving tasting and not just looking at or smelling the food. It is normal for young children to be fussy and reject new food, however, the emotional feeding tactics of coercion or rewarding intake can lead to learned food aversions. Birch’s studies on instrumental consumption (i.e. eating to obtain a reward) support that these feeding practices may encourage consumption during their use, but at the expense of a negative shift in preference for the targeted food longer-term.

Johnson’s study on preschooler self-regulation found that most young children can adjust food intake to meet their energy needs. The findings suggest that both overeaters and under eaters can be taught to use their internal cues of hunger and satiety to improve regulation of energy intake. Furthermore, an assessment of the 2002 FITS data found a
significant association between eating frequency and portion size, supporting infant energy self-regulation. However, given children’s learned preferences for energy-dense foods, the role of parents to provide a structured healthy food environment is paramount, as highlighted in Satter’s “division of responsibility” in feeding.

2.7.2 MOTHER

Mothers are the prime carers of infants and are primarily responsible for the food provisioning needs of the family. They are largely responsible for their young child’s food choices as well as when and how these are presented, subsequently shaping the eating experiences, food preferences and eating behaviours of their offspring. Traditional feeding practices such as feeding in response to child distress and coercion to encourage intake have been shown to override internal satiety cues and promote eating in the absence of hunger which can lead to rapid weight gain and obesity. Parental feeding styles and practices have been identified as mediating roles between the genetic potential of obesity and body weight in children.

Maternal characteristics associated with poor feeding practices include socioeconomic background (i.e. lower education and/or income), ethnicity, weight and eating psychopathology (e.g. bulimia). Other factors influencing feeding practices and infant dietary intake include the maternal diet, marital status, child temperament and behaviour, maternal age and maternal self-efficacy.

2.7.2.1 PARENTING STYLE

Parenting styles are classified as either authoritative, authoritarian, indulgent or neglectful based on the parenting domains of demandingness (i.e. behavior control) and responsiveness (i.e. warmth). Parenting styles indirectly affect children’s outcomes through influencing the effectiveness of parenting practices. In the feeding context, parenting styles are based on how parents interact with their children through the use of demanding or responsive feeding behaviours and attitudes. While the literature around parenting styles and/or feeding styles in infancy is sparse, responsive parenting (e.g. authoritative) as opposed to unresponsive, controlling parenting (e.g. authoritarian) is associated with increased fruit and vegetable intake and lower risk of childhood obesity. Responsive parenting with limited demands on food intake (e.g. indulgent) is associated with poorer child weight status.
2.7.2.2 FEEDING PRACTICES

Feeding practices defined by the tactics used to control what, how much or when children eat, are generally categorized into the domains of restriction, pressure-to-eat and monitoring. Restriction has generally been associated with parental concerns for heavier child weight and unhealthy eating. Unfortunately restricting food has been shown to place undue attention on food which can have the opposite effect to that intended and lead to increased intake of restricted foods, eating in the absence of hunger, higher energy intake and weight gain. Restriction in infancy has been associated with lower child weight at 2 years, which may reinforce its use longer term, where overconsumption may occur when there is free access to restricted foods.

Parental pressure has been associated with poor oral intake and underweight in children. Evidence suggests that pressure-to-eat or using food as a reward can lead to food dislikes (particularly healthy foods) and reduced intake in children. Monitoring of food intake has been associated with healthy food intake and lower weight in young children. However, unlike restriction and pressure-to-eat, monitoring does not appear to be influenced by child weight or eating behaviours.

Much of the evidence on the association between feeding practices with poor dietary and weight outcomes in children is based on cross-sectional studies limiting the understanding of the causative factors. While there is evidence that feeding practices are driven by poor or large appetites in the child, with paradoxical child eating and weight outcomes as outlined above, there is some support that these practices are also mediated by concern for child weight as well as child weight. Current longitudinal evidence now supports the bidirectional relationship between these feeding practices and child weight, with a few large studies suggesting that feeding practice adaption in response to child’s weight as the dominant direction.

If infant weight status is a driver of inappropriate feeding practices, then parental perceptions of their child’s weight and identification of healthy weight is important. Unfortunately there is evidence that parents of young children are more likely to misinterpret weight status. Furthermore, parental preference for heavier infants has been identified with parental favor of higher percentiles and negativity towards lower percentiles on growth charts. In fact, heavier weight is seen as a sign of good infant health and a reflection of good parenting.
Given that rapid weight gain and BMI in infancy is linked with later risk of overweight, and that lifelong food preferences may be established as young as 2 years, modifying feeding practices before they become established appears to be the most effective strategy in preventing obesity. A better understanding of the causal factors of these feeding practices is needed to guide preventative efforts.

### 2.8 OBESITY PREVENTION INTERVENTIONS

To date, childhood obesity prevention has focused on school aged children, with attempts to change established dietary habits found to be largely unrewarding. One explanation for this may be that as parents are the gatekeepers to food; interventions that do not include parents are unlikely to succeed.

While early childhood interventions addressing obesity are on the rise, they are still relatively scarce, with the majority only appearing in the literature since 2003. A number of reviews have been undertaken. In 2010 Campbell and Heskeith identified 23 studies in children 0-5 years, six including infants, one third without a dietary focus. Many of these studies were based in the US, targeted vulnerable families and delivered interventions in either home or preschool/childcare settings. Poor sample size and inadequate reporting were cited as contributing to poor outcomes, with only some studies showing positive behavioural change that impacted on childhood obesity. Similar to school based interventions, preschool or childcare interventions which excluded parents were found to have the least impact, while those that focused on improving parental knowledge and skills showed the most promise. A more substantial and integrated approach to build upon the existing literature was recommended.

A review by Ciampa in 2010 in children 0-2 years found fewer studies (n=10), with poor study quality and intervention duration (generally < 6 months) contributing to the modest impact on behaviour change and no improvement on child weight status. Laws 2014 review of obesity prevention interventions in socioeconomic disadvantaged and/or indigenous families in children 0-5, found 32 studies (2 in Indigenous groups). While interventions during infancy had a positive impact on behaviour change, few measured longer-term impact on weight status. Parent engagement and skill development was again raised as successful intervention elements for preschoolers. The need for improving study quality and longer-term follow up was highlighted.
Redsell’s 2016 review found 24 behavioural obesity prevention trials in children 0-2 years. Nutritional and/or responsive feeding interventions (n=12) showed the most promise based on improved feeding practices and a positive impact on child weight. The other interventions based on breastfeeding, family lifestyle and maternal health improved feeding but did not influence child weight.

Blake’s 2016 review of obesity prevention interventions in the first 1000 days (conception to 2 years) identified 26 interventions, with only nine effective at influencing child weight status.188 While behaviour change of parents and infants were the basis for these successful interventions, the author argued the need for a systematic approach,189 ground in theoretical frameworks.

In the Australian context, three early childhood obesity prevention randomized controlled trial (RCT) interventions have been conducted.113-115 While sharing similar aims based on family behaviour change models, they vary in population groups and delivery mode. The Healthy Beginnings RCT Trial113 conducted in socially and economically disadvantaged areas of Sydney (n=667 mothers) involved eight home visits from pregnancy to 2 years postnatally and resulted in improved infant feeding and sedentary behaviours and a reduced child BMI at 2 years of age.190

The INFANT cluster RCT trial of 542 mothers with infants (mean age 3.8 months) from pre-existing parent groups in Melbourne involved six 2 hour group education sessions over 15 months and resulted in reduced sweet snack consumption and television viewing in 20 month old children but no impact on BMI at intervention conclusion (mean age 19.8 months).191 The NOURISH RCT trial (n=698 mothers) in Adelaide and Brisbane involved two modules of 6 fortnightly group education sessions commencing when the infants were aged 4-7 and 13-16 month. Anticipatory early feeding guidance provision resulted in improved infant feeding practices but no statistically significant differences in BMI at 2 years of age.192

While Australian interventions are based on sound theoretical models to modify infant feeding practices in line with recommendations, issues around recruitment, retention and intervention exposure was raised.28,29 Other than those studies specifically targeting minority groups,113 many studies struggled to achieve a sample from a mixture of socioeconomic backgrounds, ending up with older, more educated participants.28,29 Whether this is due to the intervention delivery or to the burden of study involvement it is not clear, although one study identified time and return to work as reasons for non-
Retention rates were also an issue in some studies, with higher rates of withdrawal from intervention samples suggesting participation burden. Like similar international studies captured in the reviews above, while these Australian studies have shown promising modifications to infant feeding, such as improved responsive feeding styles, this has yet to translate into being protective for childhood obesity. This may be due to lack of statistical power or insufficient intervention exposure and/or follow-up length. The Early Prevention of Obesity in Children (EPOCH) Collaboration data from the three above mentioned Australian RCT trials together with the New Zealand POI RCT trial hopes to overcome some of these limitations to allow greater precision of intervention effects. Like the Australian trials, the POI trial improved infant feeding practices but had limited impact on child intake and BMI at 2 years of age.

Eating meals within a family meal setting, reducing screen time, being physically active and achieving adequate sleep (also associated with feeding) are also important determinates of childhood obesity and have been considered in some of the obesity prevention interventions.

### 2.8.1 GUIDING THEORETICAL FRAMEWORKS

Despite theoretical frameworks attuned to social context being identified as improving intervention effectiveness, many early childhood obesity prevention interventions lack these guiding frameworks. The theoretical constructs used in early childhood obesity prevention studies vary widely, though many are grounded in the Health Belief Model which relies on the existence of parental concern and belief that following health advice will reduce obesity at an acceptable cost. Some also consider the aspect of self-efficacy in that parents feel confident to implement and maintain behaviour change as reflected in the Social Cognitive Model. The Theory of Planned Behaviour which links beliefs and behaviour has been used to explain and modify infant feeding. Interventions based on Knowledge Deficit Models only go part way to tackling obesity as they fail to capture the importance of considering parenting skills. These skills are considered in studies using the behavioural theory and the Family Partnership Model.
2.9 SUMMARY

Within the current evidence base it could be argued that while there is some data on what, when and how parents feed their infants and the impact of these practices, there remains a need to understand the contextual factors influencing these decisions. Furthermore, there remains a lack of consensus in the literature regarding the best delivery model for early childhood obesity prevention interventions.

The research within this thesis will fill some of the gaps in the literature by establishing what early childhood obesity prevention researchers know about transitional feeding, what they would like to know, what the transitional practices of mothers are, and the drivers behind the maternal infant feeding decisions. The systematic literature review of qualitative studies in Chapter 3 will provide an understanding of the infant feeding contextual factors.
CHAPTER 3: MATERNAL RATIONALE FOR TRANSITIONAL INFANT FEEDING PRACTICES

3.1 INTRODUCTION

Research is to see what everybody else has seen, and to think what nobody else has thought.

Albert Szent-Gyorgyi, Hungarian American Philologist, Nobel Prize 1937

Chapter 3 is based on the manuscript published in the journal of Maternal & Child Nutrition. It is a systematic literature review to identify the factors mothers perceive as influencing their transitional infant feeding practices. While much of the literature in Chapter 2 is based on quantitative data, this review focuses on qualitative data to better understand mothers’ reasoning about their feeding decisions.

3.2 MANUSCRIPT 1:

HARRISON M, BRODRIBB W, HEPWORTH J.

A QUALITATIVE SYSTEMATIC REVIEW OF MATERNAL INFANT FEEDING PRACTICES IN TRANSITIONING FROM MILK FEEDS TO FAMILY FOODS.

MATERNAL & CHILD NUTRITION, 2017;13(2).

3.2.1 ABSTRACT

Evidence supports the establishment of healthy feeding practices early in life to promote lifelong healthy eating patterns protective against chronic disease such as obesity. Current early childhood obesity prevention interventions are built on extant understandings of how feeding practices relate to infant’s cues of hunger and satiety. Further insights regarding factors that influence feeding behaviours in early life may improve program designs and outcomes. Four electronic databases were searched for peer-reviewed qualitative studies published from 2000 to 2014 with transitional infant feeding practice rationale from developed countries. Reporting transparency and potential bias was assessed using the COREQ quality checklist. Thematic synthesis of 23 manuscripts identified three themes (and six sub-themes): Theme 1. Infant (physical cues and behavioural cues) focuses on...
the perceived signs of readiness to start solids and the feeding to influence growth and “health happiness.” Theme 2. Mother (coping strategies and knowledge and skills) focuses on the early survival of the infant and the family and the feeding to satisfy hunger and influence infant contentment and sleep. Theme 3. Community (pressure and inconsistent advice) highlights the importance of generational feeding and how conflicting feeding advice led many mothers to adopt valued familial or culturally established practices. Overall mothers were pivotal to feeding decisions. Satisfying infant’s needs to reach “good mothering” status as measured by societal expectations was highly valued but lacked consideration of nutrition, obesity and long term health. Maternal interpretation of healthy infant feeding and successful parenting need attention when developing strategies to support new families.

**Key words:** Systematic review, qualitative, transitional feeding decisions, obesity, infant feeding, mother

**Key messages:**

- Mothers are pivotal to transitional feeding decisions however many struggle to interpret infant feeding cues.
- Many mothers use food to influence infant growth, contentment and sleep.
- Mothers choose ease of feeding over infant feeding recommendations.
- Maternal identity and parenting success are associated with infant feeding practices.
- Obesity and long term health rarely influence feeding decisions.
- The rationale for transitional feeding practices is underreported in the literature and requires further research to identify best avenues for supporting healthy infant feeding practices.

**3.2.2 INTRODUCTION**

The first year of life provides the nutritional footprint for future dietary habits and health. Evidence suggests that eating habits are established as young as 2 years of age and like weight have been shown to track into adulthood. Innate food preferences, satiety regulation and obesity risk of infants are malleable and how they are expressed is dependent on the environment in which they are exposed. Parents, in particular mothers, play an important role in what and how food is provided during the early years and focusing within this family environment may provide some answers to the current obesity crisis sweeping the world.
The challenges of changing established behaviour and the limited impact of childhood healthy lifestyle and obesity prevention interventions,\textsuperscript{180} reinforce the current preventative investment by governments and academics in supporting healthy eating practices and addressing obesogenic factors within the first years of life.\textsuperscript{6} Interventions that focus on diet quality and parental responsiveness to feeding cues are promising strategies in reducing the risk of obesity in early life.\textsuperscript{26} The relationship between child temperaments, maternal feeding (e.g. feeding to soothe) and weight gain should also be considered.\textsuperscript{134}

Feeding choices (e.g. formula versus breastmilk), timing (e.g. early introduction of solids) and quantity have all been implicated as risk factors in the development of poor dietary habits and/or subsequent health issues such as obesity.\textsuperscript{61,87,90} Parental infant feeding practices and styles which describe how food is provided have also been identified as detrimental to childhood development, specifically those practices and styles that are more controlling and unresponsive to infant feeding cues.\textsuperscript{54} In contrast, parenting and feeding styles characterised by high demandingness and responsiveness around eating (e.g. authoritative) have been found to be associated with healthier dietary intakes (e.g. increased fruit and/or vegetable) and be protective of child overweight, while strict (e.g. authoritarian) or indulgent parenting are negatively associated with health outcomes.\textsuperscript{22}

Current early childhood nutrition interventions are frequently based on responsive feeding practices,\textsuperscript{80,205,206} however recruitment and participation issues\textsuperscript{28,186} suggest a lack of appreciation of the context in which feeding behaviours develop and/or the needs of parents. The origins of feeding practices are inextricably intertwined with the social and cultural factors that govern family life.\textsuperscript{207}

While for many, motherhood signals a time of celebration and excitement for the journey ahead, it is heavily influenced and constituted by family, cultural and societal expectations. With the medicalisation of motherhood, behaviours that deviate from expert guidance are deemed as risky by health practitioners and subsequently by mothers as a threat to their identity as good mothers.\textsuperscript{208} In an emotionally charged postpartum arena where infant feeding is a key element, mothers may be left to defend their choices if they are inconsistent with recommendations, such as the early use of formula or solids.\textsuperscript{209} While the roots of scientific guidance to regulate motherhood are not new, maternal accounts suggest that practitioners fail to consider the full circumstances around infant feeding choices, resulting in many mothers feeling judged, withholding information and/or disregarding advice.\textsuperscript{131,210}
Infant feeding research to date has focused on measuring and understanding breastfeeding practices to meet policy guidelines. While some papers focus on the timing of introducing solids, there is much less emphasis on understanding the factors that influence the timing, choices and process of moving to family foods. Given that the transitional infant feeding period has been linked to the development of food preferences, dietary patterns and obesity in childhood and later life, further research about this “feeding window” is required.

With the current attention on childhood obesity and the rise in early childhood strategies to support the development of healthy lifestyle behaviours, the aim of this systematic review is to collate qualitative insights of factors mothers use to guide decisions about transitional infant feeding. The results from this systematic review will present practitioners and researchers with additional information to consider when developing interventions to support healthy family feeding in addition to identifying potential research gaps. The main objective of this review is to identify the rationale of maternal infant feeding practices when transitioning from milk feeds to family foods.

### 3.2.3 METHODS

#### 3.2.3.1 SEARCH STRATEGY & STUDY SELECTION

PubMed, Embase, CINHAL and PsycINFO were searched for papers published between January 2000 and June 2014 using key words, subject headings and MeSH terms. This timeframe was chosen as it was thought it would capture the current social context around infant feeding. All search strategy results were entered into Endnote X7©. The reference lists of included papers were searched to identify further relevant papers. Papers were included if they were full text, English written, peer reviewed journal articles based on qualitative studies in developed countries investigating parental rationale on transitional feeding practices (i.e. transition from milk diet to family foods) in children less than 2 years of age. Reporting on children less than 2 years was chosen as this age was more relevant to the transition to family foods and it was felt that parent recall would be more accurate when discussing infant feeding. Papers were excluded if they were solely quantitative studies, only contained health professional views, or if the parental feeding rationale was based on breastfeeding or formula feeding only, preterm infant feeding, food allergies or coping with feeding problems (e.g. disabilities).
The search strategy is outlined in Table 3.1. The lead author together with a librarian experienced in systematic reviews verified the search terms and review process. Titles and abstracts were reviewed and discarded if they did not meet the inclusion criteria. Two members of the research team reviewed the remaining full-text articles.

Table 3.1: Search terms used in the systematic literature review search

<table>
<thead>
<tr>
<th>Infant* OR infant OR preschool* OR child, preschool: AND</th>
</tr>
</thead>
<tbody>
<tr>
<td>parent* OR parents OR mother* OR mothers OR father* OR fathers OR caregiver* OR caregivers; AND</td>
</tr>
<tr>
<td>feeding behaviour* OR feeding behavior OR feeding behavior OR diet* OR diet OR breastfeeding OR bottle feeding OR bottle feeding OR wean* OR weaning OR &quot;complementary feed*&quot; OR &quot;infant nutritional physiological phenomena&quot; OR nutrition OR food* OR food; AND</td>
</tr>
<tr>
<td>perception* OR perception OR attitude OR attitude to health OR aware* OR awareness OR feeling* OR understand* OR knowledge* OR opinion* OR belief* OR view* OR perspective* OR &quot;health knowledge, attitudes, practice OR practice*&quot;; AND</td>
</tr>
<tr>
<td>qualitative OR focus group* OR interview* OR qualitative research* OR qualitative research OR &quot;semi-structured&quot; OR semistructured OR unstructured OR informal OR &quot;in-depth&quot; OR indepth OR &quot;face-to-face&quot; OR structured OR guide OR guides AND interview* OR discussion* OR questionnaire* OR &quot;focus group&quot; OR &quot;focus groups&quot; OR qualitative OR ethnograph* OR fieldwork OR &quot;field work&quot; OR &quot;key informant&quot; OR &quot;interviews as topic&quot; OR &quot;focus groups&quot; OR narration OR qualitative research</td>
</tr>
</tbody>
</table>

3.2.3.2 DATA EXTRACTION, ANALYSIS AND SYNTHESIS

Thematic analysis as described by Thomas and Harden\textsuperscript{213} was used to identify emerging themes and sub-themes across the data. This approach was chosen as it describes the synthesis of qualitative research explicitly used in systematic reviews. The level of analysis in this study was descriptive. The analysis process involved multiple readings by the lead author of the identified published papers followed by the manual line-by-line coding of the each study’s findings. Coded text was then extracted and organised into related areas to construct descriptive themes. The text was then grouped into sub-themes to best describe the maternal rationale around transitional feeding. Synthesis of data across studies was used to identify common concepts across settings and different ethnic groups. Any feeding practices predominant in particular settings or groups were noted. The final descriptive mapping of the main themes was subsequently discussed with the research team to reach consensus about the main constructs.

Chapter 3: Qualitative Systematic Review
3.2.3.3 DATA REPORTING AND STUDY QUALITY ASSESSMENT

Reporting of this systematic review follows the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) framework\textsuperscript{214} with each paper assessed using the Consolidated Criteria for Reporting Qualitative Research (COREQ).\textsuperscript{215} The ENTREQ framework guides the reporting of findings into the domains of introduction, methods and methodology, literature search and selection, appraisal and synthesis of findings. The 32 item checklist in the COREQ guides the reporting of the research team, study methods, context of the study, findings, analysis and interpretations. These key reporting guidelines were identified through the Enhancing the QUAlity and Transparency Of health Research (EQUATOR) Network\textsuperscript{216} and the Cochrane Collaboration.\textsuperscript{217}

The COREQ assessment was used to identify completeness of reporting and potential of bias in the qualitative studies. Assessment of paper inclusion was based on the research team appraisal of this data as to whether studies provided sufficient information. The authors also subscribed to the belief that there is the risk of losing new insights if studies were excluded due to methodological or reporting shortfalls.\textsuperscript{218}
Records identified through database searching (n = 5739)

Additional records identified through reference lists of records (n = 0)

Total records identified (n = 5739)

Records screened (n = 4136)

Records excluded based on title or abstract (n = 4102)

Duplicates removed (n = 1603)

Full-text papers assessed for eligibility (n = 34)

Full-text papers excluded (n = 11)
- No transitional feeding rationale (6)
- Review of case studies outside SC (1)
- Quantitative study (1)
- Milk feeding only (1)
- Conference abstract (1)
- PhD thesis (1)

Papers included in review (n = 23)

**Figure 3.1: PRISMA flow diagram for study selection**
3.2.4 RESULTS

A total of 5739 papers were identified with the search strategy. The titles and abstracts were assessed against the inclusion and exclusion criteria and 5705 references were discarded because they were duplicates and/or were outside the scope of this review. Thirty-four full-text articles were reviewed and a further 11 were discarded as they were outside the inclusion criteria, leaving 23 papers. Figure 3.1 presents the PRISMA flow diagram for this review.

The included papers were from the US (13), Europe (9) and Australia (1). Further details about the papers can be found in Table 3.2. Focus groups and interviews were used in equal proportions in the studies, with some studies using both methods and three using cross-sectional qualitative survey data. The majority of participants were mothers, with fathers and extended family members included in six papers.

Table 3.3 outlines the completeness of reporting and potential bias in the 23 papers based on the COREQ checklist. Overall the papers captured between 13 and 23 of the 32 checklist items, with 78% (18) reporting on at least half of the checklist (Table 3.2). Most papers identified the researcher but failed to provide details of their experience or relationship with the participants. Research method and sample were clarified however theoretical base and non-participation were rarely reported. The theoretical base provides a guide to interpreting the data and reasons for non-participation provide further weight to statements made. Description of the analysis was reported in the majority of the papers. No major flaws in the studies were detected and all papers were included given that they provided sufficient detail of the research undertaken.

Overall the studies provided few insights into the drivers of mothers’ choices when moving from milk feeds to family foods because of two key reasons. First, many of the papers focused on milk feeding determinants, with the transitional diet captured mainly in the timing of introducing solids and to a lesser degree, the food choices made. Second, not all papers clearly described the basis for infant feeding choices or clarified the predominant influencing factors of infant feeding practices.

Despite the limited data available, it was possible to identify three major themes that represented the main focus of the drivers of mothers’ infant feeding practices: (1) Infant driven transitional feeding practices; (2) Mother driven transitional feeding practices; and (3) Community driven transitional feeding practices. These themes are consistent with the
dimensions identified in Birch and Venture’s ecological model for childhood obesity etiology\textsuperscript{61} which shows how a child’s weight is influenced by the child’s behaviour that is embedded within the family and community context. Two minor sub-themes were identified for each major theme: (1) physical cues and behavioural cues; (2) coping strategies and knowledge and skills; and (3) pressure and inconsistent advice. The relationships between the mothers and the themes are presented in Figure 3.2, highlighting that all data are captured and translated through the mother.

![Figure 3.2: Systematic review themes and sub-themes relationships](image)

### 3.2.4.1 THEME 1: INFANT DRIVEN TRANSITIONAL FEEDING PRACTICES

This theme covers infant’s signs of readiness for solids and how these are interpreted by the mother.

#### 3.2.4.1.1 SUB-THEME: PHYSICAL CUES

It was common for mothers to identify introduction of solids as an important developmental milestone.\textsuperscript{220,221} With infant survival at the forefront of mothers’ minds in the early feeding stages,\textsuperscript{222} the introduction of solids was guided by the perceived physical signs of readiness such as the ability to sit, the presence of teeth and being able to control swallowing.\textsuperscript{139,221} Age and size were also reported to be markers for timing of the introduction of solids.\textsuperscript{139}
Growth was viewed as a measure of health,\textsuperscript{139,223} with insufficient growth being a source of concern for many mothers\textsuperscript{131} leading to supplementation with infant formula and/or early weaning to solids.\textsuperscript{178,200,222,224} Weight was seen a safety net as illustrated in Kaufman and Karpati’s study (“He should be fatter. He’s so fragile.”, p2186).\textsuperscript{177} Inappropriate feeding was used to influence growth (“I gave the baby cereal for the first time when the baby was 3 months, because the baby was very skinny and I wanted to see the baby a little fat.”, p32)\textsuperscript{131} and to negate concerns of underweight.

Bigger, chubbier babies tended to be viewed as healthier, normalised in the family context and fed accordingly to achieve this status through adding formula, early solids and/or cereal to bottles.\textsuperscript{177,178,200,225} The cultural value of heavier children and feeding practices was portrayed in Higgins’s study of Puerto Rican families in New York where “mothers often feed babies until they spit up….Lots of mothers feed babies extra milk and put extra sugar and baby foods in a bottle with a big hole in the nipple.” (p24)\textsuperscript{178}

A heavier infant was seen as safer\textsuperscript{177} and a sign of good parenting.\textsuperscript{178} Overall obesity concern was not evident, with weight seen as a problem for childhood post infancy, something the infant can grow out of, and only addressed if there is an associated health problem.\textsuperscript{177,200,226} While preference for heavier infants was more apparent in overweight parents and/or cultural groups such as Latino-Americans,\textsuperscript{225} Redsell et al. reported this predisposition in mothers from both affluent and deprived localities in the UK as reflected in the quote “I was quite happy that he was getting a little bit podgy.” (p6)\textsuperscript{200}

3.2.4.1.2 SUB-THEME: BEHAVIOURAL CUES

The infant showing interest in food, expressed by looking or reaching for food, was a common reason for starting solids.\textsuperscript{127,131,139,222,224,227,228} As captured in Heinig et al’s study\textsuperscript{131} mothers had no preconceived plans around when to introduce solids (“I didn’t really know exactly when [to introduce solids] or I really didn’t know. I thought I’d just go off it when she gave me the cue.”, p31) and were led by their infants (“I think they let you know themselves. They kind of know. They kind of, like, grab: ‘Can I have some of that too?’”, p35).

Facial expressions and oral behaviour such as chewing also prompted mothers to introduce solids.\textsuperscript{131,139,224,227} Happiness and contentment were identified as measures of health which supported maternal decisions to introduce solids early, and in some cases overfeed.\textsuperscript{139,220,222,223,229}
Absence of acute disease or distress were used as markers for safe early feeding\textsuperscript{139,223} with adverse long-term health outcomes being difficult for mothers to conceptualise.\textsuperscript{139} Satisfying immediate concerns of the infant reinforced parenting abilities.\textsuperscript{227} In this context mothers fed based on infant cues of food enjoyment or perceived enjoyment. Crying, while also a physical cue and related to contentment, has been categorised in the subtheme ‘coping strategies’ under the theme ‘mother driven’ due to the relationship with behaviour change beyond hunger.

### 3.2.4.2 THEME 2: MOTHER DRIVEN TRANSITIONAL FEEDING PRACTICES

This theme reflects maternal personal capacity to manage infant feeding.

#### 3.2.4.2.1 SUB-THEME: COPING STRATEGIES

The use of formula and early solid feeding to manage negative aspects of infant behaviour was highlighted in many of the papers. This was especially evident in the relationship between hunger, crying and sleep, where mothers identified crying and/or inadequate sleep as markers of hunger.\textsuperscript{131,139,200,220-222,228,230-232}

Some mothers used feeding practices such as topping up with formula feeds or introducing solids as coping strategies to settle the child (“like comfort food. If you give a baby food they will eat it”, p475\textsuperscript{139})\textsuperscript{200,223,228} or to avoid perceptions of spoiling by frequently picking up the unsettled child\textsuperscript{223} rather than to relieve hunger. These practices were reinforced by positive responses such as adequate infant sleep (“I started to wean her because she started to wake up at night”, p5).\textsuperscript{200} The addition of cereal to bottle-feeds to reduce feeding frequency and increase length of sleep was also reported (“I do it to help her sleep through the night”, p109).\textsuperscript{220} Feeding to fill, measured in some cases by infant spitting up, was a common practice amongst mothers, particularly African- and Latino-Americans\textsuperscript{131,178,226,229} as summed up by a mother in Heinig et al’s study “If he didn’t finish the jar of baby food, I put it in his night-time bottle” (p32).\textsuperscript{131}

Maternal coping strategies were also affected by time stresses and financial resources. Infants were often fed separately from the family in a variety of locations so that their needs could be met while fitting into family life (e.g. in a car seat in the bathroom while bathing other children).\textsuperscript{177,220} Convenience and time pressure also influenced food choices, with quick meal choices that satisfied hunger winning out over healthier options.\textsuperscript{228,233} While cost was found to influence food choices especially in low income families,
food was also seen as a relatively inexpensive commodity that had immediate satiety effects. “Eating right” for many mothers meant satisfying needs (generally not nutritional), with food an accessible commodity used by families to gratify their children.

Feeding was found to be an emotional journey, described by a range of feelings and related to many of the strategies outlined above to pacify the child. Some mothers were eager to start feeding solids and expressed pride in this achievement, while others found the transition to solids a stressful experience. Many mothers were concerned about their infant eating sufficient food with overfeeding a common solution. Inappropriate feeding such as starting solids early, while associated in some cases with guilt, was justified by positive infant behaviour of enjoyment and contentment. In fact success in feeding was measured by some mothers by the amount of food eaten and weight gained. Parenting skills were found to be judged by both family and the parents themselves on feeding choices and consumption with “good parents” seen to satisfy infant needs as illustrated by the quote “that’s probably the worst feeling in the world, for a mom to think that your baby is not properly nourished or full” (p32).

3.2.4.2.2 SUB-THEME: KNOWLEDGE AND SKILLS

Despite good awareness of the infant feeding guideline around when to introduce solids, meeting the infant’s immediate needs took priority. This is embodied in comments from the work of Synnott et al (“The guidelines are good, but it’s important that you listen to your child”, p951) and Arden (“Try and be guided by when your baby seems ready. Guidelines are just guidelines and every baby is different...Your baby knows best!”, p165) where mothers advocate for an infant led feeding approach to introducing solids. Certainly maternal acceptance of the guidelines varied with many not convinced of potential harm of feeding practices out of step with recommendations. Some described the guidelines as too rigid, declaring that every infant was different and the guidelines did not apply to all infants such as those that did not sleep through the night. The guidelines were seen as early safety rules that lose relevance as the infant transitions to family foods (“more to tell you what they may become sick from”, p1159).

While there was an awareness of the need for healthy foods many mothers lacked the knowledge and skills to translate this into feeding practices beyond fruit and vegetable
consumption.\textsuperscript{221,230} It was common practice for semisolids such as cereal, yoghurt and strained foods to be fed early by bottle, particularly by mothers from the US and France.\textsuperscript{131,139,221,223} These foods were not considered as solids by the mothers\textsuperscript{131,139,220} and feeding by bottle was an acceptable cultural practice to make feeding time easier and assisted transition to spoon-feeding and family foods.\textsuperscript{178,221} The health of the infant was considered by those who chose organic foods despite poverty in some cases\textsuperscript{139,234} or those seeking to reduce allergy or gut problems.\textsuperscript{224,234} Reducing the risk of obesity was not considered a high priority in feeding practices, with unhealthy foods only restricted if the child was accepted as overweight.\textsuperscript{127}

Food preparation skills also influenced the variety of food offered with some mothers doubting their cooking ability. Younger parents, especially the more vulnerable ones, were unable to cook meals at home (“My parents cooked, they cooked really nice home meals but I don’t know how to do them”, p8).\textsuperscript{200} Many trusted commercial infant foods to be nutritionally sound and cheaper than family food and were confused about the role of family food in the infant’s diet (“I didn’t realise I could put her straight on to normal food”, p5).\textsuperscript{230}

3.2.4.3 THEME 3: COMMUNITY DRIVEN TRANSITIONAL FEEDING PRACTICES

Information under this theme includes influence by those external to the mother and infant and how it is interpreted by the mother.

3.2.4.3.1 SUB-THEME: PRESSURE

The main pressure parents experienced on infant feeding practices was from the family. Feeding practices were found to be generational and mainly family taught with unsupportive breastfeeding environments and the endorsement of formula, early feeding of solids and overfeeding apparent in many of the studies.\textsuperscript{127,139,178,233} For example, this pressure was related to the insufficiency of milk (“My grandmother, she tell me to give the baby cereal. She said she needed it and would sleep longer. She say ‘she hungry cause she just drinking milk and that milk can’t fill her up that much.’”, p78)\textsuperscript{223} or solids (“I’m worried about the amount he eats, but mum always tells me to give him more”, p40).\textsuperscript{127} Pressure was also found to be non-verbal in nature (“Well yeah you know in the books now it doesn’t say to start weaning until six months anyway’, but she looked at me gone out, like ‘oh no she’s only been milk, she’s only been fed by milk”, p5).\textsuperscript{200}
While many mothers adhered to family advice, it was viewed by some, especially older mothers, as being outdated and thus disregarded. Food provided by family was also not always healthy and the pressure to adhere to family norms was reflected in healthy eating being viewed as a rejection of family and ethnic heritage.

Despite mothers’ groups being valued for their diversity of experiences in raising a child, peer pressure to introduce solids as a signal of advanced development was evident (“It seems to be a competition among new mums who can get their baby onto solids the quickest”, p164). It was clear that advice from family and friends, while not always sought, was influential on infant feeding practices.

3.2.4.3.2 SUB-THEME: INCONSISTENT ADVICE

Sources of information around infant feeding were identified as professional (e.g. nursing, medical, allied health) and lay (e.g. family and friends), as well as industry (e.g. food labels). While some advice was influential in feeding e.g. food label age range around when to start solids, conflicting advice was detrimental in many cases e.g. breastfeeding cession.

With differences in opinions about optimum infant feeding, many mothers were left confused and chose to learn by personal experience. Some found this process easier (“A lot of information available on infant feeding is contradictory. Each child is a world in himself and it is better to learn from one’s own experience with the infant”, p951) than others (“You get a lot of conflicting advice even from different health visitors… I know all babies are different and they can’t give strict guidelines, but it’s very confusing”, p26).

In summary mothers stated that health professional advice was not always consistent with infant feeding guidelines, with formula given in hospital and formula supplementation and early solids endorsed by some practitioners. Mixed messages left some mothers choosing the advice which suited them, disregarding advice if they did not like it, they did not find it useful or it conflicted with family beliefs as summed up by two mothers “We do what works for us … how it fits in with our ideas.” “You take what’s right for you and use it.” (p40)
3.2.5 DISCUSSION

This review aimed to identify insights into maternal feeding practices in the transition from milk feeding to family foods. Twenty-three papers from nine countries that met the inclusion criteria were identified. The studies were generally well described to provide a good understanding of the target group, the sampling method, the research approach and the analysis framework. They provided insights into the rationale that informs mother’s decisions around transitional feeding in infancy.

Many mothers embraced an infant led approach to feeding solids, using developmental signs of readiness such as age, size, ability to sit and interest in food to guide their feeding approaches, including when and how much to feed. The inappropriate use of food to promote development and contentment in this review would suggest a misuse of these cues and/or a possible lack of knowledge around infant readiness for solids and transitional feeding, an area yet to be explored in the literature. How mothers approached initial transitional feeding may reflect future feeding styles associated with poor food choices and obesity.⁸,²² Feeding to influence growth and behaviour overrides infant cues and is consistent with a controlling unresponsive authoritarian approach whereas basing all feeding decisions on infant cues may result in mothers moving to an indulgent feeding style whereby the child has total control. This is in stark contrast to Satter’s “division of responsibility” principle that suggests that parents should provide food and it is up to the child to decide whether to eat or not.²¹

Infant happiness was at the forefront of the feeding decisions of many mothers, with happiness and contentment equated to good health and hearty eating. This pursuit of happiness resulted in some mothers disregarding feeding guidelines, introducing solids early and feeding to keep the infant happy while ignoring infant satiety cues. These practices were also evident in the feeding strategies used by some mothers to achieve a heavier infant, with bigger being regarded as synonymous with health. Insufficient growth, as assessed by the mother, resulted in the addition of formula or early solids, including cereal added to bottles (primarily in the US studies and notably in African- and Latino-American populations). Underweight concern and inappropriate feeding strategies have been described in other studies of young children.⁴³,¹⁷⁵,²³⁷

Overweight was normalised and justified in the family context, with heavier weight status a reflection of parenting success. Poor recognition of child overweight status by parents and preference for “chubbier” children has been well reported in the literature.¹³⁸,²³⁸,²³⁹ An
overall lack of parental concern about obesity and future health in this review is a concern given the early origins of obesity.\textsuperscript{1,240} While it was clear that parents were more concerned with the `here and now' further research to tease out this phenomenon in an effort to support parents to also consider long term health is important. Indeed identifying the social, cultural and familial contextualisation of infant feeding will provide many answers to the practices observed.

Differentiating between infant-driven and mother-driven feeding responses in this review was challenging. While infant cues were used to guide maternal actions, many feeding practices were found to be built on the valued responses of growth, contentment and sleep as described in the review by Dattilo et al. on modifiable risk factors associated with early childhood obesity.\textsuperscript{68} It was apparent that sometimes feeding practices were coping strategies for the parents with feeding not always being used to relieve hunger potentially leading to overfeeding. While responsive infant feeding practices are measured by recognition and timely interactions to signs of hunger and fullness, overriding infant cues to influence behaviour may lead to the development of childhood obesity and future health problems.\textsuperscript{68,80,241,242}

Emotions were also found to play a significant role in the feeding practices documented, with the need for parents to enjoy feeding influencing choices made. In many cases this is gauged by the quantity of food eaten, with successful parenting measured by satisfying infant needs. Indeed the importance of good mothering\textsuperscript{243} was highlighted in many of the papers with feeding behaviours that deviated from medical or cultural expectations justified through maternal coping strategies. This behaviour is viewed as risky under the current medicalized lens of infant feeding with mothers left to morally defend their choices.\textsuperscript{208-210,244} It may also be argued that “professionalisation” of infant feeding has reduced the confidence of mothers around their feeding practices and promoted the move away from the use of non-expert help.\textsuperscript{245}

Maternal beliefs about how to respond to infant feeding were prioritised over knowledge, with many mothers choosing inappropriate feeding practices that appeared to settle their child despite knowing these deviate from recommendations. Variable acceptance of these recommendations and belief that exceptions to their use exist, may partially explain these responses. Health risk aversion for some is secondary to ease of feeding.\textsuperscript{210} Enquiry into elevating long-term health considerations into maternal feeding practices is warranted. Apart from their early safety relevance it was felt the recommendations fail to address the
context in which they are embedded, with intake dependent on parental social and cultural constructs and their capacity to adjust to the additional demands of feeding. Insufficient knowledge and skills to translate healthy eating into action, against a back drop of time and money barriers, were also identified.

With infant feeding practices entwined in generational experience, the pressure for parents to conform to family traditions is immense. Confused by inconsistent advice it is not surprising that many mothers adhered to trusted family customs despite their inconsistencies with infant feeding recommendations. With health professionals also providing conflicting advice it is little wonder that mothers are left confused and doing what works best for them and their infant. No matter the etiology of these feeding practices, many mothers found it difficult to measure up to health professional expectations, leaving some to lie about their feeding and in many cases to align with family beliefs. This behaviour is consistent with Lee’s study of UK mothers’ infant feeding experiences with many left struggling with their maternal identity and ‘opting to go it alone’.

3.2.5.1 LIMITATIONS AND STRENGTHS

This review incorporated the views of many low income mothers representing cultural groups primarily from the US suggesting a limitation to the generalisability of the findings reported. The papers were primarily focused on milk feeding choices and the timing of solids providing limited insights into the navigation of transitional feeding process or the food choices made. Nonetheless, the common themes reported across the included papers would suggest that all mothers face similar challenges in balancing family life and feeding their infants. The use of a peer reviewed methodology for qualitative thematic synthesis assessment and reporting, in addition to the use of a multidisciplinary team of investigators to undertake this synthesis is seen as strength of this review.

3.2.6 CONCLUSION

Many new mothers struggle to identify the best approach to transitioning from milk feeds to family foods. With the ultimate goal of doing what is best for their child, mothers were found to use a variety of cues to guide their infant feeding practices. While these prompts were sourced from either their infant or externally from an array of community supports, the ultimate decision sat with the mother, with feeding practices built on the favourable responses of growth, sleep and happiness.
In this systematic review familial and cultural influences were the basis of many infant feeding decisions. “Good mothering” as measured through cultural and societal expectations was also clearly demonstrated to have a profound effect on feeding. Given that these contextual factors are so much more prominent than a nutritional focus in feeding practices, it is imperative that practitioners acknowledge the emotional challenges and decision making influences faced by all mothers in this feeding window. Research to further investigate parental measures of infant feeding success to better understand feeding decisions and to strengthen early childhood obesity prevention interventions is recommended.
### Table 3.2: Study details of the journal papers used in the systematic literature review

<table>
<thead>
<tr>
<th>Author, Year published &amp; Country</th>
<th>COREQ Score</th>
<th>Aim</th>
<th>Method &amp; Sample</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afflerback et al (Afflerback et al. 2013), 2013, US</td>
<td>19</td>
<td>To examine meanings attached to infant food and feeding-related consumer items.</td>
<td>14 in-depth interviews - mostly white, middle class women with their first child 3-12 mths.</td>
<td>Intense mothering – baby led feeding; health driven product choices; convenience &amp; price influence choices; good mother meets needs.</td>
</tr>
<tr>
<td>Anderson et al (Anderson et al. 2001), 2001, UK</td>
<td>21</td>
<td>To identify factors influencing weaning decisions.</td>
<td>5 focus groups - 29 mothers (mean 27 yrs) with babies (mean 13 wks), 10 feeding solids (mean 11.6 wks).</td>
<td>Solids timing baby led; feed to settle; trial and error; emotional journey; decisions made on child &amp; not guidelines; inconsistent advice.</td>
</tr>
<tr>
<td>Arden (Arden 2010), 2010, UK</td>
<td>14</td>
<td>To examine the factors after the change in the recommendations to delay the introduction of solid foods until 6 months of age</td>
<td>Open-ended questions from a cross-sectional electronic survey - 105 mostly white, educated mothers, 22-45 yrs (mean 32.3) with child 26-155 wks (mean 80 wks).</td>
<td>Baby led feeding; feed to settle; maternal instinct; weaning stressful; pressure from family; competition from peers; inconsistent advice.</td>
</tr>
<tr>
<td>Bramhagen et al (Bramhagen et al. 2006), 2006, Sweden</td>
<td>20</td>
<td>To describe parents’ experiences concerning feeding situations.</td>
<td>18 in-depth interviews - mothers of 1 yr olds who differed in age, education, ethnicity and number of children.</td>
<td>Parent success based on child intake; positive feeding experience parent more responsive, negative parent more controlling.</td>
</tr>
<tr>
<td>Chaidez et al (Chaidez et al. 2011), 2011, US</td>
<td>20</td>
<td>To identify behaviours, influences and attitudes that reflects feeding styles in Latino parents with young children.</td>
<td>18 in-depth interviews - 14 Mexican born mothers, 4 US born, 21-36 yrs (mean 26 yrs) and toddlers, 12-46 mths (mean 20).</td>
<td>Indulgent baby led feeding; weight an indicator of successful parenting; poor guideline knowledge; follow family advice.</td>
</tr>
<tr>
<td>Corbett (Corbett 2000), 2000, US</td>
<td>20</td>
<td>To explore practices as well as the values, attitudes and beliefs associated with infant feeding of low income black women.</td>
<td>8 interviews during infant’s first year of life - 10 low income black mothers (18-27 yrs) with infants enrolled in Medicaid and WIC program.</td>
<td>Baby led feeding; feed to settle; early weaning and adding cereal and strained foods to bottle feeds; generational practices; poor support.</td>
</tr>
<tr>
<td>Heinig et al (Heinig et al. 2006), 2006, US</td>
<td>17</td>
<td>To understand why non optimal infant-feeding practices occur among low-income women despite WIC support.</td>
<td>8 focus groups –28 English-speaking and 37 Spanish-speaking WIC program mothers with infants 4-12 mths.</td>
<td>Baby led feeding; feed to modify behaviour; feed to fill; higher infant weight sign of health; mixed support, advice not always followed.</td>
</tr>
<tr>
<td>Higgins (Higgins 2000), 2000, US</td>
<td>22</td>
<td>To examine the cultural beliefs and practices that influence feeding practices.</td>
<td>Observation followed by 3 interviews over a year - 10 Puerto Rican participants (5 mothers, 2 grandmothers and 3 fathers) with infant under 4 mths.</td>
<td>Big is beautiful, thinness a reflection of poor parenting; overfeeding common; food added to bottle to boost weight; family taught feeding.</td>
</tr>
<tr>
<td>Hodges et al (Hodges et al. 2008), 2008, US</td>
<td>13</td>
<td>To examine responsiveness of maternal feeding to infant cues and other factors in initiation and termination of feeding.</td>
<td>Open-ended questions from a cross-sectional observational study - 71 ethnically diverse mothers of infants at 3, 6 or 12 mths.</td>
<td>Infant cues guide feeding decisions, less salient as child ages; overt cues mostly used with risk of over/underfeeding.</td>
</tr>
<tr>
<td>Horodynski et al (Horodynski, M et al. 2007), 2007, US</td>
<td>23</td>
<td>To assess low income mothers knowledge, attitudes, beliefs and family norms about infant feeding.</td>
<td>6 focus groups –23 low income mothers (12 Caucasian, 9 Black, 2 biracial), 17–41 years (mean 28 yrs) with infants 3 weeks-12 mths.</td>
<td>Healthy infant when happy and eating well; feed to settle; skeptical of guidelines harm / exceptions; family pressure to feed early.</td>
</tr>
<tr>
<td>Reference</td>
<td>Year</td>
<td>Country</td>
<td>Participants</td>
<td>Focus</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------</td>
<td>-----------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Horodynski et al (Horodynski, MA et al. 2009), 2009, US</td>
<td>21</td>
<td>To ascertain expectations and experiences with mealtimes and feeding of toddlers of low income African American mothers.</td>
<td>2 focus groups - 27 low income African American mothers (19-50 yrs) of toddlers (12-36 mths).</td>
<td>Healthy when eat well and happy; feed to fill not for health; cost a barrier to healthy foods.</td>
</tr>
<tr>
<td>Kahlor et al (Kahlor et al. 2011), 2011, US</td>
<td>17</td>
<td>To explore the nutritional challenges parents face in raising their children.</td>
<td>6 focus groups – African American (7 mothers &amp; 9 fathers), Hispanic (8 mothers &amp; 6 fathers), and Caucasian (7 mothers and 6 fathers).</td>
<td>Cultural, family, time and money challenges to raising healthy children; need strategies to maintain traditions and build food preparation skills.</td>
</tr>
<tr>
<td>Kaufman et al (Kaufman &amp; Karpati 2007), 2007, US</td>
<td>18</td>
<td>To understand the childhood obesity epidemic among Latino sub-group.</td>
<td>Individual &amp; group interviews and participant observation - 12 mothers, 3 fathers/boyfriends and extended members from 12 families.</td>
<td>Overweight acceptable if health OK; heavier child safer; feed to settle &amp; keep happy; family intimacy expressed through food.</td>
</tr>
<tr>
<td>Lovelace et al (Lovelace &amp; Rabiee-Khan 2013), 2013, UK</td>
<td>17</td>
<td>Investigated influences on the diets of young children in families on a low income.</td>
<td>11 in-depth interviews - mothers 19-25 yrs of pre-school children (mean age 22 mths).</td>
<td>Early feeding driven by infant hunger; insufficient knowledge or skill to translate healthy eating into practice; trust commercial produce aimed at infants.</td>
</tr>
<tr>
<td>McDougall (McDougall 2003), 2003, UK</td>
<td>13</td>
<td>To determine factors or influences predisposed to early weaning and principle sources of advice on weaning.</td>
<td>5 focus groups, 10 individual in-depth interviews and self-reported questionnaires with open ended questions - first time mothers (16-41yrs) of infants.</td>
<td>Unrealistic expectations of sleep; feed to settle; family pressure to wean early; conflicting advice.</td>
</tr>
<tr>
<td>McGarvey et al (McGarvey et al. 2006), 2006, US</td>
<td>14</td>
<td>To determine parental perceptions, attitudes, knowledge, beliefs and barriers to infant and child feeding practices and preferred information sources.</td>
<td>4 focus groups – 6 African American, 8 Caucasian, 6 Hispanic and 5 Vietnamese mothers from either WIC or Head Start programs.</td>
<td>Immediate health/appetite more important than weight issues; food used to shape behaviour; solids introduced early and overfeeding common; family taught feeding.</td>
</tr>
<tr>
<td>Nielsen et al (Nielsen et al. 2013), 2013, Denmark</td>
<td>16</td>
<td>To investigate parental concerns, attitudes and practices during earlier &amp; later phases of complementary and young child feeding.</td>
<td>8 focus group - 45 mothers of children 7-13 mths, groups were segmented according to the child age and maternal educational level.</td>
<td>Immediate health feeding focus; feed to satisfy hunger and promote sleep; guidelines used for safety early, less relevant as child ages.</td>
</tr>
<tr>
<td>Omar et al (Omar et al. 2001), 2001, US</td>
<td>18</td>
<td>To assess nutritional needs and barriers in establishing healthy eating habits in toddlers.</td>
<td>3 focus groups were conducted with rural, low-income caregivers – 12 males 17-42 yrs (mean 27 yrs) and 8 female 22-48 yrs (mean 30 yrs), mostly Caucasian.</td>
<td>Time challenges to food preparation; food consumption focused on quantity and not quality; limited nutrition knowledge; family beliefs reign; early feeding endorsed.</td>
</tr>
<tr>
<td>Redsell et al (Redsell et al. 2010), 2010, UK</td>
<td>21</td>
<td>To explore parental beliefs concerning infant size, growth and feeding behaviour.</td>
<td>6 focus groups in different demographic areas - 36 female &amp; 2 male, 19-45 yrs (mean 30.1 yrs) with infants 1-11 mths (mean 5.51 mths).</td>
<td>Bigger baby is healthier; feed to settle; unconvinced by 6 mths solids guideline; family pressure to top up feeds and wean early.</td>
</tr>
<tr>
<td>Schwartz et al (Schwartz et al. 2013), 2013, France</td>
<td>19</td>
<td>To describe practices, attitudes and experiences of French mothers in relation to weaning with a focus on vegetables.</td>
<td>4 focus groups and 3 individual in-depth interviews - 18 mothers 32.2 ± 4 yrs from mainly higher socio-economic groups.</td>
<td>Baby led feeding over inconsistent advice; food used for pleasure and to develop palate; cultural practice of adding food to bottle.</td>
</tr>
<tr>
<td>Synnott et al (Synnott et al. 2007), 2007, Germany, Italy,</td>
<td>16</td>
<td>To gain insight into parental perceptions of infant feeding practices in 5 European countries</td>
<td>15 focus groups (3 per centre/country) - 108 parents with infants up to 12 mths.</td>
<td>Baby led feeding; formula &amp; early solids to influence behaviour; convenience over...</td>
</tr>
<tr>
<td>Scotland, Spain and Sweden</td>
<td>countries.</td>
<td>healthier food options; variable guideline acceptance; variable health and lay influence.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waller et al (Waller et al. 2013), 2013, US</td>
<td>18 To explore interactions between mothers and infants that may influence development of feeding practices.</td>
<td>15 in-depth phone interviews - low income, primiparous mothers in their mid-20s with infants &lt;12 months (mean 5.2 mths). Guessing game initially based on positive responses to feeding (e.g. growth, sleep) which overshadow guidelines; overfeeding risk.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zehle et al (Zehle et al. 2007), 2007, Australia</td>
<td>15 To explore childhood obesity through mothers’ perceptions, attitudes, beliefs, and behaviours.</td>
<td>16 in-depth interviews - primiparous mothers 25-36 yrs, range of socioeconomic and cultural backgrounds, 9 ethnic groups, mostly university educated with children 0-2 years. Baby led feeding; immediate health and child contentment focus; unconcerned obesity risk; salience of guidelines; culturally loaded advice; health advice early helpful, later prescriptive.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 3.3: Study reporting assessment based on COREQ checklist

<table>
<thead>
<tr>
<th>Reporting criteria</th>
<th>Number of studies reporting criteria (n=23)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research team and reflexivity</strong></td>
<td></td>
</tr>
<tr>
<td>Interviewer identification</td>
<td>21</td>
</tr>
<tr>
<td>Credentials</td>
<td>21</td>
</tr>
<tr>
<td>Occupation</td>
<td>8</td>
</tr>
<tr>
<td>Gender</td>
<td>17</td>
</tr>
<tr>
<td>Experience and training</td>
<td>3</td>
</tr>
<tr>
<td>Relationship established</td>
<td>2</td>
</tr>
<tr>
<td>Participant knowledge of interviewer</td>
<td>1</td>
</tr>
<tr>
<td>Interviewer characteristics</td>
<td>4</td>
</tr>
<tr>
<td><strong>Study design</strong></td>
<td></td>
</tr>
<tr>
<td>Methodological theory identified</td>
<td>10</td>
</tr>
<tr>
<td>Sampling method</td>
<td>23</td>
</tr>
<tr>
<td>Method of approach</td>
<td>22</td>
</tr>
<tr>
<td>Sample size</td>
<td>23</td>
</tr>
<tr>
<td>Number/reasons for non-participation</td>
<td>3</td>
</tr>
<tr>
<td>Setting of data collection</td>
<td>15</td>
</tr>
<tr>
<td>Presence of non-participants</td>
<td>6</td>
</tr>
<tr>
<td>Description of sample</td>
<td>23</td>
</tr>
<tr>
<td>Interview guide</td>
<td>15</td>
</tr>
<tr>
<td>Repeat interviews</td>
<td>2</td>
</tr>
<tr>
<td>Audio/visual recording</td>
<td>3</td>
</tr>
<tr>
<td>Field notes</td>
<td>10</td>
</tr>
<tr>
<td>Duration</td>
<td>14</td>
</tr>
<tr>
<td>Data saturation</td>
<td>2</td>
</tr>
<tr>
<td>Transcripts returned to participants</td>
<td>0</td>
</tr>
<tr>
<td><strong>Analysis and findings</strong></td>
<td></td>
</tr>
<tr>
<td>Number of data coders</td>
<td>20</td>
</tr>
<tr>
<td>Description of coding tree</td>
<td>16</td>
</tr>
<tr>
<td>Derivation of themes</td>
<td>23</td>
</tr>
<tr>
<td>Software</td>
<td>9</td>
</tr>
<tr>
<td>Participant checking</td>
<td>1</td>
</tr>
<tr>
<td>Participant quotations presented</td>
<td>22</td>
</tr>
<tr>
<td>Data and findings consistent</td>
<td>23</td>
</tr>
<tr>
<td>Clarity of major themes</td>
<td>23</td>
</tr>
<tr>
<td>Clarity of minor themes</td>
<td>14</td>
</tr>
</tbody>
</table>
3.3 SUMMARY

The purpose of this systematic literature review was to identify the factors mothers perceived as influencing their transitional infant feeding practices.

The review found that much of the dialogue in infant feeding was related to milk feeding. The transitional feeding period discourse was dominated by the timing of the introduction of solid foods rather than the process and the foods chosen. Many papers described aspects of infant feeding but failed to identify why these choices were made. The lack of clarity around the basis of infant feeding decisions provides grounds for further qualitative research in this area. The information sourced from this review was used to inform the development of some of the questions in the maternal questionnaire (phase 2, Chapters 6 and 7) and provided guidance for the maternal interviews (phase 3, Chapter 8) to assist in answering the thesis research questions. Chapter 4 provides an outline of the thesis research and the methodology for each of the three phases.
4.1 INTRODUCTION

‘Research is creating new knowledge.’

Neil Armstrong

Chapter 4 presents the methodology on which this thesis is based. In particular, the theoretical rationale for the research design is discussed, as well as the major research questions and objectives for each research phase.

4.2 RESEARCH DESIGN

A review of the current early childhood obesity prevention literature suggests there is a lack of clarity about how transitional infant feeding practices impact on infant dietary intake and body weight. In addition, the reasoning behind parental feeding decisions is poorly understood. This research aimed to explore the knowledge and experiences of researchers, and mothers of infants in order to contribute to the current literature and provide guidance to interventions and services focused on the early prevention of obesity in childhood (EPOCH).

The research design encompassed an sequential explanatory three phase mixed methods strategy where the outcomes of each phase were used to inform the development of subsequent stages. The project used a strengths based approach to understand the enablers to healthy infant feeding decisions and practices and to identify the key elements for influencing behaviour. The research started by talking with researchers involved in EPOCH trials in Australia and New Zealand (phase 1). Phase 2 involved an infant feeding survey of mothers with infants aged 5-13 months, and phase 3 encompassed conversations with a sub-sample of phase 2 mothers. All phases contributed to answering the thesis research questions as presented in Figure 4.1.
4.3 MIXED METHODS

Originating in the late 1950s with major works arising in the 1990s, mixed methods methodology is now well represented in the literature.\textsuperscript{246,247} As described by Pope,\textsuperscript{248} while sometimes confused with ‘multi-methods’ or ‘multiple methods’, mixed methods is the integration of quantitative and qualitative research approaches to access a broader range of data to enhance the understating of the phenomenon under investigation. Like Silverman,\textsuperscript{249} Pope acknowledges there are strengths and weaknesses of each approach separately, however, they argue that the combination of approaches can work towards compensating for these deficiencies and provide a richer understanding of the complex results. Both researchers caution that the research questions and not the interests of the researcher or funding bodies should guide the use of the methodology.

Mixed methods methodology also fits well with the pragmatic philosophical worldview underpinning this thesis, which is practice oriented and utilises all research approaches available to understand the research problems.\textsuperscript{246,247} Pragmatism allows the researcher freedom from any one system of philosophy to choose the research methods necessary to best answer the research questions. It acknowledges the multiple contexts in which
research takes place, and allows the use of multiple methods and assumptions to explain real-world practices.

The three phase research undertaken in this thesis follows a sequential qualitative, quantitative, qualitative process. The initial interviews with researchers investigated their understanding of factors influencing maternal feeding decisions, findings from their research and knowledge gaps related to early obesity interventions, which informed the subsequent phases’ lines of enquiry. The maternal survey provided an overview of current feeding practices, knowledge and resources as well as weight concerns of mothers of infants living in Queensland. The follow-up maternal interviews built on the survey results to provide a richer comprehension of parental infant feeding practices including the contextual environments in which they occur.

4.4 GUIDING THEORETICAL FRAMEWORKS

The ecological framework proposed by Birch and Ventura provides a leading explanation for the etiology of childhood obesity, with their highly cited research on infant feeding practices providing current intervention guidance. It suggests that a child’s weight is a product of the child’s dietary and activity patterns that are influenced by the family environment, which is embedded in broader community and demographic domains. This framework which considers the pragmatic approaches to infant feeding along with the social and cultural contexts in which they develop, provided an array of touchpoints for enquiry during both the quantitative and qualitative phases of this thesis.

Regarding the social and cultural contexts, writers such as Green, Lee, Knaack and Murphy have raised the ideology of motherhood, suggesting that there are unspoken rules and regulations about how to mother, defining who is a ‘good’ versus a ‘bad’ mother. More recently the concept of intensive mothering, centred on the labour intensive and self-sacrificing care of their children, has raised mothering expectations collectively (in society) as well on a personal level. Mothers experience anxiety and guilt for not meeting this ideology of motherhood. Green suggests that the ‘good enough mother’ which allows the child to adapt to the mother’s failures, and the concept of ‘collective parenting’ which recognises that ‘it takes a village to raise a child’ provides for happier, less stressful parenting. How motherhood impacts on infant feeding and maternal infant growth expectations has been discussed in relation to breastfeeding and infant formula use, and is explored further in conversations around transitional feeding with mothers in the final qualitative phase of this thesis.
The moralisation of motherhood and maternal identity is entangled in the medicalisation of infant feeding and the risk of not following authoritative advice. Under the ‘new paradigm of health’, the sociological association between eating and risk, suggests that mothers need to adopt feeding practices that minimize risk to their child. This thesis considered these theories of health and risk along with the ideology of motherhood in investigating the socio-cultural and psychological dimensions of maternal transitional infant feeding experiences.

4.5 PHASE 1:

To build on the information about infant feeding and early childhood obesity prevention strategies found in the literature and to provide a local context, researchers involved in key EPOCH interventions in Australia were identified through the literature. This initial exploratory stage was undertaken to guide the subsequent study phases and identify future research investment and knowledge requirements.

4.5.1 RESEARCH QUESTIONS:

RQ1: What are the issues and knowledge gaps of current EPOCH interventions?

RQ5: What are the optimal components of EPOCH interventions and support services?

4.5.2 OBJECTIVES

1. To explore researcher understanding of parental infant feeding decisions.
2. To determine what has worked well in EPOCH studies.
3. To identify knowledge gaps and future research directions.

4.5.3 METHODOLOGY

A qualitative research approach was selected as it provided the investigator the opportunity to systematically collect data about the researchers' work in early childhood nutrition and explore their appreciation of influences on maternal infant feeding decisions. The researchers participated in individual interviews. Personalised interviews were selected over focus group discussions to enable each respondent to speak freely about their research experiences and understanding behind parental feeding practices without the competitive environment of a group situation with fellow researchers.
4.5.4 SAMPLE & RECRUITMENT

One researcher from each of the three key Australian EPOCH trials were identified through the literature and approached to be interviewed. An additional researcher involved in the revision of the Australian Infant Feeding Guidelines\(^9\) was also contacted given her command of the literature and ongoing research commitment in supporting healthy infant feeding.

A recruitment email was sent to each researcher in December 2013, along with the researcher information sheet and the consent form (Appendix 1). The email offered the researcher to nominate their preferred means of interview. Subsequent emails were exchanged to arrange timing of interview in February 2014 and provide call-in details for recording purposes.

As part of the interview each researcher was asked to identify other researchers in the area that should also be interviewed as part of this study. Researchers from the three identified interventions and the Guidelines review were mentioned along with an additional New Zealand counterpart who was subsequently contacted and interviewed by telephone. This snowball sampling approach\(^{252,253}\) ensured that a researcher from all Australian and New Zealand EPOCH trials were included. While the sample for this research phase is small and has limited generalisability, because it does include leading experts from the review of the Infant Feeding Guidelines and each of the EPOCH RCTs in Australia, it reflects the best available perspectives on infant feeding.

4.5.5 METHODS

As the research experts were spread across Australia and New Zealand it was not possible to conduct face-to-face interviews. Even though digital options of video conferencing or Skype calling were available to enable body language to also be recorded, the interviews were eventually conducted over the telephone based on the researchers’ preferences and ease of access to supporting equipment. Interviews were conducted between 29 January and 20 February 2014.

Interviews were based on a semi-structured interview guide (Appendix 4) which included a list of open ended questions to guide the interview conversation. This approach allowed the interviewer to guide the conversation around the phase 1 objectives while also providing an opportunity to probe further based on the participants’ responses.
Chapter 4: Research Design

The interviews were digitally recorded by an external telephone provider (Chorus Call: www.choruscallaustralia.com.au) and the digital files transcribed by an external data transcribing service (DAATS Pty Ltd: www.daats.com.au). Verbatim approach to transcribing was chosen over conversational to capture every word, including joining responses such as ‘Mmm’, ‘umm’ and ‘yep’ which may have influenced the direction or outputs of the conversation.

4.5.6 ANALYSIS

Thematic analysis as described by Pope254 and Fade255 was used to identify emerging themes and sub-themes across the data. The level of analysis in this phase was descriptive. The analysis process involved multiple readings of the transcripts followed by the manual line-by-line coding of the text. Coded text was then extracted and organised into related areas to construct descriptive themes. The text was then grouped into sub-themes to best describe parental feeding practices, intervention learnings and knowledge gaps. The final descriptive mapping of the main themes was subsequently discussed multiple times with the research supervisors of this thesis over an extended period of several months to reach consensus about the main constructs.

4.6 PHASE 2:

A quantitative survey approach was undertaken to establish the transitional infant feeding practices and supporting factors for mothers living in Queensland. While similar datasets were available nationally109 and statewide,81 they primarily focused on evaluating compliance to the Guidelines.9 This survey provided new data on how food was being offered, Guideline knowledge, support and infant weight concerns. The survey participants also provided the sample from which a subsample was drawn for a qualitative measure of the infant feeding decisions made by the mothers (phase 3).

4.6.1 RESEARCH QUESTIONS:

RQ2: Do parental concerns about infant weight influence infant feeding practices, infant dietary intake and body weight?

RQ3: What resources do mothers living in Queensland use to inform their infant feeding knowledge and practices?

RQ5: What are the optimal components of EPOCH interventions and support services?
4.6.2 OBJECTIVES:

1. To identify infant feeding knowledge and current infant feeding practices of mothers living in Queensland.
2. To explore concerns about childhood obesity and the rationale for infant feeding practices of mothers living in Queensland.
3. To identify the resources that guide infant feeding practices of mothers living in Queensland.

4.6.3 METHODOLOGY

A questionnaire was used as it provided a relatively quick and cheap way to gather objective data from a relatively large pool of individuals. It provides the numerical data to quantify or measure relationships already described in different populations, or to predict new relationships, while also being able to control for the confounding influence of other variables. The weaknesses of this approach is that the questions asked may be misinterpreted by the participants and that this detached line of enquiry may miss the phenomena occurring due to the predetermined nature of the questionnaire and theories to be tested. The follow-up interviews with mothers in phase 3 were seen to go part of the way to overcome these limitations by providing the avenue to confirm their survey responses and provide the context around the person journey of feeding their infants.

4.6.4 SAMPLE AND RECRUITMENT

The quantitative survey (i.e. FAB survey) targeted mothers of infants aged 5 to 13 months. Mothers were chosen as they have been identified as the prime carers of infants and are primarily responsible for family food. The age group of the infants was based on capturing fresh transitional feeding experiences, moving from exclusive milk feeding at around 6 to family foods by12 months as recommended by the Guidelines.

The study aimed to include mothers with a range of age, education, social and ethnic backgrounds that were representative of the general population. The sample size was calculated based on the number of independent variables, with 15 participants for each independent variable required to allow appropriate analysis. Based on the variables in Table 4.2, a maximum of 18 independent variables were identified to be analysed per dependent variable, resulting in a minimum sample size of 270. This sample size is consistent with other infant feeding studies that have been reported in the literature.
Recruitment processes were focused in early childhood settings within South Eastern Queensland to permit the follow-up face-to-face phase 3 maternal interviews. Socio Economic Indexes for Areas\textsuperscript{257} (SEIFA) was used to identify these settings to ensure access to mothers from a range of social and economic backgrounds. Given the challenge of recruiting disadvantaged families\textsuperscript{29}, services in lower SEIFA quintiles along with supported young parenting groups were targeted. Early childhood settings for this study were classified as any community services accessed by mothers postnatally. This initially included playgroups and supported parenting groups, and later expanded to include a major childcare chain (i.e. Good Start) and a local council immunisation clinic.

The recruitment process started in July 2014 with overarching early childhood support agencies such as Playgroup Queensland, Mission Australia and Save the Children contacted to introduce the study and identify a possible gatekeeper within the service to assist in facilitating recruitment. A snowballing process was also used to identify smaller service providers to approach.

A Feeding A Baby (FAB) Facebook page was established in September 2014 to provide a platform for mothers to access the survey online and for early childhood support agencies to promote the survey to their audience to encourage participation. Depending on the resources of the agency, the study was advertised through their websites, newsletters and/or programs. The principal researcher was also invited to attend some groups to promote the study, and in some cases, assist mothers to complete the questionnaire.

Other electronic platforms such as major parenting forums accessed by mothers living in Queensland were used to promote the study (e.g. The Bub Hub, Babycenter Australia). To encourage participation, all mothers who completed the survey were eligible to enter into a draw to win a AUD$100 Coles supermarket gift voucher.

### 4.6.5 METHODS

#### 4.6.5.1 PARTICIPANT ACCESS TO QUESTIONNAIRE

The questionnaire was available electronically through SurveyMonkey\textsuperscript{258} or in hard copy from September 2014 to June 2015. Participants could complete the questionnaire online using the link provided on the FAB Facebook page or in the circulated information, or by contacting the participating service or principal investigator to obtain a paper copy to fill out and return by free post. Alternatively, participants could give permission to be contacted by
the principal investigator to receive telephone assistance to complete the questionnaire. All participants received an information sheet (Appendix 2) and completion of the questionnaire was deemed as informed participant consent.

4.6.5.2 QUESTIONNAIRE

The questionnaire (Appendix 5) was developed based on validated survey items identified through the literature and informed by phase 1. Questionnaire topics included infant dietary intake (breastmilk, infant formula, other milks, solid foods, fruit, vegetables, takeaways, sugar sweetened beverages); parental feeding styles (warmth, hostility) and practices (restriction, pressure to eat, monitoring); food access; reasons for feeding decisions; transitional feeding resources and support; knowledge of the Guidelines; infant weight concerns (overweight, underweight); parental self-efficacy and feeding confidence; self-reported anthropometric data for mother and child (weight, length or height); and demographic information (age, ethnicity, family structure, employment status, education, annual household income, residential suburb and postcode).

The validated early childhood feeding and parenting questionnaires from which items were drawn included the Child Feeding Questionnaire (CFQ), the Longitudinal Study of Australian Children (LSAC), the Nutrition Education Aimed at Toddlers study (NEAT), the Australian National Infant Feeding Survey (ANIFS), the Queensland Health Infant Feeding Survey (QHIFS), and the Australian Census.

Questions on parental concern about their child becoming overweight and parental feeding practices such as restriction, pressuring and monitoring of food were sourced from the CFQ. Parental underweight concern was added by replacing overweight with underweight in the above CFQ question. While the CFQ was designed for use in children aged 2-11 years most questions were applicable for infants who had commenced solids. However, to emphasise the feeding practice over the food choice, similar worded questions were grouped. The eight restriction questions were reduced to four (e.g. `offering sweets or favourite foods in exchange for good behaviour' were grouped as `offering food in exchange for good behaviour'). All four pressure questions were included, while the three monitoring questions were combined to one (i.e. `keep track of the high sugar or high fat foods'). The Cronbach’s alpha for the four pressure items was 0.67, indicating reasonable internal consistency. While the Cronbach’s alpha for the four restriction items was only 0.38, removal of the item with a corrected item-total correlation of <0.2 ('I intentionally
keep some foods out of the reach of my child’) would have significantly increased this to 0.51. While this question is more of an imperative for mothers of older children who may actively source food for themselves (i.e. the CFQ target group), it was left in as some infant’s less than 12 months of age may also be able to actively source their own food. It should also be noted that while the Cronbach’s alpha is widely used to test reliability, its value is reduced with small numbers of items, thus making it a less reliable measure.263

The LSAC global parental self-efficacy question was used to measure parental self-efficacy, while the NEAT self-efficacy questions were used to measure feeding confidence. Parental warmth and hostility LSAC questions were used to measure parental style. While these questions only measured the responsiveness dimension of parental style, it has been argued that the effect of the demandingness dimension is dependent on the responsiveness dimension which has been used alone in another study to measure parental style.58 Questions from the ANIFS and QHIFS were used to determine infant dietary intake in addition to feeding decision and supporting resources. The final questionnaire measures, questions, responses and management of data analysis are captured in Table 4.1.

In total there were 89 items in the survey. The questionnaire was piloted on a small group of mothers to refine the questions and to keep the time for completion down to between 10-15 minutes.

### 4.6.5.3 DATA MANAGEMENT & CLEANING

Participant data received by hard copy (n=26) were entered into SurveyMonkey258 for ease of managing one database. On completion of the survey period, all the participant data (n=290) were exported from SurveyMonkey into a Microsoft Excel (2010) spreadsheet before uploading into SPSS 23. Two respondents were removed from the spreadsheet transferred to SPSS as they did not provide any infant feeding data.

Once in SPSS the ages of the infants (in months) and mothers (in years) were calculated using the difference in time between the date of birth and the survey completion date. Imperial data for anthropometric body measurements were converted to metric measures using a website metric convertor.264 The World Health Organisation’s Anthro software265 used infant length and weight measurements to produce birth and current z scores for weight-for-age, weight-for-height and body mass index (BMI)-for-age. Maternal BMI was calculated and classified using the international cutoffs for underweight (<18.50),
normal/healthy weight (18.50-24.99), overweight (25-29.99) and obese (≥30). Further details about individual variables can be found in Table 4.1 and in the methods section of papers in Chapters 6 and 7.

Cleaning of the data was carried out in SPSS. This involved ensuring that:

- the infant’s age was between 5 and 13 months
- there were acceptable length/height and weight measurements for infant and mother (based on growth and BMI charts [≥+/- 3z for infants] checked for outliers)
- missing data were coded as 999 for most items
- invalid responses such as multiple responses for one response items or a number > 10 for items 68-72 were coded as missing data
- missing values for Guideline knowledge were coded as incorrect answer
- missing values for data used to construct continuous variables were replaced by a mean response for the item (e.g. feeding practices)
- string variables were converted to numerical responses to allow for analysis
- categorical variable data were grouped and coded as outline in on Table 4.1.
<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Number of questions</th>
<th>Response scale</th>
<th>Data management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant dietary intake – milks, other drinks and introduction of solids(^{81,111})</td>
<td>Has your child ever been given any (item) regularly (daily or almost daily)? Items: breast milk, infant formula, follow-on formula, plain water, cow’s milk, other milks, fruit juice, sweetened drinks, solid or semi-solid food</td>
<td>1 for each item</td>
<td>Yes – start age=1 Not regularly – age first given=2 No – never=3</td>
<td>Continuous: months for breastfeeding duration and timing of solids introduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Categorical: BF ≥6mths=1 BF &lt;6mths=0 Solids &gt;4.0mths=1 Solids ≤4.0mths=0</td>
<td></td>
</tr>
<tr>
<td>First solid food(^{81,111})</td>
<td>What was the first solid or semi-solid food you gave your child (one only)? 1 7 food options, 1 other-specify, 1 don’t remember</td>
<td>1</td>
<td></td>
<td>Categorical: Baby cereal=1 Other responses=0</td>
</tr>
<tr>
<td>Fruit and vegetables(^{81,111})</td>
<td>How many serves of (item) does your child usually eat each day? Note: 1 vegetable serve = 1 tablespoon cooked vegetables or legumes e.g. baked beans 1 fruit serve = 1 tablespoon mashed/diced/tinned fruit or 1 teaspoon of dried fruit</td>
<td>1 for each item</td>
<td>Meets required serves=1, does not meet=0, does not eat (item) at all=0, does not eat solids yet=999</td>
<td>Categorical: Meet serves=1 Does not meet=0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take-away food(^{81,111})</td>
<td>How often, on average, does your child have meals or snacks such as burgers, pizza, chicken or chips from places like McDonalds, Hungry Jacks, Pizza Hut, Red Rooster or take-away food places?</td>
<td>1</td>
<td>Daily=0, weekly=0, monthly=0, rarely=1, never=1</td>
<td>Categorical: Rare/never=1 Other responses=0</td>
</tr>
<tr>
<td>Information sources</td>
<td>Where do you get information about feeding your child solid foods? (Multiple answers)</td>
<td>1</td>
<td>Extensive list including family, health providers, print and electronic media</td>
<td>Categorical for each item: Use=1 Non-use=0</td>
</tr>
<tr>
<td>Guideline knowledge</td>
<td>Knowledge around recommended time period for exclusive breastfeeding, any breastfeeding, infant formula, introduction of solids, first food</td>
<td>5</td>
<td>Time in weeks or months, food item for first food Correct=1 Incorrect=0</td>
<td>Continuous: mean of 5 items Range=1-5</td>
</tr>
<tr>
<td>Infant age</td>
<td>What is the date of your child’s birth?</td>
<td>1</td>
<td>Age converted to months based on date of response.</td>
<td>Continuous</td>
</tr>
</tbody>
</table>
### Infant height and weight

Birth and current height and weight measurements. Using WHO Anthro<sup>2005</sup> converted into z-scores: Weight-for-age (WAZ), Weight-for-length (WHZ), BMI-for-age (BAZ)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Categorical underwt:</th>
<th>Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underwt:</td>
<td>&lt;-1.65</td>
<td>0</td>
<td>Underwt &lt;-1.65 = 1 Not ≥ -1.65 = 0</td>
</tr>
<tr>
<td>Norm:</td>
<td>-1.65 to 1.04</td>
<td>1</td>
<td>Not ≤ 1.04 = 0</td>
</tr>
<tr>
<td>Overwt:</td>
<td>&gt;1.04</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Categorical overwt:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Overwt:</td>
<td>&gt;1.04</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Norm:</td>
<td>-1.65 to 1.04</td>
<td>0</td>
<td>Not ≤ 1.04 = 0</td>
</tr>
<tr>
<td>Underwt:</td>
<td>&lt;-1.65</td>
<td>0</td>
<td>Underwt &lt;-1.65 = 1 Not ≥ -1.65 = 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean of 5 items Range=1-5</td>
</tr>
</tbody>
</table>

### Description of infant weight<sup>18</sup>

Based on perceived child weight question: How would you describe your child's weight?

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Categorical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underwt:</td>
<td>&lt; -1.65</td>
<td>1</td>
</tr>
<tr>
<td>Not ≥ -1.65</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

### Infant weight concern<sup>18</sup>

How concerned are you about your child becoming (item)?

**Item:** overweight, underweight

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Categorical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconcerned</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A little concerned</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Concerned</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Fairly concerned</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Very concerned</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

### Feeding practice: restriction (R), pressure-to-eat (P)<sup>18</sup>

R1: I have to be sure that my child does not eat too much
R2: I intentionally keep some foods out of the reach of my child
R3: I offer my child food in exchange good behaviour (e.g. dessert if meal is eaten, snack if child stops crying)
R4: If I do not guide or regulate my child’s eating, he/she would eat more than they should
P1: My child should always eat all the food on his/her plate
P2: I have to be especially careful to make sure my child eats enough
P3: If my child does not want to eat I try to get him/her to eat anyway
P4: If I did not guide or regulate my child’s eating, he/she would eat much less than they should

<table>
<thead>
<tr>
<th>Item</th>
<th>Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean of 5 items Range=1-5</td>
</tr>
</tbody>
</table>

### Feeding practice: monitoring<sup>18</sup>

How much do you keep track of the high sugar or high fat foods that your child eats?

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Categorical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Rarely</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mostly</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

---

<sup>18</sup>Based on Child Development Questionnaire

Chapter 4: Research Design
| **Parenting style: warmth**<sup>259</sup> | Express affection by hugging, kissing and holding your child; Hug or hold your child for no particular reason; Tell your child how happy he/she makes you; Have warm, close times together with your child; Enjoy doing things with your child; Feel close to your child both when he/she is happy and when he/she is upset | 6 | Never=1, rarely=2, sometimes=3, mostly=4, always=5 | Continuous: mean of 5 items Range=1-5 |
| **Parent style: hostility**<sup>259</sup> | I have been angry with my child; I have raised my voice with or shouted at my child; When my child cries, he/she gets on my nerves; I have lost my temper with this child; I have left this child alone in his/her bedroom when he/she was particularly irritable or upset | 5 | Number range 0 (not at all) to 10 (all the time) | Continuous: mean of 5 items Range=1-10 |
| **Feeding confidence**<sup>260</sup> | I give my child healthy food; I can get my child to eat enough; I can get my child to try vegetables; I give my child the right amounts of food; I can get my child to taste new food | 5 | Confidence: not at all=1, not so=2, somewhat=3, confident=4, very=5 | Continuous: mean of 5 items Range=1-5 |
| **Self-efficacy**<sup>259</sup> | Overall, as a parent do you feel you are… | 1 | Not very good=1, has some trouble=2, average=3, better than average=4, very good=5 | Categorical |
| **Maternal height and weight** | Pre-pregnancy and current weight measurements and height – converted into BMI based on wt(kg)/ht(m)<sup>2</sup> based on International cut-offs<sup>266</sup> | 1 for each item | Underwt <18.50, Normal wt 18.5-24.99, Overwt 25-29.99, Obese ≥30 | Continuous |
| **Description of maternal pre-pregnancy weight**<sup>18</sup> | Based on perceived child weight question: Before you became pregnant, how would you describe your weight? | 1 | Markedly underwt, underwt, normal, overweight, markedly overwt | Categorical: Marked underwt = 1 Under wt = 1 Normal = 2 Overwt = 3 Obese = 4 |
| **Smoking status** | Are you currently a smoker? Did you smoke during your pregnancy with this child? | 2 | Yes, No | Categorical: Smoker = 1 Non-smoker = 0 |
| **Number of children** | Is this your first child? | 1 | Yes, No | Categorical |
Questions were sourced from state and national infant feeding surveys and the Census collection tool. The main independent variables are described.

Questions about language spoken at home, Aboriginal and Torres Strait origin, primary and secondary school education, residential suburb and postcode were also included.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>1 for each item</th>
<th>Age – years</th>
<th>BC – categorical: Australia=1,other=0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Birth country</td>
<td>MS – categorical: married/de facto = 1, other =0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marital status</td>
<td>Employment – categorical: full/part=1, other=0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education</td>
<td>Edu – categorical: University=1, other=0</td>
</tr>
</tbody>
</table>
4.6.6 ANALYSIS

The quantitative data were analysed using SPSS 23. Descriptive statistics was carried out for all the variables (Table 4.2) and are presented as frequencies and percentages. Variables of interest for further testing were examined for normality, whereby the mean was within 10% of the median; the minimum and maximum were +/- 3 standard deviations of the mean; the skewness and kurtosis were within +/- 3; and the histogram was symmetrical. The statistical significance level was set at the conventional level of p<0.05 (two sided) for all analyses, consistent with the early childhood obesity prevention literature.

Univariate tests of associations between categorical variables were conducted using chi-square analyses to examine relationships between variables. Chi-square tests were also used to detect differences in the study sample compared to all mothers who birthed in Queensland.

Bivariate logistic regression was carried out to identify associations between maternal feeding practices, parenting styles, infant weight concerns, infant intake and weight. Multivariable logistic regression was completed to adjust for the confounding influence of maternal BMI, age, education, income, breastfeeding duration, infant weight concerns, number of children and infant birth weight. Odds ratios and 95% confidence intervals were identified.

Correlations were performed to investigate the relationships between maternal feeding practices, parenting styles, infant weight concerns and infant weight. Multiple linear regressions accounted for the confounders as per multivariate logistic regressions.
### Table 4.2: Variable relationships investigated

<table>
<thead>
<tr>
<th>Dependent/outcome variables</th>
<th>Independent/effect variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding at 6 months</td>
<td>Age, education level, ethnicity, parity, marital status, household income, employment status, smoking status, maternal BMI, infant birth weight, weight concerns, intent to breastfeed, restriction, pressure to eat, parental warmth, parental hostility, self-efficacy, Guideline knowledge</td>
</tr>
<tr>
<td>Early introduction of solids (before 4 months)</td>
<td>Age, education level, ethnicity, parity, marital status, household income, employment status, smoking status, maternal BMI, infant birth weight, weight concerns, restriction, pressure to eat, parental warmth, parental hostility, self-efficacy, Guideline knowledge</td>
</tr>
<tr>
<td>Fruit and/or vegetable intake (healthy nutrient rich)</td>
<td>Age, education level, ethnicity, parity, marital status, household income, employment status, smoking status, maternal BMI, infant weight/BMI, weight concerns, breastfeeding, restriction, pressure to eat, parental warmth, parental hostility, self-efficacy, Guideline knowledge</td>
</tr>
<tr>
<td>Take away food/snack intake (high energy, nutrient poor)</td>
<td>Age, education level, ethnicity, parity, marital status, household income, employment status, smoking status, maternal BMI, infant weight/BMI, weight concerns, breastfeeding, restriction, pressure to eat, parental warmth, parental hostility, self-efficacy, Guideline knowledge</td>
</tr>
<tr>
<td>Sweetened drink usage</td>
<td>Age, education level, ethnicity, parity, marital status, household income, employment status, smoking status, maternal BMI, infant weight/BMI, weight concerns, breastfeeding, restriction, pressure to eat, parental warmth, parental hostility, self-efficacy, Guideline knowledge</td>
</tr>
<tr>
<td>Feeding practices – restriction; pressuring; monitoring</td>
<td>Age, education level, ethnicity, parity, marital status, household income, employment status, smoking status, maternal BMI, infant weight/BMI, weight concerns, breastfeeding, parental warmth, parental hostility, self-efficacy, Guideline knowledge</td>
</tr>
<tr>
<td>Feeding style - warmth; hostility (responsiveness dimension)</td>
<td>Age, education level, ethnicity, parity, marital status, household income, employment status, smoking status, maternal BMI, infant weight/BMI, weight concerns, breastfeeding, restriction, pressure to eat, self-efficacy, Guideline knowledge</td>
</tr>
</tbody>
</table>
4.7 PHASE 3:

To understand the meaning of mothers' infant feeding decisions captured in the phase 2 survey, a subsample of mothers was selected for follow-up discussions. This final phase of the research was used to validate phase 2 responses while unravelling the rationale mothers' attach to transitional infant feeding decisions. It is anticipated that the outcomes from this phase will be used by practitioners and researchers to guide future strategies to support early healthy family eating environments.

4.7.1 RESEARCH QUESTIONS

RQ2: Do parental concerns about infant weight influence infant feeding practices, infant dietary intake and body weight?

RQ4: What influences mothers when making decisions about transitional feeding?

RQ5: What are the optimal components of EPOCH interventions and support services?

4.7.2 OBJECTIVES:

1. To explore concerns about childhood obesity and the rationale for infant feeding decisions of mothers living in Queensland.
2. To identify the factors that influence infant feeding decisions of mothers living in Queensland.

4.7.3 METHODOLOGY

A qualitative approach was selected in this final phase to confirm and offer explanatory reasoning behind the maternal survey responses. Given the sensitive nature of early parenting decisions as highlighted in the systematic literature review (Chapter 3) and by the researchers interviews (Chapter 5); individual interviews were selected over focus groups. The personal nature of the interviews provided an opportunity for mothers to talk as openly as possible about their infant feeding experiences without the potential judgment of other mothers which may silence their voices.
4.7.4 SAMPLE AND RECRUITMENT

On completion of the maternal survey (phase 2), mothers could opt-in to a group or individual discussion or both by completing the optional follow up participation question at the end of the questionnaire. If mothers agreed to participate they were asked to provide a first name, contact telephone number and/or email address for follow-up. Following the decision to do individual interviews, only mothers who agreed to an individual interview or both discussion options were eligible for phase 3.

Early analysis of the phase 2 data suggested a strong association between infant weight concerns and subsequent feeding practices and infant dietary intake. Based on these relationships, mothers were purposively selected based on concern for their child becoming: (1) overweight or underweight; (2) overweight; (3) underweight; or (4) neither overweight nor underweight (i.e. no concern). A sample sized of 20 was set based on 5 mothers per group to gather adequate qualitative data for analysis. Only first time mothers were selected for this phase as it was agreed that parenting experience would provide a different picture to factors influencing feeding decisions. Where possible, younger, less educated mothers were selected as the literature and phase 2 results identified these mothers as more likely to use feeding practices inconsistent with the Guidelines.

The principal investigator contacted eligible participants to arrange involvement in the interview and determined a mutually convenient place and time for the discussion. Based on the selection criteria, mothers were randomly contacted until each of the four samples was filled. Many of the mothers on the list could not be contacted via the mobile number they provided. Only one mother who was contacted refused to participate due to current family/study commitments. All participants were provided with a participant information sheet and a consent form (Appendix 3) and received a AUD$30 Coles supermarket gift voucher following completion of the interview to compensate mothers for their involvement.

4.7.5 METHODS

The venues for these interviews were based on the participant’s preference to reduce the burden on the participant and facilitate a safer environment for information sharing. While all discussions were planned to be face-to-face, to satisfy the sample requirement, two of the final interviews were conducted over the telephone due to the distance of those participants from Brisbane.
Interviews were conducted using a semi-structured interview guide (Appendix 6) which included a list of open ended questions to facilitate the conversation. This approach allowed the interviewer to guide the conversation around the phase 3 objectives while also providing an opportunity to probe further based on the participants’ responses. To facilitate the conversations, the interviewer (principal researcher) disclosed her personal role as a mother but not her professional qualifications as a nutritionist/dietitian.

All the interviews were digitally recorded by the principal researcher using an Olympus DS-2400 digital voice recorder and the digital files transcribed by an external data transcribing service (Jean Bowra: bowrajean@gmail.com). As in phase 1, a verbatim approach to transcribing was chosen over conversational to capture every word, which may have influenced the direction or outputs of the conversation.

4.7.6 ANALYSIS:

Digital audio recordings of the maternal interviews were transcribed and thematic analysis used to examine the verbatim comments. The thematic analysis was based on the framework outlined by Pope and Mays. The analysis process involved multiple readings of the transcripts followed by the manual line-by-line coding of the text. Coded text was then extracted and organised into related areas to construct descriptive themes consistent with the phase 2 survey and phase 3 questions (i.e. milk feeding, transitional feeding, feeding resources, infant weight, infant behaviour). Subsequently, the text was grouped based on common relationships across the themes.

To validate these themes with the infant feeding decisions of mothers, a deductive analysis was also undertaken. This involved identifying the key infant feeding recommendations from the literature (i.e. introduction of solids timing [when], types of solids [what], feeding practices used [how]) and arranging respondent rationale under these headings grouped by weight concerns. Themes identified across these groupings to describe the reasoning behind these feeding decisions were then cross checked with those identified in the initial inductive analysis.

4.8 ETHICS

The study was granted institutional human research ethics clearance by The University of Queensland through the Behavioural & Social Sciences Ethical Review Committee – approval number 2013001520 (Appendix 7).
4.9 SUMMARY

The research design for this thesis – based on a mixed methods methodology - as described in this chapter allows the use of qualitative data (phase 3, Chapter 8) to explain the quantitative data from the maternal survey (phase 2, Chapters 6 and 7). The researcher interviews (phase 1) captured in the next chapter provide a baseline of what is already known about transitional infant feeding and EPOCH intervention approaches, as well as the current gaps in the evidence which this thesis may be able to address.
CHAPTER 5: INSIGHTS OF EARLY CHILDHOOD NUTRITION RESEARCHERS

5.1 INTRODUCTION

‘Don’t reinvent the wheel, just realign it.’ Anthony J. D’Angelo

Although Chapter 2 highlighted that investment in Early Prevention of Obesity in ChildHood (EPOCH) is increasing, with four Random Controlled Trials (RCTs) identified in Australia and New Zealand, Chapter 3 suggested that further investigation of the factors underpinning feeding decisions would strengthen EPOCH efforts.

To ensure that this thesis contributed to the transitional infant feeding literature, the research commenced with talking to EPOCH researchers. These researchers were selected based on their involvement in the RCTs and their recognition as regional experts on early childhood feeding and obesity in the literature. The interviews set out to establish researchers’ understanding of parental infant feeding decisions and what further research is required to support the development of healthy infant feeding. The preceding chapter included an overview of the research questions, methodology and analysis for these researcher interviews (phase 1). This chapter provides the results from these semi-structured discussions. The interpretation of the findings from the research interviews has guided the subsequent research phases and the final synopsis of the thesis.

5.2 PHASE 1: RESEARCHER SEMI-STRUCTURED INTERVIEWS

5.2.1 RESULTS

5.2.1.1 PARTICIPANTS

All five researchers who had been identified through the literature and the subsequent snowball approach agreed to be part of the study. These participants were subsequently interviewed by telephone for approximately 30 minutes. Information shared during the interview reflected the participants’ research track records, including current EPOCH intervention involvement (n=4) or related infant feeding guideline research (n=1). Four of the participants had nutrition qualifications and the fifth had a medical and public health background. At the time of the interviews, three of the four EPOCH studies were completed, but not all data had been analysed.
5.2.1.2 THEMES

Thematic descriptive analysis of the participant transcripts resulted in the identification of five themes:

1. Theme 1: Maternal infant feeding expectations
   - Sub-theme: Readiness
   - Sub-theme: Sleep

2. Theme 2: Maternal infant feeding success
   - Sub-theme: Immediate health
   - Sub-theme: Weight

3. Theme 3: Maternal infant feeding influences

4. Theme 4: EPOCH intervention learnings

5. Theme 5: EPOCH knowledge gap

5.2.1.3 THEME 1: MATERNAL INFANT FEEDING EXPECTATIONS:

5.2.1.3.1 SUB-THEME: READINESS

Maternal misinterpretation of readiness to start solids was raised as an issue by all participants, with developmental cues, such as reaching for or mouthing objects, commonly cited. Participants acknowledged the overall keenness of mothers to see their infant be developmentally advanced, with the introduction of solids viewed by mothers as a developmental milestone.

…they say that, “oh, the baby’s reaching for what I put in my mouth,” but that’s developmental. I mean, if mum was putting a block in her mouth the baby would be reaching for that, you know? (Participant 2)

…by having an age, it then gives them this thing, ‘well, they should be on it by this time, and my baby is more advanced, so I’m going to bring it forward’ (Participant 1)

I think there’s an excitement about moving children onto foods and, sort of, hurrying them to grow up. (Participant 3)
The participants agreed that more guidance was required around what readiness is. Having a recommended age for introduction of solids may provide mothers with a sense of permission or incentive to ensure their infants are eating solids before this age to assist their development or so as to be seen as more advanced.

### 5.2.1.3.2 SUB-THEME: SLEEP

Participants discussed the ways in which mothers’ expectations that introducing solids would also modify behaviour, especially sleep. Feeding to settle the infant and encourage sleep was a notion that was also reinforced by family pressure.

… the mum’s mum or the dad’s mum is pressuring them that the child needs to have solids so they’ll sleep better at night, or things like that. (Participant 5)

So the sleep comes up quite often. Mums think that introducing solids will help with sleep. (Participant 2)

The fact that they’re wanting to feed more means that they can’t be [getting enough], you know, they need something other than the breast milk [and] crying and fussiness is misinterpreted as hunger…there seems to be a lot of expectation around these babies, ah, the idea that, you know, if you feed them solids they’ll go longer between breastfeeds, they’ll sleep more through the night. (Participant 1)

There does seem to be an anxiety, um, in parents that their child isn’t getting enough food, perhaps stimulated by growth, perhaps stimulated by not enough sleeping, you know, in their mind, not sleeping as much as they’d expected the child to be. (Participant 3)

The expectations of infant contentment, sleep, and growth were seen to also be tied to maternal anxiety of the child not receiving enough food or milk, leading to the use of formula and/or the early introduction of solids.

### 5.2.1.4 THEME 2: MATERNAL INFANT FEEDING SUCCESS

#### 5.2.1.4.1 SUB-THEME: IMMEDIATE HEALTH

Through the eyes of mothers, the participants felt parenting success was measured by a healthy and happy infant. Furthermore, participants maintained that long term problems appear not to register in comparison to what mothers can see now.
…they’re going on the immediate, and if their baby seems to be happy and satisfied, then that’s what they use as their marker of success. (Participant 1)

They didn’t seem to be [concerned], as far as they were concerned, the evidence was in front of them and they had healthy, happy babies… what you can’t see, it doesn’t necessarily measure or rate. (Participant 1)

Despite maternal knowledge of infant feeding guidelines, inappropriate feeding practices to modify infant demeanor was highlighted by the participants, with anecdotal suggestions of a lack of disclosure by some mothers.

Mums say “Oh well yeah, I’ve started using formula, but I’m not telling the community health nurse cause she’ll have a go at me.” (Participant 2)

It was acknowledged that infant formula use and giving solids prior to 6 months was common practice, and mothers may miss out on the best advice if they felt threatened because of their feeding decisions.

**5.2.1.4.2 SUB-THEME: WEIGHT**

Poor understanding of normal weight was raised by some of the participants, with concern for underweight far outweighing concern for overweight. The essence of the prevailing “cubby baby, healthy baby” culture was evident in the participant conversations, alongside with maternal expectations that babies need to eat a lot.

Yeah. People are concerned that their child might not be getting enough. (Participant 3)

That’s probably the issue here is that at this…early life stage the mothers often didn’t think that overweight obesity is the main issue. They are more thinking about, yeah, I want my baby healthy. But what they consider healthy they consider their baby can eat a lot…they want little overweight, a healthy baby. (Participant 4)

We don’t see a lot of parents who are concerned that their baby or infant is overweight at all. Uh, any concerns that often come up is that the baby hasn’t put on enough weight or baby isn’t growing, or the baby is a lot smaller than everyone else…but the vast majority of the time those children are well within normal growth ranges. I think there is this real background, sort of, a bonnie baby, chubby baby is a healthy baby. (Participant 5)
One participant also described how underweight concern is supported to a degree by the weight check environment.

So there’s still issues around perceived weight. Around being worried that the child won’t eat enough. That the child will be underweight. [And then there’s] that fundamental issue [of child health staff saying] “oh they’ve done really well this week, they’ve gained 250g”…is still just the pervading, kind of, dialogue. (Participant 2)

Overall, participants described how maternal concern about underweight and intake was common, despite reassurances by health professionals, resulting in the use of formula or early solids to promote growth.

### 5.2.1.5 THEME 3: MATERNAL INFANT FEEDING INFLUENCES

Participants commented that the introduction of solids marks a time where mothers are, “…more confident in their own, sort of, intuition and ability, or in following the advice of other people who have been before them with experience” (Participant 1). Transitional feeding was felt to be influenced by a range of factors including social norms, friends and family, especially the maternal mother. One participant went so far as to call infant feeding “secret women’s business” (Participant 2), passed down through generations of women. This participant went on to highlight the concern of traditional feeding practices such as “feeding-to-soothe” in the current obesogenic environment.

It’s interesting, this was where the maternal grandmother seemed to really come into their own…if their mothers didn’t [breastfeed] then they need to look somewhere else, but their mothers all did introduce solids. (Participant 1)

There’s so much, bringing of old fashioned ways, or bringing of traditional ways…so we can’t ignore some of these factors, particularly for some of the more vulnerable groups. And the value of a heavy baby… new immigrants, grandparents playing a really important role (Participant 3)

Beyond family, health professionals and the internet were further identified by participants as important sources of infant feeding information, with inconsistent messages a source of confusion for some. Returning to work was also noted as a signal of a return to “normality” with the introduction of solids to help sleep one solution.
I know it’s rapidly changing, so parents just use traditional sources, books and other mothers and their family and friends are important resources, but progressively, the use of apps and website resources seem to be really important. (Participant 3)

While mothers groups were mentioned by some participants as providing a supportive peer learning environment, they were also noted to be a source of pressure.

“…bit of a competition to see whose baby’s the most advanced, the most gifted” (Participant 2).

I don’t think there’s enough out there, that every baby is an individual, and you can’t expect them all to, you know, don’t measure them against someone else. (Participant 1)

It was postulated that lack of transitional feeding knowledge contributes to mothers being more susceptible to external pressures and suboptimal feeding decisions.

5.2.1.6 THEME 4: EPOCH INTERVENTION LEARNINGS

The RCTs that the participants were involved with focused on the process of transitional infant feeding to support healthy eating habits and weight. While the intervention messages were not new, the participants found that maternal knowledge around transitional infant feeding was limited to what to feed their infant rather than how to feed their infant. The notion of feeding to the infant’s cues of hunger and satiety, and not coercing or forcing the child to eat, were unfamiliar concepts for the mothers.

It was a big day for us when a couple of the mums came in and said “we’ve chucked out our aeroplane spoons.” The notion that you could put trust in the baby to regulate their intake was something they’d never heard of and something they really struggled with. (Participant 2)

Not persisting in encouraging children to eat what’s on their plate, but to eat to appetite. So supporting parents just to learn some of these skills, or be more aware of the assumptions that they bring to that table. (Participant 3)

Overall the partipants felt the program messages, which were relatively consistent across the interventions, were appropriate and planned to be retained for future strategies. However, the format was identified as problematic, particularly the delivery mode, with
some participants exploring alternate delivery modes for their studies. The need to maintain an element of peer support was also raised.

*There are very few elements that we would drop out because we, sort of, feel it still ticks the right boxes...people found the kind of information they were getting was relevant to or useful...this next intervention is going to be delivered by mobile phones.* (Participant 3)

*...to use technology in ways that didn’t just pop it on the internet [such as] a virtual group...perhaps some phone call support in between.* (Participant 2)

*So what we are thinking at the moment is whether we can deliver this using other means, some cheaper way, such as like telephone coaching, whether we can use a website, whether we can use, other electronic means of delivering this kind of intervention. [But] if we deliver this intervention, we’ve got to consider [maternal computer skills and access] to address this issue where probably then widening the gap.* (Participant 4)

In reviewing the current intervention outcomes, the participants stated there was a positive shift in maternal feeding and child eating behaviour. It was felt that the interventions impact on dietary intake and growth was limited by the sample size and follow-up periods; a reflection of funding restraints.

*Most funding does not allow you a kind of a long term intervention...we have to meet the funding requirements, so we often design a one year intervention, so that’s too short. And consequently, so the study period, just not enough to generate strong evidence [and] follow up, that’s also too short.* (Participant 4)

Efforts to pool intervention results as well as seek additional funding were mentioned.

5.2.1.7 THEME 4: EPOCH KNOWLEDGE GAP

The participants raised the issue of the lack of longitudinal evidence to inform current RCTs, with transitional feeding messages based on the literature.

*The messages actually aren’t new, in a way...we package them, and [when] we try to promote optimal feeding practices, do we actually get an outcome? So, you know, the evidence isn’t entirely there yet.* (Participant 2)
While the participants acknowledged that longer breastfeeding and later introduction of solids were protective of childhood obesity, it was felt that further research was needed around the timing of introduction of solids (i.e. 6 months over 4-6 months) and the influence on dietary variety, texture tolerance and obesity risk. A lack of research around infant formula use was also noted.

*No one would argue that [introducing solids] should not be before four months. The evidence is very clear about that, but there’s very few studies that actually evaluate the new dietary guidelines…we need evidence about that 4-6 month age group.*  
(Participant 2)

*So most women out there are using formula, and most women out there are introducing solids before six months…Once they’ve made that decision we then still have to know, what is the best advice we can give them? How to best deliver that advice, and how best to support them too, it’s really harm minimisation in a way.*  
(Participant 2)

The call for a better understanding of readiness for solids and influences on maternal feeding practices was unanimous amongst the participants. The level of knowledge of health professionals around the transitional feeding process was also raised.

*I think parents’ understandings of how much food is enough is interesting… the way in which the mum sees the role of food in promoting growth and preventing hunger or preventing distress…what informs them introducing solids early? Yeah. Look, I think we’re grappling with this a little bit.*  
(Participant 3)

*I don’t know that health professionals are as invested, or themselves are as knowledgeable around the whole introduction to solids stuff beyond the advice around the age.*  
(Participant 1)

With the goal of producing rigorous evidence around promoting healthy early eating and growth, one participant also highlighted the need for consistency in monitoring.

*Measurement probably is the issue…early infant feeding practice, I am talking about breastfeeding measurement, talking about how can we record this and their fruit and vegetable intake at an early stage. Yeah, all these behaviour factors they actually lack validation and reliable measurement at this stage.*  
(Participant 4)
The lack of surveillance of dietary intake and growth of children less than 2 years despite Infant Feeding Guidelines was raised by the researchers as a knowledge gap in understanding the dietary patterns of young children and their relationship with growth.

5.2.2 DISCUSSION

Based on the conversations with the researchers undertaking transitional feeding research, it would appear that early childhood healthy eating and obesity prevention research is still in its early stages. Despite the significant government investment in the early years obesity agenda, the list of information needs outlined by the researchers would suggest there is a still work to be done. The current interventions will only provide some of the answers.

Much of the researcher discourse around transitional feeding decisions focused on mothers trying to meet the perceived physical cues of readiness and growth entangled with the desired infant behavioural outcomes of happiness and sleep. While these relationships are consistent with those captured in the systematic literature review\textsuperscript{203} (Chapter 3), what fuels these expectations and feeding responses is less clear. Understanding maternal beliefs around the influence of food on behaviour and growth, while determining the origins of growth concerns, is of equal importance.

The notion of successful parenting was raised by the researchers’ descriptions of feeding, measured by mothers and benchmarked by societal expectations to meet infants’ needs. This was described by researchers in terms of maternal use of food to influence sleep and growth, which is supported by family and peer pressures and the health environment which commends early weight gain. While these external pressures are not new, understanding how mothers deal with these in their feeding decision process requires further investigation. The influence of knowledge and self-efficacy in early feeding\textsuperscript{157,197} is one important direction for further enquiry.

The lack of knowledge of parents and health professionals on interpreting infants’ cues of hunger and satiety was a significant finding, addressed in the responsive feeding approaches underpinning the EPOCH trials. What appeared less clear was the preferable delivery model for this information and integration into health service delivery which would support a less rigid approach to enforcing infant feeding recommendations. Flexibility in supporting all feeding decisions was regarded as a prerequisite for better support. Further probing about what and how this advice can be delivered is required. There is evidence
that mothers prefer to learn from experienced supports with empathetic characteristics,\textsuperscript{270} and are embracing new technology for this advice.\textsuperscript{271}

Regardless of the EPOCH trial limitations associated to funding (e.g. sample size, intervention length), the researchers are mindful of the pervasive influences on transitional infant feeding. While the evidence based intervention messages are not new, further work is needed to understand why mothers feed the way they do in order to provide guidance on how best to deliver this advice.

\textbf{5.2.3 CONCLUSION}

EPOCH trials appear to be heading in the right direction to addressing childhood obesity. Further probing around maternal use of food to influence infant behavioural and physical outcomes is supported, including investigation around maternal knowledge, self-efficacy, weight concerns, parenting success and supporting resources on transition infant feeding.

\textbf{5.3 SUMMARY}

Maternal infant feeding is a complex interface between juggling feeding knowledge and socioecological\textsuperscript{61} expectations. While there are sound messages to establishing early healthy eating practices, more information is needed to determine how to best support mothers to ensure the best health outcomes for their children. The information needs raised in this chapter will be used to inform the topics under investigation in the subsequent phases of this thesis.
CHAPTER 6: MATERNAL CONCERNS ABOUT INFANT WEIGHT

6.1 INTRODUCTION

The manuscript in this chapter has been submitted to the Maternal and Child Health Journal and provides some of the results from the maternal survey (phase 2). The primary purpose of this quantitative analysis was to determine if maternal concern about infant weight influence infant feeding practices, infant dietary intake and weight (research question 3). Items in the Feeding A Baby (FAB) survey were based on validated questionnaires as outlined in Chapter 4. The weight concern relationships identified in this paper guided the sampling framework for the follow-up maternal interviews (phase 3) and the line of enquiry within these semi-structured discussions (Chapter 8).

6.2 MANUSCRIPT 2:

HARRISON M, BRODRIBB W, DAVIES PSW, HEPWORTH J.

MATERNAL INFANT WEIGHT PERCEPTIONS AND THEIR RELATIONSHIP TO INFANT FEEDING AND DIETARY INTAKE.

MATERNAL AND CHILD HEALTH JOURNAL, DECEMBER 2016; UNDER REVIEW.

6.2.1 ABSTRACT

Background: Obesity is a global problem that is challenging to prevent and expensive to treat. Early childhood interventions show promise in establishing lifelong healthy eating patterns, however a better understanding of how parental feeding practices develop is needed. Infant weight concerns are associated with maternal control of how food is provided to infants. The Feeding A Baby study aimed to further investigate transitional infant feeding determinants and their relationship to infant dietary intake and body weight.

Methods: A questionnaire was completed by 290 Queensland mothers of infants aged between 5 and 13 months. Logistic regression was used to describe the association between maternal feeding practices (restriction, pressure to eat, monitoring), parenting style (warmth, hostility), infant weight concern (underweight, overweight) and infant dietary intake (breastmilk, solids, vegetables, fruit and takeaway). Correlation and linear
regression were used to identify relationships between maternal feeding practices, parenting style, infant weight concern and infant weight.

**Results:** Mothers were found to be more concerned about underweight than overweight, tended to misjudge infants as being underweight and failed to recognise overweight and obese infants. Pressure feeding practices were associated with underweight concern, lower infant weight, early introduction of solid foods and lower fruit and vegetable intake. Restrictive feeding practices were correlated to overweight concern.

**Conclusions:** Given the inaccuracy of maternal infant weight perceptions and the controlling feeding practices and poor infant dietary intake associated with weight concerns, discussing unhealthy growth (insufficient and excess) should be a fundamental component of strategies to support healthy infant feeding and eating.

### 6.2.1.1 SIGNIFICANCE

#### 6.2.1.1.1 WHAT IS ALREADY KNOWN ON THE SUBJECT?

Eating habits are established early in life and can track with weight into adulthood. Relationships between feeding practices, weight concern, weight and dietary intake have been described in children but underreported in infants.

#### 6.2.1.1.2 WHAT THIS STUDY ADDS?

Mothers find it difficult to interpret infant weight. Weight may influence maternal infant weight concerns resulting in the use of controlling feeding practices and poor infant dietary intake associated with childhood obesity.

#### 6.2.1.1.3 KEYWORDS

Weight perceptions, weight concern, feeding practices, dietary intake, childhood obesity
6.2.2 INTRODUCTION

Worldwide 41 million children under the age of 5 years are overweight. The first 1000 days of life (conception to 2 years) has been identified as a pivotal point for primary prevention, fueling investment in childhood obesity prevention interventions. The family environment is crucial in shaping child eating behaviour, with mothers fundamental to food provision and feeding decisions. Understanding the factors that influence maternal feeding practices will strengthen obesity prevention efforts.

The transitional diet of the infant from milk feeds to family foods offers an opportunity to establish lifelong healthy eating habits. The current Australian Infant Feeding Guidelines, consistent with international recommendations, endorse breastfeeding to at least 12 months, introducing solids at around 6 months and consuming a wide variety of family foods by 12 months. They provide guidance on foods and quantities to use, but lack adequate authoritative advice about how food should be given.

Controlling feeding practices have been identified as undermining child self-regulation of energy intake. The rationale for their use during infancy has been linked to maternal infant weight concerns, with food restriction associated with heavier infants, and pressure to eat associated with smaller infants. Interestingly, both these feeding practices have been associated with lower child weight initially, despite longer term association with obesity. The influence of these relationships on infant dietary intake is not clear. Whether child eating and weight influence feeding practices, or feeding practices influence child eating and weight (or both) remains unanswered.

Parenting styles which consider the dimensions of parental responsiveness (or warmth) and demandingness (or parent control) when interacting with children also influence feeding practices and potentially the development of obesity. Their relationship to weight is underrepresented in studies involving infants.

In spite of the interest in the early prevention of obesity, there is a paucity of literature examining the impact of parenting on infant dietary intake and weight. This study aimed to explore the relationship between maternal concerns about infant weight, feeding practices and infant dietary intake.
6.2.3 METHODS

6.2.3.1 STUDY DESIGN AND SAMPLE

To gather information about transitional infant feeding practices, mothers of infants aged between 5 and 13 months completed the Feeding A Baby (FAB) survey. Mothers living in Queensland from a range of demographic backgrounds were recruited through a dedicated FAB Facebook page, posting on parenting websites and Facebook pages, and through targeted requests to parenting organisations. To ensure the views of more vulnerable mothers were represented, young parenting groups and parenting support organisations around Brisbane were also targeted.

The questionnaire could be completed online, by hard copy, or over the telephone. The survey was piloted and refined to ensure the questions gathered the relevant information. The survey took around 10-15 minutes to complete and the study was granted ethics clearance by The University of Queensland (#2013001520).

6.2.3.2 MATERIALS - QUESTIONNAIRE

6.2.3.2.1 DEMOGRAPHICS

Mothers’ age, marital status, education, employment status, annual household income, residential suburb and postcode were collected using questions consistent with the Queensland Infant Feeding Survey and the 2011 Australian Census.

6.2.3.2.2 INFANT DIETARY INTAKE

Queensland Infant Feeding Survey questions were used to determine the regular use of breastmilk, infant formula, follow-on formula, cow’s milk, other milks, solids, fruit, vegetables, takeaways, fruit juice and sweetened drinks (e.g. ‘Has your child ever been given any solid or semi-solid food regularly [daily or almost daily]?’). Fruit and vegetables serves were modified to tablespoons to be consistent with infant requirements, and were dichotomised based on meeting or not meeting recommendations.

Responses to timing of solids introduction and breastfeeding duration were dichotomised as ≤4/>4 months and <6/>≥6 months respectively. Introducing solids after 4 months was selected as it was postulated that introducing solids during the 4th or 5th month met the
recommended timing of around 6 months. Breastfeeding to at least 6 months represents half the recommended minimum length of breastfeeding and was a national target.

6.2.3.2.3 MATERNAL PARENTING STYLE AND FEEDING PRACTICES

As a measure of responsiveness in parenting style, six warmth and five hostility questions from The Longitudinal Survey of Australian Children were used. The warmth questions asked how the parent expressed affection (e.g. `How often do you hug or hold your child for no particular reason?'). Responses scored from 1 for `never' to 5 for `always or almost always,' and a mean score achieved by dividing the combined score by 6 (range=1-5). The hostility questions asked mothers to rate their feelings/behaviour towards their child over the last 4 weeks (e.g. `I have been angry with my child'). Responses were scored from 0 as `not at all' to 10 for `all the time', added together and divided by 5 to obtain a mean score (range=0-10).

Items from the Child Feeding Questionnaire (CFQ) were used to measure the feeding practices of restriction, pressure to eat and monitoring. Designed for use in children aged 2-11 years, the CFQ questions were applicable for infants who have commenced solids. However, similar worded questions were grouped to emphasise the feeding practice over the food choice. The eight restriction questions were reduced to four (e.g. `offering food [instead of sweets or favourite foods] in exchange for good behaviour'). All four pressure questions were included (e.g. `my child should always eat all the food on his/her plate'), while the three monitoring questions were combined to one (i.e. `keep track of the high sugar or high fat foods'). The responses, scored from 1 for `disagree' to 5 for `agree' were summed and divided by 4 to get a mean score for restriction and pressure (range=1-5). Monitoring was used as a binary variable (`mostly' and `always' versus remaining responses) in logistical regression and a categorical variable in correlations.

6.2.3.2.4 BMI, WEIGHT DESCRIPTION AND CONCERNS

Mothers reported on their infants’ birth and current weight and length. The World Health Organisation’s Anthro software used these measures to produce birth and current z scores for weight-for-age, weight-for-height and body mass index (BMI)-for-age. Mothers were also asked to describe their child’s current weight status as either `markedly underweight', `underweight', `normal', `overweight' or `markedly overweight'.
Maternal concern about infant weight was measured using the CFQ question ‘how concerned are you about your child becoming overweight?’ and the response options ‘unconcerned,’ ‘a little concerned,’ ‘concerned’, ‘fairly concerned’ and ‘very concerned’. Underweight concern was measured by substituting underweight for overweight in the aforementioned item. Overweight and underweight concerns were dichotomised (‘unconcerned’ versus remaining responses) for logistic regression or used as a categorical variable for correlations.

Mothers also reported their pre-pregnancy and current weight and height. BMI was calculated using the international classification of underweight (<18.50), normal/healthy weight (18.50-24.99), overweight (25-29.99) and obese (≥30) and used as a continuous variable. Mothers were also asked to describe their pre-pregnancy weight status as either ‘markedly underweight’, ‘underweight’, ‘normal’, ‘overweight’ or ‘markedly overweight’.

6.2.3.2.5 SAMPLE SIZE

A minimum sample size of 270 was calculated based on a required 15 participants for each independent variable assessed.

6.2.3.3 STATISTICAL METHODS

SPSS 23 was used to carry out all the statistical analyses with statistical significance set at 0.05. Descriptive analysis was completed for all the variables. Chi-square tests were used to detect differences in the study sample compared to all mothers who birthed in Queensland. Bivariate logistic regressions were carried out to identify associations between maternal feeding practices, parenting styles, infant weight concerns, infant intake and weight. Statistically significant bivariate results were adjusted for the confounding influence of maternal BMI, age, education, income, breastfeeding duration, infant weight concerns, number of children and infant birth weight. Odds ratios and 95% confidence intervals were identified.

Correlations were performed to investigate the relationships between maternal feeding practices, parenting styles, infant weight concerns and infant weight. Multiple linear regressions accounted for the confounders as per multivariate logistic regressions for the statistically significant relationships between maternal feeding practices and infant weight concerns.
6.2.4 RESULTS

6.2.4.1 PARTICIPANTS

The survey was completed by 290 mothers, 264 online and 26 via hardcopy. No mothers completed the survey by telephone however some responses were completed with assistance from the principal investigator or parenting group staff. Respondents with infants outside the inclusion age range (n=25) or with no infant data (n=2) were removed.

The final sample of 263 mothers was made up of 54% primagravida and 46% multigravida women aged between 18 and 44 (mean=31.4 years). Compared to all birthing Queensland mothers\textsuperscript{268} the participants were more likely to be older, non-indigenous, in a relationship, not smoking during pregnancy and have a healthy weight (Table 6.1). While most mothers appeared well educated, half had a household annual income less than AU$100,000 and one in five mothers less than AU$50,000 well below the national mean of $107,276 (median=$80,704).\textsuperscript{274}

The infants ages ranged from 5.2 to 13.4 months (mean=8.8 months), with sex nearly equally distributed (Table 6.1). Compared to the Queensland infants born in 2013,\textsuperscript{268} the infants had a higher mean birth weight, with fewer low birth weight infants but more than double the proportion of infants with high birth weight.

6.2.4.2 INFANT DIETARY INTAKE

While the majority of the mothers initiated breastfeeding (95.7%), around one third (31.6%) indicated they had ceased; 45.9% of these before 4 months. Almost two thirds of the mothers (63.8%) had introduced infant formula and 41.1% had introduced follow-on formula. Cow’s milk had been used regularly by 6.2% mothers. Fruit juice and sweetened drinks had been introduced respectively to 15.1% and 3.2% of infants.

All infants had been introduced to solid foods with the most common first food being infant cereal (47.6%), followed by mashed vegetables (24.2%) and mashed fruit (15.9%). One-third (31.1%) of the mothers had introduced solids at 4.0 months or earlier.

Mothers were most likely to feed their child, with 86.7% indicating feeding most meals. Most infants (87%) were meeting both their fruit and vegetable requirements. Only 6.2% of infants were having takeaway foods on a weekly or monthly basis, with 77.2% of mothers reporting that they always or mostly prepare their infant’s meals from scratch. Over half
(57.8%) of the mothers identified their own food preferences as a primary influence on food purchases.

Table 6.2 outlines the mean, standard deviation and median for maternal infant feeding practices and parenting style. There were no associations between infant dietary intake and parenting styles (Table 6.3). However, there was a positive correlation between maternal hostility and pressure-to-eat (Table 6.4). While there were no associations between infant dietary intake and restriction or monitoring, there was for pressure-to-eat (Table 6.3). The odds of infants eating the recommended servings of vegetables, or fruit and vegetables combined, were lower with increasing maternal pressure-to-eat. There was also a trend towards a relationship between the early introduction of solids and pressure-to-eat (Table 6.3).

### 6.2.4.3 INFANT WEIGHT

Current weight measures found 67.7 % of infants were in the healthy weight range while 6.2 % were underweight, 11.2 % overweight and 14.9 % obese (Table 6.1). Most mothers described their infant's current weight as normal (92.1 %), 7 % as underweight and only 0.9% as overweight. No mother indicating that their infant was obese (Table 6.1). Of the 11 infants described as underweight, 3 (27.3%) were underweight while 8 (72.7%) had a healthy weight. Of the 145 infants described as normal, 99 (68.3%) had a healthy weight while 18 (12.4%) were overweight, 21 (14.5%) obese and 7 (4.8%) underweight. The odds of mothers being concerned about their infants becoming underweight was less when mothers described their infants weight as normal (OR 0.14, 95% CI 0.05-0.41) and more when described as underweight (OR 12.21, 95% CI 3.35-44.48).

Fewer mothers were concerned about their child becoming overweight (26.3%) than underweight (30.1%) and 10.9% were concerned about both (Table 6.1). Overweight concern was positively correlated with restrictive feeding (r=0.14, p=0.036) while underweight concern was positively correlated with pressure to eat (r=0.30, p<0.0001). These relationships remained after controlling for confounders (Table 6.4).

Overweight concern was positively correlated to maternal BMI but not to infant weight. Underweight concern was not correlated to maternal BMI but was negatively associated with current infant weight for age. Pressure to eat was also negatively related to infant current weight for age, infant birth weight and maternal description of infant weight. There
was a positive correlation between infant birth weight and maternal weight but no correlation between current infant weight and maternal weight (Table 6.4).

No associations were found between infant weight and infant dietary intake. The only feeding practice related to infant underweight or overweight outcome was pressure-to-eat, whereby the odds of infants being overweight were lower with pressure-to-eat (OR 0.50, 95% CI 0.30-0.84). Mothers who introduced solids after 4 months were less likely to be concerned about their child becoming underweight and women who breastfed for 6 months or more had lower odds of being overweight (Table 6.3).

6.2.5 DISCUSSION

This study aimed to investigate the relationships between maternal concerns about infant weight and their impact on feeding practices and infant dietary intake. Given that most of the 263 mothers indicated that they were the main person to feed their child, the responses would be a reasonable indication of the family feeding environment.

In comparing maternal description of infant weight and reported weight, it appeared that the mothers misinterpreted infant weight, with many healthy weight infants described as underweight and even more overweight and obese infants described as normal weight. The inability to recognise weight problems is not a new phenomenon and summarised well in Doolen et al’s meta-synthesis of the disconnect between perceived and actual weight of children. This misconstruction has only been captured in few studies involving infants, with evidence suggesting parents preference for growth in the higher percentiles (i.e. “more is better”). Failure to recognise overweight or overweight preference could explain the lower concern for overweight, the lower use of restriction and lack of association between restriction and infant diet and weight in the current sample. Preference for chubbier infants with weight viewed as a “safety net” and/or a sign of “good health” and “good parenting,” leading to inappropriate feeding has been well described in the literature.

Mothers in the study concerned about their child becoming overweight were more likely to use restriction, whereas concern about underweight had a wider impact on feeding decisions. Not only was underweight concern associated with pressure-to-eat, it was also linked to the early introduction of solids, a risk factor for childhood obesity. Given that infants of mothers who use pressure-to-eat are also less likely to meet their fruit and vegetable requirements as highlighted in Blissett’s review, underweight concern would
appear to be a mediator for both inappropriate controlling feeding practices as well as poor dietary intake, both associated with obesity risk. Infant temperament has also been associated with higher weight concerns (both under and overweight), suggesting feeding may be related to influencing weight as well as modifying behaviour, such as feeding to soothe, which in itself is associated with weight status.

Feeding practices and weight concern relationships seen in this study were consistent with the findings from other studies, but more importantly add to those focused in infancy. The present study also showed a relationship between infant birth weight and pressure to eat, implicating weight as an initiator for feeding practices. While maternal weight was not directly associated with feeding practices, higher maternal weight was associated with infant overweight concern, suggesting acknowledgement of the genetic obesity risk placed on the child.

### 6.2.5.1 STRENGTHS AND LIMITATIONS

There is a risk of recruitment bias in the study sample. While the sample’s feeding choices are similar to a broader sample of women, their demographics differ from Queensland mothers. Given the significant relationship between maternal education/income and infant feeding, the study attempted to recruit vulnerable mothers through parenting organisations. This group was under represented in the sample and advice from their support agency may have influenced their responses.

The lack of association between parenting style and infant dietary intake may be due to not measuring the demandingness dimension of parenting style, although similar methodology used elsewhere did detect relationships. Modification of the CFQ restriction questions to better measure transitional feeding practices may have affected the relationships detected, though this is not the first time the CFQ has been modified, specifically around the restriction subscale.

The association between pressure-to-eat and both low birth and low current weight would suggest an infant-led interaction. However, like all cross-sectional studies causality of the relationships reported in this paper cannot be inferred. Longitudinal data would assist in defining this association.
6.2.6 CONCLUSION

Mothers in this study appeared to misinterpret healthy infant growth leading to weight concerns which resulted in the use of feeding practices and infant dietary choices predictive of obesity. The data suggests that these weight concerns were related to both maternal and infant weight.

With dietary habits shown to be established by 2 years of age \(^{142}\) and track with weight into later life,\(^{7}\) it is important for parents to provide a supportive healthy family food environment early in their child’s life. Maternal concerns about infant weight were shown to lead to the early introduction of solids and other controlling feeding practices associated with poor dietary eating patterns. Although infant weight concerns is just one factor influencing infant intake, given the inability of some mothers to recognise healthy child growth, this study highlights the need for health practitioners to be aware of this misperception and start discussing the consequences of unhealthy growth, both underweight and overweight, early with parents. Further research into the origins of infant weight concerns is also warranted.
## Table 6.1: Demographic and anthropometric characteristics of mothers and infants

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Group</th>
<th>FAB Number (%)</th>
<th>2013 Qld birthing mothers %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Age (years) (n=218)</td>
<td>&lt; 20</td>
<td>10 (4.6)</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>20-24</td>
<td>24 (11.0)</td>
<td>16.5*</td>
</tr>
<tr>
<td></td>
<td>25-29</td>
<td>39 (17.9)</td>
<td>28.3**</td>
</tr>
<tr>
<td></td>
<td>30-34</td>
<td>88 (40.4)</td>
<td>31.8**</td>
</tr>
<tr>
<td></td>
<td>≥ 35</td>
<td>57 (26.2)</td>
<td>19.2**</td>
</tr>
<tr>
<td>Aboriginal or Torres Strait Islander (TSI) Status (n=213)</td>
<td>Aboriginal</td>
<td>3 (1.4)</td>
<td>5.3*</td>
</tr>
<tr>
<td></td>
<td>TSI</td>
<td>0 (0)</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>Aboriginal &amp; TSI</td>
<td>0 (0)</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>Non Aboriginal &amp; TSI</td>
<td>210 (98.6)</td>
<td>93.4**</td>
</tr>
<tr>
<td>Country of birth (n=220)</td>
<td>Australia</td>
<td>170 (77.3)</td>
<td>74.4</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>50 (22.7)</td>
<td>25.6</td>
</tr>
<tr>
<td>Language at home (n=220)</td>
<td>English</td>
<td>213 (96.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>7 (3.2)</td>
<td></td>
</tr>
<tr>
<td>Marital status (n=220)</td>
<td>Married or de facto</td>
<td>200 (90.9)</td>
<td>85.4*</td>
</tr>
<tr>
<td></td>
<td>Single/never married</td>
<td>20 (9.1)</td>
<td>14.6</td>
</tr>
<tr>
<td>Education level (n=222)</td>
<td>Less than year 12</td>
<td>5 (2.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Completed year 12</td>
<td>29 (13.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diploma/certificate</td>
<td>55 (24.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bachelor degree or higher</td>
<td>133 (59.9)</td>
<td></td>
</tr>
<tr>
<td>Employment status (n=222)</td>
<td>Full-time</td>
<td>14 (6.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Part-time or casual</td>
<td>57 (25.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Home duties</td>
<td>58 (26.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maternity leave</td>
<td>74 (33.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student</td>
<td>10 (4.6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unemployed/unable to work</td>
<td>9 (4.1)</td>
<td></td>
</tr>
<tr>
<td>Household income (n=218)</td>
<td>&lt;25,000</td>
<td>24 (11.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25,000 – 49,999</td>
<td>22 (10.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50,000 – 99,999</td>
<td>65 (29.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100,000 – 149,999</td>
<td>62 (28.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥150,000</td>
<td>45 (20.6)</td>
<td></td>
</tr>
<tr>
<td>Smoker – pregnancy (n=219)</td>
<td>Yes</td>
<td>9 (4.1)</td>
<td>12.9**</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>210 (95.9)</td>
<td>86.8**</td>
</tr>
<tr>
<td>Number of children (n=263)</td>
<td>One</td>
<td>142 (54.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>More than one</td>
<td>97 (46.0)</td>
<td></td>
</tr>
<tr>
<td>BMI: pre-pregnancy (n=219)</td>
<td>Underweight</td>
<td>12 (5.5)</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>Healthy</td>
<td>120 (54.8)</td>
<td>45.9**</td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>53 (24.2)</td>
<td>26.2</td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>33 (15.5)</td>
<td>22.2*</td>
</tr>
<tr>
<td>Maternal description of pre-pregnancy weight (n=222)</td>
<td>Underweight</td>
<td>6 (2.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normal</td>
<td>132 (59.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>72 (32.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Markedly overweight</td>
<td>12 (5.4)</td>
<td></td>
</tr>
<tr>
<td>BMI: current (n=218)</td>
<td>Underweight</td>
<td>11 (5.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Healthy</td>
<td>99 (45.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>68 (31.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obese</td>
<td>40 (18.3)</td>
<td></td>
</tr>
</tbody>
</table>
### Infant overweight concern (n=228)

<table>
<thead>
<tr>
<th>Concern Level</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconcerned</td>
<td>168</td>
<td>73.7</td>
</tr>
<tr>
<td>Little concerned</td>
<td>45</td>
<td>19.7</td>
</tr>
<tr>
<td>Concerned</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>Fairly concerned</td>
<td>4</td>
<td>1.8</td>
</tr>
<tr>
<td>Very concerned</td>
<td>3</td>
<td>1.3</td>
</tr>
</tbody>
</table>

### Infant underweight concern (n=229)

<table>
<thead>
<tr>
<th>Concern Level</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconcerned</td>
<td>160</td>
<td>69.9</td>
</tr>
<tr>
<td>Little concerned</td>
<td>43</td>
<td>18.8</td>
</tr>
<tr>
<td>Concerned</td>
<td>13</td>
<td>5.7</td>
</tr>
<tr>
<td>Fairly concerned</td>
<td>5</td>
<td>2.2</td>
</tr>
<tr>
<td>Very concerned</td>
<td>8</td>
<td>3.5</td>
</tr>
</tbody>
</table>

### Infant overweight & underweight concern (n=230)

<table>
<thead>
<tr>
<th>Concern Level</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconcerned</td>
<td>205</td>
<td>89.1</td>
</tr>
<tr>
<td>Concerned</td>
<td>25</td>
<td>10.9</td>
</tr>
</tbody>
</table>

### Sex of infant (n=260)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>135</td>
<td>51.9</td>
</tr>
<tr>
<td>Male</td>
<td>125</td>
<td>48.1</td>
</tr>
</tbody>
</table>

### Birth weight (g) (n=226)

<table>
<thead>
<tr>
<th>Weight Category</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2500 (low birth weight)</td>
<td>10</td>
<td>4.4</td>
</tr>
<tr>
<td>2500-4499</td>
<td>208</td>
<td>92.0</td>
</tr>
<tr>
<td>≥4500 (high birth weight)</td>
<td>8</td>
<td>3.5</td>
</tr>
<tr>
<td>Mean</td>
<td>3463</td>
<td></td>
</tr>
</tbody>
</table>

### Current weight (BMI for age) (n=161)

<table>
<thead>
<tr>
<th>Weight Category</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>10</td>
<td>6.2</td>
</tr>
<tr>
<td>Healthy</td>
<td>109</td>
<td>67.7</td>
</tr>
<tr>
<td>Overweight</td>
<td>18</td>
<td>11.2</td>
</tr>
<tr>
<td>Obese</td>
<td>24</td>
<td>14.9</td>
</tr>
</tbody>
</table>

### Maternal description of infant current weight (n=227)

<table>
<thead>
<tr>
<th>Weight Category</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>16</td>
<td>7.0</td>
</tr>
<tr>
<td>Normal</td>
<td>209</td>
<td>92.1</td>
</tr>
<tr>
<td>Overweight</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Markedly overweight</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*p<0.05  **p<0.01  Chi squared test for differences between FAB mothers and Queensland (QLD) birthing mothers

### Table 6.2: Maternal infant feeding practices and parenting style descriptive statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Feeding Practice</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restriction</td>
<td>2.16</td>
<td>0.74</td>
<td>2.00</td>
</tr>
<tr>
<td>Pressure-to-eat</td>
<td>2.27</td>
<td>0.94</td>
<td>2.25</td>
</tr>
<tr>
<td><strong>Parenting style</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal warmth</td>
<td>4.83</td>
<td>0.30</td>
<td>5.00</td>
</tr>
<tr>
<td>Maternal hostility</td>
<td>1.33</td>
<td>1.53</td>
<td>0.80</td>
</tr>
</tbody>
</table>
Table 6.3: Logistical regression between feeding practices, infant weight concern, weight and infant dietary intake [OR (95% CI)]

<table>
<thead>
<tr>
<th></th>
<th>Breast-feeding Initiation</th>
<th>Breast-feeding &gt;6mths</th>
<th>Introduction of solids &gt;4mth</th>
<th>Vegetable intake meets FD¹</th>
<th>Fruit intake meets FD¹</th>
<th>Fruit &amp; vege intakes meets FD¹</th>
<th>Takeaway &gt;1 time / week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restriction</td>
<td>0.43 (0.18-1.02)</td>
<td>1.21 (0.78-1.88)</td>
<td>0.81 (0.55-1.19)</td>
<td>1.26 (0.59-2.69)</td>
<td>1.38 (0.73-2.58)</td>
<td>1.16 (0.66-2.03)</td>
<td>0.88 (0.42-1.85)</td>
</tr>
<tr>
<td>Pressure to eat</td>
<td>0.60 (0.30-1.19)</td>
<td>1.10 (0.79-1.54)</td>
<td>0.74 (0.54-1.00)</td>
<td>0.45⁵ (0.21-0.97)</td>
<td>0.71 (0.44-1.13)</td>
<td>0.50° (0.27-0.92)</td>
<td>1.09 (0.60-1.96)</td>
</tr>
<tr>
<td>Monitoring</td>
<td>0.00 (0.00)</td>
<td>2.18ᵃ (0.83-5.75)</td>
<td>1.05 (0.47-2.37)</td>
<td>0.94 (0.20-4.41)</td>
<td>2.45 (0.88-6.83)</td>
<td>1.81 (0.67-4.91)</td>
<td>1.55 (0.41-5.87)</td>
</tr>
<tr>
<td>Maternal warmth</td>
<td>0.31 (0.02-5.71)</td>
<td>0.58 (0.19-1.82)</td>
<td>0.89 (0.34-2.37)</td>
<td>3.13 (0.72-13.58)</td>
<td>1.14 (0.27-4.80)</td>
<td>1.56 (0.45-5.41)</td>
<td>1.82 (0.37-8.97)</td>
</tr>
<tr>
<td>Maternal hostility</td>
<td>0.91 (0.63-1.31)</td>
<td>0.95 (0.77-1.17)</td>
<td>1.09 (0.90-1.33)</td>
<td>0.85 (0.63-1.15)</td>
<td>0.89 (0.69-1.16)</td>
<td>0.85 (0.67-1.06)</td>
<td>0.92 (0.67-1.26)</td>
</tr>
<tr>
<td>Underweight concern for infant</td>
<td>0.95 (0.24-3.78)</td>
<td>1.07 (0.54-2.13)</td>
<td>0.24⁺ (0.11-0.51)**</td>
<td>0.54 (0.18-1.63)</td>
<td>0.78 (0.31-1.94)</td>
<td>0.74 (0.32-1.70)</td>
<td>0.75 (0.24-2.33)</td>
</tr>
<tr>
<td>Overweight concern for infant</td>
<td>0.52 (0.14-1.91)</td>
<td>0.60 (0.31-1.18)</td>
<td>1.15 (0.60-2.21)</td>
<td>1.37 (0.37-5.07)</td>
<td>1.85 (0.80-5.67)</td>
<td>1.40 (0.54-3.65)</td>
<td>1.19 (0.32-4.49)</td>
</tr>
<tr>
<td>Pre-pregnancy maternal BMI</td>
<td>0.91ᵇ (0.86-0.97)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current maternal BMI</td>
<td>0.89ᵇ (0.83-0.95)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹FD = Foundation diet for infants  
ᵃ=adjusted for maternal BMI, age, education, income, first child, infant birthweight  
ᵇ=adjusted for maternal age, education, income, first child, infant birthweight  
ᶜ=adjusted for maternal BMI, age, education, income, first child, breastfeeding duration, infant birthweight  
ᵈ=adjusted for maternal BMI, age, education, income, infant underweight concern, first child, breastfeeding duration, infant birthweight  
*p<0.05 **p<0.01
Table 6.4: Correlation coefficients between feeding practices, feeding styles, weight concern and weight

<table>
<thead>
<tr>
<th></th>
<th>Restriction</th>
<th>Pressure to eat</th>
<th>Monitoring</th>
<th>Overweight concern</th>
<th>Underweight concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restriction</td>
<td></td>
<td>0.28**</td>
<td>-0.05</td>
<td>0.08*</td>
<td>-0.12</td>
</tr>
<tr>
<td>Pressure-to-eat</td>
<td></td>
<td>-0.10</td>
<td>0.02</td>
<td>0.19**</td>
<td></td>
</tr>
<tr>
<td>Maternal warmth</td>
<td>-0.03</td>
<td>-0.03</td>
<td>0.03</td>
<td>0.08</td>
<td>0.00</td>
</tr>
<tr>
<td>Maternal hostility</td>
<td>0.07</td>
<td>0.14*</td>
<td>-0.12</td>
<td>0.11</td>
<td>0.04</td>
</tr>
<tr>
<td>Describe weight</td>
<td>0.11</td>
<td>-0.21**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current weight for age</td>
<td>0.06</td>
<td>-0.17*</td>
<td>0.02</td>
<td>0.07</td>
<td>-0.27**</td>
</tr>
<tr>
<td>Births weight</td>
<td>0.03</td>
<td>-0.16*</td>
<td>0.00</td>
<td>0.04</td>
<td>-0.05</td>
</tr>
<tr>
<td>Current maternal BMI</td>
<td>0.03</td>
<td>-0.07</td>
<td>-0.09</td>
<td>0.22*</td>
<td>0.09</td>
</tr>
</tbody>
</table>

*p<0.05 **p<0.01
a= adjusted for maternal BMI, age, education, income, number of children, breastfeeding duration, infant birthweight
b= adjusted for maternal BMI, age, education, income, number of children, breastfeeding duration, infant birthweight

6.3 SUMMARY

The results in this chapter show that maternal concern about infant weight influence infant feeding practices, infant dietary intake and weight. Controlling feeding practices were associated with both under and overweight concerns, with underweight concerns being associated with lower fruit and vegetable intake. Furthermore, mothers appeared to misinterpret their infants’ weight, overestimating underweight and failing to recognize overweight and obesity. These weight concerns and associated feeding practices are investigated further through the follow-up interviews with mothers in Chapter 8, while Chapter 7 explored the resources influencing infant feeding decisions.
CHAPTER 7: MATERNAL KNOWLEDGE, SELF-EFFICACY AND INFORMATION SOURCES

7.1 INTRODUCTION

The manuscript in this Chapter, submitted to the Journal of Paediatrics and Child Health, provides further results from the maternal survey (phase 2). The primary purpose of the quantitative analysis in this manuscript was to identify the resources mothers used to inform their infant feeding knowledge and practices (research question 2). The Questions in the FAB survey for this investigation were formulated based on the Australian Infant Feeding Guidelines in addition to validated questionnaires. The findings of this paper informed the line of questioning used in the maternal interviews (phase 3) particularly around feeding confidence and influencing factors (Chapter 8).

7.2 MANUSCRIPT 3:

HARRISON M, HEPWORTH J, DAVIES PSW, BRODRIBB W.

MATERNAL KNOWLEDGE, SELF-EFFICACY AND SUPPORT INFLUENCES ON FEEDING PRACTICES AND INFANT DIETARY INTAKE.

JOURNAL OF PAEDIATRICS AND CHILD HEALTH, FEBRUARY 2017; UNDER REVIEW.

7.2.1 ABSTRACT

AIM: Changing established eating habits to tackle obesity is challenging. The family environment provides a unique setting to establish healthy eating early to support normal childhood growth and development. This can be achieved through influencing parenting style and feeding practices known to impact on the dietary intake and body weight of young children.

METHODS: This cross-sectional survey of 290 mothers of infants aged between 5 and 13 months investigated the influence of Infant Feeding Guidelines knowledge, maternal parenting self-efficacy and feeding confidence on maternal parenting style, feeding practices and infant dietary intake. Breastfeeding, timing of solid food introduction and fruit
and vegetable intake were assessed in line with the Infant Feeding Guidelines recommendations. Relationships were measured using logistic regression and correlations.

RESULTS: Maternal parenting self-efficacy and feeding confidence were positively correlated with maternal warmth and negatively associated with maternal hostility, and were more strongly correlated with infant feeding practices than Guidelines knowledge. Mothers with higher parenting self-efficacy or feeding confidence had higher odds of meeting their infants’ requirements for fruit and vegetables. Mothers were more likely to introduce solids after 4 months of age if they had higher Guidelines knowledge or actively sought information through print or electronic media. Breastfeeding initiation and duration was not found to be associated with Guidelines knowledge, parenting self-efficacy or feeding confidence.

CONCLUSIONS: Childhood obesity prevention efforts could benefit from establishing healthy eating early in life, incorporating strategies which optimise maternal self-efficacy and focusing on both traditional and new electronic information modalities to provide support.

7.2.2 INTRODUCTION

Poor adherence to dietary guidelines is contributing to the global obesity epidemic evident from a young age\textsuperscript{90} with over 41 million children under five years overweight worldwide.\textsuperscript{3} Obesity prevention sits across many sectors of society but particularly within the family context where mothers have a pivotal role in early food provision.\textsuperscript{31} Engaging and supporting parents to provide a healthy family eating environment requires an appreciation of the underlying factors that influence their feeding practices, particularly in the second six months of life where there are rapid changes in the infant’s diet.

While infant feeding is shaped by the social and cultural dynamics that govern family life,\textsuperscript{203} infant feeding knowledge, feeding confidence and feeding support are also potential influences on feeding decisions. These relationships are embodied in Birch and Venture’s ecological model of childhood obesity etiology\textsuperscript{61} whereby weight is a product of a child’s behaviour which is influenced by the family environment embedded within the community context (Figure 7.1).
The Australian Infant Feeding Guidelines⁹ (hereafter, Guidelines) which are consistent with international infant feeding standards,¹⁰⁰ recommend introducing solids at around 6 months and breastfeeding until at least 12 months. Given the positive influence of maternal education on feeding styles²⁸⁰ and dietary patterns in infancy,⁹¹,²⁸¹,²⁸² understanding the impact of infant feeding knowledge on establishing healthy eating habits is of interest. Yet knowledge alone is not enough to change behaviour with attitudes and self-belief contributing to action.⁴⁷,¹²⁵,¹²⁶

Self-efficacy, in the context of the early feeding environment involves the confidence of parents to be able to provide optimal infant nutrition conducive to healthy growth and development. According to Bandura’s Social Learning Theory,²⁸³ it is this belief in one’s capacity to perform that task that influences behaviour. Maternal self-efficacy has been shown to improve breastfeeding duration²⁸⁴ and vegetable intake in infants.¹⁵⁷,¹⁹⁷ The reported decline in the influence of maternal self-efficacy on dietary intake as children age, suggests an early window of influence for establishing healthy eating habits.¹⁹⁷

Infant feeding practices used by some parents, such as restriction, pressure-to-eat and monitoring, have been shown to influence dietary quality and quantity and obesity risk in children.¹⁶⁰ Despite the limitations in the literature, it appears that parenting styles modify the effectiveness of feeding practices, child dietary intake and body weight through the emotional climate they provide.²² The origins for these behaviours in the infant feeding arena have been linked to concerns about growth¹⁹ and the inability of parents to trust their infant’s ability to self-regulate intake to meet their nutritional needs.⁶⁰,²⁸⁵

Where parents obtain their transitional infant feeding information and support and how it impacts on feeding practices needs to be considered when developing strategies to support healthy eating habits in infants and prevention of childhood obesity. While sparse, the literature in this area would suggest an array of conflicting lay and professional sources competing alongside personal experiences and beliefs.²⁸⁶,²⁸⁷ Acceptance of advice from family and friends in this transitional feeding stage may reflect similar lived experiences, including feeding to influence infant growth and contentment.²⁰³,²⁸⁶

The relationships between feeding practices, infant dietary intake and weight in this study have been described elsewhere.²⁰³ To guide infant feeding interventions, this paper aims to investigate the relationship between maternal infant feeding knowledge, self-efficacy and support on maternal feeding practices and parenting styles and infant dietary intake.
7.2.3 METHODS

7.2.3.1 STUDY DESIGN AND SAMPLE

Mothers of infants aged between 5 and 13 months were recruited to gather information about the feeding practices in transitioning from milk feeding through to family foods. Queensland mothers completed the Feeding A Baby (FAB) survey via the FAB Facebook page, parenting websites and associated Facebook posts and newsletters. To capture the views of more vulnerable mothers, parenting support organisations in Brisbane and the surrounding areas were also targeted. Mothers completing the questionnaire had the option of going into a draw to win a AUD$100 supermarket gift voucher.

The questionnaire could be done online via SurveyMonkey, by hard copy, or over the telephone. The 10-15 minute survey was piloted with a small group of mothers before going ‘live’. The study was granted institutional human research ethics clearance (Approval Number 2013001520) by The University of Queensland through the Behavioural & Social Sciences Ethical Review Committee.
7.2.3.2 MATERIALS – QUESTIONNAIRE

7.2.3.2.1 DEMOGRAPHICS

Age, marital status, education, employment status, annual household income, residential suburb and post code of the mothers’ were determined using questions from the Queensland Infant Feeding Survey\textsuperscript{81,111} and the 2011 Census.\textsuperscript{262}

7.2.3.2.2 INFANT DIET, MATERNAL KNOWLEDGE, SELF-EFFICACY AND INFORMATION SUPPORT

To determine the dietary intake of the infants items from the Queensland Infant Feeding Survey\textsuperscript{81,111} were used to ask about the regular use of breast milk, infant formula, follow-on formula, cow’s milk and other milks, solids, fruit, vegetables, takeaways, fruit juice and sweetened drinks (e.g. ‘Has your child ever been given any solid or semi-solid food regularly [daily or almost daily]?’).

To see if breastfeeding and the introduction of solids were consistent with the Guidelines\textsuperscript{9} responses were dichotomised. Introduction of solids timing was divided into $\leq 4.0$ and $> 4$ months based on the belief that solids introduced during the 4\textsuperscript{th} or 5\textsuperscript{th} month is consistent with the around 6 month recommendation. Breastfeeding duration was split as $< 6$ and $\geq 6.0$ months representing half the recommended minimum length of breastfeeding. The Foundation Diet\textsuperscript{97,99} recommended serves for infants were used to determine fruit and vegetable adequacy.

Maternal knowledge of the Guidelines was determined by asking about the recommended length of exclusive breastfeeding, any breastfeeding and infant formula use. Mothers were also asked about the recommended age to introduce solid or semi-solid foods, and what the first food should be. Responses could be recorded in day, months or years with data converted to months using a website time converter.\textsuperscript{288} Responses were scored as a 1 if correct or 0 if incorrect, with a mean score achieved by adding up the scores to the five questions and dividing by 5 (range 0-5).

Maternal parenting self-efficacy was measure through the global parental self-efficacy question from the Longitudinal Study of Australian of Children (i.e. ‘Overall, as a parent do you feel you are…’).\textsuperscript{259} The five response categories were: ‘not very good at being a parent’, ‘has some trouble being a parent,’ ‘average parent,’ ‘better than average parent’.
and ‘very good parent.’ For logistic regression, responses were dichotomised with the last two categories grouped as high self-efficacy and the others as low self-efficacy. Responses were handled as a categorical variable for correlations.

Maternal feeding confidence was gauged using the Nutrition Education Aimed at Toddlers (NEAT) Feeding Self-Efficacy Questionnaire. While it was felt that the questions were appropriate to infants, only the five key questions about feeding types and amount of foods were used (i.e. ‘I give my child healthy food;’ ‘I can get my child to eat enough;’ ‘I can get my child to try vegetables;’ ‘I give my child the right amounts of food;’ ‘I can get my child to taste new food’). The five point scale responses from ‘not confident’ through to varying degrees of confidence were scored from 1 to 5, added and divided by 5 to attain a mean value (range 1-5).

Mothers were asked where they accessed information about feeding their infants solid foods. Multiple responses were allowed from the following list: mother, partner’s mother, siblings, other relatives, friends, mothers’ group, General Practitioner (family doctor), child health nurse, pharmacist, magazines, books, television, internet, nowhere and other (specify). Each information source was dichotomised as used or not used.

7.2.3.2.3 MATERNAL PARENTING STYLE AND FEEDING PRACTICES

The warmth and hostility questions from the LSAC were used to measure maternal parenting style. Sharing affection with the child was assessed using five warmth questions and scored from 1 for ‘never’ to 5 for ‘always or almost always’ with a mean score achieved by dividing the combined score by 5 (range 1-5). Angry behaviour towards the child was gauged using six hostility questions and scored from 0 as ‘not at all’ to 10 for ‘all the time’, added together and divided by 6 to obtain a mean score (range 0-10).

The Child Feeding Questionnaire (CFQ) was used to measure the feeding practices of restriction, pressure to eat and monitoring. Intended for use in children aged 2-11 years, the questions were applicable for infants who had commenced solids, however given the younger age group, the restriction questions were group to focus on the feeding practice over food choice (e.g. ‘offering sweets or favourite foods in exchange for good behaviour’ was grouped as ‘offering food in exchange for good behaviour’) leaving four in total. All four pressure questions were included (e.g. ‘my child should always eat all the food on his/her plate’). Given the reduced time exposure to food in this age group, the three monitoring questions were combined to one (i.e. ‘keep track of the high sugar or high fat...’).
foods'). Responses for the restriction, and for pressure, scored from 1 for ‘disagree’ to 5 for ‘agree’ were summed and divided by 4 for a mean score (range 1-4). Monitoring was used as a categorical variable in correlations.

7.2.3.3 STATISTICAL METHODS

The statistical analyses were carried out using SPSS 23\textsuperscript{267} at a 0.5 statistical significance. Descriptive analyses were performed for all the variables. The association between maternal Guidelines knowledge, feeding confidence, self-efficacy and infant dietary intake were investigated using bivariate logistic regression tests with odds ratios and 95% confidence intervals identified. Multivariable logistic regressions were completed to account for confounders (maternal BMI, age, education, income, breastfeeding duration, infant birth weight and number of children). Correlations were also completed to explore maternal IFG knowledge, feeding confidence, self-efficacy, feeding practices and parenting feeding styles relationships.

7.2.4 RESULTS

7.2.4.1 PARTICIPANTS

Overall 290 mothers completed the questionnaire, 264 online and 26 by hardcopy. Some mothers used a computer/ipad with staff assistance to read out the questions and mark the responses, but none used the telephone option. Respondents were not included if their infants were outside the age range (n = 25) or they provided insufficient data (n = 2).

Of the final 263 mothers, the mean age was 31.4 years (range 18-44 years) and over half were first time mothers (Table 7.1). Most mothers were non-Indigenous, born in Australia, in a relationship and generally well educated. Around one third were found to be employed with another third on maternity leave. Overall household incomes were low compared to national median ($80,704) and mean ($107,276), with one in two mothers having an household annual income less than $100,000 and one in five mothers less than AU$50,000. There were almost equal numbers of female and male infants, with a mean age of 8.8 months (range 5.2-13.4 months).
7.2.4.2 INFANT DIET

Most mothers (95.7%) initiated breastfeeding with around one third (31.6%) having ceased breastfeeding at the time of the survey; of these 45.9% before 4 months and 51.8% before 5 months. Around two thirds of mothers (63.8%) used infant formula and 39.1% used follow-on formula. Cow’s milk was used regularly by 6.2% mothers, while juice was used by 15.2% of mothers but only regularly by 3.5%. No infants consumed sweetened drinks regularly and only 2.7% had tried them.

Mothers were primarily responsible for feeding their infant. The majority of infants (93.8%) were consuming solid foods on a regular basis with infant cereal (47.6%), mashed vegetables (24.2%) and mashed fruit (15.9%) the most common first foods. Finger foods (excluding rusks) were used as first foods by 5.2% of mothers. Around 1 in 3 mothers (31.1%) introduced solids early (i.e. 4 months or earlier). The majority of infants were meeting the fruit and vegetable recommendations (88% and 91.7% respectively) and only 6.2% infants were found to eat takeaway foods on a weekly or monthly basis. Most infant meals were prepared from scratch (77.2%), with prepared commercial baby foods used by 11.4% of mothers on a regular basis. Maternal and child food preferences were the most commonly cited influencers of food purchases (57.8% and 58.2% respectively).

7.2.4.3 MATERNAL KNOWLEDGE, SELF-EFFICACY, FEEDING CONFIDENCE, INFORMATION SUPPORT AND INFANT INTAKE

Most mothers (85.5%) knew at least three of five Guidelines (mean = 3.75). Timing of the introduction of solids had the most variability with around a third (32.0%) of mothers indicating solids should be introduced at 4 months or earlier. The odds of introducing solids after 4.0 months or meeting both fruit and vegetable recommendations were higher with maternal knowledge of 3 or more Guidelines (Table 7.2).

In terms of maternal parenting self-efficacy, 71% mothers thought they were very good or better than average at being a parent. The odds of infants meeting vegetable, fruit or combine fruit and vegetable recommendations were higher with greater maternal parenting self-efficacy (Table 7.2). Maternal parenting self-efficacy was positively correlated with maternal feeding confidence \( (r=0.34, p<0.0001) \) but not associated to Guidelines knowledge (Table 7.5).
Maternal feeding confidence was high (mean = 4.3, range = 1.4 – 5). The odds of infants eating the recommended servings of vegetables, fruit or both fruit and vegetables were higher with increasing maternal feeding confidence (Table 7.2). Maternal feeding confidence was not associated to Guidelines knowledge (Table 7.5).

Looking at where mothers get information about feeding infants solids, the odds of introducing solids after 4.0 months were lower with information from the paternal grandmother, other relatives or GP, and higher with information from magazines, books and the internet (Table 7.3).

7.2.4.4 MATERNAL KNOWLEDGE, SELF-EFFICACY, FEEDING CONFIDENCE AND FEEDING PRACTICES AND STYLES

The mean, standard deviation and median for maternal infant feeding practices and parenting style are captured in Table 7.4. Maternal Guidelines knowledge was found to be negatively correlated with pressure to eat (r=-0.142, p=0.033) and positively related to monitoring (0.136, p=0.043).

Maternal parenting self-efficacy was found to be negatively correlated to pressure to eat (r=-0.182, p=0.006) and maternal hostility (r=-0.200, p=0.003), while being positively correlated to maternal warmth (r=0.257, p=0.003). Maternal feeding confidence was also negatively correlated to pressure to eat (r=-0.413, p<0.0001) and maternal hostility (r=-0.275, p<0.0001), while it had a positive relationship with monitoring (r=0.189, p=0.005) and maternal warmth (r=0.228, p=0.001).

7.2.5 DISCUSSION

The transition to family foods is an important period given that eating habits are established in children as young as 2 years of age,142 and along with body weight can track into adulthood.7,40 This study explored the relationships between maternal infant feeding guideline knowledge, parenting self-efficacy, feeding confidence and information support on maternal feeding practices, parenting styles and infant dietary intake.

In this sample of 263 mothers, breastfeeding was initiated by most, infant formula used by two thirds and solids introduced earlier than recommended to one third of the infants. Previous studies have found a relationship between maternal confidence, self-efficacy and breastfeeding.289,290 The fact that this study has not, may reflect the use of questions nonspecific to detect this relationship. Given the obesity protective effect of
breastfeeding, the poor duration of breastfeeding in this sample and the relationship between formula feeding and early solids use, interventions need to include breastfeeding support.

The introduction of solid foods at or before 4 months is another contributor to childhood obesity, however in the sample of mothers around one third believed this was the recommended age to start solids and one third introduced solids early. While Guidelines knowledge in this study was related to the delay in the introduction of solids, the use of ‘food to soothe’ infant distress and promote sleep and growth is prominent in the literature, and another key modifiable obesity risk factor to address.

Fruit and vegetable intake are fundamental indicators of a healthy diet and early exposure during infancy is associated with higher intakes during childhood. Our findings that both feeding confidence and maternal self-efficacy directly affected infant fruit and vegetable intake builds on the limited studies on this relationship. Unlike the other studies, which only found an association between maternal self-efficacy and infant vegetable intake, this study also found an association with infant fruit intake. With neither maternal feeding confidence nor parenting self-efficacy was associated with Guidelines knowledge, intervention strategies need to go beyond simple knowledge transfer to building the skills necessary to provide a healthy diet.

The negative relationship between maternal self-efficacy and pressure-to-eat and maternal hostility adds to the evidence base linking low maternal responsiveness (i.e. high hostility) with more controlling feeding practices, and suggests a mediating role for maternal self-efficacy in this relationship. Further, our results would suggest that maternal self-efficacy improves infant dietary intake through the use of responsive parenting styles (i.e. high warmth) whereby feeding may be guided by the infant’s feeding cues and not the mother’s feeding practices.

Transitional infant feeding resources were found to have a significant impact on the timing of introducing solids in this study, indicating pathways to target to support parents (Figure 7.1: community dimension). This includes broader messages to family and health professionals around the misuse of ‘food to soothe’ and the dangers of the early introduction of solids. GP information did increase maternal feeding confidence (p<0.05, 1.93[1.16-3.22]), supporting their role in establishing healthy maternal infant feeding practices. The positive impact of information actively sourced through channels such as internet (accessed by most households) provides guidance to the use of newer
communication strategies over ones less accessed (e.g. helpline) in supporting healthy eating early.

### 7.2.5.1 STRENGTHS AND LIMITATIONS

While this sample has similar infant feeding practices to a broader sample of women, they differ from the demographics of all birthing Queensland mothers (Table 7.1), suggesting a recruitment bias risk. Less educated/lower income mothers known to have poor infant feeding practices were under represented in this sample despite a dedicated recruitment strategy. Further, responses of these mothers may have been influenced by the infant feeding advice from their support agency.

The lack of association between maternal Guidelines knowledge, feeding confidence or parenting self-efficacy and restriction may be due to the modification of the CFQ restriction questions to improve transitional feeding practice measures, although similar modifications have been done elsewhere. The authors also acknowledge the limitations of this cross-sectional study in inferring causality from the reported relationships and support further longitudinal research.

### 7.2.6 CONCLUSION

The first 12 months of life provides an opportunity for parents to influence the future health and welling of their child. Information alone is insufficient to cultivate maternal parenting styles and feeding practices supportive of healthy infant eating. The results in this study support the nurturing of maternal self-efficacy, through enhancing both parenting and feeding confidence and skills, in addition to investing in newer communication channels to support the development of lifelong healthy eating patterns.
Table 7.1: Demographic characteristics of mothers

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Group</th>
<th>FAB Number</th>
<th>FAB %</th>
<th>2013 Qld birthing mothers %&lt;sup&gt;268&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Age (n=218)</td>
<td>&lt; 20</td>
<td>10</td>
<td>4.6</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>20-24</td>
<td>24</td>
<td>11.0</td>
<td>16.8</td>
</tr>
<tr>
<td></td>
<td>25-29</td>
<td>39</td>
<td>17.9</td>
<td>28.6</td>
</tr>
<tr>
<td></td>
<td>30-34</td>
<td>88</td>
<td>40.4</td>
<td>30.6</td>
</tr>
<tr>
<td></td>
<td>≥ 35</td>
<td>57</td>
<td>26.2</td>
<td>19.3</td>
</tr>
<tr>
<td>Aboriginal or Torres Strait Islander (TSI) Status (n=213)</td>
<td>Aboriginal</td>
<td>3</td>
<td>1.4</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>TSI</td>
<td>0</td>
<td>0</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>Abor &amp; TSI</td>
<td>0</td>
<td>0</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>Non Aboriginal &amp; TSI</td>
<td>210</td>
<td>98.6</td>
<td>94.0</td>
</tr>
<tr>
<td>Country of birth (n=220)</td>
<td>Australia</td>
<td>170</td>
<td>77.3</td>
<td>75.2</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>50</td>
<td>22.7</td>
<td>24.8</td>
</tr>
<tr>
<td>Language at home (n=220)</td>
<td>English</td>
<td>213</td>
<td>96.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>7</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>Marital status (n=220)</td>
<td>Married or de facto</td>
<td>200</td>
<td>90.9</td>
<td>87.1</td>
</tr>
<tr>
<td></td>
<td>Single/never married</td>
<td>20</td>
<td>9.1</td>
<td>12.9</td>
</tr>
<tr>
<td>Education level (n=222)</td>
<td>Less than year 12</td>
<td>5</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Completed year 12</td>
<td>29</td>
<td>13.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diploma/certificate</td>
<td>55</td>
<td>24.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bachelor degree or higher</td>
<td>133</td>
<td>59.9</td>
<td></td>
</tr>
<tr>
<td>Employment status (n=222)</td>
<td>Full-time</td>
<td>14</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Part-time or casual</td>
<td>57</td>
<td>25.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Home duties</td>
<td>58</td>
<td>26.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maternity leave</td>
<td>74</td>
<td>33.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student</td>
<td>10</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unemployed/unable to work</td>
<td>9</td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>Household income (n=218)</td>
<td>&lt;25,000</td>
<td>24</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25,000 – 49,999</td>
<td>22</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50,000 – 99,999</td>
<td>65</td>
<td>29.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100,000 – 149,999</td>
<td>62</td>
<td>28.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥150,000</td>
<td>45</td>
<td>20.6</td>
<td></td>
</tr>
<tr>
<td>Smoker – pregnancy (n=219)</td>
<td>Yes</td>
<td>9</td>
<td>4.1</td>
<td>14.2</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>210</td>
<td>95.9</td>
<td>85.4</td>
</tr>
<tr>
<td>First child (n=263)</td>
<td>Yes</td>
<td>142</td>
<td>54.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>97</td>
<td>46.0</td>
<td></td>
</tr>
<tr>
<td>Sex of infant (n=260)</td>
<td>Female</td>
<td>135</td>
<td>51.9</td>
<td>48.3</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>125</td>
<td>48.1</td>
<td>51.7</td>
</tr>
</tbody>
</table>
Table 7.2: Logistic regression relationships between maternal Guidelines knowledge, feeding confidence, parenting self-efficacy and infant dietary intake

<table>
<thead>
<tr>
<th></th>
<th>Breastfeeding Initiation</th>
<th>Breastfeeding &gt;6mths</th>
<th>Introduction of solids &gt;4mth</th>
<th>Vegetable intake meets FD¹</th>
<th>Fruit intake meets FD¹</th>
<th>Fruit &amp; vege intakes meets FD¹</th>
<th>Takeaway &gt;1 time / week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of ≥3 Guidelines</td>
<td>2.37 (0.60-9.40)</td>
<td>1.49 (0.59-3.73)</td>
<td>5.54b (2.23-13.77)**</td>
<td>2.74 (0.90-8.32)</td>
<td>3.14b (0.89-11.10)</td>
<td>3.34b (1.02-10.97)*</td>
<td>0.50 (0.06-4.00)</td>
</tr>
<tr>
<td>Maternal self-efficacy</td>
<td>0.26 (0.03-2.07)</td>
<td>1.03 (0.49-2.20)</td>
<td>0.74 (0.39-1.42)</td>
<td>13.56b (2.66-69.26)**</td>
<td>3.96b (1.31-12.01)*</td>
<td>4.28b (1.54-11.93)**</td>
<td>0.96 (0.29-3.17)</td>
</tr>
<tr>
<td>Feeding confidence</td>
<td>0.89 (0.33-2.45)</td>
<td>0.87 (0.51-1.51)</td>
<td>0.91 (0.59-1.41)</td>
<td>6.76b (2.53-18.08)**</td>
<td>2.51b (1.21-5.19)*</td>
<td>3.48b (1.71-7.11)**</td>
<td>1.93 (0.96-3.89)</td>
</tr>
<tr>
<td>University education</td>
<td>2.45 (0.67-8.95)</td>
<td>2.11a (0.94-4.73)</td>
<td>1.03 (0.57-1.85)</td>
<td>1.32 (0.43-4.08)</td>
<td>1.57 (0.65-3.79)</td>
<td>1.58 (0.70-3.60)</td>
<td>2.08 (0.69-6.22)</td>
</tr>
</tbody>
</table>

* p<0.05  ** p<0.01  ¹FD = Foundation diet for infants

a = adjusted for maternal BMI, age, income, first child, infant birthweight

b = adjusted for maternal BMI, age, education, income, first child, breastfeeding duration, infant birthweight
Table 7.3: Sources of information about introducing solids and bivariate logistic regression relationships (n = 251)

<table>
<thead>
<tr>
<th>Information source</th>
<th>≤ 4 months n=78 (%)</th>
<th>&gt; 4 months n=173 (%)</th>
<th>Introduction of solids &gt;4mth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother's mother</td>
<td>40 (51%)</td>
<td>68 (39%)</td>
<td>0.62 (0.36-1.05)</td>
</tr>
<tr>
<td>Partner's mother</td>
<td>13 (17%)</td>
<td>10 (6%)</td>
<td>0.31 (0.13-0.73)**</td>
</tr>
<tr>
<td>Siblings</td>
<td>7 (9%)</td>
<td>23 (13%)</td>
<td>1.56 (0.64-3.8)</td>
</tr>
<tr>
<td>Relatives</td>
<td>10 (13%)</td>
<td>9 (5%)</td>
<td>0.37 (0.15-0.96)*</td>
</tr>
<tr>
<td>Friends</td>
<td>32 (41%)</td>
<td>63 (36%)</td>
<td>0.82 (0.48-1.42)</td>
</tr>
<tr>
<td>Mothers groups</td>
<td>41 (53%)</td>
<td>87 (50%)</td>
<td>0.91 (0.54-1.56)</td>
</tr>
<tr>
<td>GP</td>
<td>38 (49%)</td>
<td>35 (20%)</td>
<td>0.27 (0.15-0.48)**</td>
</tr>
<tr>
<td>Child health nurse</td>
<td>37 (47%)</td>
<td>105 (61%)</td>
<td>1.71 (1.0-2.93)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>2 (3%)</td>
<td>2 (1%)</td>
<td>0.44 (0.61-3.21)</td>
</tr>
<tr>
<td>Magazines</td>
<td>5 (6%)</td>
<td>29 (17%)</td>
<td>2.94 (1.09-7.91) *</td>
</tr>
<tr>
<td>Books</td>
<td>26 (33%)</td>
<td>89 (51%)</td>
<td>2.12 (1.21-3.70)**</td>
</tr>
<tr>
<td>Television</td>
<td>2 (3%)</td>
<td>4 (2%)</td>
<td>0.90 (0.16-5.02)</td>
</tr>
<tr>
<td>Internet</td>
<td>50 (64%)</td>
<td>135 (78%)</td>
<td>1.99 (1.11-3.58)*</td>
</tr>
</tbody>
</table>

*p<0.05 **p<0.01
Table 7.4: Maternal infant feeding practices and parenting style descriptive statistics

<table>
<thead>
<tr>
<th>Feeding Practice</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restriction</td>
<td>2.16</td>
<td>0.74</td>
<td>2.00</td>
</tr>
<tr>
<td>Pressure-to-eat</td>
<td>2.27</td>
<td>0.94</td>
<td>2.25</td>
</tr>
<tr>
<td>Parenting style</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal warmth</td>
<td>4.83</td>
<td>0.30</td>
<td>5.00</td>
</tr>
<tr>
<td>Maternal hostility</td>
<td>1.33</td>
<td>1.53</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Table 7.5: Correlation coefficients between maternal Guidelines knowledge, feeding confidence, self-efficacy, feeding practices and parenting styles

<table>
<thead>
<tr>
<th></th>
<th>Guidelines Knowledge</th>
<th>Feeding confidence</th>
<th>Maternal self-efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restriction</td>
<td>-0.039</td>
<td>-0.059</td>
<td>0.049</td>
</tr>
<tr>
<td>Pressure to eat</td>
<td>-0.142*</td>
<td>-0.413**</td>
<td>-0.182**</td>
</tr>
<tr>
<td>Monitor</td>
<td>0.136*</td>
<td>0.189**</td>
<td></td>
</tr>
<tr>
<td>Feeding confidence</td>
<td>0.117</td>
<td>0.341**</td>
<td></td>
</tr>
<tr>
<td>Maternal warmth</td>
<td>-0.001</td>
<td>0.228**</td>
<td>0.257**</td>
</tr>
<tr>
<td>Maternal hostility</td>
<td>0.069</td>
<td>-0.275**</td>
<td>-0.200**</td>
</tr>
<tr>
<td>Guidelines knowledge</td>
<td></td>
<td>0.117</td>
<td>0.058</td>
</tr>
</tbody>
</table>

*p<0.05 **p<0.01

7.3 SUMMARY

The results in this chapter show that while maternal Guideline knowledge was associated with later introduction of solids and less use of controlling feeding practices, maternal feeding confidence and self-efficacy were more strongly associated with less use of controlling feeding practices. Furthermore, mothers with higher feeding confidence and self-efficacy were more likely to meet their infants’ fruit and vegetable requirements. In looking at where mothers source their infant feeding knowledge, mothers who used print or electronic media were more likely to introduce solids after 4 months, while those that used paternal grandmother, child health or GP advice were more likely to introduce solids early. These relationships are investigated further through the follow-up interviews with mothers in Chapter 8.
Chapter 7: Maternal Survey – Self-efficacy
CHAPTER 8: MATERNAL TRANSITIONAL INFANT FEEDING EXPERIENCES

8.1 INTRODUCTION

“Research is formalized curiosity. It is poking and prying with a purpose.”
Zora Neale Hurston, African-American novelist, folklorist, and anthropologist

The qualitative work contained in this chapter builds on the phase 2 maternal survey results outlined in the preceding two chapters. Chapter 6 described how maternal weight perception and weight concerns impact on transitional infant feeding practices and dietary intake. Chapter 7 explored the relationship between maternal infant feeding knowledge, self-efficacy and information resources with transitional infant feeding practices and dietary intake.

To provide context and meaning to the responses from the maternal survey, a sub-sample of respondents were selected and interviewed as part of the final phase of the research. The methodology and analysis for these phase 3 interviews along with the research questions are outlined in Chapter 4. The interviews provided an opportunity to validate the maternal survey responses and further explore the origins of maternal infant feeding decisions. This type of investigation was recommended in the outcomes of the systematic literature review in Chapter 3 and the researcher interviews in Chapter 5. To understand the rationale behind the transitional infant feeding process of moving from milk feeding to family foods, a qualitative approach provided insight into the attitudes and values of the mothers which in turn enabled the researcher to develop a more nuanced understanding of how and why mothers make decisions about feeding their infants. In this chapter the results of the semi-structured interviews are presented and analysed, and the key findings reported. This chapter has been captured in a manuscript titled ‘Navigating motherhood and maternal transitional infant feeding: Learnings for health professionals,’ submitted to Appetite in June 2017 and is under review.

8.2 PHASE 3: MATERNAL SEMI-STRUCTURED INTERVIEWS

8.2.1 RESULTS
8.2.1.1 PARTICIPANTS

The mean age of the mothers who completed the phase 2 survey was 27 years and their children were all 12 months or younger. The children were around 2 years (mean=24mths, range=18-28mths) when the interview was completed. Table 8.1 provides the characteristics of the mothers interviewed. Sixty percent of the mothers had breastfed for six months or longer and 60% of the mothers had introduced solid foods after four months.

Table 8.1: Characteristics of 15 mothers interviewed

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overweight&amp; underweight concern (n=5)</th>
<th>Overweight concern (n=2)</th>
<th>Underweight concern (n=3)</th>
<th>No weight concerns (n=5)</th>
<th>Total (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother's age mean years</td>
<td>26.8</td>
<td>30.5</td>
<td>32.0</td>
<td>21.6</td>
<td>26.6 (18-40)</td>
</tr>
<tr>
<td>&lt;20</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>20-&lt;25</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25-&lt;30</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>30-&lt;35</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>35-&lt;40</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>≥40</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/de facto</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Single</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>No Uni</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Income level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25K</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>25-50K</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>50-100K</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>100-150K</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>150+K</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full time</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Part time</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Maternity leave</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Home duties</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;6 mths</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>≥6 mths</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Solids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤4 mths</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>&gt;4 mths</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Infant's age mean months</td>
<td>6.8</td>
<td>9.8</td>
<td>9.5</td>
<td>9.9</td>
<td>8.7 (5.4-12.2)</td>
</tr>
</tbody>
</table>
8.2.1.2 THEMES

The interviews were conducted with a confirming and disconfirming purposive sample of first time mothers. The selection of these mothers was based on their phase 2 survey response as to whether they were concerned about their child becoming overweight and/or underweight. All mothers contacted agreed to take part in the interviews except for one, who declined due to current work and study commitments. While the intention was to interview five mothers from each weight concern category, no additional interviews were conducted after 15 were completed due to data saturation in the responses to the interview questions.

Using the inductive qualitative analysis framework described by Pope and Mays, three major themes were identified that embodied the main reasons behind maternal transitional infant feeding decisions: (1) Expectations; (2) Trust; and (3) Stress. Each theme has two sub-themes to better describe this rationale: (1) Motherhood and Infant Temperament; (2) Maternal-child feeding and Endorsement; and (3) Confidence and Thriving. The themes are outlined in Figure 8.1.

Mothers’ quotes under the themes and sub-themes are identified by maternal age, length of breastfeeding (e.g., BF12mths), timing of introduction of solids (e.g., S6mths), use of controlling feeding practices (pressure = P, restriction= R) and infant weight concern (underweight = UWT, overweight = OWT).

Figure 8.1: Inductive themes and subthemes
8.2.1.3 THEME 1: EXPECTATIONS

8.2.1.3.1 SUB-THEME: MOTHERHOOD

One of the most important expectations defining mothers’ approach to infant feeding was their identity as a mother. In the context of infant feeding in this study, motherhood has been defined by the mother’s ability to meet professional and lay feeding recommendations while satisfying the needs of the infant.\(^{203}\)

Choosing how their infants were fed generated strong emotional responses in mothers, ranging from anticipation and enjoyment to guilt and failure. Mothers often described infant feeding decisions and practices in terms that implied a moral evaluation of their identity as mothers.

*I was really proud of myself for making all her purees...she was eating really well...asparagus, and things like that, so I was really happy with that.' *I was really happy with myself, so I always felt really good giving her everything that I wanted to give her...I didn’t want to give her um, you know the shop food (21, BF6wks, S4mths, nil PorR, nil UWTorOWT)*

While overall there appeared to be less anxiety in transitioning onto solid foods than decisions about milk feeding, the choices made and the impact on the child’s growth and behaviour were extremely important to many women’s identity as mothers.

*I felt a lot of pressure to make sure that I was getting his food right, making sure it was healthy and balanced...[I measure myself up against other people’s expectations] all the time, yeah. My mom, my sister, friends. Again, it was all in my head. (25, BF12mths, S5mths, nil RorP, nil UWTorOWT)*

Mothers described their emotions and expectations about what and how to feed their infant from their own viewpoints as well as the impact of comments and expectations made by others. Underpinning these descriptions was the notion that mothers’ actions were inextricably linked to her being seen as a “good” or “bad” mother. In this study, many mothers were emotionally challenged by the ongoing judgement of feeding decisions.
...people make you feel guilty because you are not doing the perfect thing...everyone felt they have a right to tell you what to do...it’s always a constant pressure like that mum’s doing that and I’m not doing that, that makes me a bad mum...and then society’s like “your kid should be eating gluten-free, nut-free, wheat-free, dairy-free”...all this social pressure...I don’t think any mum ever really feels like they’re doing a really awesome job, even if they’re doing everything 100%... (20, BF2mths, S5mths, nil PorR, nil UWTorOWT)

In some cases the desire to see their child eat and grow was intertwined with their “success” as mothers. This led mothers to use controlling feeding practices such as pressure-to-eat and top up feeds, not without feeling a sense failure.

...[I pushed him to eat] because I like, I think most of the mums like um to like their baby to eat, yeah I like him to eat. Yeah I like him to get bigger and healthy... (26, BF>12mths, S5mths, P, UWT)

Well when your child starts pushing away meals, not eating anything, you think oh my god, oh my god, oh my god. So then I started giving them toddler milk and I felt really bad doing it, I felt like, here I am bagging all these parent giving their children toddler milk... I felt guilty the whole time but at least I knew they were getting [something], and that’s what, it preys on your guilt as a parent... (40, BF7mths, S4mths, P, UWT)

When discussing the rewards and challenges of transitional feeding, it appeared that the infant’s acceptance of food was also connected to maternal emotions and expectations.

...it was always satisfying to see her eating my food that I’d cooked...feeling really good that I prepared the food and um she was content with the food ...and then the times when you go to all this effort to make something and then she refuses...[I] just felt defeated... (37, BF6mths, S6mths, nil PorR, UWT&OWT)

Clearly what and how a mother fed her infant were seen as a determinant of successful mothering, with inappropriate feeding used in some cases to ensure adequate infant intake as perceived by the mother.
8.2.1.3.2 SUB-THEME: INFANT TEMPERAMENT

How mothers feed their infants was found to be related to the perceived disposition of the infant, influencing behaviour and ensuring intake. Infants with regular eating and sleeping routines required less controlling feeding practices from their mothers.

He just loved food from the get go…This is the quietest most chilled baby I have ever seen. He’s such a happy kid, he’d never tell me he was hungry. [If he didn’t eat] I just left it. I’m not going to pressure him in to eating…he slept through the night still and he still had plenty of energy… (30, BF12mths, S4mths, nil PorR, UWT)

She wasn’t a big fan [of solids], like it was always having to force feed her…I still have to encourage her, it’s just finding the times when she is actually hungry and not set meal times… She’s still not a big food eater [and] she still wakes… (31, BF>12mths, S6mths, P, OWT)

The desire for the infant to sleep more was also a commonly cited reason for introducing solids early, using controlling feeding practices or topping up with formula. What’s more, despite many mothers describing their infants as good sleepers, some mentioned offering multiple meals or topping up with formula to ensure night sleeping.

I introduced solids around then because she still was waking really regularly through the night and I thought it might fill her up for longer. Didn’t work. (31, BF>12mths, S6mths, P, OWT)

So they weren’t sleeping they were cranky, I knew they weren’t getting enough, doctor said oh they’re fine, they’re fine…I topped them up with milk…I was just desperate for them to have something in their tummies…because if they don’t sleep, I don’t sleep and I had to keep going, so it was about me and it about their weight and sleeping so I could sleep. (40, BF7mths, S4mths, P, UWT)

Mothers of infants with more placid temperaments appeared to take infant feeding in their stride.

I didn’t find any [challenges] really not especially…she was like eating everything she was happy she was growing well so yeah I think that made me sort of feel comfortable with everything. (30, BF5mths, S5mths, P&R, OWT)
…he was a fairly cruisy kid [and] we’ve tried to follow his cues, like we didn’t jam it down his throat, we kind of let him tell, like he showed curiosity so we tried to follow him. (26, nil BF, S4mths, nil PorR, UWT&OWT)

For the most part, infants described as good eaters and sleepers appeared to be fed based on their cues, while infants with irregular feeding and sleeping patterns had mothers who used controlling feeding practices such as pressure-to-eat.

8.2.1.4 THEME 2: TRUST

8.2.1.4.1 SUB-THEME: MATERNAL-CHILD FEEDING

This sub-theme recognises the bidirectional nature of feeding where mothers feed in response to their child’s behaviour and perceived needs, while children’s behaviour and eating is responsive to the mother’s feeding.

By the time mothers have progressed to introducing solids they appeared to have developed a better understanding of their infant’s needs and were more likely to trust their infant’s cues as well as their own instincts in transitioning onto family foods.

Mothers described the process of moving from milk feeds to family foods in a systematic approach generally consistent with the Infant Feeding Guidelines.9 Most started with pureed foods and gradually building on texture and variety, while others embraced a baby-led weaning approach where family foods were offered from the start.

In many cases the feeding process was generally based on the infant’s cues of hunger and satiety.

I probably would be more inclined to go for signs that they’re ready than particular time…I gave her one food at a time to start off…[I had no idea of amounts], I sort of went with what she was eating… (30, BF5mths, S4mths, nilPorR, UWT&OWT)

Despite variations in the timing of introducing solids all infants were receiving family foods by 12 months, differing only in the variety and texture eaten. Initially foods were generally limited to infant cereal, fruit and vegetables, with the sixth month marking an unspoken agreed point for increases in food variety and texture.
Um, well he was [4 months], I think he was ready for it…rice cereal, the baby cereal and like um, fruit and vegetable purees. Um and then at about six months we moved on to pretty much anything...he basically ate what we were eating. (30, BF12mths, S4mths, nil PorR, UWT)

…from what I could gather it was best to start a six months but she didn’t eat much solids at 6 months, she didn’t really start eating food until she was like 9 months...for the first couple of months it was just fruit and veg. (20, BF>12mths, S6mths, nil PorR, nil UWT&OWT)

Ongoing milk feeds provided comfort to some mothers when discussing solids, while the inferiority of infant formula influenced feeding in others. There was no evidence of food, such as infant cereal, being added to infants’ bottles, although one Aboriginal mother mentioned that her mother and friends had done so.

I don’t think [solids] was too stressful…I didn’t get too worked up about it, because I’d just say, just offer it and then if they don’t want it, it’s not like that’s [it], they’re still having all the breast feeds and things, so it’s not like that’s their full meal… (23, BF9mths, S5mths, nil PorR, UWT&OWT)

I wanted to start [solids] as soon as possible…get more nutrients. I know breast milk has, but she wasn’t getting much and formula, I know they say has the same amount as breast milk but… (18, BF5mths, S4mths, P, UWT&OWT)

When asked to reflect on their feeding experience, many mothers talked about not being influenced by others and being led by the child. While some of these mothers had introduced solids early, in general they did not use controlling feeding practices to influence intake. Furthermore, milk feeds (breastmilk or formula) were trusted by many mothers to fill the gap of inadequate infant intake.

…not to feel pressured to do what’s the ‘right thing’ just, yeah, just go with it and get to know the baby… (30, BF5mths, S4mths, nil PorR, UWT&OWT)

…stick to your instincts…there are so many people are saying “don’t do that, don’t do this.” But I don’t know. If it’s best to like, do puree then do that. If you feel like it’s best to do baby-led weaning then do that. Do what’s best for you and your baby. (20, BF>12mths, S6mths, nil PorR, nil UWT&OWT)
Trust in the instinctive mother-child feeding relationship however was benchmarked by the potential risk to the child’s health.

All of the information is out there of what we have to do with our kids or should and shouldn’t be doing…I just tried to go with less worry and follow my instincts…any less stress that I can give myself that will not harm my child I will do it (26, nil BF, S4mths, nil PorR, UWT&OWT)

I think everyone just needs to let everyone be, like…unless it’s a genuine health concern or issue that you think they might be hurting their baby or, yeah, just leave it, leave it alone… (20, BF2mths, S5mths, nil PorR, nil UWT&OWT)

The time delay between the initial maternal survey and the interviews also provided an opportunity for mothers to reflect on the challenges of feeding toddlers.

…he has become more picky…around the second birthday…we offer him a lot less and then if he wants more we’ll top it up (25, BF12mths, S5mths, nil RorP, nil UWTorOWT)

…the older she got, the less she wanted the things that we were eating I guess…as soon as she turned two she decided that she’s never eating vegetables ever again…you try and hide them all you want and if she sees a fleck of anything she’s just like I’m not eating that now. (20. BF2mths, S5mths, P, nil UWTorOWT)

We definitely go through days where all he’ll eat is banana’s and rice crackers…but kids are like that (26, nil BF, S4mths, nil PorR, UWT&OWT)

Overall the mothers appeared more accepting of the new challenges and less likely to use controlling feeding practices than during the first 12 months of life. Some mothers also reflected on how they may or are feeding their subsequent child. There was evidence of less monitoring of infant intake in the second year.

Yes different, when he was 6 months sometime I would push to give him food and now when I think, I’m thinking it’s not important to push him because he doesn’t need a lot and when I go back I don’t repeat that…the second one I be relaxed and don’t push… (26, BF>12mths, S5mths, P, UWT)
With [second child’s name] I’ve more, just had a lot more guilt from myself that I put a lot of effort into [first child’s name] food. And [second child’s name] has just been yeah much less thought but a lot easier for me so. (25, BF12mths, S5mths, nil RorP, nil UWTorOWT)

I didn’t want to give her sugar especially within the first twelve months. So I just tried to give her fruit and veggies and really healthy stuff so the majority of her food was fruit and veg based. She has so much sugar [now]. (20, BF>12mths, S6mths, nil PorR, nil UWT&OWT)

While there was no evidence that the mothers were currently using controlling feeding, neither were they concerned about the current weight of their child. There was no probing on future weight concerns and impact on feeding.

8.2.1.4.2 SUB-THEME: ENDORSEMENT

Endorsement in the context of infant feeding considers the information used by mothers to guide their feeding decisions. It explores the information provided as well as the delivery mode and its influence on maternal acceptance of advice. The influence of care giver acceptance of maternal feeding decisions was also examined.

Mothers sought information from a range of lay and professional sources. Compared to breastfeeding, mothers reported being more relaxed and self-directed in sourcing information on transitional infant feeding. In addition to books and the internet; family, friends and mothers groups were found to be the biggest resources.

Learning by the experience of others was mentioned by a number of mothers.

…combination of friends um websites so forums lots of chat forums…I’ve got quite a few friends who had older babies than mine so they’re been through it so they gave me a lot of advice on what they did, and a lot of the time it wasn’t right for me but it was good to know what they were trying as well. (37, BF6mths, S6mths, nil PorR, UWT&OWT)

…I think I did read it was 6 months and I thought “oh, it can’t hurt, I’ll try at 4”, because I had seen people have fruit in um, mother’s group…I didn’t see anyone start any earlier than 4 months… (21, BF6wks, S4mths, nil PorR, nil UWTorOWT)
The use of the internet for information and support was a key resource for all the mothers.

*I googled heaps, I googled, googled, googled...without google I wouldn’t have got through, I googled everything...* (40, BF7mths, S4mths, P, UWT)

…I had a group of friends on Facebook and we would often share information that we had and we were a bunch of mums who were doing the baby-led weaning...it was really good having that connection and we would just send ideas…* (20, BF>12mths, S6mths, nil PorR, nil UWT&OWT)

The influence of professional support depended to some extent on who provided it but more importantly on how it was delivered. In some cases mothers appeared compelled to follow authoritative advice, while other mothers appeared empowered by the people who supported them.

*I started on solids slightly early because the paediatrician recommended it...I thought well, he must know [but] I thought they were being pushed sooner than they should be. *(40, BF7mths, S4mths, P, UWT)

*I wasn’t really stressed about it, I was like “he will eat it when he is ready”...well it was like [my] GP said like, not to worry because like I could even wait until 9 months to start it if I wanted, so I didn’t think it was a big deal. * (22, BF13mths, S6mths, nil PorR, nil OWTorUWT)

Professional support that was accepting of maternal infant feeding decisions appeared more involved in the transitional feeding process.

*Yeah, it’s really excellent to have that good community based relationship...[I never felt judged by] the child health services and or the group leaders...* (20, BF2mths, S5mths, nilPorR, nil UWT&OWT)

*I usually tell mums about the child health clinics and to go, become acquainted with them just because I did so much through them and I think it’s a really useful avenue to get good solid advice...* (25, BF12mths, S5mths, nil RorP, nil UWTorOWT)

…I usually tell mums about the child health clinics and to go, become acquainted with them just because I did so much through them and I think it’s a really useful avenue to get good solid advice...* (25, BF12mths, S5mths, nil RorP, nil UWTorOWT)

*Yeah, it’s really excellent to have that good community based relationship...[I never felt judged by] the child health services and or the group leaders...* (20, BF2mths, S5mths, nilPorR, nil UWT&OWT)

…and the [child health nurse] that I did have, she worked with a lot of young mums and stuff and she was really good…When I told her about the baby-led weaning, she was like, “that’s interesting. If it works for you, then cool.” She’s like “I’ve never heard of it, but that’s cool”. * (20, BF>12mths, S6mths, nil PorR, nil UWT&OWT)
However, these mothers, like others, also shared less positive experiences which influenced maternal information sharing and acceptance of advice.

…but I did go to a doctor for her 18 month needles and her check-up and yeah thought he was a little bit judgmental the fact that I was still breastfeeding and some of the things I did…it did make me hold back a little bit of information. And I haven’t gone back to him… (20, BF>12mths, S6mths, nil PorR, nil UWT&OWT)

I did feel like there was, there was a right way according to [child health] to raise the kids…routines and schedules are usually frowned upon…so I would say I breastfeed on demand but usually it’s about every 3 to 3 ½ hours… (25, BF12mths, S5mths, nil RorP, nil UWTorOWT)

…the biggest problem I had with their feeding, the worst offenders were the health nurses…they were really rude to me, really rude, dismissive and so I stopped going…women I’ve spoken to, the same thing…they don’t tell them the truth, sometimes they don’t say what they are really doing because they don’t want to be judged, they go to just get weighed (or) they stop going… (40, BF7mths, S4mths, P, UWT)

The inconsistency of information about infant feeding was also raised by some mothers as a further source of confusion and frustration.

I was quite conflicted about when to start giving solids because there was a lot of conflicting advice from sort of yeah doctors, and midwives and nurses and people in the mother’s groups…now I’m, I don’t even really know to be honest what the proper guidelines are or whether there are even you know set guidelines on it. (30, BF5mths, S5mths, R, OWT)

While mothers appeared to prefer to learn from the experience of others, professional advice was also welcome if the messages are consistent and supportive.

8.2.1.5 THEME 3: STRESS

8.2.1.5.1 SUB-THEME: CONFIDENCE

Confidence in transitional feeding explores the influences on a mother’s belief to be able to meet their infant’s needs. It considers maternal knowledge and experience in addition to the infant’s responses.
In discussing transitional infant feeding, most conversations with mothers started with the challenges of breastfeeding. The dialogue around the journey from milk feeds to family foods suggests increasing maternal confidence with feeding over time.

Yeah, I was really excited about [starting solids], I didn't think it was going to be that hard. But now looking back on it, everything was actually really easy, I just, the lack of knowledge that I had made it harder. But now I feel like I just, I'd know what to do. I don't know, I just learnt. (21, BF6wks, S4mths, nil PorR, nil UWT&OWT)

Yeah, within a few months of starting the solids I think I sort of got an idea of how much to give her and you know, sort of what kind of things to make and how to make it… (30, BF5mths, S5mths, R, OWT)

The positive impact on infant behaviour and growth appeared to encourage maternal self-efficacy around infant feeding.

…she was like eating everything she was happy she was growing well so yeah I think that made me sort of feel comfortable with everything. (30, BF5mths, S5mths, R, OWT)

Yeah, I relaxed [at around 12 months], I realized you know they’re pretty strong, they’re hardy, they’ll be fine. (40, BF7mths, S4mths, P, UWT)

I think after twelve months I started growing confidence in my parenting skills…For solids she was never really into it so she never really asked for it until probably about one year’s old when she started actually being interested in food. (20, BF>12mths, S6mths, nil PorR, nil UWT&OWT)

The challenges of infant feeding and meeting expectations were encapsulated by some mothers’ resolution that success in feeding is a reflection of the child and not the choices made.

Fed is best. Bottle, breast, packet food, homemade food, fed is best. If your kid is fed and happy and healthy just, you know, yeah…people make you feel guilt…because you’re not doing the perfect, right thing to do. (20, BF2mths, S5mths, nil PorR, no UWT&OWT)
While feeding confidence improved over the first year, from the conversations with the mothers it is apparent that there is room to improve maternal knowledge and skills to ensure healthy transitional infant feeding.

### 8.2.1.5.2 SUB-THEME: THRIVING

Thriving captures the health of the infant as well as the feeding choices of mothers to influence infant growth and development. It contemplates maternal perceptions of acceptable growth and the relationship to parenting success.

Readiness to eat was the most cited reason for starting solids early (i.e. ≤ 4 months of age). Underpinning this readiness, which was described by hunger and interest in food, were the subtle undertones of using food to assist weight gain to justify this early introduction.

*Like he was watching everyone eating, really interested in looking at food and then we started and he just loved it…So I think it kind of helped, something else to sort of boost him up with food…4 months was better for us…because he was underweight but also because he looked hungry… (30, BF12mths, S4mths, nil PorR, UWT)*

*…before we started solids [she] was around 60 [percentile], and then sort of caught up to her height being 95 [percentile], so it was obviously good for her to start on solids [at 4 months] (30, BF5mths, S4mths, nilPorR, UWT&OWT)*

Concern about infant weight was a common theme amongst the mothers who introduced solids early or used controlling feeding practices. Pressure-to-eat and formula top ups were feeding strategies used to ensure sufficient intake.

*She was really lengthy but she didn’t gain much weight for a while and it did worry me because I wasn’t sure if she was eating enough…I tried to give her more…nothing I did worked…(18, BF5mths, S4mths, P, UWT&OWT)*

*I used to get stressed, if they didn’t eat enough I’d get upset…I started giving them toddler milk and felt really bad doing it [but] I was worried that they would not thrive (40, BF7mths, S4mths, P, UWT)*

In some cases it became obvious that the feeding practices to promote infant intake did not work and like other mothers were content that the milk feeding would make up for the shortfall.
…then I heard that food before one is just for fun. And that’s when I started relaxing about it, that she does have another source of nutrition [breastmilk]…she eats minimal but healthy… (31, BF>12mths, S6mths, P, OWT)

I felt like doing it but I wouldn’t usually [push her to eat] ….I just felt like, she would know when to feed herself …she was still breastfeeding heaps… (20, BF>12mths, S6mths, nil PorR, nil UWT&OWT)

A preference for a heavier infant led some mothers to take control of their infant’s intake, while others trusted their infant’s ability to self-regulate their intake based on their perceive assessment of health and happiness.

…his weight was normal [but] my friends they have children as same age as my son, he’s weight is less than them. Yeah I like him to get bigger and healthy yeah it’s not most of the time, sometime I push him. I know that’s bad. (26, BF>12mths, S5mths, P, UWT)

Yeah weights and measurements they were within the normal range but I wasn’t happy…I wanted them to have a bit of meat on their bones. (40, BF7mths, S4mths, P, UWT)

…I always had people pointing out how tiny she was…I was like stressing out about it…but I just trusted my instincts and was like well, if she was hungry she’ll eat…she’s really active and she seems really healthy. (20, BF>12mths, S6mths, nil PorR, nil UWT&OWT)

Overall mothers were less concerned about their child becoming overweight than underweight, with some surprised that they had indicated obesity concerned in their survey responses. Some mothers mentioned future overweight concern based on genetic grounds and monitoring what they give their infant to eat.

…it’s always a bit of a worry about what they eat and weight…had it in the back of his mind that we should be careful with how much we feed her… (30, BF5mths, S4mths, nilPorR, UWT&OWT)

Yeah well my metabolism isn’t so great and my partner’s metabolism is not so great and so in the future she may have a problem with her weight….I’m always trying to do healthy, like she’s never had really anything sugary… (18, BF5mths, S4mths, P, UWT&OWT)
Few mothers mentioned restricting intake to influence weight and these mothers had also used pressure-to-eat earlier due to underweight concern. No mothers were concerned about their child’s weight at the time of the interview.

[I was concerned about her becoming overweight at 11 months] because she went down a real, the only food she’d eat would be junk…and she was pudgy at the time…she just seems to be growing normally now so I don’t stress too much.’ (31, BF>12mths, S6mths, P, OWT)

‘…she was pretty chubby [at 8 months] and yeah I guess I just was worried you know if I was overfeeding her or something…I tried not to feed her too much…[now] I think she’s fairly you know normal weight’ (30, BF5mths, S5mths, R, OWT)

Clearly underweight concern dominated maternal action to use controlling feeding practices while overweight concern had limited impact on feeding practices.

8.2.2 DISCUSSION

What, when and how infants are fed have been shown to have a lifelong impact on the health of the child and the adult.7,8,40 While feeding practices are primarily based on maternal decisions, a range of factors influence these decisions. In this study these factors included expectations of the mother and for the infant, trust in the mother-infant feeding relationship and information sources, maternal confidence and infant development.

The findings of this research add to the relatively small amount of literature which helps explain the origins of infant feeding practices. The findings confirm that traditional feeding practices, such as maternal coercion to eat, and preference for a heavier infant, consistent with the literature,44,203 still exist despite the changing obesogenic food environment. The cultural practice of adding cereal to bottle feeds, particularly seen in the US,43,131,220 although not directly evident in this sample, was suggested to be occurring in Aboriginal families. The study also highlights the emotionally charged environment of infant feeding and the challenges faced by mothers to receive adequate information and support.

The finding that infant feeding success is based on maternal assessment of adequate infant eating, sleeping and growth patterns is consistent with other studies investigating maternal infant feeding determinants.203 In this study the use of inappropriate feeding practices, such as pressure-to-eat, were mostly seen in less educated, lower income mothers concerned about their infant’s intake and weight, a finding also seen in the
Furthermore, the discourse around the pressure to ensure the “right” food for the infant and the “guilt” associated with using formula, together with the emotions associated with infant intake in this study provides further evidence of the influence of maternal identity in infant feeding which can drive poor feeding decisions. Furthermore, the discourse around the pressure to ensure the “right” food for the infant and the “guilt” associated with using formula, together with the emotions associated with infant intake in this study provides further evidence of the influence of maternal identity in infant feeding which can drive poor feeding decisions.177,203,243

An infant’s temperament, considered the innate personality which influences both their behaviour and external interactions, can be classified as easy, difficult or slow-to-warm-up. Infants with an easy temperament tend to have regular eating and sleeping routines, adapt well to new situations and have positive moods. Infants with a difficult temperament tend to have irregular routines, cry more and are slower to adapt to new routines. Infants with a slow-to-warm-up temperament are also slow to adapt to new things but have lower activity levels and tend to have slightly negative moods.297

The temperament of the child and societal expectations of the mothers were also dominant factors influencing feeding decisions. While the feeding of infants with an easy temperament was child-driven based on trusting the infant’s cues of hunger and satiety, the feeding of infants with a difficult temperament was more likely to be mother-driven based on controlling feeding practices to achieve behaviour change goals. The negative impact of temperament on infant sleep has been described in the literature, in addition to its association with maternal feeding behaviours and childhood obesity.134

Maternal trust in their infant’s feeding cues was higher amongst infants described as good eaters and sleepers. Recognition of the nutritional significance of milk feeds during the transitional feeding process helped extend this trust to fussier or smaller eaters, although sometimes only after force-feeding had been tried. In many cases this trust was coupled with maternal instinct, or unspoken confidence in her ability to adequately feed their child. This instinct is considered a naturally occurring component of motherhood, and something undermined by motherhood being “increasingly standardised and medicalised.”208

Waller et al’s conceptualisation of the mother-infant communication dynamic over the first year of life supports an increasing maternal feeding confidence linked to positive feedback from the child, as was reflected in the current study data. Harnessing this confidence or instinct to support healthy feeding practices was influenced by the mother’s knowledge and how it was obtained. It was clear from the conversations with mothers, that knowledge of transitional infant feeding beyond timing and food choices was lacking,
which lead in some cases to inappropriate feeding practices based on perceived improved infant behaviour.

While family and friends continued to be a primary source of transitional infant information, mothers’ experiences in this study highlighted the significant influence of the manner in which health professional support is delivered. In an age of “intensive mothering”\textsuperscript{150,209} where mothers feel scrutinised for their ‘risky’ feeding practices if not following authoritative or accepted societal advice, it is not surprising to see the demise of maternal instinct and professional trust. Unfortunately the loss of professional input can lead to maternal isolation or self-reliance on limited knowledge which can result in the misinterpretation of infant cues and behavior and the subsequent use of inappropriate feeding. In contrast, flexible, open-minded health professionals were valuable partners for other mothers.

Many of the mothers who participated in this study, as with those in other similar research, reported feeling “judged,” a reflection of the changing standards for “good parenting.” With so many expectations around parenting and motherhood,\textsuperscript{150} the emotional highs and lows of transitional infant feeding are not surprising. Mothers are the most knowledgeable about their infants, and as such need to be guided rather than judged about their transitional feeding journey.

8.2.3 CONCLUSION

Infant feeding is a fundamental part of raising a child. Consistent with early milk feeding experiences,\textsuperscript{243} the mother’s moral aspiration of successful parenting does influence transitional feeding responses. Although we need to celebrate that all infants are different, we must also acknowledge that their size and behaviour does impact on feeding decisions. From this study it is clear that despite early breastfeeding support, more practical transitional feeding information is needed, particularly around responsive feeding practices to match infants’ cues of hunger and satiety, and not their temperament or weight. Transitional feeding support is particularly imperative for mothers with lower income and/or education. While infant feeding guidelines exist, practitioners need to be more flexible in their approach to how these are implemented and mindful of the various determinants of maternal feeding decisions. Small incremental consistent messages based on the needs of the mothers, regardless of the feeding decisions made, may pave the way to supporting lifelong healthy eating habits.
This chapter provided the findings of the interviews with mothers who completed the phase 2 survey. These final phase maternal interviews were to validate and explain the phase 2 survey responses and investigate maternal infant weight concerns and resources use to inform transition infant feeding decisions.

There is clear evidence that concerns about infant underweight results in controlling feeding practices that are inconsistent with infant feeding recommendations. Perceptions of underweight resulted in the early introduction of solids and the use of formula in addition to mothers forcing their infants to eat. In some cases these weight concerns were based on the knowledge that their child’s weight and growth was within the acceptable range. On the other hand, overweight concern in most cases did not influence transitional infant feeding, as many mothers stated that they were already providing healthy foods for their offspring.

There are also clear messages for health practitioners on how best to provide advice that is more conducive to maternal perceptions. Mothers who felt judged or pressured to change their current infant feeding routines were less likely to engage with the provider (either professional or lay). More alarmingly, unsupported mothers may use inappropriate feeding practices and/or possibly have infants whose faulting growth and development is left untreated. Chapter 9 will draw together the findings of the three phases of the study and discuss the results in the context of the current literature.
9.1 INTRODUCTION

You may have heard the world is made up of atoms and molecules, but it’s really made up of stories. When you sit with an individual that’s been here, you can give quantitative data a qualitative overlay.

William Turner, 16th century British scientist and naturalist

The aim of this dissertation was to develop recommendations to improve maternal transitional infant feeding to assist in the reduction of childhood obesity. To do this, the research focused primarily on the process of moving infants and young children from milk feeds to family foods, investigating what and how mothers feed their infants and, more importantly, understanding the basis for these decisions. The research began by interviewing early childhood nutrition researchers (phase 1) to explore their knowledge about the decision making process underpinning maternal infant feeding, their EPOCH research findings and to identify knowledge gaps.

Information from these researcher interviews guided the development of a survey for mothers of infants in the transitional feeding age and was called The Feeding A Baby (FAB) survey (phase 2). Through this survey information about maternal infant feeding knowledge, confidence and self-efficacy; the infant’s diet and feeding practices; infant weight and weight concerns of the mother; and resources that guide feeding decisions was collected.

The research concluded with qualitative interviews with a sample of mothers who completed the FAB survey. These maternal interviews (phase 3) provided an opportunity to validate the responses to the survey, but more importantly, to understand the context in which many of the feeding decisions were made. Despite the current appetite for the early prevention of obesity in childhood, the evidence base of longitudinal interventions is limited (though expanding) and the use of qualitative data to inform interventions and service delivery is underutilised.

This mixed method research approach has generated new evidence about maternal infant transitional feeding decisions that can inform future strategies to support the early development of healthy eating patterns. This chapter synthesises the conclusions derived...
from all the research phases looking for convergent or inconsistent results, and presents
the main findings from the study in the context of the available literature.

The chapter begins by providing some characteristics of the infants’ diet and the factors
guiding maternal decisions. Following on from this are discussions focusing on maternal
concerns about infant weight and infant feeding, and the impact of infant behaviour on
maternity identity and food provision. This work reviews the mothers’ ability to meet the
nutritional needs of their infants and the supporting frameworks used to facilitate the
development of early healthy eating patterns. The chapter concludes with a synopsis of
the findings. Figure 9.1 presents an overview of the conceptual model describing the
associations between infant intake, growth and behaviour with maternal expectations and
feeding approaches.

Figure 9.1: Conceptual model of influences on maternal transitional infant feeding
9.1.1 INFANT DIET

This thesis did not intend to comprehensively investigate the dietary quality of infants’ intake. However, key questions in the maternal survey and the follow-up interviews provided some insight into the feeding of infants over the first year and are useful to briefly include here to understand maternal infant feeding knowledge and approaches.

The infant feeding approaches of breastfeeding (95.7% initiated), infant formula use (63.8% ever used) and early introduction of solids (≤4 months, 31.1%) were comparable with those identified at a state and national level. While the challenges of breastfeeding and breastmilk supply concerns are not new, the results suggest that the lack of maternal guidance on the appropriate use of infant formula contributed to poor infant feeding approaches along with the emotional distress mothers experienced through their infant feeding decisions. Furthermore, maternal concern about infant weight and perception of infant formula inferiority to breastmilk which contributed to the early introduction of solids, were also a result of inadequate professional support, in addition to professional and lay expectations about healthy infant growth and development.

The relationship between early introduction of solids and maternal misinterpretation of readiness reflected in the study results concurred with other studies on the timing of the introduction of solids. Research to improve maternal interpretation of readiness is needed given the additional linkages found in this thesis between perceived readiness and mothers’ use of solids to promote sleep and weight gain. Similar to the systematic review finding in Chapter 4 and Baughcum’s study about feeding young children, this early use of food for non-nutritional purposes again highlights the need for support, in particular around interpretation and response to infant feeding cues, currently lacking in infant feeding guideline advice.

Despite variations in timing of introducing solids, and in food texture choices (i.e. pureed over baby-led weaning finger foods), all infants were found to be consuming modified family foods by 12 months, supporting the adequacy of current infant feeding guidelines on the timing of introducing solid foods which the majority of mothers followed (68.9%). Nonetheless, a lack of iron-rich first foods (>50% of all infants), insufficient fruit and vegetable intake (13% not meeting recommendations), regular intake (weekly or monthly) of high energy takeaway foods (6.2%), and any consumption of fruit juice (15.1%) and sweetened drinks (3.2%) by infants, supports the qualitative findings that mothers are...
unsure of what to feed their infants. These findings on the poor dietary intake of some infants concur and add to the sparse data currently available (Section 2.5.2). Furthermore, with maternal food preference found to be a key factor in infant food purchases (Section 6.2.4.2), and infant diet reflective of maternal intake, any dietary guidance needs to focus on the family environment and not solely on the infant.

9.1.2 MATERNAL INFANT WEIGHT CONCERNS

In exploring maternal perceptions on weight and associated concerns about childhood obesity, this thesis identified a number of key findings.

The proportion of infants found to be underweight (6.2%) or overweight (26.1%) were similar to national rates for 2-4 years, however, they were very different to maternal perceptions, with many normal weight infants described as underweight (72.7%) and even more not recognised as overweight (96.6%). While parental misinterpretations of child weight are not new, the substantial misinterpretation of weight so early in life as found in this study is alarming. Furthermore, the feeding approaches described by the mother may in fact be contributing to rapid weight gain and subsequent tendency to be overweight in these infants, which are linked with later obesity.

While maternal concern for infants becoming underweight (30.1%) was associated with current infant weight, early introduction of solids and pressure-to-eat, only those mothers dissatisfied with their infant’s intake or weight used these controlling feeding approaches. The results suggest that these weight expectations are driven by a health environment which praises early weight gain, and thus is an indicator of “good mothering.” These findings along with the significant relationship found between pressure-to-eat and both current and birth weight, also provides evidence earlier than previously reported, that this controlling feeding practice may be influenced by, as well as having an impact on, weight status, reinforcing the need to address weight expectations.

In contrast, maternal concern for the infant becoming overweight (26.3%) had limited impact on how infants were fed. While the survey results found a relationship between overweight concern and restriction of food, in the follow-up interviews with mothers, overweight concern was only associated with monitoring of infant food choices. Furthermore, the finding of a lack of a relationship between overweight concern or restriction with infant weight is consistent with other study outcomes, suggesting changes to infant feeding only when excess weight is seen as a real problem.
something the mothers in this sample failed to recognise. This may reinforce, and not
guard against, the ongoing use of inappropriate infant feeding approaches, as seen in this
study.

9.1.3 INFANT BEHAVIOUR

This thesis did not specifically set out to investigate the relationship between infant
temperament and infant feeding, however, the conversations with both the researchers
and mothers revealed that infant behaviour did impact on maternal identity and infant
feeding.

Many mothers acknowledged the pressure associated with what and how they chose to
feed their infant, describing the guilt when they deviated from professional or lay
expectations. This undermined and influenced decisions in less confident mothers, while
others justified their choices through satisfying their infants’ immediate needs (i.e. “fed is
best”). Mothers viewed successful food provision and “mothering” as synonymous,
measured through adequate infant intake, growth and sleep and using food to reach these
expectations (i.e. early solids, infant formula top ups, pressure-to eat). While maternal
identify has been well described in relation to breastfeeding and infant formula use,208-
210,250 this study provides new information of the ongoing evaluation of successful
mothering in the transitional feeding process and its impact on feeding decisions.
Furthermore, mothers who deviated from feeding recommendations tended to be those
lacking professional support (possibly due to incompatible expectations250 and contributed
to their lower confidence levels) and/or with infants described as having a difficult
temperament.

The results are broadly consistent with the characteristics that define infant
temperament,297 in that infants described as “easy,” based on their acceptable eating and
sleeping routines, were generally fed based on their feeding cues. In contrast, “fussy” or
less settled infants were fed based on the mother’s desire to influence behaviour and
weight. Early introduction of solids and pressure-to-eat were used to encourage intake to
promote sleep at night and growth, more evident in lower income and/or less educated
mothers. Further understanding of the mediating effect of maternal demographics between
child temperament and maternal feeding has been raised elsewhere,300 and supports the
broader ecological framework to addressing childhood obesity.
9.1.4 KNOWLEDGE AND SELF-EFFICACY

In determining the infant feeding knowledge of mothers, this thesis also explored the evidence base supporting current EPOCH interventions.

Current EPOCH trials built on supporting breastfeeding and responsive feeding practices have improved maternal feeding behaviour but have had limited impact on child weight. The sustainability and cost effectiveness of these interventions support longer-term exposure and alternate delivery models (e.g. electronic devices). Delivery of these interventions would benefit from better understanding the determinants of feeding decisions, a gap identified by the researcher and the transitional infant feeding literature. The findings from the maternal interviews in this study brought new explanations for the feeding relationships described in the maternal survey and the literature, supporting the use of mixed methodology in EPOCH research.

Maternal knowledge of infant feeding guidelines was hypothesised as influencing infant feeding, however, it had little impact in this study. Knowledge of the guideline on timing of the introduction of solids had the most variability, with around one third (32.0%) indicating ≤ 4 months as the recommended time. The timing of solids is a contentious guideline, and found in this study to be influenced by mixed messaging from health professionals and family, demonstrating a need for more appropriate messages spanning across all the ecological domains.

In contrast, maternal self-efficacy and feeding confidence were found to improve infant fruit and vegetable intake and reduce the use of controlling feeding practices such as pressure-to-eat. Maternal discourse suggested that self-efficacy was validated through the mothers’ expectations of their infant’s intake and growth. Maternal self-efficacy has been shown to be protective of poor eating behaviours in the preschool years; however, the decline in self-efficacy during these years highlights the need for early and continuous targeted support to improve maternal skills and capacity to impact on child eating behaviours. The relaxing of dietary intake in the second year of life, evident in the follow-up interviews (Section 8.2.1.4.1), reinforces this ongoing support.

The increase in parenting confidence apparent in the conversations with mothers concurs with Waller’s mother-infant communication dynamic model, based on a positive feedback loop. However, a lack of support due to poor professional knowledge around responsive feeding, or inappropriate judgemental delivery of advice, may result in the ongoing use of
unhealthy feeding approaches conducive to childhood obesity. Approaches towards feeding that are “unstandardised,”\textsuperscript{302} unconditional (to the expectations of others)\textsuperscript{250} and mindful of the psychosocial factors underpinning infant feeding decisions,\textsuperscript{203} are endorsed by the findings of this thesis to foster maternal engagement and not isolation.

9.1.5 SYNOPSIS OF FINDINGS

This chapter draws together results relating to similar concepts and topics from three data collection processes within this research program: (1) interviews with EPOCH researchers; (2) infant feeding survey with mothers of infants aged between 5-13 months; and (3) follow-up interviews with a sample of these mothers.

While the evidence base for early childhood obesity prevention is expanding, the findings from this research suggest that mothers are not being adequately supported during the transitional infant feeding period. Importantly, evidence suggests that the current health environment may in fact be contributing to inappropriate infant feeding approaches.

In the wake of the current obesity epidemic, recognising healthy weight is made more difficult in a population where overweight dominates adult weight status.\textsuperscript{4} Disturbingly this study found that weight misinterpretation begins early, with maternal concern for infant underweight fostered in the early postnatal environment focusing on weight gain and meeting weight targets. This underweight concern translated into reduced breastfeeding duration, infant formula top ups, early solids introduction, and/or pressure-to-eat; increasing the infant’s risk of childhood obesity and contributing to the generational obesity cycle. Conversely, the lesser concern for infant overweight had limited impact on feeding, with the inability to identify overweight possibly preventing action to address sub-optimal feeding habits.

As captured in figure 9.1, transitional feeding is mother-focused, seemingly driven by how infant physical and behaviour cues measure up to maternal expectations. Based on this conceptual interpretation of transitional feeding, there is also a valid argument that feeding decisions are child-focused, built on meeting their nutritional and developmental needs. However, the evidence in this thesis suggests maternal identity as a mother was an overarching key determinate of feeding decisions, with the expectations of others influential in this decision process, resulting in food used for non-nutritional purposes.
The research findings suggest support services should focus their efforts on how mothers manage the inconsistencies between these expectations, including a self-appraisal of their professional support. There is a clear need for transitional infant feeding knowledge around the what, when and how for mothers, their families and health professionals. The anticipatory use of responsive infant feeding needs to build on maternal confidence in interpreting infant behaviour and feeding cues, without prescriptive expectations (such as volume of formula drunk, amount of food eaten, number of hours slept or grams of weight gain). Services need to be more forthcoming in their support for all milk feeding approaches (including infant formula use), and employ flexible unconditional approaches guided by the needs of the family and not by the regimented use of feeding and growth guidelines (which could be argued as a sign of low professional confidence).

Given the use of food to settle infants and encourage sleep, mothers also need guidance on alternate methods to settling. This includes understanding that unsettled behaviour and night waking is normal and feeding may in fact contribute to the behavioural problems. Evidence supports behaviour approaches such as settling while awake to reduce night waking and crying. Furthermore, delayed feeding (e.g. changing nappy first) has been shown to break the bond between waking and feeding, supporting autonomous resettling. Delivery of this information needs to use multiple platforms; with the integration of EPOCH learnings into early childhood service models an important first step to ensuring consistent, persistent, cost effective messaging.

9.2 SUMMARY

Transitional feeding knowledge gaps exist across all the ecological model’s dimensions (i.e. mother, family, community, policy), with incompatible expectations between the mothers and their supports (both professional and lay) undermining mothers’ infant feeding decisions. The findings from this thesis support building the knowledge and self-efficacy of both mothers and health services to improve communication and the opportunities to influence maternal infant feeding. Chapter 10 provides recommendations to guide this process, along with implications for research and practice. Strengths and limitations of this research are also discussed.
CHAPTER 10: RECOMMENDATIONS & CONCLUSIONS

10.1 INTRODUCTION

The purpose of this thesis was to understand why mothers feed their infants the way they do, so that opportunities to improve maternal transitional infant feeding could be identified. The findings in the previous chapter clearly indicate that for mothers, infant feeding is an emotionally challenging time. Interpreting infant behaviour and feeding cues is influenced by societal and professional expectations of what is thought to be “good mothering”. Both mothers and health professionals lacked transition infant feeding knowledge and skills, exacerbated by incompatible communication between them.

This chapter will provide some recommendations for researchers and practitioners on how to improve infant feeding decisions to reduce the risk of childhood obesity. The strengths and limitations of the study will be discussed, along with implications for research and practice.

10.1.1 RECOMMENDATIONS

To date EPOCH interventions have concentrated on sustaining breastfeeding, timely solid food introduction, responsive feeding and healthy child food intake; with some also focusing on reducing TV viewing, promoting active play and developing good sleep habits.117 This research has found other aspects of mother-infant interactions also play a pivotal part in transition feeding and thus influence obesity prevention activities. In moving forward with obesity prevention interventions for infants and young children, these other influences must be considered. Therefore this thesis recommends that obesity prevention researchers include the following aspects in future interventions:

1. Identification of healthy growth. Mothers need to be able to identify healthy growth; including the dangers of rapid weight gain and excess weight gain during infancy and that a healthy baby does not translate to having a chubby baby. The use of growth trajectory over specified incremental weight gain is recommended.

2. Understanding normal infant development, infant feeding cues and cues of hunger and satiety. Mothers need to be able to identify normal infant behaviour and to interpret infant feeding cues of hunger and satiety, to prevent the use of food for non-nutritional purposes. Unsettled infant behaviour is common and can include prolonged and
inconsolable crying, resistance to soothing, frequent night waking, and waking after short sleeps.\textsuperscript{303}

3. Identification of the signs of readiness to start solid food and iron-rich first foods. Mothers need to be able to differentiate between signs of readiness to start solid foods and signs of development for age, given that at around 4 months infants are interested in everything. Attention to oral motor function and loss of the tongue-thrust reflex are recommended. Mothers need to be able to identify iron-rich foods to include as part of the infant’s first foods to ensure adequate iron intake.

4. Information about providing food variety and texture progression based on infant’s cues. Mothers need to be able to identify infant food variety from the five food groups to meet nutritional needs for growth and development, and to develop taste sense and food acceptability. Exposure to a variety of textures based on infant’s developmental stage is recommended for oral motor development.

5. Use of other support platforms to provide information and deliver the intervention. Mothers need to identify evidence based infant feeding information and support platforms for use (e.g. face-to-face, helplines, websites, apps) and researchers need to use a variety of communication tools to communicate with mothers.

More broadly, these recommendations should also be incorporated into consultations with health professionals (e.g. child health nurses, GPs, dietitians) who would also benefit from education on healthy transitional infant feeding and growth. In addition, health professionals can improve their assistance in providing transitional infant feeding advice by:

1. Supporting mothers to develop parenting skills; including understanding the developmental differences of infants, normal infant behaviour and that maternal success is not defined by infant feeding decisions or infant outcomes.
2. Providing mothers with nonjudgmental, objective support and technical information on both breastfeeding and infant formula use.
3. Delivering consistent infant feeding information and support using multiple support communication platforms (e.g. helplines, websites, apps).

It is acknowledged that the implementation of all these recommendations will take time and financial resources to implement, and that change in generational, traditional feeding beliefs and feeding approaches will also be a gradual process.
10.1.2 STRENGTHS AND LIMITATIONS

The pragmatic paradigm used in this study provided a suitable framework for the use a
mixed method research design to understand maternal transitional infant feeding
experiences and identify practical support solutions. The initial qualitative researcher
interviews provided direction for the subsequent research. While the sample for this phase
was small and not generalisable, the EPOCH RCTs undertaken by these leading
researchers are well recognised in the international literature,\(^\text{26}\) and represents most of the
regional leading experts in the field.

The quantitative maternal survey was an effective methodology to provide descriptive data
on infant feeding and factors influencing feeding decisions. Given the well recognised
limitations of this cross-sectional approach to describing causality, the follow-up interviews
made it possible to validate some of these relationships and provide some contextual
meaning behind the decisions made.

The Queensland mothers involved in the study was a convenience sample sourced
through an electronic platform (FAB Facebook community page), and cross-linked to
parenting websites, forums and support groups. The online nature of the survey had the
potential to limit the response by all socioeconomic groups and as such may not be
representative of a broader population, or arguably provided an enhanced representation
of a broader population. To ensure the views of younger and/or lower educated/income
mothers were included, young parenting groups and supported mothers groups in low
SIEFA areas in South East Queensland were targeted. While this approach was
successful, it is acknowledged that the knowledge and parenting confidence of these
mothers may be different from mothers not attending these groups due to the services
attached to these groups (e.g. child health). As highlighted in Chapters 6 and 7, while the
final survey sample demographics did differ from all birthing Queensland mothers,\(^\text{268}\) the
sample’s breastfeeding, infant formula use and timing of introduction of solids rates were
compatible to a broader national sample of women.\(^\text{109}\)

The maternal survey used a questionnaire based on validated early childhood tools for
measuring infant feeding, parenting and feeding practices. Questions from the CFQ\(^\text{18}\) were
used to measure parental feeding practices and weight beliefs. While well represented in
the early childhood literature, it was designed for use in parents with children 2-11 years.
To improve applicability in the transitional feeding stage, the CFQ restriction questions
were modified as outlined in Chapters 4. While this may have impacted on the relationships recorded, such as the lack of association between restriction and infant diet and weight, the follow-up interview data confirmed these results. The lack of validated early childhood measurement tools as well as consistent feeding and parenting terminology was raised by the EPOCH researchers and in the literature.27

Sample selection for the maternal interviews was based on infant weight concerns given its impact on infant feeding, intake and weight in the survey results. The sampling framework ensured that only first time mothers were chosen, focusing on lower educated and/or income mothers who are more likely to use poor feeding habits.152 The final sample was reflected of this purposively selection process; however, the timing of these interviews in some cases involved mothers who had since had a subsequent child. This was seen as a welcome addition to the study, as the maternal survey results were not influenced by the additional child and these infant feeding experiences could be compared in the context of their experience with their second child. The final sample size for this sample was determined by data saturation based on the responses to the research questions. The quality of this data was assessed using both inductive and deductive analysis as described in Chapter 4, in addition to identifying “deviant” feeding experience inconsistent with the emerging themes.254 While these qualitative results were successfully triangulated246,248 with the quantitative results to explain the survey relationships, there is also a valid argument to have used a explorative mixed methods approach,246 whereby the maternal interviews would have informed the survey. In this research the knowledge of the EPOCH researchers were used for this process.

10.1.3 IMPLICATIONS FOR RESEARCH

Systematic national collection on infant/toddler dietary intake and growth is an identified data gap needed to inform infant feeding guidelines and recommendations. While the updated Australian Infant Feeding Guidelines provided a more flexible approach to the transitional feeding process, this thesis supports expanding them further to better describe how mothers should give food to their infants based on responsive feeding practices. Attention should also be given to terminology and measuring tools used in the early childhood feeding interventions and support services, to improve the examination of early childhood feeding relationships and practice advice, with longitudinal research warranted to understand causative relationships.
Findings from this thesis can inform EPOCH interventions, focusing on both maternal and health professional expectations of growth, intake and infant behaviour, in addition to their impact of motherhood. This could be enriched through further qualitative enquiry of the influence of food on these expectations. While research exploring effective ways to deliver this support is underway, the translation into current early childhood services needs to be ongoing to keep pace with the changing communication environment. Accessing health or peer support via the internet or smart phone apps are endorsed models for delivering support.

The findings of this thesis have identified two clear paths for further investigation. Firstly, given the overarching conceptualisation of motherhood, parenting expectations and their pivotal impact on feeding over the first 12 months of life, further research with mothers is warranted to better understand the current emotional minefield of “good mothering”. The results support the inclusion of other aspects of early parenting, such as infant behaviour, and the positioning of health professionals and parenting services to best navigate this challenging period.

Secondly, given the inconsistent expectations between mothers and health professionals identified in this research, maternal perceptions of suitable support should be compared against the perspective and experiences of health professionals. This needs to explore the tension between infant feeding recommendations and supporting the realities of early feeding in the context of reducing the medicalisation of feeding and the nurturing of a mother’s instinct to care for her young child.

10.1.4 IMPLICATIONS FOR PRACTICE

This thesis suggests that mothers are currently being let down by antiquated health services out of step with the research in understanding mothers needs to support healthy infant feeding. This is reflected in what information and support mothers require to inform feeding decisions as well as how best to deliver it. Given that infant feeding is entwined with infant behaviour, supporting healthy infant feeding must also include helping mothers understand what normal infant behaviour is and help set realistic expectations around intake, sleep and growth. Practitioners ought to be aware of how maternal identify as a “good” or “bad” mother is related to infant feeding, and be flexible in their approach to administering feeding and growth recommendations. Advice should be guided by the evidence, but delivered to match the mother’s needs, conscious of the socioecological
influences underpinning the infant feeding decision process and the technology mothers used to inform these decisions.

Empathetic, objective dialogue around infant feeding and growth is needed to prevent mothers from feeling judged by their choices or set up expectations on what mothers should be doing or how their infants should be developing. Health professionals need to be mindful of the sheer responsibility of motherhood, the range of aspects to caring for an infant and how this impacts on the mother's identity and emotions. It is critical that advice goes beyond transitional feeding, to cover pertinent topics such as settling techniques or normal infant behaviour, with the conversation generated from a shared-care prospective based on the mother's current needs. Infant feeding and growth recommendations should be used as guides and not checklists, with mothers navigated through this period to support development of their parenting confidence and skills, and the subsequent healthy growth of children.

10.2 CONCLUSION

This thesis was driven by a desire to better understand the maternal transitional infant feeding process so as to improve health service delivery. Reducing childhood obesity was a key identifiable health outcome to guide this investigation. The findings provide new information for both researchers and practitioners to consider when providing support to mothers of infants in the first year of life.

Mothers in this study did not know what is normal for infant behaviour, infant intake or infant growth. Their ability to meet infants' needs was perceived as being judged by many people and seen as a measure of success as a mother, driving unfounded concerns about eating and weight, and influencing infant feeding decisions and practices. Despite increasing confidence in parenting skills over the first year, mothers clearly require ongoing support to navigate from milk feeding onto family foods based on their infant's feeding cues. Support needs to be mindful of the sociocultural boundaries of the family environment, with consistent messaging delivered across multiple communication platforms that mothers' access.
CHAPTER 11: REFERENCES


References


References


References


References
References


158 References


213. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. BMC Medical Research Methodology. 2008;8:45.


Wight Hat Ltd. Metric conversions. 2015 [cited 2016 August 16]; Available from: www.metric-conversions.org


IBM Corp. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp. 2015;


APPENDIX 1: RESEARCHER INTERVIEW INFORMATION SHEET AND CONSENT FORM

Participant Information Sheet (Researcher Interview)
Research title: Reducing childhood obesity. Influencing parental infant feeding practices in line with the NHMRC Infant Feeding Guidelines
Principle Investigator: Michelle Harrison, michelle.harrison@uq.edu.au, ph 3345 5142

What is the research about and why is it being conducted?
The purpose of the study is to better understand the infant feeding choices of parents, including what parents give their infant, how they give it and why they make these decisions. It will also investigate where parents go for information and support about infant feeding and growth. It is hoped that the information provided will be used to guide future support services.

What will be my part in the study?
If you agree to participate in the study, you will be asked questions about your knowledge of infant feeding practices and early childhood obesity prevention interventions. The interview will be face to face through videoconferencing or a webinar, or if required by telephone and will take around 30 minutes to complete. The interview will be arranged based on time and technology which is convenient for you. With your permission the interview will be recorded, otherwise notes will be hand written.

There will be no payment to you or your university for taking part in this study.

What are the risks and benefits of being involved in this study?
There are no known risks if you decide to take part in the study. Any information you provide will be treated as confidential, and you are free to withdraw at any time.

Benefits identified from this research will help us better understand what is needed by new parents to support infant feeding practices and healthy childhood growth and development.

What else do I need to know?
Your identity and personal details provided for this interview will be kept strictly confidential and accessible only to the researchers involved in the study. Your personal details will be stored separately to the recordings and notes, and the recordings will be transcribed verbatim and eventually destroyed as per the university’s guidelines. The results will be presented at conferences and published in scientific journals, but will not identify any individuals.

Your rights
Your participation in this study is completely voluntary. You are free to change your mind and withdraw from the study at any time. If you decide to participate, you will need to sign a consent form. The study will run until mid 2015, after which you will be able to request a progress report and/or a summary of the final results.

This study adheres to the Guidelines of the ethical review process of The University of Queensland and the National Statement on Ethical Conduct in Human Research. Whilst you are free to discuss your participation in this study with project staff (contactable on 3346 5142), if you would like to speak to an officer of the University not involved in the study, you may contact the Ethics Coordinator on 3365 3924.

Thank you for participating in this research.
**Participant Consent Form (Researcher Interview)**

Research title: Reducing childhood obesity: Influencing parental infant feeding practices in line with the NHMRC Infant Feeding Guidelines

Principal Investigator: Michelle Harrison, michelle.harrison@uq.edu.au, ph 3348 5142

I .................................................. (print name), understand that by signing this form, I agree to take part in this research project.

- I have read and understood the Participant Information Sheet;
- I have had an opportunity to ask questions and I am satisfied with the answers I have received;
- I understand that participation in this study does not affect my work within my University or dealings with other Universities;
- I understand there are no direct benefits to me participating in this study;
- I have been informed that the confidentiality of the information will be maintained and my personal details will not be revealed;
- I freely agree to participate in this research project as described and understand that I am free to withdraw at any time during the project without comment or penalty.

Participant Signature....................................................

Date.....................

Thank you for participating in this research.
APPENDIX 2: MATERNAL QUESTIONNAIRE INFORMATION SHEET

Participant Information Sheet (Maternal Questionnaire)

Research title: Reducing childhood obesity: Influencing parental infant feeding practices in line with the NHMRC Infant Feeding Guidelines

Principal Investigator: Michelle Harrison, michelle.harrison@uq.edu.au, ph 3345 5142

What is the research about and why is it being conducted:
The purpose of the study is to better understand the infant feeding choices of parents, including what parents give their infant, how they give it and why they make those decisions. It will also investigate where parents go for information and support about infant feeding and growth. It is hoped that the information provided will be used to guide future support services.

What will be my part in the study?
If you agree to participate in the study, you will be asked questions about your infant feeding experiences and needs, in addition to some basic background information about you and your baby. The questionnaire can be completed on paper and returned in person to either your early childhood service provider where you got it or mailed back using the attached prepaid envelope. Alternatively, the questionnaire can be done online through the internet. The questionnaire should take between 10 to 15 minutes to complete.

What are the risks and benefits of being involved in this study?
There are no known risks if you decide to take part in the study. Any information you provide will be treated as confidential, and you are free to withdraw at any time.

Benefits identified from this research will help us better understand what is needed by new parents to support infant feeding practices and healthy childhood growth and development.

What else do I need to know?
The completed questionnaire will be stored in locked files and password protected computers and will only be accessible by the researchers for the purpose of the study. Only participants who agree to take part in follow up interviews will need to provide contact details and these will be stored separately so answers cannot be linked to personal details. The results will be presented at conferences and published in scientific journals, but will not identify participants.

Your rights
Your participation in this study is completely voluntary. You are free to change your mind and withdraw from the study at any time. If you decide to participate, completion of the questionnaire will be considered informed consent. The study will run until mid 2015, after which you will be able to request a progress report and/or a summary of the final results.

This study adheres to the Guidelines of the ethical review process of The University of Queensland and the National Statement on Ethical Conduct in Human Research. Whilst you are free to discuss your participation in this study with project staff (contactable on 3345 5142), if you would like to speak to an officer of the University not involved in the study, you may contact the Ethics Coordinator on 3365 3924.

Thank you for participating in this research.
APPENDIX 3: MATERNAL INTERVIEW INFORMATION SHEET AND CONSENT FORM

Participant Information Sheet (Maternal Interview)

Research title: Reducing childhood obesity. Influencing parental infant feeding practices in line with the NHMRC Infant Feeding Guidelines

Principle Investigator: Michelle Harrison, michelle.harrison@uq.edu.au, ph 3345 5142

What is the research about and why is it being conducted?

The purpose of the study is to better understand the infant feeding choices of parents, including what parents give their infant, how they give it and why they make those decisions. It will also investigate where parents go for information and support about infant feeding and growth. It is hoped that the information provided will be used to guide future support services.

What will be my part in the study?

If you agree to participate in the study, you will be asked questions about your infant feeding experiences and needs, in addition to some basic background information about you and your baby. The interview will be face to face and will take around 30 minutes to complete. The researcher will arrange an interview time and place which is convenient for you such as your home, a park or a private room at your early childhood service. With your permission the interview will be recorded, otherwise notes will be hand written.

You will not be paid for this part of the study, however a food shopping voucher will be offered to participants at the end of their interview for their time.

What are the risks and benefits of being involved in this study?

There are no known risks if you decide to take part in the study. Any information you provide will be treated as confidential, and you are free to withdraw at any time.

Benefits identified from this research will help us better understand what is needed by new parents to support infant feeding practices and healthy childhood growth and development.

What else do I need to know?

Your identity and personal details provided for this interview will be kept strictly confidential and accessible only to the researchers involved in the study. Your personal details will be stored separately to the audio tapes and notes, and the recordings will be transcribed and eventually destroyed as per the university’s guidelines. The results will be presented at conferences and published in scientific journals, but will not identify any individuals.

Your rights

Your participation in this study is completely voluntary. You are free to change your mind and withdraw from the study at any time. If you decide to participate, you will need to sign a consent form. The study will run until mid 2015, after which you will be able to request a progress report and/or a summary of the final results.

This study adheres to the Guidelines of the ethical review process of The University of Queensland and the National Statement on Ethical Conduct in Human Research. Whilst you are free to discuss your participation in this study with project staff (contactable on 3346 5142), if you would like to speak to an officer of the University not involved in the study, you may contact the Ethics Coordinator on 3365 3924.

Thank you for participating in this research.
Participant Consent Form (Maternal Interview)

Research title: Reducing childhood obesity: Influencing parental infant feeding practices in line with the NHMRC Infant Feeding Guidelines

Principle Investigator: Michelle Harrison, michelle.harrison@uq.edu.au, ph 3346 5142

I ......................................................... (print name), understand that by signing this form, I agree to take part in this research project.

- I have read and understood the Participant Information Sheet;
- I have had an opportunity to ask questions and I am satisfied with the answers I have received;
- I understand that participation in this study does not affect the early childhood service care I usually receive;
- I understand there are no direct benefits to women participating in this study;
- I have been informed that the confidentiality of the information will be maintained and my personal details will not be revealed;
- I freely agree to participate in this research project as described and understand that I am free to withdraw at any time during the project without comment or penalty.

Participant Signature.................................................................
Date......................

Thank you for participating in this research.
APPENDIX 4: RESEARCHER INTERVIEW GUIDE

Semi-structured Interviews

Early childhood nutrition researcher

Guide

Introduction of interviewer:

Hello my name is Michelle Harrison and in this initial part of my PhD research I want to interview researchers involved in the area of early childhood nutrition. The focus of my study is to better understand parental infant feeding practices and concerns about growth and obesity. During this interview I would like to discuss your knowledge in this field, including the literature, interventions and identified knowledge gaps. The information from these interviews will inform the development of a maternal quantitative questionnaire and follow up maternal in-depth interviews.

If you agree, I will be recording the interview and later turning it into a written document without your personal details. A summary of the final results will be sent to you and a copy of this interview can also be sent if you want. The interview will take around 30 minutes but can be stopped at any time if you want.

OK, so unless you have any questions about the research or interview shall we get started?

Background / setting the scene

1. Can you tell me about your professional background and how you became involved in the area of early childhood nutrition?

2. What is your current or most recent involvement in the area?

Literature

3. From your review of the literature, what do you think are the key factors that need to be considered when addressing infant feeding practices and obesity prevention?

4. What do you believe are the strengths and weaknesses of current early childhood obesity prevention interventions? Why? (prompt: in the literature; unpublished; in the field)

Interventions

Moving onto your own research experience in this area...

5. In your experience, how aware are parents about infant feeding guidelines? (prompts: All parents or specific population groups? Depth and extent of knowledge?)
6. In your opinion, do you think parents are concerned about these guidelines and use them to guide choices?

7. What do you understand are the common challenges raised by parents to meeting these recommendations?

8. What do you believe are the key enablers to assist parents to establish infant feeding practices consistent with the recommendations?

9. Do parents raise any concerns about infant feeding and growth? If yes, in what context? (Prompts: underweight, overweight) Do they raise any other health concerns?

10. From your experience, how do parents learn about how to feed their infant? (Prompts: Mother, sister, step mother, partner, other family members, friends, health professionals, books, internet)

11. Generally speaking, are people satisfied with the services available? If yes, why? If not, what are the problems they cite? What services do they want?

12. From your research, what do you consider are the key successful elements to influencing infant feeding practices? What has worked well and why? What has not worked well and why?

13. Is there any further information you would like to inform your future work in this area? If yes, what is it and what would be your approach to finding this?

**Conclusion**

14. Is there any other aspects of infant feeding or obesity prevention that we have not discussed that you think need to be considered?

15. Is there anything further you would like to add?

**Thank you for your time**

General probes:
Can you expand a little on this?
Can you tell me anything else?
Can you give me some examples?
APPENDIX 5: MATERNAL SURVEY

Feeding A Baby (FAB) Study

Thank you for agreeing to complete this questionnaire about your experiences of feeding your baby. To participate in the study your baby must currently be aged between 6 to 12 months. The questionnaire will take around 15 minutes to complete and if you choose, your name will go in a draw to win a $100 supermarket shopping voucher. Participation is voluntary and all answers will remain confidential.

About your baby

1. What is today's date?  Day/month/year (eg 07/05/2014)
   
2. What is date of your child's birth?  Day/month/year (eg 07/06/2014)
   
3. Is this child a male or female?
   - Male
   - Female

4. Is this your first child?
   - Yes
   - No - I have □ other children living with me (please put number of other children in the box)

5. What country was your child born in?
   - Australia
   - Other – please specify which country: ____________

6. Which hospital was your child born in or taken to after the birth? (Note: if you had a homebirth and did not go to hospital at all, write homebirth as your answer) ____________

7. Based on your due date, was your child born:
   - Earlier than the due date - he/she was □ weeks OR □ days early
   - On the due date
   - After the due date - he/she was □ weeks OR □ days late

Feeding your baby

8. Prior to the birth of your child, did you intend to feed your child breastmilk or infant formula?
   - Breastmilk (and for how long did you intend to feed your child breastmilk? ____________)
   - Infant formula
   - Breastmilk and infant formula
   - Did not think about it prior to the birth

ID □□□
9. Has your child ever been given any breastmilk?
   - Yes and is still being fed some breastmilk
   - Yes but stopped when he/she was ___ days old OR ___ weeks old OR ___ months old
   - No

10. Has your child ever been given any infant formula regularly (daily or almost daily)?
    - Yes, from when he/she was ___ days old OR ___ weeks old OR ___ months old
    - Not regular but first given infant formula when he/she was ___ weeks old OR ___ months old
    - No, has never been given any infant formula ever

11. Has your child ever been given any follow-on formula regularly (daily or almost daily)? (Note: Follow-on formula is formula made for babies aged 6 months or older)
    - Yes, from when he/she was ___ days old OR ___ weeks old OR ___ months old
    - Not regularly but first given follow-on formula when he/she was ___ weeks old OR ___ months old
    - No, has never been given any follow-on formula ever

12. Has your child ever been given any plain water regularly (daily or almost daily)?
    - Yes, from when he/she was ___ days old OR ___ weeks old OR ___ months old
    - Not regularly but first given plain water when he/she was ___ weeks old OR ___ months old
    - No, has never been given any plain water ever

13. Has your child ever been given any cow's milk to drink regularly (daily or almost daily)? (Note: This is milk given to your child to drink and not milk that may be added to food)
    - Yes, from when he/she was ___ days old OR ___ weeks old OR ___ months old
    - Not regularly but first given cow's milk to drink when he/she was ___ weeks old OR ___ months old
    - No, has never been given any cow's milk to drink ever

14. Has your child ever been given any milk other than cow's milk to drink regularly (daily or almost daily)? (e.g. goat, soy, rice but not breastmilk or infant formula or follow-on formula)
    - Yes, from when he/she was ___ days old OR ___ weeks old OR ___ months old
    - Not regularly but first given other milk to drink when he/she was ___ weeks old OR ___ months old
    - No, has never been given any milk other than cow's milk to drink ever
Feeding A Baby (FAB) Study

15. Has your child ever been given any fruit juice regularly (daily or almost daily)?
   □ Yes, from when he/she was ___ days old OR ___ weeks old OR ___ months old
   □ Not regularly but first given fruit juice when he/she was ___ weeks old OR ___ months old
   □ No, has never been given any fruit juice ever

16. Has your child ever been given any sweetened drinks regularly (daily or almost daily)? (Note: Sweetened drinks include cordial, flavoured water, fizzy drinks)
   □ Yes, from when he/she was ___ days old OR ___ weeks old OR ___ months old
   □ Not regularly but first given sweetened drinks when he/she was ___ weeks OR ___ months old
   □ No, has never been given any sweetened drinks ever

17. Has your child ever been given any solid or semi-solid food regularly (daily or almost daily)?
   □ Yes, from when he/she was ___ days old OR ___ weeks old OR ___ months old
   □ Not regularly but first given solid or semi-solid food when he/she was ___ weeks OR ___ mths old
   □ No, has never been given any solid or semi-solid food ever

18. What was the first solid or semi-solid food you gave your child? (Tick one only)
   □ Rusks
   □ Baby or rice cereal
   □ Other cereals eg Weetbix, porridge
   □ Mashed fruit
   □ Mashed vegetables
   □ Pureed meat meal
   □ Custard or yoghurt
   □ Don’t remember
   □ Other, please specify: ________________________________________

19. What was the main reason you commenced solid foods? (Tick one only)
   □ Showing cues / signs of readiness (eg can sit upright with support, shows interest in food, reaches for food)
   □ Advice from health professional – child health nurse, pharmacist, doctor
   □ Advice from family or friends
   □ To help with sleeping and settling
   □ I thought it was time
   □ Other, please specify: ________________________________________

20. Do you sit down for family meals together?
   □ Never
   □ Rarely
   □ Some of the time
   □ Most of the time
   □ Always

ID   3
21. For each carer listed below, please indicate on average how often they feed your child?

You:

☐ most meals ☐ daily ☐ weekly ☐ monthly ☐ rarely ☐ never

Your husband/partner:

☐ most meals ☐ daily ☐ weekly ☐ monthly ☐ rarely ☐ never

Grandparents:

☐ most meals ☐ daily ☐ weekly ☐ monthly ☐ rarely ☐ never

Other relatives:

☐ most meals ☐ daily ☐ weekly ☐ monthly ☐ rarely ☐ never

Childcare (in home or external setting):

☐ most meals ☐ daily ☐ weekly ☐ monthly ☐ rarely ☐ never

Other, please specify:

☐ most meals ☐ daily ☐ weekly ☐ monthly ☐ rarely ☐ never

22. How many serves of vegetables does your child usually eat each day? (Include fresh, dried, frozen and tinned vegetables. One serve = 1 tablespoon cooked vegetables or legumes eg baked beans)

☐ One serve or more per day (ie 1 tablespoon or more per day) ☐ serves per day

☐ Less than one serve per day (ie less than 1 tablespoon per day)

☐ None / doesn't eat vegetables

☐ None/doesn't eat any solid/semi-solid food yet

23. How many serves of fruit does your child usually eat each day? (Include fresh, dried, frozen and tinned fruit but not fruit juice. One serve = 1 tablespoon mashed/diced/tinned fruit or 1 teaspoon of dried fruit)

☐ ¾ serve or more per day (ie ¾ tablespoon or more per day) ☐ serves per day

☐ Less than ¾ serve per day (ie less than ¾ tablespoon per day)

☐ None / doesn't eat fruit

☐ None/doesn't eat any solid/semi-solid food yet

24. How often, on average, does your child have meals or snacks such as burgers, pizza, chicken or chips from places like McDonalds, Hungry Jacks, Pizza Hut, Red Rooster or local take-away food places?

☐ Daily or almost daily

☐ 2-3 times a week

☐ Once a week

☐ 2-3 times a month

☐ Once a month

☐ Rarely

☐ Never

25. How often do you prepare your child's meals from scratch?

☐ Never

☐ Rarely

☐ Sometimes

☐ Mostly

☐ Always
26. How often do you use prepared food? (eg packaged baby food in a pouch or jar, frozen meals, takeaway)
   - Never
   - Rarely
   - Sometimes
   - Mostly
   - Always

27. Which of the following things might influence the food and drink you buy? (Multiple answers allowed)
   - Your food preferences
   - Your child’s food preferences
   - Availability
   - Convenience
   - Cost
   - Ability to shop
   - Health concerns
   - Other, please specify: ________________________________

28. In the last 12 months, were there any times in which you ran out of food and couldn’t afford to buy more?
   - Yes
   - No

29. Where do you get information about feeding your child solid foods? (Multiple answers allowed)
   - Mother
   - Partner’s mother
   - Brothers and/or sisters
   - Other relatives, please specify: ______________________
   - Friends
   - Mother’s group
   - General Practitioner (GP)
   - Child health nurse
   - Pharmacist
   - Magazines
   - Books
   - Television
   - Internet
   - Nowhere
   - Other, please specify: ________________________________
30. What services have you used to provide you with support around feeding your child solid foods? (Multiple answers allowed)
- Community health/child health
- Dietitian/Nutritionist
- Lactation consultant
- Australian Breastfeeding Association (ABA)
- General Practitioner (GP)
- Pharmacy/Pharmacist
- Telephone helpline eg 13HEALTH
- Mother's group/Playgroup
- Church
- No support services used
- Other, please specify: ________________________________

31. How would you prefer to get information about feeding your child solid foods? (Tick one only)
- Written information
- Individual consultation with health professional (eg child health nurse, GP)
- Group education with health professional
- Internet website (with or without chat forums)
- Social networking site (Facebook)
- Mobile phone text messages
- Other, please specify: ________________________________

Infant feeding recommendations

32. From what you've heard and read, what do you understand to be the recommended age to which you should exclusively breastfeed your child? (Exclusively breastfed = baby fed breastmilk only)
- ___ Weeks OR ___ Months

33. From what you've heard and read, what do you understand to be the recommended age to which you should continue to breastfeed your child whilst also feeding them solid foods?
- ___ Weeks OR ___ Months

34. From what you've heard and read, what do you understand to be the recommended age mums using infant formula should stop using infant formula and replace it with milk?
- ___ Weeks OR ___ Months

35. From what you've heard and read, what do you understand to be the recommended age to first give your child solid or semi-solid foods?
- ___ Weeks OR ___ Months

36. From what you've heard and read, what is the recommended first solid or semi-solid food mums should feed their child? (Tick one only)
- Rusks
- Baby or rice cereal
- Other cereals eg Weet-bix, porridge
- Mashed fruit
- Mashed vegetables
- Pureed meat meal
- Custard or yoghurt
- Other, please specify: ________________________________
Your child’s body measurements

37. What is your child’s recorded birth length? (If needed refer to your baby book)
   □ □ . □ □ Centimetres
   OR
   □ □ . □ □ Inches

38. What is your child’s recorded birth weight? (If needed refer to your baby book)
   □ □ □ □ □ □ Kilograms
   OR
   □ □ Pounds and □ □ Ounces

39. What is your child’s most recent recorded weight? (If needed refer to your baby book)
   □ □ □ □ □ □ Kilograms
   OR
   □ □ Pounds and □ □ Ounces

   Date recorded: □ □ / □ □ / □ □ □ □

40. What was your child’s most recent recorded length? (If needed refer to your baby book)
   □ □ □ □ □ □ Centimetres
   OR
   □ □ □ □ □ □ Inches

   Date recorded: □ □ / □ □ / □ □ □ □

41. How would you describe your child’s weight?
   □ Markedly underweight
   □ Underweight
   □ Normal
   □ Overweight
   □ Markedly overweight

42. What is the main way you monitor/measure your child’s growth? (Tick one only)
   □ Compare with other babies
   □ Weight and appearance (eg chubby cheeks)
   □ Size of clothes
   □ Growth charts (eg in your baby book or used by your doctor or other health professional)
   □ Don’t monitor/measure growth
   □ Other, please specify: ____________________________
43. How concerned are you about your child becoming overweight?
   - Unconcerned
   - A little concerned
   - Concerned
   - Fairly concerned
   - Very concerned

44. How concerned are you about your child becoming underweight?
   - Unconcerned
   - A little concerned
   - Concerned
   - Fairly concerned
   - Very concerned

To what extent do you agree with the following statements? (Tick one only for each statement)

45. Children under 12 months can be overweight
   - disagree
   - slightly disagree
   - neutral – neither disagree nor agree
   - slightly agree
   - agree

46. My child’s weight influences how I feed him/her
   - disagree
   - slightly disagree
   - neutral – neither disagree nor agree
   - slightly agree
   - agree

47. I have to be sure that my child does not eat too much
   - disagree
   - slightly disagree
   - neutral – neither disagree nor agree
   - slightly agree
   - agree

48. I intentionally keep some foods out of the reach of my child
   - disagree
   - slightly disagree
   - neutral – neither disagree nor agree
   - slightly agree
   - agree

49. I offer my child food in exchange good behaviour (eg dessert if meal is eaten, snack if child stops crying)
   - disagree
   - slightly disagree
   - neutral – neither disagree nor agree
   - slightly agree
   - agree

50. If I do not guide or regulate my child’s eating, he/she would eat more than they should
   - disagree
   - slightly disagree
   - neutral – neither disagree nor agree
   - slightly agree
   - agree

51. My child should always eat all the food on his/her plate
   - disagree
   - slightly disagree
   - neutral – neither disagree nor agree
   - slightly agree
   - agree

52. I have to be especially careful to make sure my child eats enough
   - disagree
   - slightly disagree
   - neutral – neither disagree nor agree
   - slightly agree
   - agree

53. If my child does not want to eat I try to get him/her to eat anyway
   - disagree
   - slightly disagree
   - neutral – neither disagree nor agree
   - slightly agree
   - agree

54. If I did not guide or regulate my child’s eating, he/she would eat much less than they should
   - disagree
   - slightly disagree
   - neutral – neither disagree nor agree
   - slightly agree
   - agree
55. How much do you keep track of the high sugar or high fat foods that your child eats?

☐ Never
☐ Rarely
☐ Sometimes
☐ Mostly
☐ Always

56. Overall, as a parent do you feel you are...

☐ Not very good at being a parent
☐ A person who has some trouble being a parent
☐ An average parent
☐ A better than average parent
☐ A very good parent

For each of the following statements, please indicate how confident you feel when feeding your child:

57. I give my child healthy food

☐ not at all confident ☐ not so confident ☐ somewhat confident ☐ confident ☐ very confident

58. I can get my child to eat enough

☐ not at all confident ☐ not so confident ☐ somewhat confident ☐ confident ☐ very confident

59. I can get my child to try vegetables

☐ not at all confident ☐ not so confident ☐ somewhat confident ☐ confident ☐ very confident

60. I give my child the right amounts of food

☐ not at all confident ☐ not so confident ☐ somewhat confident ☐ confident ☐ very confident

61. I can get my child to taste new food

☐ not at all confident ☐ not so confident ☐ somewhat confident ☐ confident ☐ very confident

How often do you do the following with your child?

62. Express affection by hugging, kissing and holding your child

☐ never or almost never ☐ rarely ☐ sometimes ☐ often ☐ always or almost always

63. Hug or hold your child for no particular reason

☐ never or almost never ☐ rarely ☐ sometimes ☐ often ☐ always or almost always

64. Tell your child how happy he/she makes you

☐ never or almost never ☐ rarely ☐ sometimes ☐ often ☐ always or almost always

65. Have warm, close times together with your child

☐ never or almost never ☐ rarely ☐ sometimes ☐ often ☐ always or almost always

66. Enjoy doing things with your child

☐ never or almost never ☐ rarely ☐ sometimes ☐ often ☐ always or almost always

67. Feel close to your child both when he/she is happy and when he/she is upset

☐ never or almost never ☐ rarely ☐ sometimes ☐ often ☐ always or almost always
For questions 68 to 72, please choose a number from 1 to 10 and write it next to each statement to indicate the extent to which the following statements describe how you have been feeling or behaving with your child over the last 4 weeks.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>All the time</td>
</tr>
</tbody>
</table>

68. ___ I have been angry with my child
69. ___ I have raised my voice or shouted at my child
70. ___ When my child cries, he/she gets on my nerves
71. ___ I have lost my temper with my child
72. ___ I have left this child alone in his/her bedroom when they were particularly irritable or upset

**About you**

73. How tall are you without shoes?
   - [ ] [ ] [ ] Centimetres
   - OR [ ] [ ] Feet and [ ] [ ] Inches

74. How much did you weigh at the start of your pregnancy with this child?
   - [ ] [ ] [ ] Kilograms
   - OR [ ] [ ] Stones and [ ] [ ] Pounds

75. What is your current weight?
   - [ ] [ ] [ ] Kilograms
   - OR [ ] [ ] Stones and [ ] [ ] Pounds
76. Before you became pregnant, how would you describe your weight?
   - Markedly underweight
   - Underweight
   - Normal
   - Overweight
   - Markedly overweight

77. What is your date of birth? Day/month/year eg 07/06/2014

78. In which country were you born?
   - Australia
   - Other, please specify: __________________________

79. What language do you speak at home?
   - English
   - Other, please specify: __________________________

80. Are you an Aboriginal or Torres Strait Islander?
   - Yes – Aboriginal only
   - Yes – Torres Strait Islander only
   - Yes – Aboriginal and Torres Strait Islander
   - No

81. What is your current marital status?
   - Married
   - De facto
   - Separated but not divorced
   - Divorced
   - Widowed
   - Single / Never married

82. Which of the following best describes your current employment status?
   - Employed full-time
   - Employed part-time or casual
   - Home duties or carer
   - Maternity leave
   - Unemployed
   - Full-time student
   - Part-time student
   - Retired
   - Permanently ill/unable to work
   - Other (Specify) __________________________
83. Are you currently a smoker?

☐ Yes
☐ No

84. Did you smoke during your pregnancy with this child?

☐ Yes
☐ No

85. What is the highest level of primary or high school that you have completed?

☐ Did not go to school
☐ Year 8 or below (age 12 – 13 years)
☐ Year 9 or equivalent (age 13 - 14 years)
☐ Year 10 or equivalent (age 14 – 15 years)
☐ Year 11 or equivalent (age 15 – 16 years)
☐ Year 12 or equivalent (age 16 – 17 years)

86. What qualifications have you completed since leaving school?

☐ None
☐ Bachelor degree or higher
☐ Trade certificate/apprenticeship (4 years duration)
☐ Diploma or certificate taking 12 months or more full time
☐ Diploma or certificate taking less than 12 months full time

87. Approximately, what was your total GROSS household income from ALL sources for the past 12 months? That is the total income for the year from ALL members of your household before tax is deducted. Would it be:

☐ less than $25,000
☐ $25,001 - $50,000
☐ $50,001 - $100,000
☐ $100,001 - $150,000
☐ Over $150,000

88. What is the suburb, rural locality or town of your usual residence? __________________________

89. What is the postcode of your usual residence? [______]
Contact details

If you would like to go in the draw for a $100 supermarket voucher please provide a first name and telephone number or email address where you can be contacted:

Name: ____________________________

Telephone: _______________________
(Home or mobile)

Email address: _______________________

Follow up discussion

Would you be willing to participate in a discussion around how women feed their young children and the reasons behind these choices? The discussion will be no longer than 1 hour and a supermarket voucher will be given to each participant for their time.

Please tick which option you would prefer:

☐ Individual discussion

☐ Group discussion

☐ Individual or group discussion

☐ Not interested in being involved in any discussions

If not already provided above, please provide a first name and telephone number or email address where you can be contacted by the principle researcher (Michelle) to arrange the follow-up discussion:

Name: ____________________________

Telephone: _______________________
(Home or mobile)

Email address: ________________________
Semi-structured Interviews - mothers

Guide

Introduction of interviewer:

Hello my name is Michelle Harrison and as part of my PhD research I am talking to mums about their experiences of feeding their infants. During this interview I will be asking you about how you feed your baby, what makes it easier or harder, how you learnt about how to feed your baby and what you think is important. This information will be used to assist maternal and child health services to advise new parents.

The interview will take around 30 minutes but can be stopped at any time if you want. If you agree, I will be recording the interview and later turning it into a written document without your personal details. A summary of the final results will be sent to you and a copy of this interview can also be sent if you want.

OK, do you have any questions about the research or interview? If not, shall we get started?

Background / setting the scene

1. Can you tell me when you first thought about how you were going to feed your baby? (Prompts: when - pregnancy, postnatal; how - breastfeeding, formula, solids)

2. What did you decide to do then?

3. What influenced that decision then? (prompt: partner, mother, sister, mother in law, other family members, friends, health professionals, books, internet, infant feeding guidelines)

4. Did the initial decision about feeding your baby change over time? Why or why not?

5. How did you end up feeding your baby? (prompts: breastfeeding, formula, solids)

6. What factors influenced this? (prompts: family, friends, health professionals, books, internet, infant feeding guidelines, comparison with peers, money, own diet, own health, baby’s health, sleep, etc)

7. What do you use as a guide to measure how the feeding is going? (prompt: nothing, infant feeding guidelines, growth & grow charts, comparison with other babies, contentment, sleep, not crying, etc)

8. Can you recall any of the infant feeding guidelines / recommendations in Australia? How did you find out about them? How do they influence how you feed your baby? How does your infant feeding practices compare with them? What factors help/ would help you meet these recommendations?
Feeding practices

9. How confident are you about the feeding choices you have selected for your baby?

10. How much control do you feel you have over what your child eats?

11. To what extent do you keep check of or limit the foods your baby eats?

12. What things do you do to ensure your baby eats? (eg food baby all bottle or all the food served, feed baby anything just to get something in, use food as a reward)

13. Can you describe the types of foods and drinks you give your baby?

Weight

14. How concerned are you about your baby’s weight? (prompt: underweight, overweight, obese) Why? Why not? How does your baby’s weight influence how you feed him/her?

15. How do you monitor your baby’s growth? (prompt: growth chart, comparison with other babies, Do others monitor for you?)

Information sources / support

16. Where do you prefer to get information on infant feeding and growth? Why?

17. What maternal and child services have you used? Why?

18. What, if any, websites or social networks do you use to get information or support about infant feeding and growth? (prompt: parenting websites, blogs, apps, Facebook, Twitter) What devices do you use to connect to them? (computer, tablet, smartphone)

Conclusion

19. Is there any other infant feeding or growth issues that we have not discussed that you think need to be considered?

20. Is there anything further you would like to add?

Thank you for your time

General probes:
Can you expand a little on this?
APPENDIX 7: ETHICS APPROVAL

THE UNIVERSITY OF QUEENSLAND
Institutional Human Research Ethics Approval

Project Title: Reducing Childhood Obesity: Influencing Parental Infant Feeding Practices in line with the NHMRC Infant Feeding Guidelines

Chief Investigator: Ms Michelle Harrison
Supervisor: A/Prof Wendy Brodribb, Prof Peter Davies, Prof Julie Hepworth
Co-Investigator(s): None
School(s): School of Medicine, Discipline of General Practice
Approval Number: 2013001520
Granting Agency/Degree: PhD
Duration: 31st December 2016

Comments/Conditions:
Expedited Review - Low Risk

The project complies with the provisions contained in the National Statement on Ethical Conduct in Human Research and complies with the regulations governing exploitation on humans.

Name of Ethics Committee representative:
Associate Professor John McLean
Chairperson
Behavioural & Social Sciences Ethical Review Committee

Signature [Signature] Date 31/12/2013

188 Appendix 7