



UNIVERSITY OF CALGARY

University of Calgary

PRISM: University of Calgary's Digital Repository

Graduate Studies

Legacy Theses

2007

Parenting stress, well-being, and resiliency among mothers of multiple births in urban Alberta

Kostaras, Xanthoula

Kostaras, X. (2007). Parenting stress, well-being, and resiliency among mothers of multiple births in urban Alberta (Unpublished master's thesis). University of Calgary, Calgary, AB.

doi:10.11575/PRISM/22271

<http://hdl.handle.net/1880/45046>

master thesis

University of Calgary graduate students retain copyright ownership and moral rights for their thesis. You may use this material in any way that is permitted by the Copyright Act or through licensing that has been assigned to the document. For uses that are not allowable under copyright legislation or licensing, you are required to seek permission.

Downloaded from PRISM: <https://prism.ucalgary.ca>

UNIVERSITY OF CALGARY

Parenting Stress, Well-Being, and Resiliency Among
Mothers of Multiple Births in Urban Alberta

by

Xanthoula Kostaras

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF SCIENCE

DEPARTMENT OF COMMUNITY HEALTH SCIENCES

CALGARY, ALBERTA

SEPTEMBER, 2007

© Xanthoula Kostaras 2007

UNIVERSITY OF CALGARY
FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Parenting Stress, Well-Being, and Resiliency Among Mothers of Multiple Births in Urban Alberta" submitted by Xanthoula Kostaras in partial fulfilment of the requirements of the degree of Master of Science in Epidemiology.

Supervisor, Dr. Carol E. Adair
Department of Community Health Sciences

Co-Supervisor, Dr. Reg Sauve
Department of Community Health Sciences

Dr. Suzanne Tough
Department of Community Health Sciences

Dr. Karen Benzies
Faculty of Nursing

Date

Abstract

Objective: To describe parenting stress, well-being, and resiliency in a population-based sample of mothers of multiples and singletons.

Design: Nested follow-up study, with initial data derived from a large population-based cohort study (Delayed Childbearing (DC) study) of 1044 first-time mothers who gave birth between July 2002 and September 2003 in two large urban health authorities in Alberta.

Participants: Forty-one mothers of multiples and 1002 mothers of singletons from the 1044 first-time mothers from the DC study were eligible for the present study. 20 women who delivered multiples and a comparison sample of 38 women who delivered singletons completed interviews between August 2005 and April 2006.

Main Outcome Measure: Parenting Stress Index (PSI).

Main Results: Mothers of multiples reported higher mean scores on the PSI than mothers of singletons (68.90 ± 13.75 vs. 64.55 ± 19.41), though the majority of scores were not clinically significant. Mothers of both singletons and multiples had low rates (5%) of depression before the births of their children, and these rates increased at the time of follow-up (18.4% and 35.0%).

Conclusions: The findings suggest that mothers of multiples experience higher rates of depression and more parenting stress compared to mothers of singletons. Caring for additional children and returning to employment after childbirth are both important to consider when assessing the relationship between the birth of multiples and various indicators of maternal well-being.

Acknowledgements

I would like to extend my most sincere gratitude to everyone who has helped and supported me along the way:

My family and friends, for your unwavering support and encouragement during the past four years.

My supervisor, Dr. Carol Adair, for guiding me through my development and growth as a scientist, for encouraging me to think critically about every aspect of my research, and for teaching me how to keep everything in perspective throughout my graduate education.

My committee members, Drs. Reg Sauve and Suzanne Tough, for your enthusiasm and thoughtful insight throughout every stage of my study.

And the many mothers I have had the fortune of interacting with, both those who participated in my study, and those who are a part of my life, for inspiring me with your unique perspectives and experiences.

Table of Contents

Approval Page.....	ii
Abstract.....	iii
Acknowledgements.....	iv
List of Tables.....	vii
List of Figures.....	viii
CHAPTER ONE: INTRODUCTION.....	1
1.1 Introduction.....	1
1.2 Statement of the research problem.....	2
CHAPTER TWO: LITERATURE REVIEW.....	4
2.1 Overview.....	4
2.2 Parenting stress and well-being.....	3
2.3 Resiliency.....	6
2.4 Postpartum depression.....	8
2.5 Findings of a literature review on multiple births, stress, well-being, and resiliency.....	10
2.5.1 Literature search strategy.....	10
2.5.2 Multiple births and maternal mental health.....	11
2.5.3 Impact of method of conception on parenting stress.....	14
2.5.4 Multiple births and mental health outcomes.....	15
2.5.5 Employment status as a predictor of parenting stress in mothers of multiples.....	19
2.6 Limitations of the extant literature.....	26
CHAPTER THREE: METHODS.....	28
3.1 Objectives.....	28
3.1.1 Primary objective.....	28
3.1.2 Secondary objectives.....	28
3.2 Study design.....	28
3.3 Delayed Childbearing study.....	30
3.4 Procedures.....	31
3.4.1 Focus group protocol.....	31
3.4.2 Pre-testing protocol.....	32
3.4.3 Recruitment for the study sample.....	32
3.5 Variables and measures.....	34
3.5.1 Parenting Stress Index, Short-Form (PSI-SF).....	34
3.5.2 Edinburgh Postnatal Depression Scale (EPDS).....	35
3.5.3 Zung Self-Rating Anxiety Scale (SAS).....	36
3.5.4 Rutter Malaise Inventory (RMI).....	36
3.5.5 Resilience Scale (RS).....	37
3.6 Analysis.....	38
3.6.1 Study variables.....	38

3.6.2 Sample size calculations.....	40
3.6.3 Data management.....	40
3.6.4 Data analysis.....	41
3.6.4.1 Univariate analyses.....	41
3.6.4.2 Bivariate analyses.....	42
3.6.4.3 Classical stratified analysis.....	42
CHAPTER FOUR: RESULTS.....	43
4.1 Demographic and clinical characteristics of the overall sample.....	43
4.2 Characteristics of women who responded to the follow-up study.....	44
4.3 Demographic and clinical characteristics of mothers of singletons versus mothers of multiples.....	47
4.3.1 Overall sample.....	47
4.3.2 Follow-up sample.....	49
4.4 Scores on standardized questionnaires measuring parenting stress, well-being, and resiliency in the follow-up study.....	52
4.5 Classical stratified analysis.....	56
4.6 Health status of children at the time of the follow-up study.....	57
4.7 Comparison of results with the British Cohort Study.....	57
4.8 Summary of key findings.....	58
CHAPTER FIVE: DISCUSSION.....	60
5.1 Overview.....	60
5.2 Sample characteristics for primary outcome variables.....	61
5.2.1 Parenting stress.....	61
5.2.2 Depression, anxiety, and well-being.....	62
5.2.3 Return to employment.....	65
5.3 Comparison to the British Cohort Study.....	67
5.4 Methodologic problems.....	69
5.4.1 Issues of chance (statistical power).....	69
5.4.2 Issues of confounding.....	71
5.4.3 Issues of bias.....	72
5.4.3.1 Information bias.....	72
5.4.3.2 Selection bias.....	73
5.5 Study limitations.....	75
5.6 Study strengths.....	75
5.7 Conclusions and recommendations.....	76
REFERENCES.....	77
APPENDIX A: Transcript from a Focus Group with Mothers of Twins.....	84
APPENDIX B: Telephone Interview Guide.....	90

List of Tables

Table 2.1 Search strategy and results.....	10
Table 2.2 Summary of literature review on multiple births, stress, well-being, and resiliency.....	22
Table 3.1 Study variables and operational definitions.....	38
Table 4.1 Demographic and clinical characteristics of the eligible sample.....	43
Table 4.2 Demographic and clinical characteristics of respondents versus non-respondents to the follow-up study (N=119).....	45
Table 4.3 Demographic and clinical characteristics of mothers of singletons and mothers of multiples in the eligible sample.....	47
Table 4.4 Demographic and clinical characteristics of mothers of singletons and mothers of multiples who completed the follow-up study.....	49
Table 4.5 Comparison of scores for parenting stress, well-being, and resiliency measures of mothers of singletons and mothers of multiples in the follow-up study.....	52
Table 4.6 Odds ratios for the relationship between multiple birth and a history of depression in mothers of singletons and mothers of multiples who responded to the follow-up study, adjusted for potentially confounding variables	56
Table 4.7 Comparison of key findings from the present study to key findings from the British Cohort Study.....	57

List of Figures

Figure 3.1 Study design.....	30
Figure 3.2 Overview of study timelines and participation.....	33
Figure 4.1 Boxplot comparison of RMI scores for mothers of singletons and mothers of multiples in the follow-up study.....	53
Figure 4.2 Boxplot comparison of EPDS scores for mothers of singletons and mothers of multiples in the follow-up study.....	54
Figure 4.3 Boxplot comparison of SAS scores for mothers of singletons and mothers of multiples in the follow-up study.....	54
Figure 4.4 Boxplot comparison of RS scores for mothers of singletons and mothers of multiples in the follow-up study.....	55
Figure 4.5 Boxplot comparison of PSI Total Stress Scores for mothers of singletons and mothers of multiples in the follow-up study.....	55

Chapter One: Introduction

1.1 Introduction

The number of twin births in Canada has increased by 40 percent in the past 25 years, while the number of triplet births has skyrocketed by 300 percent in the same time period (1, 2). In the Calgary Health Region, the proportion of multiple births rose significantly from 2.1% in 1994 to 3.6% in 2001 (3); in Canada, the overall rate of multiple births increased from 2.1 per 100 total births in 1991 to 2.7 per 100 total births in 2000 (4). These increases are attributed to greater numbers of births to women over the age of 30, who are at a higher risk of multiple births, as well as to the use of assisted reproductive technologies (ART) such as ovulation induction and *in vitro* fertilization (4,5).

Multiple births are largely responsible for the rise in the preterm birth rate in Canada; in the year 2000, the rate of preterm births (less than 37 weeks gestation) in Canada was 50 per 100 live births among twins, and over 95 per 100 live births among triplets and higher order multiples (4). Other known risk factors for preterm birth include black race, single marital status, younger or older maternal age, a history of preterm deliveries, maternal smoking, extreme low or high weight gain during pregnancy, and low pre-pregnancy weight (4). Because multiple birth infants are more likely to be born preterm, they are at a higher risk for the health consequences of preterm birth, including cerebral palsy. Population-based studies conducted in Australia and Japan indicate that twins have a 3- to 7-fold higher incidence of cerebral palsy than singletons, and for triplets, the incidence is almost 10-fold higher compared to singletons (6, 7). In addition, international statistics indicate that 50 percent of twins, 90 percent of triplets, and nearly

all quadruplets have birth weights of less than 2500 grams (5). Factors that adversely influence growth during the intrauterine period may also continue during early childhood: developmental problems that have been associated with multiple births include speech and language difficulties, reading difficulties, and behavioural problems (8-10). Furthermore, stress associated with a multiple birth may be a risk factor for the development of depressive symptoms in the mother.

There is a paucity of information available in the literature regarding stress and well-being among mothers of multiples. This may be because the dramatic increase in multiple birth rates worldwide is a very recent development. Sample sizes of studies conducted prior to this increase may have been too small to detect significant relationships between stress, well-being, and the birth of multiples. Several more recent small studies have reported the intuitive expectation that mothers of multiples experience more stress than mothers of singletons. However, these studies are plagued by methodologic problems, including the use of only self-reported measures, lack of measurement of maternal employment status and/or the role of work-related stress, relatively small sample sizes drawn from very select or convenience samples, and no mention of pre-existing mood or anxiety disorders in the mothers (11-16).

1.2 Statement of the research problem

Although the concepts of well-being and resiliency are closely related, there have been no studies published that describe the relationship among stress, well-being, *and* resiliency in mothers of multiples. The purpose of this study was to examine parenting stress, well-being, and resiliency associated with bearing and parenting infants among mothers of multiples and mothers of singletons in urban Alberta. The present study

examined secular trends such as the impact of ART, workforce participation and employment after childbirth, and delayed childbearing.

Chapter Two: Literature Review

2.1 Overview

This chapter will cover the general literature available on the dependent variables of parenting stress and well-being, resiliency, and postpartum depression, as well as the independent variable of multiple births. A literature review focused on the research questions will then be presented.

2.2 Parenting stress and well-being

The concept of psychological stress, as first described by Selye, concerns a state of tension, agitation, and preoccupation reported by many people. Stress is considered to be a precipitating factor in the development of various physical and mental disorders; in particular, the role of stress in increasing vulnerability to depression is well documented. Stressful life events, including death, illness, or separation, as well as stressful life circumstances such as poverty, social isolation, unemployment, and marital discord, are all associated with the onset and maintenance of depression in the general population (17-19).

In the parenting literature, feeding and sleeping problems, excessive crying, and infections or illnesses in the child have all been shown to influence parents' perceptions of their child, and to increase perceived parenting stress levels (20). Demographic variables, including low social support, low education levels, younger maternal age, high domestic workload, and the presence of more children in the family have also all been associated with higher reported parenting stress (21, 22). Mothers of multiples may be particularly vulnerable to stress: the pregnancy, birth, and care of multiples presents a series of life events that are typically more challenging than those experienced by

mothers of singletons (23). Such stressors include: increased risk of obstetric problems such as preterm labour, fetal growth retardation, and pre-eclampsia, increased risk of congenital abnormalities, perinatal mortality, and admission of the infants to a special care nursery. During the first few months of life, there may be difficulties in coping with the sleeping, feeding, and crying patterns of two or more infants. In addition, feelings of guilt due to the mother's perceived inability to give equal attention to all of the multiples may also contribute to increased stress levels. These problems may be further exacerbated if there are older children who also require the mother's attention and care (8, 23).

There is an extensive body of literature that has addressed the concept of well-being. While most early theorists and philosophers have described well-being simply as the absence of illness, more recent theories focus on defining well-being as positive psychological functioning, a multidimensional construct made up of six dimensions (24). Ryff and Singer have described these dimensions in a recent review: 1) self acceptance; 2) positive interpersonal relationships; 3) autonomy, which includes such qualities as self-determination, independence, and the ability to regulate behaviour from within; 4) environmental mastery, or the ability to choose or create environments suitable to ones' psychic condition, as well as the active participation in and mastery of ones' environment; 5) belief that there is purpose and meaning to life and; 6) personal growth (24). The concepts of well-being and resiliency are closely related; Ryff and Singer posit that variations in well-being, in combination with specific mental health indicators leading to either high or low levels of resiliency.

2.3 Resiliency

Resiliency is a complex construct that has been defined by several different researchers in several different populations. The Oxford English Dictionary defines resiliency as the ability to resist or recover from adversity, a theme that is underlying in all definitions.

The majority of research regarding resiliency has been conducted in children and adolescents living in high-risk situations. Rutter describes resiliency in children as a buffering factor that protects them from psychotic disorders (25). Further, he describes resilient individuals as those possessing self-esteem, belief in one's own self-efficacy, a variety of problem solving skills, and satisfying interpersonal relationships. Wagnild and Young add to this definition by stating that resiliency is a positive personality characteristic that moderates the negative effects of stress and promotes adaptation (26). In addition, resilient individuals display adaptive behaviours, particularly as they relate to social functioning, morale, and physical health (26). Crago and her colleagues describe resilience as the ability to recover from, or cope successfully with, significant stress or adversity. Whether an individual demonstrates resilience or pathology in response to a stressful situation is dependent on the balance of individual and environmental risk and protective factors operating in his or her life at the time (27).

Most research suggests that resilience develops over time, and that early childhood experiences, such as close relationships, positive role models, and effective family functioning contribute to the development of resilience in an individual (26, 28, 29). In addition, the mechanism by which resilience facilitates adaptation has been

described as the ability to identify a stressor, realistically appraise one's capacity for action, and effectively problem solve (26, 28, 30).

McCubbin and McCubbin's Resiliency Model of Family Stress, Adjustment, and Adaptation is a framework intended to explain how a family responds to stress in a process of response, adjustment, and final adaptation over a period of time (31). This model is useful for understanding the ability of a family to recover from a life-changing event, and for identifying the strengths and limitations that may influence this process. When faced with a stressful situation, such as the birth of a child, McCubbin and McCubbin describe a resilient family as one that demonstrates positive patterns of behaviour as a family unit. Conversely, maladaptive responses to stress place the family at risk for negative outcomes such as depression, violence, substance abuse, and divorce (31).

Research specific to resiliency in women is scarce. Resiliency in women aged 85 and older is described by Felton and Hall as the ability to achieve, retain, or regain a level of physical or emotional health after devastating illness (32). Wagnild and Young have described resilient older women as being socially active and scoring mid to high on a measure of life satisfaction (33). In addition, in their article describing the development and psychometric testing of the Resiliency Scale (RS), Wagnild and Young describe an unpublished study of first-time mothers returning to work (26). The RS was administered to 130 women during pregnancy and at several intervals during the first postpartum year; although the findings of that study are not reported (26).

Ryff and Singer have described resilient women as those with a prior history of depression but who report high current well-being (24). Resilient women have lives that

include adversity, such as growing up with an alcoholic parent or experiencing early family death, but these women possess important protective factors, such as a high IQ, high grades in school, and good physical health. In addition, these women are more likely to have experienced more promotions in the workplace, have more positive interpersonal relationships, and participate more in social organizations (24).

2.4 Postpartum depression

There are few comprehensive comparisons of rates of anxiety and major depression between women with single and multiple births. However, there is a growing body of evidence to suggest that the risk factors associated with these disorders in women with singletons are exacerbated in women with multiples. For example, caesarean sections and prematurity, both of which are more common among women with multiples, are associated with independent heightened risks of psychological distress (34). The loss of an infant, either during pregnancy, at birth, or during the neonatal period, which is a risk factor for postpartum depression (PPD), is also more likely in multiple than in single pregnancies. Furthermore, there is increasing evidence that poor physical health after childbirth contributes to poor mental health, and mothers of multiples are at highest risk, as they are more likely to have experienced operative childbirth, which is associated with prolonged physical recovery (34).

PPD is characterized by the presence of cognitive and affective symptoms for at least two weeks; including low mood, decreased interest or pleasure in most activities, feelings of worthlessness and guilt, decreased concentration, irritability, anxiety, and social withdrawal (35). The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) also describes sleep and appetite disturbances as being characteristic of

major depression, but these symptoms are harder to elucidate from the “normal” sleep and appetite changes that accompany a pregnancy or postpartum period (35).

There is consistent evidence from multiple studies that the prevalence of PPD is between 12 and 16 percent, and rises to as high as 26 percent in adolescent mothers (36, 37). While the DSM-IV-TR applies the “postpartum onset” specifier when an episode of major depression begins within the first four postpartum weeks, most researchers refer to the postpartum period as extending from six months up to one year after delivery (38). A recent study by Stowe and colleagues suggests that inconsistent diagnostic criteria for PPD, particularly the onset of the disorder, may result in inadequate guidelines for screening and treatment of the disorder (39). Of the 209 women who fulfilled the inclusion criteria for their study, 24 reported onset of symptoms during pregnancy (21.8 ± 12.7 weeks gestation), 139 reported early postpartum onset (2.2 ± 1.7 weeks), and 46 reported late postpartum onset (13.3 ± 6.7 weeks) (39).

The most consistent predictors of PPD are a previous history of mood disorders, particularly in previous pregnancies or postpartum periods, as well as a family history of mood disorders (36, 40-42). In addition, psychosocial stress, poor social support, adverse life events, marital instability, younger maternal age, and infants with health problems or perceived difficult temperament are all contributors to the development and maintenance of PPD (36, 37, 40, 42, 43). The relationship between these predictors and multiple birth status has yet to be reported in the literature.

The effects of PPD on the developing infant or infants have also been reported in numerous studies (44-47). Untreated maternal depression that extends into the postpartum period has been shown to have a negative effect on the emotional, cognitive,

and developmental growth of young infants (46). Clinical data have demonstrated that maternal depression is adversely associated with infant temperament and mother-infant attachment (45, 47). In addition, these effects extend into middle childhood, where they are expressed as academic and behavioural problems in the child or children (44).

2.5 Findings of a literature review on multiple births, stress, well-being and resiliency

2.5.1 Literature search strategy

There is limited current information available regarding parenting stress and well being among mothers of multiples. For the present review, the primary source of relevant literature was scientific journal articles. The specific search strategy and Medical Subject Heading (MeSH) terms that were used in the Medline (1966 to present), EMBASE (1980 to present) and PsycINFO (1974 to present) electronic databases are outlined in Table 2.1.

Table 2.1 Search strategy and results

Number	Search History	Resulting Articles
1	exp stress, psychological/	48381
2	exp depression/	34022
3	1 or 2	80155
4	exp parenting/	3444
5	exp parents/	35709
6	exp mothers/	11462
7	4 or 5 or 6	38227
8	3 and 7	2398
9	exp multiple birth offspring/	15043
10	8 and 9 (final search)	26

In addition, the reference lists of relevant articles were searched for other relevant citations. Articles were excluded from the final review if they had a non-English abstract, addressed stress only as it relates to ART procedures, or if they only addressed stress

associated with the death of one or more of the multiple birth offspring. Although efforts were made to include as many articles as possible from a variety of scientific databases, there are two key limitations that must be noted. First, the search strategy did not involve pre-determined criteria to limit the possibility of bias in the critical appraisal of the articles, and therefore cannot be defined as a completely systematic review. Second, the content of the review was limited to three databases, and therefore articles that appeared in other databases, such as CINAHL, may have been overlooked in the search. After applying these exclusion criteria, nine articles were included in the final literature review.

2.5.2 Multiple births and maternal mental health

Only one study was found that is directly relevant to the current research question; that is because it addressed one of the primary associations of interest (multiple births and depression). This study was a retrospective cohort study conducted in Great Britain by Thorpe and colleagues and published in 1991 (23). The study sample was comprised of 139 mothers of twins and 12573 mothers of singletons from a birth cohort of the 1970 British Cohort Study. This cohort consisted of all children born in England, Scotland, and Wales between April 5th and 11th, 1970. Following the initial surveys at birth, the mothers were interviewed five years after childbirth to assess physical and educational development of the children at age five and, as a part of this interview, they were asked to complete the Rutter Malaise Inventory. The Rutter Malaise Inventory is a self-report questionnaire based on the 196-item Cornell Medical Index of Health that measures the presence or absence of symptoms associated with mood and psychosomatic disorders (48). A higher proportion of the mothers of twins had scores predictive of depression at five years postpartum compared with mothers of singletons, (34.4% vs.

23.9%, respectively). Logistic regression analysis confirmed an association that having and parenting multiples was significantly predictive of depressive symptoms (OR 1.6, 95% CI 1.1 – 2.3) after adjusting for maternal age, social class, number of children in the household, and disability in the study child or children. Further, mothers who had borne twins, one of whom had subsequently died, were three times more likely to experience depression than mothers of singletons (OR 3.0, 95% CI 1.1 - 8.1) after adjusting for maternal age, social class, number of children in the household, and disability in the study child or children.

The most critical limitation of this study is the date it was undertaken, having been based on data from over 30 years ago. No follow-up study has since been published. Thus the information collected at that time, particularly information regarding the roles of ART, work-related stress, and delayed childbearing, is likely to have little applicability to mothers of multiples and mothers of singletons today. First, the study by Thorpe et al. was conducted prior to the widespread availability of ART. It is probable that women who give birth to multiples with the help of ART have different characteristics than women who give birth to naturally conceived multiples. Second, a recent longitudinal study conducted by Statistics Canada reported that 86 percent of women who gave birth in either 1993 or 1994 returned to work within one year (49). While the women who had not returned to work after two years were in the majority at the time Thorpe conducted her study, they represented only seven percent of women who gave birth in Canada in 1993 and 1994. Third, approximately 23 percent of mothers participating in the Thorpe study were 30 years of age or older, whereas recent Canadian statistics indicate that approximately 42 percent of all live births in the year 2000 were to women over the age

of 30 (4). The present study addressed these limitations by including information on the use of ART, as well as by collecting information on the mothers' working status and work-related stress, and delayed childbearing, and by stratifying the analyses accordingly.

An additional limitation of the study by Thorpe and her colleagues is that there was no mention in the study of medications, psychotherapy, or other interventions for the treatment of depression and stress from the time the women and their infants were enrolled in the study to the time of the interview five years later. During this five-year period, some of the women may have had depression that was either treated or remitted spontaneously, and therefore would not have been documented during the interview five years after childbirth. Further, women who were identified by the authors to be depressed at the five-year mark may not have been the same women who were depressed after the birth of the infant or infants, and the study did not make any distinction between these two groups of women. Another limitation is that the study did not include information on a history of depression in any of the study participants, a known risk factor for the development of depression after childbirth (40). A final limitation of the Thorpe study is the use of the Malaise Inventory as the only measure of depressive symptoms in the participants. This questionnaire was administered to mothers five years after the birth of their child or children, and no baseline measurements were taken for comparison. Although the Malaise Inventory has been found to have moderate associations with psychosomatic symptoms and with reported medications taken for depression (50, 51), validity testing of the instrument has occurred only in studies of mothers with severely disabled children, and this limits the validity of the instrument for the study population.

2.5.3 Impact of method of conception on parenting stress

Two more recent but smaller studies addressing the issue of mental health and multiple births were also found. Unfortunately, the focus of both studies is primarily on stress associated with the method of conception, rather than stress associated with having or parenting multiples. The first study, published by Colpin and colleagues found that there was no significant effect of conception method on parenting stress for either mothers of multiples or mothers of singletons (11). This study, which was conducted in Belgium, recruited 103 families with twins from maternity hospitals in an earlier stage of the study (n=40), as well as from a governmental organization for mother and child care (n=68). The parent-child relationship was assessed using the short form of the Parenting Stress Index (PSI), which is a tool designed to assess the degree of stress associated with parenting (52). The parents' psychosocial well-being was also assessed using the General Health Questionnaire (GHQ), a tool developed to detect emotional problems such as anxiety and depression (53). Results of the study indicate that first-time mothers of multiples who underwent assisted reproduction and/or hormonal treatments had significantly higher stress and lower psychosocial well-being compared with mothers of multiples who had older children. One of the limitations of this study is that there was no information on the employment status of the women, and therefore it was not possible to determine the role of work-related stress in the overall stress and psychosocial well-being of the mothers. In addition, there was no indication of whether the stress or depressive symptom levels existed prior to the birth of the multiples.

The second study, conducted by Cook and colleagues, reported that parents of twins conceived by *in vitro* fertilization had significantly higher levels of stress than

parents of twins conceived naturally (12). The aim of this study was to examine parenting quality and parenting stress in families of twins conceived either naturally or by *in vitro* fertilization (IVF). Twelve families with IVF twins were recruited in infertility clinics in the United Kingdom. In addition, 14 families with naturally conceived twins were recruited through a local Twins and Multiple Births Association. The quality of parenting was assessed using a standardized interview, and parenting stress was assessed using the PSI. Parents of IVF twins reported significantly higher levels of stress than parents of naturally conceived twins. A limitation of this study is that comparisons were not made with families of singletons; conclusions therefore cannot be made regarding heightened stress associated with parenting multiples specifically. In addition, similar to other studies reviewed, there was no mention of employment status or work-related stress, and there was no indication of whether the parents had high stress levels prior to conception; therefore it cannot be concluded that the differences were due to the conception method. A further limitation to this study is that the small sample size and recruitment of women from a very select population (those who visit infertility clinics) limit the generalizability of the findings.

2.5.4 Multiple births and mental health outcomes

Follow-up of parents of multiples has occurred in only one series of studies to date. Garel and colleagues have reported the results of a prospective follow-up study of 12 mothers of triplets in a series of recent publications (14, 15). The sample represented all but two mothers who delivered triplets in a public hospital in Paris between October 1988 and February 1990. Eleven pregnancies were the result of ART, and one was spontaneous. One infant with a major malformation died a few days after birth; all other

infants were admitted to a special care nursery for an average of one month. At discharge, two infants had minor neurological anomalies. The parents were assessed using semi-structured interviews at the time of delivery, and then at four months, one year, two years, and four years postpartum. At one year postpartum, all mothers reported fatigue and stress, six experienced serious psychological difficulties such as anxiety or irritability, and three were being treated by a psychiatrist for their depression, and were taking antidepressant medications. At four years postpartum, all mothers reported emotional problems, particularly stress and fatigue, and four of these mothers had depression severe enough to require treatment, as measured by the Center for Epidemiological Studies Depression Scale (CES-D) (54). Individual or group scores for the CES-D were not reported. Although this study is an important contribution to the literature due to the lengthy follow-up period, there are several limitations. First, the level of depression was only assessed using a standardized instrument at four years postpartum; measures at one and two years postpartum were all based only on self-reported feelings, and did not involve assessment by a standardized tool. Further, there was no indication of whether the depression was pre-existing or a result of the pregnancy or postpartum period. Second, none of the infants in this study had any sequelae of prematurity, and all were in satisfactory health at hospital discharge. Since almost all triplets are born preterm (less than 37 weeks), and 90 percent of triplets have a birthweight of less than 2500 grams, the results of this study are generalizable to only a very select group of women who complete their twin or triplet pregnancies without any complications of preterm birth or low birth weight. Finally, the small sample size,

recruitment of women from only one specific maternity hospital, and lack of a comparison group also decrease the generalizability of the findings.

A recent study by Ellison and Hall addressed quality of life (QoL) issues associated with multiple births (13). This study used focus groups and qualitative research methods to identify the QoL domains that were most relevant to mothers of multiples. The focus groups involved 29 mothers of triplets and 13 mothers of singletons; some of the participants were identified randomly from a birth registry, while others were identified from a convenience sample of peer-support groups. Eight core QoL domains were identified as being most impacted by the birth of multiples: social stigma, pregnancy or neonatal loss, marital satisfaction, health of the children, meeting family needs, parenting stress, maternal depression, and the infertility treatment experience. The most significant stressor reported by the mothers of multiples was managing the daily routines of family life. In addition, families with older children reported stress in struggling to meet the needs of these children. With regards to depression, a number of participants who experienced postpartum depression felt that their condition had been intensified by their birth of multiples. Although the results of this study are an important addition to the literature, a critical limitation is the small, non-representative sample. Furthermore, the sample only involved mothers of triplets; therefore the results may not be generalizable to mothers of twins. This study does, however, provide information on important domains of measurement related to stress, well-being, and resiliency in the study population.

In a follow-up to their focus group study, Ellison and her colleagues recently conducted a survey of mothers whose children had been conceived as the result of ART

(55). The mailed, self-administered survey was designed from the findings of their previous focus group research, identifying the core QoL domains of ART singleton and multiple birth mothers, and was administered to a random sample of 249 women identified from infertility and obstetric clinics in Massachusetts. The survey included mothers of 128 singletons, 111 sets of twins, and ten sets of triplets, and all children were between 12 and 48 months of age. Response rates were higher among multiple birth mothers (77%) than singleton mothers (52%). The results of this study suggest that ART multiple births result in increased psychosocial risks, and these risks increase by multiplicity (55). Using multivariate logistic regression models, for each additional multiple birth child, the odds of having difficulty meeting basic material needs such as food, clothing/shoes, equipment, supplies, transportation, housing, childcare, education, and healthcare needs, more than tripled (OR 4.71, 95% CI 2.23 - 10.09), while the odds of a lower QoL (OR 2.45, 95% CI 1.16 – 5.15) and increased social stigma (OR 2.08, 95% CI 1.11 – 3.91) doubled. In addition, each increase in multiplicity was associated with an increased risk of maternal depression (OR 1.71, 95% CI 1.00 – 2.92), as measured by the CES-D. Multiple birth children were also reported to have greater health and developmental problems than singletons (17% singletons, 22% twins, 30% triplets); however, possibly due to the use of a binary maternal self-report measure of the children's health, this result was not statistically significant.

The results of this follow-up study are an important addition to the literature, adding support to the findings that the experience of raising more than one child at the same developmental stage puts a mother at risk of psychiatric outcomes. However, there are several limitations to this study that must be addressed. The first limitation is the 64

percent response rate, which may have resulted in bias if mothers with negative experiences were more likely to respond than those with positive experiences. In addition, there was no information included on whether any of the women had a previous history of depression, which would make them more vulnerable to depression after the birth of their child or children, independent of multiplicity. In addition, there was no data included on the employment status of the mothers in the study, and therefore the impact of any work-related stress on the overall stress score cannot be determined.

2.5.5 Employment status as a predictor of parenting stress in mothers of multiples

Only two studies to date have included information on the employment status of mothers of multiples. The first study was conducted in Southwestern Nigeria, an area where almost all women are employed and are responsible for a major proportion of the resources needed to raise their children (16). A random sample of 101 mothers of multiples was drawn from a birth register maintained by the local university. These mothers were randomly selected from a list of all twin births recorded between 1994 and 1998. Each mother was age-matched with a mother of a singleton from the same community. A questionnaire was developed based on in-depth interviews with ten of the mothers of twins; the final instrument included questions on demographic variables, beliefs about twins, rating of common stress factors, coping mechanisms, and perceived levels of social support. More of the mothers of twins reported having problems caring for their children than mothers of singletons (OR 2.15, 95% CI 1.15 – 4.01). In addition, the mothers of twins had higher overall scores on the stress factor scale than mothers of singletons. Results of the multi-variate analysis indicated that a lack of social support, high parity, perceiving a problem caring for the child, and being a mother of twins were

all associated with heightened stress levels. Although this study contributes to the literature by including information on the employment status of mothers of multiples, there are several limitations. First, although the mothers of twins were age-matched to mothers of singletons, there was no mention of whether their children were also age-matched. All children were between the ages of two and six years at the time of the interviews, but it is likely that the stressors experienced by a mother of two-year-old twins are very different from those experienced by a mother of a six-year-old singleton. Second, the mean age of the mothers of twins was statistically significantly older than that of the mothers of singletons (32.8 years vs. 29.4 years, $t = 3.418$, $p < .008$), and the mean parity was higher for mothers of twins than for mothers of singletons (3.4 vs. 2.6, $t = 4.310$, $p < .00003$), both of which could be potential confounding factors. Finally, although the authors indicated that all but one mother in each study group was employed outside the home, there was no data provided on the number of hours worked by each woman, or the length of time for return to employment after childbirth, and therefore comparisons could not be made on the role of work-related stress relative to stress associated with parenting of singletons or twins.

The second study, published by Glazebrook and colleagues in 2004, was a prospective cohort study examining psychosocial and obstetric outcomes at one year postpartum in first-time mothers who conceived after IVF (56). The investigators recruited 129 mothers with a naturally conceived singleton birth, 95 mothers with an IVF singleton birth, and 36 mothers with an IVF multiple birth from a university medical centre in the United Kingdom. These women were followed up at 6 weeks and 12 months postpartum using the General Health Questionnaire and the PSI. The response rates at the

one-year follow up were 77.9% for the naturally conceived singleton group, 77.7% for the IVF singleton group, and 61.0% for the IVF multiple group. Twenty-two percent of the women with an IVF multiple birth, 5.3% of women with an IVF singleton birth, and 9.4% of women with a naturally conceived singleton birth had Total Stress Scores on the PSI at or above the 85th percentile, which is indicative of clinically significant parenting stress levels. With regards to employment status, mothers in the IVF multiple group were the least likely to work outside the home at the time of follow-up; only 44% reported returning to work, while 73% of mothers in the IVF singleton group and 74% of mothers in the naturally conceived singleton group had returned to work at 12 months postpartum.

The main limitation of this study is the use of a convenience sample of women: all women in the IVF groups were recruited from the same treatment and research unit at a single university medical centre, while all women in the non-IVF group were recruited through antenatal bookings at the same medical centre. It is likely that, because of the special characteristics of the women who participated, the findings are not generalizable to all women who give birth to multiples.

Table 2.2 summarizes the key findings from the nine articles that were included in the literature review.

Table 2.2 Summary of a literature review on multiple births, stress, well-being, and resiliency

Author, Publication Date Study Date, Location	Study Design	Population and Sample	Main Outcome Measures	Results
Thorpe, 1991 (23) Great Britain, 1970-1975	Retrospective cohort study	<p>Birth cohort of 13135 children born between April 4th-11th, 1970</p> <p>Information was collected on 139 mothers of twins and 12573 mothers of singletons when the children were five years of age (1975)</p>	Rutter Malaise Inventory	<p>Mothers of twins more likely to be depressed than mothers of singletons (34.4% vs 23.9%)</p> <p>Mothers of twins where 1 had died had the highest proportion of malaise scores indicative of depression (52.9%)</p> <p>Younger maternal age, lack of partner support, higher number of children in the household, and disability in the study child were all independent predictors of high malaise scores</p>
Colpin, 1999 (11) Belgium, 1997	Case-control study	103 families with twins conceived naturally, after hormonal	Parenting Stress Index and the General Health Questionnaire (GHQ-30)	No significant effects of the conception method on the PSI or GHQ

Author, Publication Date Study Date, Location	Study Design	Population and Sample	Main Outcome Measures	Results
		treatment, or IVF; recruited from 3 maternity hospitals, and from the Child & Families Department of the government		scores; therefore the influence of method of conception is not more significant in families with twins versus families with singletons
Cook et al., 1998 (12) UK, 1998	Case-control study	Twelve families with twins conceived by IVF were recruited from infertility clinics; 14 families with twins conceived naturally were recruited from the Twins & Multiple Births Association.	Parenting Stress Index, Short-Form	Parents of IVF twins reported significantly higher levels of stress than parents of naturally conceived twins.
Garel, 1992 (14) Garel, 1997 (15) Paris, 1998-1990	Prospective follow-up study	Eleven consecutive mothers who delivered triplets between October 1988 & February 1990; were assessed at delivery, 4 months postpartum and 1, 2 & 4 years postpartum	CES-D	At one year postpartum, all mothers reported fatigue and stress; six mothers experienced serious psychological difficulties and three others were treated for depression At two years postpartum, four mothers still suffered

Author, Publication Date Study Date, Location	Study Design	Population and Sample	Main Outcome Measures	Results
				with anxiety & depression At four years postpartum, all mothers reported emotional problems; four had a high level of depression and were using psychotropic medications
Ellison, 2003 (13) Boston, 2003	Focus groups, qualitative research	29 mothers of multiples and 13 mothers of singletons identified from random and convenience samples	Maternal self-reports	Quality of life domains that were most impacted by raising multiples were social stigma, pregnancy loss, marital satisfaction, children's health, family needs, parenting stress, maternal depression, and the infertility experience
Ellison, 2005 (55) Boston, 2005	Mail survey	Stratified random sample of 249 mothers of singletons and multiples identified from infertility clinics	CES-D	ART multiple births were associated with an increased risk of maternal depression, and the risk increased by multiplicity

Author, Publication Date Study Date, Location	Study Design	Population and Sample	Main Outcome Measures	Results
Salami, 2003 (16) Nigeria, 1994-1998	Nested case-control study	Random sample of 100 mothers drawn from a birth registry of all twin births occurring at a university health program between 1994 and 1998	15-point stress factor scale developed specifically for the study	Mothers of twins reported more problems coping with their children, and had higher overall stress than mothers of singletons
Glazebrook, 2004 (56) UK, 2003	Prospective cohort study	129 mothers of naturally conceived singletons, 95 mothers with an IVF conceived singletons, and 36 mothers with an IVF conceived multiple were recruited at 18 weeks of pregnancy and followed-up at six weeks and 12 months postpartum	General Health Questionnaire (GHQ-12), Parenting Stress Index	22% of mothers of multiples, 5% of mothers of IVF singletons, and 9% of mothers of naturally conceived singletons had PSI scores indicating severe parenting stress Mothers of multiples were less likely to return to employment than mothers of singletons

2.6 Limitations of the extant literature

There are several key limitations in the existing literature that, taken together, limit our understanding of the relationship between multiple births and parenting stress. First, a major shortcoming is the use of a variety of different questionnaires and interviews to assess parenting stress and depression, making comparability of results across studies difficult. Indeed, the PSI is the only standardized instrument that has been used in more than one study (11, 12, 56). Second, several of the studies were based on convenience samples of participants from hospitals or clinics (11-14, 56), which may not be a good representation of all women who give birth to multiples, thereby limiting generalizability. Further, several of the studies were plagued by small sample sizes, which may have resulted in insufficient power to find real differences if they exist (12-14). Finally, variables that are relevant to modern obstetrics and the parenting situation such as ART and work life for women have had little examination to date. Given the paucity of published research on the subject, as well as the existing limitations, it is difficult, if not impossible, to ascertain the applicability of current knowledge to mothers who have recently given birth to multiples or singletons in the Canadian context, and even more difficult to envision effective interventions to prevent or reduce their levels of parenting stress.

The present study was designed to improve on the shortcomings identified in the existing literature. First, the use of well-validated instruments that have been used in other studies was intended to enhance comparability of results. Second, the use of a population-based sample rather than a sample drawn from a hospital or fertility clinic was intended to increase the generalizability (external validity) of the results of the present

study. Third, the present study involved the collection of information on the use of ART, workforce participation and return to work after childbirth, and the impact of delayed childbearing on maternal mental health. The present study also involved the collection of information on the mothers' history of depression and anxiety, in order to determine whether any symptoms reported after the birth of the children were associated with the birth or are pre-existing symptoms. Further, the design of the present study included follow-up measures, as some preliminary information on emotional health, stress, and employment was collected in the original population-based survey (described below). Finally, the collection of information on key outcomes such as emotional health during pregnancy and again at the time of follow-up in the present study was intended to reduce the influence of recall bias as well as to assess its role.

Chapter Three: Methods

3.1 Objectives

3.1.1 Primary objective

To describe parenting stress, well-being, and resiliency in a population-based sample of mothers of multiples as compared to mothers of singletons.

3.1.2 Secondary objectives

1. To examine associations between ART use, workforce participation, return to employment after childbirth, work-related stress, delayed childbearing, and maternal mental health in mothers of multiples compared with mothers of singletons.
2. To compare levels of parenting stress, well-being, and resiliency reported in the present study to those reported in a large cohort study conducted in the UK in 1970.

3.2 Study design

The present study was a nested follow-up study, with initial data derived from a large population-based cohort study (the Delayed Childbearing (DC) study) of 1044 first-time mothers who gave birth between July 2002 and September 2003 in two large urban health authorities in Alberta, Canada (57). A nested study design is one in which study participants are drawn from a population already under investigation in a larger cohort (58). One of the main benefits of such a design is that some data are available about the study participants at the start of the study, thereby reducing the potential for recall bias, and minimizing the effects of some potential confounding variables (58). For the present study, the independent variable (multiple birth status) was identified at the outset of the

study; participants were grouped according to “exposure” (multiple or singleton birth), and then all participants were followed in order to assess outcomes (parenting stress, well-being, resiliency).

Forty-two of the women from the DC study gave birth to multiples. Women who delivered multiples and a comparison random sample of 78 mothers of singletons were invited to participate in the present study. Data on baseline variables such as age, marital status, education, income, employment status, ethnicity, ART use, health region, and infant outcomes were obtained for these women from the DC study. Next, a focus group involving eight mothers of multiples was held to assess if all relevant areas of interest had been covered by the draft interview questionnaire. The draft questionnaire was then pre-tested in a different sample of three mothers of multiples and one mother of a singleton. The final version of the questionnaire, which included topics such as parenting stress, well-being, resiliency, and the impact of secular trends such as ART use, workforce participation, and return to employment after childbirth was administered in telephone interviews to 20 mothers of multiples and 38 mothers of singletons that consented to participate in the present study. Figure 3.1 displays the steps involved in this nested follow-up study.

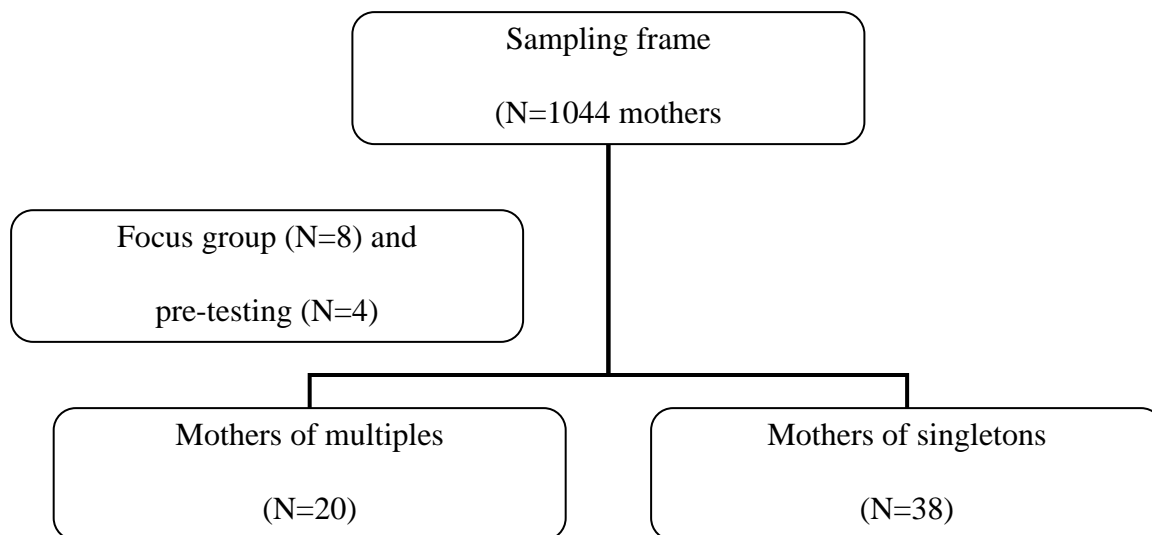


Figure 3.1 Study design.

3.3 Delayed Childbearing study

The purpose of the Delayed Childbearing (DC) study was to determine the social, environmental, and individual factors related to the decision to delay childbearing, and to assess whether women were aware of the potential consequences of such decisions (57). A computer-assisted telephone survey was conducted, and in addition to information collected from the labour and delivery records and the Physician Notice of Live Birth (PNOB), data were collected on over 600 variables using a questionnaire designed specifically for the study. The questionnaire focused on three key areas: background variables (demographic characteristics, medical and reproductive history, family planning history), attitudes and knowledge towards maternal risks of delayed childbearing, and knowledge of the risks associated with poor infant outcomes (57). The population consisted of women giving birth in the Calgary Health and Capital Health regions over a 14-month period between July 2002 and September 2003. The sample from this population consisted of 1450 women who were randomly selected from hospital records of all women delivering a first child within the time period of interest.

In total, 1044 women (N=42 mothers of multiples, N=1002 mothers of singletons) completed the survey, resulting in a response rate of 72 percent. Over 12 percent of women (N=127) had conceived after receiving some form of ART (6.8% fertility medications, 5.4% IVF/ICSI). The risk of multiple births increased with increasing level of reproductive assistance, from none to drugs to IVF/ICSI (1.5%, 4.2%, 44.6%, $p<.001$). There were no statistically significant differences in birth weight or gestational age among multiples conceived spontaneously or by ART. The complete results of the study by Tough and colleagues were published in 2006 (57).

3.4 Procedures

3.4.1 Focus group protocol

The purpose of the focus group was to determine if all major areas of inquiry related to the study objectives had been addressed by the draft questionnaire. An email was sent to potential participants through the Twins, Triplets and More Association of Calgary (TTMAC) describing the study and providing contact information. Interested participants received a letter describing the study and the purpose of the focus group, as well as an informed consent form. The focus group involved eight mothers of twins, and signed consent was obtained from each participant at the beginning of the session. The focus group lasted one hour, and was audio taped and transcribed verbatim. The session followed a schedule of topics derived from the literature, including: social support, stress, marital impact, and the impact on the woman's sense of self. Spontaneous comments of the women on the issues of parenting multiples were documented, but the pre-test was not designed to systematically solicit qualitative information. The transcripts from the focus group are included in Appendix A.

3.4.2 Pre-testing protocol

The purpose of the pre-testing phase was to assess the readability, flow, ease of understanding, acceptability, and time for completion of the draft questionnaire. A draft version of the questionnaire was pre-tested in person with four volunteers (one mother of a singleton and three mothers of twins). Participants were recruited via the same email sent to TTMAC members. Interested participants received a letter describing the purpose of the pre-test, as well as an informed consent form. Signed consent was received from each participant prior to the pre-testing. As a result of the focus group and pre-testing phases, several minor changes were made to the draft questionnaire. The majority of these changes involved the wording of the transition phrases, as well as clarification of some of the response categories and time frames.

3.4.3 Recruitment for the study sample

The final study sample consisted of women who participated in the DC study and who agreed to be contacted for future research. Forty-one out of the 42 mothers of multiples in the original study had given prior agreement to be contacted for further research studies. In addition, a comparison sample of 78 mothers of singletons who also agreed to be re-contacted was drawn randomly from the 1002 mothers of singletons who participated in the DC study. All selected participants were sent a letter by the DC study coordinator outlining the details of the present study, and advising them that they would be contacted by mail by the coordinator of the present study. All women were given the option to decline participation by contacting either the DC study coordinator or the investigator of the present study. A package that included the letter describing the purpose of the present study, consent form, and self-addressed stamped envelope was

sent to those who did not decline participation. Women who returned the consent form were then contacted by telephone to set up their preferred time for the telephone interview. Figure 3.2 outlines the timelines and number of participants at each stage of the study.

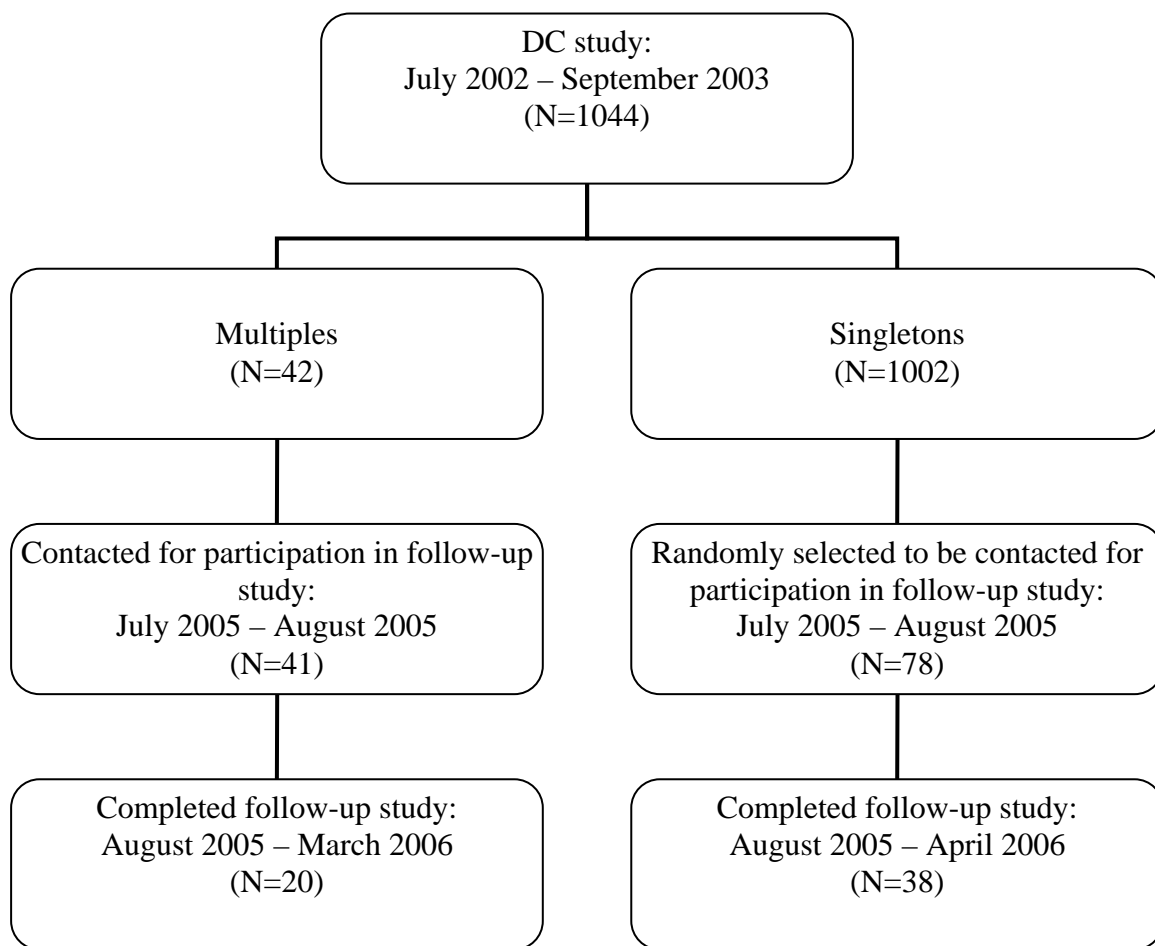


Figure 3.2 Overview of study timelines and participation.

The protocol for the entire study, including the focus group and pre-testing phases, was reviewed and approved by the Conjoint Health Research Ethics Board (CHREB) at the University of Calgary.

3.5 Variables and measures

Demographic data including maternal age, marital status, history of depression, employment status, and residence was collected at the time of the telephone interview. In an effort to make the results of this study comparable with those of previously published studies, various standardized questionnaires were used as part of the telephone interview. First, the short form of the Parenting Stress Index (PSI), which is the most widely used and best-known measure in the parenting literature, was used to measure maternal parenting stress. Depressive symptoms were measured using the Edinburgh Postnatal Depression Scale (EPDS), the most widely-used measure of depression in the postnatal population. Anxiety symptoms were measured using the Zung Anxiety Scale. In addition, the Rutter Malaise Inventory was used as a measure of well-being in an effort to make the results of this study comparable to the British study by Thorpe (23). The Resilience Scale (RS) was used to identify the degree of resilience in relation to stress and well-being. The psychometric properties of each instrument are described below, and a copy of the complete telephone interview is included in Appendix B.

3.5.1 Parenting Stress Index, Short-Form (PSI-SF)

The PSI was developed as a measure of child characteristics, parenting characteristics, and parent-child relationship dimensions associated with the presence of parenting stress and troubled relationships (52). The full-length questionnaire consists of 101 items scored using a five-point Likert scale, as well as an optional 19-item Stressful Life Events Scale with yes/no responses. The short-form of the instrument is a direct derivative of the full-length instrument, and is scored using the same five-point Likert scale. While it takes between 20 and 30 minutes to complete the full questionnaire, the

PSI-SF can be completed in approximately ten minutes. The PSI-SF consists of three subscales and a Total Stress Score (TSS). The three subscales are parental distress, parent-child dysfunctional interaction, and difficult child. The TSS is a summary of the three subscale scores, and provides an overall indication of the level of parenting stress. The PSI manual reports a normative mean TSS of 71.0 ± 15.4 , with a range of 59.0 to 82.0. Further, according to the manual, parents with a score above the 85th percentile, which is equivalent to a score above 86, are experiencing clinically significant levels of parenting stress. The PSI manual presents over 250 abstracts supporting the validity of the full-length instrument, which has been reported to be highly correlated with the PSI-SF (52).

3.5.2 Edinburgh Postnatal Depression Scale (EPDS)

The EPDS is a ten-item self-report questionnaire developed by Cox and colleagues in 1987, and is used specifically for the detection of depression in the postpartum period (59). This scale was developed in response to the observation that standard rating scales have been found to be sub-optimal in detecting depressive symptoms in new mothers. For example, normal postnatal symptoms, such as changes in sleep patterns and appetite, as well as a loss of energy could be easily misconstrued as depressive symptoms; for this reason, scales such as the Beck Depression Inventory have been found to have poor validity when applied to postnatal women. For each question on the EPDS, mothers are instructed to choose one of four possible replies that is closest to how they have been feeling over the past seven days. Responses are scored zero, one, two, or three, giving a maximum score of 30. A minimum score of 12 or 13 has been found to identify most women with a diagnosis of postpartum depression. A recent

review of 18 validation studies of the EPDS reported high sensitivity values, ranging from 0.65 to 1.0 (95% CI 0.35-1.0), as well as high specificity values, ranging from 0.49 to 1.0 (95% CI 0.37-1.0) (60). Assuming a 13 percent prevalence rate for postpartum depression, positive predictive values were found to range between 22 and 79 percent. The authors suggest that variations in selection of study populations, diagnostic criteria, and EPDS cut-off values among the 18 studies all contribute to the large ranges of values and corresponding confidence intervals (60).

3.5.3 Zung Self-Rating Anxiety Scale (SAS)

The Zung Self-Rating Anxiety Scale (SAS) is a widely-used measure that is sensitive to the frequency of anxiety symptoms (61). Participants rate the five affective and 15 somatic symptoms on a four-point Likert scale ranging from zero (none) to four (all the time) for their severity during the past week. The ratings are summed for a total raw score, which is then converted to an Anxiety Index score. Higher scores are representative of higher levels of anxiety. The SAS has been translated into five languages, and has been used in variety of patients, including adolescents, geriatric patients, and patients with impaired cognitive functioning (33, 62). In addition, the SAS has been reported to discriminate significantly between patients diagnosed with anxiety disorders and those diagnosed with other mood disorders (61).

3.5.4 Rutter Malaise Inventory (RMI)

The Rutter Malaise Inventory (RMI) was frequently used in early literature on parenting, particularly to assess the level of well-being experienced by mothers of severely disabled children (48). However, while most early research described well-being simply as the absence of physical illness, the more recent theories focusing on well-being

as a multi-dimensional state of positive psychological functioning bring the applicability of this instrument into question for the population under investigation. The RMI was selected for use in the present study in an effort to make comparisons with the British study conducted by Thorpe and colleagues (23). The questionnaire contains 24 questions, each requiring a yes or no response, about physical and emotional states that have an important psychological component, including headaches, upset stomach, and sleeping difficulties. The total number of questions answered affirmatively is taken as the Malaise Score. In a validation study of the RMI, the mean score for 210 mothers of severely disabled children was 6.9 (SD=4.5) (50); Rutter has reported that scores in excess of five are outside the normal range (48). Scores for the Malaise Inventory have also been found to have moderate associations with psychosomatic symptoms and with reported medications taken for depression (50, 51).

3.5.5 Resilience Scale (RS)

The Resilience Scale (RS) is an instrument used to measure the degree of individual resilience (26). The scale consists of 25 items scored on a seven-point Likert scale ranging from one (disagree) to seven (agree). Possible overall resilience scores range from 25 to 175, with higher scores reflecting higher resiliency. Scores from 147 to 175 are considered high, scores from 121 to 146 are in the mid-range, and scores lower than 121 are considered to reflect less resilient individuals. Internal consistency of the RS has been reported ranging from 0.76 to 0.91, and a reliability coefficient of 0.75 has also been reported (26). The RS has been used in studies of adults, particularly women, geriatric patients, and adolescents, all of which have supported the construct and concurrent validity of the scale (33, 62, 63).

3.6 Analysis

3.6.1 Study variables

The variables collected during the interview were based on the hypotheses of the study as well as on the literature, and are included, along with their operational definitions, in Table 3.1. The independent variable was single or multiple birth status. The dependent variables were parenting stress, symptoms of depression, anxiety, and well-being. Potential confounders and covariates included maternal age, marital status, socioeconomic status, low maternal education, hours per week worked outside the home, child care arrangements, and infant outcomes.

Table 3.1 Study variables and operational definitions

Variable	Type	Operational Definition	Source
Independent/Predictor Variable:			
Birth Status	Categorical	Number of infants born (1 or 2)	DC study
Intervening/Confounding or General Descriptive Variables:			
History of depression	Categorical	Response to “Have you ever been diagnosed with depression?” (Y/N)	Follow-up study
ART use	Categorical	Type of ART used (none/fertility drugs/AI/IVF/ICSI)	DC study
Maternal age	Both	Age in years; Age group (>35 years/ <35 years)	DC study
Other children	Continuous	Number of children in the household	Both
Employment	Both	Working for pay (Y/N); number of jobs; hours worked (per week)	Both
Return to employment	Continuous	Length of time to return to work after childbirth (weeks)	Follow-up study
Baby’s date of birth	Both	Date of birth (YYYY/MM/DD)	DC study
Gestational age	Continuous	Gestational age (weeks)	DC study
Maternal education	Categorical	Type of education (High school/ College/ University/ Post graduate)	Both
Household income	Categorical	Gross income before taxes (categorized per 2003 tax return)	DC study

Variable	Type	Operational Definition	Source
Ethnic status	Categorical	Census Canada categories	DC study
Marital status	Categorical	Married or living with partner/ divorced/ separated/ single/ widowed	Both
Support after pregnancy	Both	Number of people providing support	Follow-up study
Outcome variables:			
Parenting stress	Both	PSI-SF total score based on ratings of 36 items on a 5-point response scale. The total stress score is a summary of 3 subscale scores, and provides an overall indication of the level of parenting stress, with higher scores indicating higher stress.	Follow-up study
Mental health	Continuous	Depressive symptoms measured by the EPDS, a 10-item self-rating scale used specifically in the postnatal period. Responses are scored from 0-3, giving a maximum score of 30, with higher scores indicating more depressive symptoms. Anxiety measured by the Zung SAS, a widely-used scale for assessing symptom severity in patients with anxiety. The scale consists of 20 items and is scored using a four-point Likert scale, ranging from 1 (none or a little of the time) to 4 (most or all of the time), with higher scores indicating higher anxiety.	Follow-up study
Well-being	Continuous	Rutter Malaise Inventory – total score based on ratings of 24 yes/no questions addressing physical and emotional states with a psychological component (headaches, upset stomach, sleeping difficulties). Higher scores reflect greater malaise.	Follow-up study

Variable	Type	Operational Definition	Source
Resiliency	Continuous	Resiliency Scale – consists of 25 items scored on a 7-point Likert scale ranging from 1 (disagree) to 7 (agree). Possible overall resilience scores range from 25 to 175, with higher scores reflecting higher resiliency.	Follow-up study

3.6.2 Sample size calculations

The sample size calculation was based on the Total Stress Score (TSS) of the PSI-SF. According to the PSI manual, the normative mean of the TSS is 71.0 (SD 15.4) (52). Parents with a TSS above the 85th percentile, which is equal to a mean score of 86.0, are experiencing clinically significant levels of stress. Using Stata version 8 statistical software (StataCorp), the power was estimated for a two-sample comparison of means (64). If the mean TSS score for the 42 mothers of multiples was 86.0 and the mean TSS score for the comparison group of 78 mothers of singletons was 71.0, a 2:1 comparison of the two samples was calculated to provide an estimated power of 96.9 percent.

3.6.3 Data management

Relevant data were extracted from the original DC study database by the DC study coordinator, all participants were assigned a new study identifier (ID) for the present study, and their records were entered into an electronic database using Stata version 8 statistical software. Primary data were coded and entered into the same database according to the new study ID. After entry, a ten percent random sample of records was checked for error rates against the hard copy interview forms. Re-sampling and correction were repeated two times until error rates were found to be below one

percent. The data were then coded, cleaned, checked, and converted into a format ready for statistical analysis. New variables were created by converting some of the continuous data into categorical data, in order to allow for stratified analyses. In addition, some of the categorical variables were combined to make fewer categories in order to increase cell sizes.

3.6.4 Data analysis

Because associations between multiple births and parenting stress, depression, anxiety and well-being are at a fairly early stage of exploration, an exploratory staged approach to the data analysis was used, beginning with the examination of univariate summary statistics and bivariate relationships. Stata version 8 statistical software (StataCorp) was used for all analyses.

3.6.4.1 Univariate analyses

In order to describe the characteristics of the study sample, univariate summary statistics were produced for all continuous and categorical variables, including distribution boxplots, means, median, and variance statistics for continuous variables, and distribution bar charts, frequencies, and percents for categorical variables. The number, minimum, maximum, mean and standard deviation are presented for continuous variables while the frequency and percent are presented for categorical variables.

3.6.4.2 Bivariate analyses

Student's t-tests were used for comparisons involving differences in means across groups. For comparisons of categorical variables across groups, either Pearson's chi-square test or Fisher's exact test when expected cell counts were five or less was used. All tests were two-tailed, with p-values of less than .05 considered statistically significant. All confidence intervals presented are exact 95% confidence intervals calculated by Stata, and were considered significant if they did not include the value of one.

3.6.4.3 Classical stratified analysis

A series of classical stratified analyses using crude and Mantel-Haenszel adjusted odds ratios and 95% confidence intervals was then used to assess whether any of the other variables were modifying or confounding the relationship between a history of depression and multiple births.

Chapter Four: Results

4.1 Demographic and clinical characteristics of the overall sample

Table 4.1 displays the demographic and clinical characteristics of the 119 women that were drawn from the Delayed Childbearing (DC) study and were eligible for the present study.

Table 4.1 Demographic and clinical characteristics of the eligible sample

Characteristics	N	%
Maternal Age at Delivery (mean \pm SD years) (N=118)	33.06 \pm 4.98	
Maternal Education :		
High school	21	17.6
College	30	25.2
University	52	43.7
Post graduate	16	13.5
Income Quintile ^a :		
Top	42	36.5
Fourth	30	26.1
Middle	18	15.7
Second	16	13.9
Lowest	9	7.8
Ethnicity :		
Caucasian	98	82.4
Not Caucasian	21	17.6
Health Region :		
Calgary	60	50.4
Capital	59	49.6
Employed Before/During Pregnancy:		
Yes	107	89.9
No	12	10.1
Hours Worked per Week Before/During Pregnancy (mean \pm SD hours) (N=107)	40.54 \pm 8.39	
Marital Status Before/During Pregnancy:		
Married/Common Law	116	97.5
Single	3	2.5
Children Living in Household at Time of Pregnancy:		
Zero	109	93.1
One	6	5.1
Two	1	0.9
Three	1	0.9

Characteristics	N	%
Method of Conception:		
Spontaneous	84	70.6
Fertility Medications Only	9	7.6
IVF/ICSI	26	21.8
Birth Status^b:		
Singleton	78	65.6
Multiples	41	34.4
Responded to Follow-up Study^c:		
Yes	58	48.7
No	61	51.3

^a Income quintiles are based on total family income, before tax and deductions, for the tax year 2002.

^b Forty-one out of 42 mothers of multiples who participated in the original Delayed Childbearing (DC) study and who agreed to be re-contacted for further studies. A comparison sample of 78 mothers of singletons from the DC study who also agreed to be re-contacted was randomly drawn from the original sample.

^c This is the sum of the mothers of multiples (N=20) and the mothers of singletons (N=38) who agreed to be re-contacted for the follow-up study and who actually completed the follow-up interview.

The mothers in the overall sample ranged in age from 18.48 years to 45.52 years at the time of delivery, with the mean age of 33.06 years. Seventy eight (65.6%) of the women in the overall sample gave birth to a single infant, whereas 41 (34.4%) gave birth to twins. The majority of women in the overall sample were highly educated (57.2% with a university education or higher), and had high total household incomes (62.6% were in the top two income quintiles). Eighteen percent of the women in the overall sample were not Caucasian, a value which is slightly higher than the 16.1% of visible minorities in urban Alberta as reported in the 2001 Canadian Census. Approximately 90% of the women in the overall sample were employed before and during their pregnancy.

4.2 Characteristics of women who responded to the follow-up study

As shown in Table 4.1, 58 of the 119 women who were contacted for participation in the follow-up study actually completed the study. Twenty of these women were

mothers of multiples, while 38 were mothers of singletons. Table 4.2 displays the demographic and clinical characteristics of the respondents and non-respondents.

Table 4.2 Demographic and clinical characteristics of respondents versus non-respondents to the follow-up study (N=119)

Characteristics	Respondents (N=58)	Non- Respondents (N=61)	P
Birth Status:			
Singletons	38 (65.5%)	40 (65.6%)	ns
Multiples	20 (34.5%)	21 (34.4%)	
Maternal Age at Delivery (mean + SD years)	34.20 ± 4.19	31.96 ± 5.46 (N=60)	<.05
Maternal Education:			
High School	8 (13.8%)	13 (21.3%)	ns
College	17 (29.3%)	13 (21.3%)	
University	23 (39.7%)	29 (47.6%)	
Post graduate	10 (17.2%)	6 (9.8%)	
Income Quintile:			
Top	28 (49.1%) ^a	14 (24.1%) ^b	<.05
Fourth	15 (26.3%)	15 (25.9%)	
Middle	6 (10.6%)	12 (20.7%)	
Second	4 (7.0%)	12 (20.7%)	
Lowest	4 (7.0%)	5 (8.6%)	
Ethnicity:			
Caucasian	50 (86.2%)	48 (78.7%)	ns
Not Caucasian	8 (13.8%)	13 (21.3%)	
Health Region:			
Calgary	30 (51.7%)	30 (49.2%)	ns
Capital	28 (48.3%)	31 (50.8%)	
Employed Before/ During Pregnancy:			
Yes	56 (96.6%)	51 (83.6%)	<.01
No	2 (3.4%)	10 (16.4%)	
Hours Worked per Week Before/ During Pregnancy (mean ± SD hours)	40.33 ± 8.18	40.77 ± 8.68	ns
Marital Status Before/During Pregnancy:			
Marital/Common Law	57 (98.3%)	59 (96.7%)	ns
Single	1 (1.7%)	2 (3.3%)	

Characteristics	Respondents (N=58)	Non- Respondents (N=61)	P
One or More Children Living in Household At Time of Pregnancy: Yes No	2 (3.5%) 56 (96.5%)	6 (10.2%) ^c 53 (89.8%)	.05
Depression and/or Anxiety Diagnosed Prior to Pregnancy: Yes No	3 (5.2%) 55 (94.8%)	2 (3.3%) 59 (96.7%)	ns
Self-Rating of Emotional Health Six Months Prior to Pregnancy: Very Good/Excellent Good Fair/Poor	45 (77.6%) 9 (15.5%) 4 (6.9%)	42 (68.9%) 11 (18.0%) 8 (13.1%)	ns
Method of Conception: Spontaneous Fertility Medications IVF/ICSI	40 (69.0%) 4 (6.9%) 14 (24.1%)	44 (72.1%) 5 (8.2%) 12 (19.7%)	ns
Gestational Age (mean \pm SD weeks)	38.47 \pm 2.53	37.42 \pm 3.20 (N=60)	.05
Preterm Delivery (<37 weeks)	8 (13.8%)	21 (N=59) (35.6%)	<.01
Birthweight (mean \pm SD grams): Infant #1 Infant #2	3225.07 \pm 683.13 (N=58) 2395.65 \pm 630.80 (N=20)	3057.76 \pm 766.11 (N=59) 2290.10 \pm 703.53 (N=20)	ns ns

^aData missing for one participant, therefore N=57.

^bData missing for three participants, therefore N=58.

^cData missing for 2 participants, therefore N=59.

The overall response rate for the current study was 48.7%, and there was no difference in the birth status of women who responded to the follow-up study versus those who did not respond. Table 4.2 does show several key differences between the respondents and non-respondents. Respondents were: statistically significantly older than

non-respondents (34.20 ± 4.19 versus 31.96 ± 5.46 , $p < .05$), more likely to be in the top income quintile, more likely to be employed during their pregnancies, and less likely to have additional children to care for in the household at the time of pregnancy.

The birth outcomes between these two groups were also notable. Non-respondents had infants with statistically significantly lower gestational ages when compared to respondents (37.42 ± 3.20 versus 38.47 ± 2.53 weeks, $p = .05$), and also had more preterm infants (21/59 versus 8/58, $p < .01$).

4.3 Demographic and clinical characteristics of mothers of singletons versus mothers of multiples

4.3.1 Overall sample

Table 4.3 displays the frequencies and percents of women who gave birth to singletons and women who gave birth to multiples that were contacted for participation in the present study (N=119). P-values for Pearson's chi-square test or Fisher's exact test (where appropriate) are also presented.

Table 4.3 Demographic and clinical characteristics of mothers of singletons and mothers of multiples in the eligible sample

Characteristics	Singletons (N=78)	Multiples (N=41)	P
Maternal Age at Delivery (mean \pm SD years)	32.22 ± 5.15	34.70 ± 4.23 (N=40)	<.01
Education:			
High School	14 (17.9%)	7 (17.1%)	ns
College	19 (24.4%)	11 (26.8%)	ns
University	34 (43.6%)	18 (43.9%)	ns
Post graduate	11 (14.1%)	5 (12.2%)	ns
Income Quintile:			
Top	26 (34.7%)	16 (40.0%)	ns
Fourth	19 (25.3%)	11 (27.5%)	ns
Middle	12 (16.0%)	6 (15.0%)	ns
Second	11 (14.7%)	5 (12.5%)	ns
Lowest	7 (9.3%)	2 (5.0%)	ns

Characteristics	Singletons (N=78)	Multiples (N=41)	P
Ethnicity:			
Caucasian	64 (82.1%)	34 (82.9%)	ns
Not Caucasian	14 (17.9%)	7 (17.1%)	ns
Health Region:			
Calgary	36 (46.1%)	24 (58.5%)	ns
Capital	42 (53.8%)	17 (41.5%)	ns
Employed Before/During Pregnancy:			
Yes	72 (92.3%)	35 (85.4%)	ns
No	6 (7.7%)	6 (14.6%)	ns
Hours Worked per Week Before/During Pregnancy (mean \pm SD)	39.89 \pm 8.26	41.86 \pm 8.62	ns
Marital Status Before/During Pregnancy:			
Married/Common Law	77 (98.7%)	39 (95.1%)	ns
Single	1 (1.3%)	2 (4.9%)	ns
Children Living in Household at Time of Pregnancy:			
Zero	73 (94.8%)	36 (90.0%)	ns
One	3 (3.9%)	3 (7.5%)	ns
Two	1 (1.3%)	0 (0%)	ns
Three	0 (0%)	1 (3.5%)	ns
Method of Conception:			
Spontaneous	70 (89.7%)	14 (34.2%)	<.001
Fertility Medications Only	6 (7.7%)	3 (7.3%)	
IVF/ICSI	2 (2.6%)	24 (58.5%)	
Self-Rating of Emotional Health Six Months Prior to Pregnancy:			
Very Good/Excellent	60 (76.9%)	27 (65.9%)	ns
Good	11 (14.1%)	9 (21.9%)	ns
Fair/Poor	7 (9.00%)	5 (12.2%)	ns
Depression and/or Anxiety Diagnosed Prior to Pregnancy:			
Yes	3 (3.9%)	2 (4.9%)	ns
No	75 (96.1%)	39 (95.1%)	ns

The mean maternal age at delivery was statistically significantly higher for mothers who gave birth to multiples compared to mothers who gave birth to singletons in the overall sample (34.70 ± 4.23 versus 32.22 ± 5.15 years, $p < .01$). There was also a statistically significant difference in the method of conception: 89.7% of singleton births in the overall sample were the result of natural or spontaneous conception, whereas only 34.2% of multiple births in the overall sample were *not* the result of fertility medications, ICSI, and/or IVF ($p < .001$). There were no other major differences in demographic characteristics in the overall sample.

4.3.2 Follow-up sample

Table 4.4 displays the frequencies and percents of women who gave birth to singletons and women who gave birth to multiples that completed the present follow-up study (N=58). P-values for Pearson's chi-square test or Fisher's exact test (where appropriate) are also presented.

Table 4.4 Demographic and clinical characteristics of mothers of singletons and mothers of multiples who completed the follow-up study

Characteristics	Singletons (N=38)	Multiples (N=20)	P
Maternal Age at Delivery (mean \pm SD years)	33.57 ± 4.45	35.40 ± 3.42	ns
Education:			
High School	7 (18.4%)	1 (5.0%)	ns
College	8 (21.1%)	9 (45.0%)	
University	15 (39.5%)	8 (40.0%)	
Post graduate	8 (21.0%)	2 (10.0%)	
Income Quintile:			
Top	19 (51.4%) ^a	9 (45.0%)	ns
Fourth	10 (27.0%)	5 (25.0%)	
Middle	3 (8.1%)	3 (15.0%)	
Second	2 (5.4%)	2 (10.0%)	
Lowest	3 (8.1%)	1 (5.0%)	

Characteristics	Singletons (N=38)	Multiples (N=20)	P
Ethnicity: Caucasian Not Caucasian	33 (86.8%) 5 (13.2%)	17 (85.0%) 3 (15.0%)	ns
Health Region: Calgary Capital	19 (50.0%) 19 (50.0%)	11 (55.0%) 9 (45.0%)	ns
Employed Before/During Pregnancy: Yes No	37 (97.4%) 1 (2.6%)	19 (95.0%) 1 (5.0%)	ns
Hours Worked per Week Before/During Pregnancy (mean \pm SD):	39.81 \pm 8.64 (N=37)	41.39 \pm 7.25 (N=18)	ns
Employed After Pregnancy: Yes No	34 (89.5 %) 4 (10.5%)	13 (65.0%) 7 (35.0%)	<.05
Hours Worked per Week After Pregnancy (mean \pm SD)	31.16 \pm 13.12 (N=34)	33.15 \pm 15.76 (N=13)	ns
Time to Return to Work After Pregnancy (mean \pm SD hours)	54.24 \pm 31.98 (N=33)	68.85 \pm 37.59 (N=13)	ns
Marital Status Before/During Pregnancy: Married/Common Law Single	38 (100%) 0 (0%)	19 (95.0%) 1 (5.0%)	ns
One or More Children Living in Household at Time of Pregnancy: Yes No	1 (2.6%) 37 (97.4%)	1 (5.0%) 19 (95.0%)	ns
One or More Additional Children Living in Household at Time of Follow-up: Yes No	22 (57.9%) 16 (42.1%)	4 (20.0%) 16 (80.0%)	<.01
Number of People Providing Social Support at Follow-up: One or Less Two or More	32 (84.2%) 6 (15.8%)	11 (55.0%) 9 (45.0%)	<.05

Characteristics	Singletons (N=38)	Multiples (N=20)	P
Method of Conception:			
Spontaneous	34 (89.4%)	6 (30.0%)	<.001
Fertility Medications Only	2 (5.3%)	2 (10.0%)	
IVF/ICSI	2 (5.3%)	12 (60.0%)	
Self-Rating of Emotional Health Six Months Prior to Pregnancy:			
Very Good/Excellent	32 (84.2%)	13 (65.0%)	ns
Good	5 (13.2%)	4 (20.0%)	
Fair/Poor	1 (2.6%)	3 (15.0%)	
Self-Rating of Emotional Health at Follow-up:			
Very Good/Excellent	23 (62.2%) ^a	13 (65.0%)	ns
Good	8 (21.6%)	5 (25.0%)	
Fair/Poor	6 (16.2%)	2 (10.0%)	
Depression and/or Anxiety Diagnosed Prior to Pregnancy:			
Yes	2 (5.3%)	1 (5.0%)	ns
No	36 (94.7%)	19 (95.0%)	
Depression and/or Anxiety Diagnosed at Follow-up:			
Yes	7 (18.4%)	7 (35.0%)	ns
No	31 (81.6%)	13 (65.0%)	

^a Data missing for one participant, therefore N=37 for singletons.

The mean age of the mothers of multiples in the present study was still higher than that of the singletons (35.40 ± 3.42 versus 33.57 ± 4.45 years), though the difference was not statistically significant, likely due to the small sample size. With regards to employment, fewer mothers of multiples returned to employment after their pregnancies compared to mothers of singletons (65.0% versus 89.5%, $p < .05$), and for those mothers of multiples who did return to work, their time to return was more than 14 weeks longer than the mothers of singletons (68.85 ± 37.59 versus 54.24 ± 31.98 weeks), though this difference was not statistically significant. Mothers of multiples in the present study had more social support than mother of singletons, with 45.0% indicating that they received support with care of the children and daily activities from two or more people, compared

to only 15.8% of mothers of singletons. Mothers of multiples were also less likely to have one or more additional children living in the household at the time of follow-up compared to mothers of singletons (20.0% versus 57.9%, $p < .01$).

4.4 Scores on standardized questionnaires measuring parenting stress, well-being, and resiliency in the follow-up study

Table 4.5 displays the mean scores and standard deviations for the standardized questionnaires that were administered to mothers of multiples and mothers of singletons as part of the telephone interview in the present study. P-values for Student's t-test, which was used to compare the differences in mean scores, are also presented.

Table 4.5 Comparison of scores for parenting stress, well-being, and resiliency measures of mothers of singletons and mothers of multiples in the follow-up study

Measure	Singletons (N=38)	Multiples (N=20)	P
Rutter Malaise Inventory (RMI) ^a	2.89 ± 2.49	2.50 ± 2.14	ns
Edinburgh Postnatal Depression Scale (EPDS) ^b	3.55 ± 4.33	2.80 ± 2.59	ns
Zung Self-Rating Anxiety Scale (SAS) ^c	33.71 ± 5.79	30.70 ± 4.55	<.05
Resilience Scale (RS) ^d	149.32 15.45	144.65 15.57	ns
Parenting Stress Index, Short Form (PSI-SF):			
Total Stress Score ^e	64.55 ± 19.41	68.90 ± 13.75	ns
Parental Distress Subscale	23.11 ± 6.86	24.95 ± 6.74	ns
Parent-Child Dysfunctional Interaction Subscale	14.21 ± 4.33	14.95 ± 3.27	ns
Difficult Child Subscale	27.47 ± 9.87	29.00 ± 5.80	ns

^a Possible scores range from 0 to 24, with higher scores indicating a lower level of well-being. Scores in excess of five are considered to be outside the normal range (48).

^b Possible scores range from 0 to 30, with higher scores corresponding to more depressive symptoms. Scores higher than 12 are considered to be indicative of clinical depression (59).

^c Possible scores range from 25 to 100, with higher scores being representative of higher levels of anxiety. Scores higher than 45 are considered to be indicative of moderate anxiety (61).

^d Possible scores range from 25 to 175, with higher scores reflecting higher levels of resiliency. Scores from 147 to 175 are considered high, scores from 121 to 146 are in the mid-range, and scores lower than 121 are considered to reflect less resilient individuals (26).

^e Possible scores range from 39 to 112. The Total Stress Score is a summary of the three subscale scores, and provides an overall indication of the level of parenting stress. A Total Stress Score above 86 represents clinically significant levels of parenting stress (52).

At the time of the follow-up in the present study, none of the mean scores were above the thresholds indicative of clinical levels of parenting stress, anxiety, depression, or malaise in the mothers in either of the two study groups. Mothers of singletons did appear to have higher anxiety levels than did mothers of multiples, as indicated by higher mean scores on the Zung Self-Rating Anxiety Scale, and this difference was statistically significant. There also appeared to be a trend toward higher parenting stress for mothers of multiples compared to mothers of singletons, though this result was not statistically significant, likely due to power issues and loss to follow-up. Figures 4.1 through 4.5 display comparative boxplots of the distributions of scores on the five standardized questionnaires.

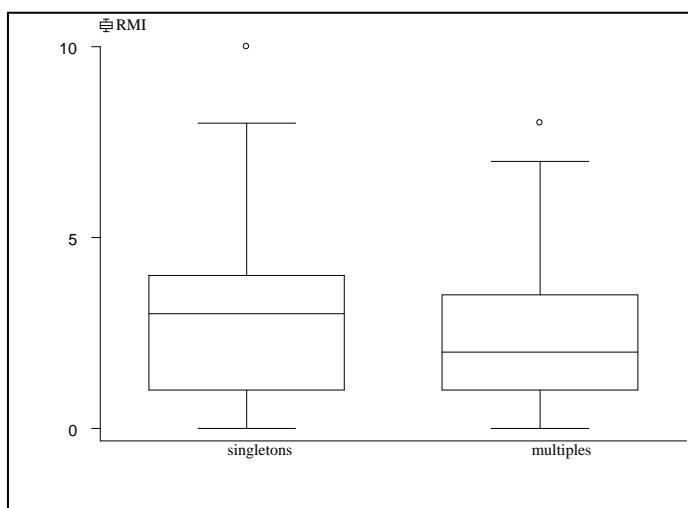


Figure 4.1 Boxplot comparison of RMI scores for mothers of singletons and mothers of multiples in the follow-up study.

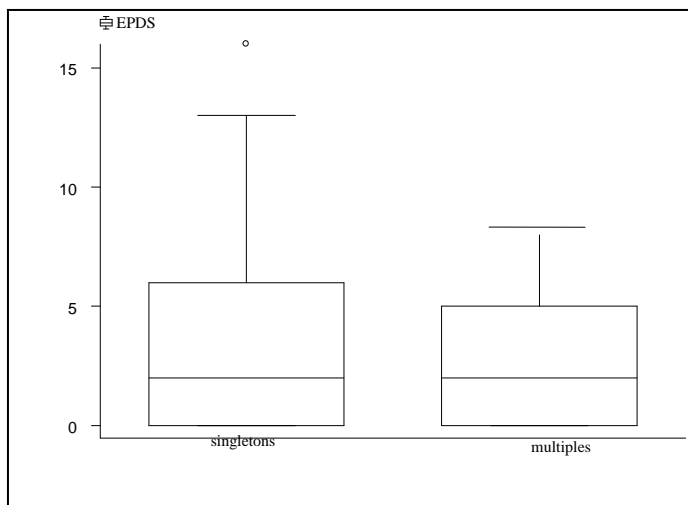


Figure 4.2 Boxplot comparison of EPDS scores for mothers of singletons and mothers of multiples in the follow-up study.

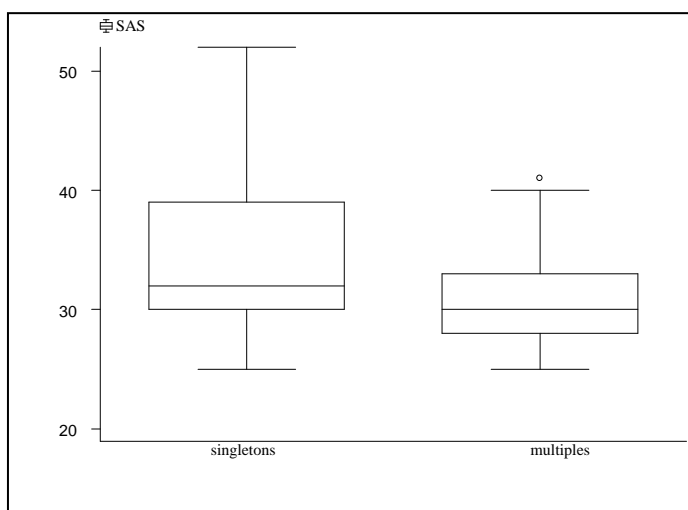


Figure 4.3 Boxplot comparison of SAS scores for mothers of singletons and mothers of multiples in the follow-up study.

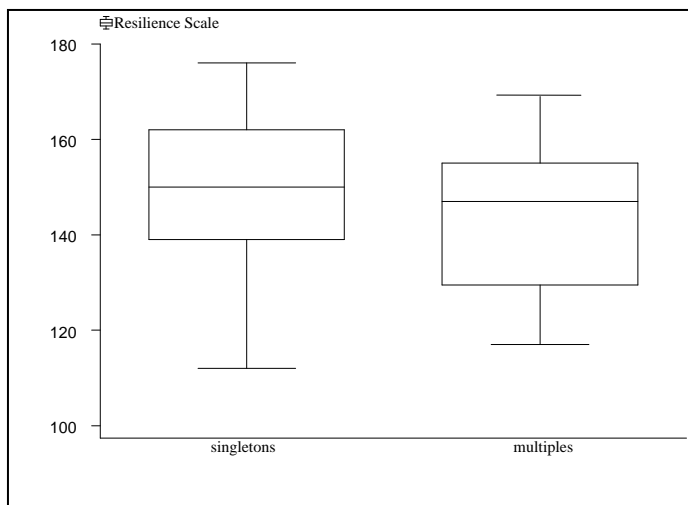


Figure 4.4 Boxplot comparison of RS scores for mothers of singletons and mothers of multiples in the follow-up study.

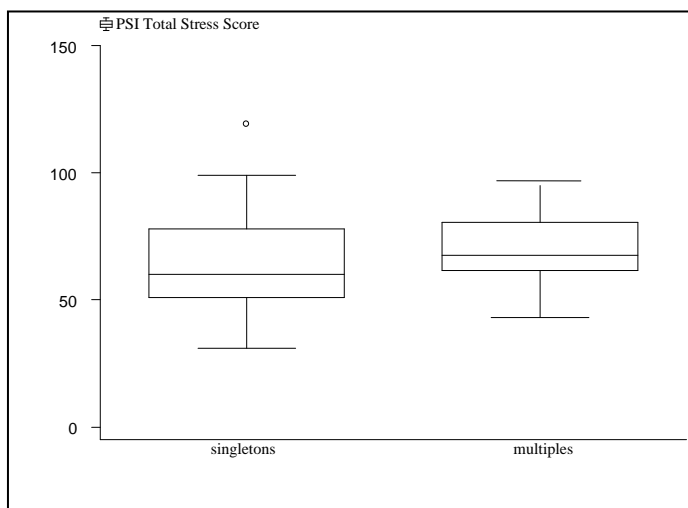


Figure 4.5 Boxplot comparison of PSI Total Stress Scores for mothers of singletons and mothers of multiples in the follow-up study.

Visual inspection of the boxplots in Figures 4.1 through 4.5 illustrate that the scores on the standardized instruments were fairly normally distributed with few outliers.

4.5 Classical stratified analysis

A classical stratified analysis was conducted in order to assess if any of the demographic or clinical variables were confounding or modifying the relationship between multiple birth and a history of depression in the mothers of multiples and mothers of singletons who participated in the follow-up study. The crude and Mantel-Haenszel adjusted odds ratios and 95% confidence intervals for potential confounding third variables are presented in Table 4.6.

Table 4.6 Odds ratios for the relationship between multiple birth status and a history of depression in mothers of singletons and mothers of multiples who responded to the follow-up study, adjusted for potentially confounding variables

Exposure Measure	Odds Ratio (OR)	95% Confidence Interval	P
Crude OR	2.38	(0.58 – 9.72)	0.20^a
Additional Children in Household at Time of Follow-up:			
Yes	2.11	(0.03 – 39.03)	0.51 ^a
No	1.80	(0.31 – 11.14)	0.70
Mantel-Haenszel OR	1.87	(0.50 – 6.94)	0.92^b
Number of People Providing Support at Time of Follow-up:			
≤1	2.48	(0.39 – 14.04)	0.25
>1	2.50	(0.13 – 157.06)	0.60
Mantel-Haenszel OR	2.48	(0.67 – 9.17)	0.99
Returned to Employment at Time of Follow-up:			
Yes	2.58	(0.41 – 14.84)	0.24
No	0.75	(0.03 – 16.92)	1.00
Mantel-Haenszel OR	1.79	(0.50 – 6.46)	0.40

^a P-values calculated using the two-sided Fisher's exact test (65).

^b Mantel-Haenszel p-values calculated from Mantel-Haenszel Test of Homogeneity (65).

4.6 Health status of children at the time of the follow-up study

A binary measure was used to determine the health of the children at the time of the follow-up. Mothers were asked, “Has your child or children had any long-term (greater than six months) health problems, disabilities, or handicaps that are serious or chronic enough to limit daily activities?”. Three of the mothers of singletons responded affirmatively, reporting one child each with a speech problem, asthma, and a heart condition. Seven of the mothers of multiples responded affirmatively, reporting one child with a heart condition, one with severe food allergies, one with arthritis, and four with speech problems. These differences were not statistically significant.

4.7 Comparison of results with the British Cohort Study

One of the objectives of the present study was to compare the results to those obtained by Thorpe and colleagues in the British Cohort Study (23). Table 4.7 highlights some of the main details and results of the present study and compares them to results that were available from the published study by Thorpe.

Table 4.7 Comparison of key findings from the present study to key findings from the British Cohort Study

Characteristic	Thorpe et al., 1991 Study	Present Study
Study Design	Retrospective cohort study	Nested follow-up study
Dates of Data Collection	April 1970	July 2002 – September 2003
Response Rate	80.0%	48.7%
Birth Status:		
Singleton	12573	38
Multiple	139	20
Maternal Age:		
Singletons		
<30	9472 (75.3%)	10 (26.3%)
≥30	2958 (23.5%)	28 (73.7%)
Multiples		
<30	87 (62.6%)	0 (0%)
≥30	35 (25.2%)	20 (100%)

Characteristic	Thorpe et al., 1991 Study	Present Study
Time to Follow-up	5 years after birth	2-4 years after birth
Rutter Malaise Inventory (RMI) Scores ≥ 6 :		
Singletons	23.9%	15.8%
Multiples	34.4%	10.0%
Additional Children in the House at Follow-up:		
Singletons		
Yes	11264 (89.6%)	22 (57.9%)
No	1307 (10.4%)	16 (42.1%)
Multiples		
Yes	94 (67.6%)	4 (20.0%)
No	28 (20.1%)	16 (80.0%)

Greater proportions of mothers of both singletons and multiples in the British study were younger than 30, though this difference was due in part by the deliberate over-sampling of older mothers in Delayed Childbearing Study from which the sample for the present study was drawn. In addition, compared to the present study, greater proportions of mothers of both singletons and multiples in the British study were caring for additional children in the household. Scores on the Rutter Malaise Inventory were higher for both singleton and multiple birth mothers in the Thorpe study compared to the present study.

4.8 Summary of key findings

The key findings of the present study are summarized as follows:

- Mothers of multiples reported higher mean scores on the Parenting Stress Index than mothers of singletons, although the difference was not statistically significant, and the majority of the scores were below the cut-off indicative of clinically significant levels of parenting stress.

- Mothers of both singletons and multiples reported low rates (5%) of depression and anxiety before the births of their children; these rates increased to 18.4% and 35.0% respectively at the time of the follow-up study.
- Both groups of mothers had comparable scores on ratings of well-being (RMI, EPDS) and resilience (RS), and none of the mean scores were above the thresholds indicative of adverse psychiatric outcomes.
- Stratified analyses suggest that caring for additional children in the household and returning to work after pregnancy were both slight confounders in the relationship between multiple births and a history of depression.
- The study was under-powered (due to low follow-up) to find differences across all outcome variables if they did indeed exist.

Chapter Five: Discussion

5.1 Overview

The first objective of this study was to examine parenting stress, well-being, and resiliency associated with bearing and parenting infants among mothers of multiples and mothers of singletons in urban Alberta. Compared to mothers of singletons, mothers of multiples in this study reported non-significant trends to higher levels of parenting stress, and more depression at the time of the follow-up study. Mothers of singletons scored higher on the self-reported anxiety measure compared to mothers of multiples, though the scores were well below the threshold for clinically significant anxiety. There was no difference between the two groups with regards to resiliency, though scores on the self-reported measure of resiliency were moderate to high for both groups of mothers. Results from a classical stratified analysis suggested that caring for additional children and returning to employment after childbirth were both confounding factors in the relationship between the birth of multiples and a history of depression.

The second objective of this study was to compare associations between ART use, workforce participation, work-related stress, delayed childbearing, and maternal mental health between the mothers of multiples and the mothers of singletons who participated in the follow-up study. Due to the low response rate and resulting small cell sizes in the present study, comparisons between mothers of multiples and singletons who used ART and those who conceived naturally were not possible. With regards to employment status, all but one mother in each of the two groups who completed the follow-up study was employed before pregnancy. At the time of the follow-up study, however, there was a statistically significant difference in the rate of employment: while almost 90 percent of

the mothers of singletons returned to employment after the birth of their children, only 65 percent of the mothers of multiples had done so.

The third objective was to compare the results of the present study with those of a large cohort study based on data collected in 1970 that was conducted in the UK by Thorpe and colleagues (23). In the latter, a significantly higher proportion of mothers of twins had scores on the Rutter Malaise Inventory indicative of depression at five years when compared to mothers of singletons (34.4% and 23.9%, respectively). For comparability, the Rutter Malaise Inventory was used in the present study, but did not result in similar or significant findings. However, the rates of depression in the present study, as measured by self-report, were very similar to those reported by Thorpe et al.: at the time of follow-up, 18% of mothers of singletons and 35% of mothers of multiples reported being diagnosed with depression by a healthcare provider. In addition, Thorpe and colleagues reported a strong trend between the presence of additional children in the household and higher rates of depression, and this trend was more pronounced for mothers of multiples compared to mothers of singletons. Similarly, the results from the present study suggest that having additional children in the household impacted the relationship between multiple births and a history of depression.

5.2 Sample characteristics for primary outcome variables

5.2.1 Parenting stress

Mothers of multiples experienced higher levels of parenting stress than mothers of singletons at follow-up. Scores on total parenting stress, parental distress, parent-child dysfunctional interaction, and perception of child difficulty, as measured by the Parenting Stress Index (PSI), were higher for mothers of multiples compared to mothers of

singletons, though these differences were not statistically significant. These trends in PSI scores are similar to those reported in a recent study on parenting stress in mothers of multiples conceived using *in vitro* fertilization (IVF) (56). In the Glazebrook study, mothers of multiples conceived by IVF had significantly higher PSI scores for total stress, parent-child dysfunctional interaction, and perceived child difficulty when compared to both mothers of singletons conceived by IVF and mothers of singletons conceived naturally (56).

In both the present study and that conducted by Glazebrook and colleagues, the mean Total Stress Score for the PSI was below the 85th percentile, which is cut-off indicative of clinically significant levels of parenting stress, and this was the case for both mothers of multiples and mothers of singletons. However, while only two of the twenty mothers of multiples (10%) in the present study had total scores above the 85th percentile, six of the thirty-eight mothers of singletons (16%) scored above this cut-off. In comparison, Glazebrook and colleagues reported that eight of the 36 mothers of multiples (22.2%), five of the 95 mothers of IVF singletons (5.3%), and 12 of the 129 (9.4%) of the mothers of naturally conceived singletons had PSI scores above the 85th percentile. The other two studies that have used the PSI did not report overall scores, therefore no comparison can be made (11, 12).

5.2.2 Depression, anxiety, and well-being

When asked about depression or anxiety before their pregnancies, approximately five percent of the mothers of both singletons and multiples in the follow-up study reported experiencing any depression, anxiety, or stress disorder in the two years prior to their pregnancy. This is much lower than the results from a recent population-based study

conducted in urban Alberta populations (66). Data from the Alberta Depression Initiative (ADI) study were isolated for a subset of women aged 18-44 years (mean = 32.7 ± 7.6 years) from Calgary and Edmonton health regions (N=718). One hundred and sixty (22.3%) of these women reported experiencing *any* mood or anxiety disorder in a similar timeframe. One of the reasons for such a large difference between the rates reported in the present study and those reported in the ADI study is likely due to the wording of the question asked of the participants in the present study. Women were asked if they had experienced *any* emotional health conditions, including depression, anxiety, or stress two years prior to their pregnancy that influenced the timing of that pregnancy. The non-specific wording of the question may have affected the reporting of the true rate of mental disorders in the study population. Further, even if they had been diagnosed by a healthcare provider with depression or anxiety, women may have answered no to the question if they did not perceive the diagnosis to have specifically influenced the timing of their pregnancy.

In contrast, at the time of the follow-up study, when women were asked if they had *ever* been diagnosed by a healthcare provider with depression, 18.4% of mothers of singletons and 35.0% of mothers of multiples reported that they had. Although this difference was not statistically significant, these values are higher than those reported for similarly aged women in the ADI study, where only 12.4% reported a major depressive episode (current or lifetime) or dysthymia (past two years) (66). One explanation for this difference is that the ADI study included all women aged 18 to 44 years, not just those with young children. The values in the present study are similar, however, to those reported in the literature on multiple births. Most relevant, Thorpe and colleagues

reported that 23.9% of mothers of singletons and 34.4% of mothers of multiples who participated in their cohort study had depression at five years postpartum (23). Similarly, Ellison and colleagues reported that 15.9% of mothers of singletons and 22.9% of mothers of multiples had depression at one to four years after the birth of their children (13). Along with the results of the present study, these findings lend support to the hypothesis that mothers of multiples are more likely to experience depression than mothers of singletons, and that there is a relationship between maternal mental health and the additional and exceptional stresses associated with parenting multiples.

Several studies have supported the intuitive notion that mothers who receive more social support develop fewer depressive symptoms than those who receive less support (36, 40, 42). In the present study, there was a statistically significant difference between the amount of support received by mothers of multiples compared with that of the mothers of singletons: 45.0% of the mothers of multiples indicated that they received regular support with care of the children and daily activities from two or more people, compared to only 15.8% of the mothers of singletons ($p < .05$). In addition, qualitative information collected from spontaneous comments made by participants in the focus group conducted during the pre-testing phase of the present study further support the relationship between high social support and positive well-being in mothers of multiples:

“The first eight weeks were difficult, because nobody helped me. I wasn’t working at the time [before the pregnancy], so I didn’t really have friends that were new moms, or someone who could help me. My family wasn’t here, my husband’s family doesn’t live here; so I was alone with them, and just waking up, taking care of them, going to bed...my husband didn’t take any time off from work, because he couldn’t take any time off. I was thinking I was going insane...it was really really hard.”

“...When you have two, or in my case three, it’s hard to find somebody that wants to come and look after your kids for you when they’re so small, while you go out and go to the gym. Even my mom and dad have trouble with the three without feeling overwhelmed.”

“Trying to find time for myself. It’s huge. You have to find that time. And trying to find help and support.”

Taken together with previously published literature, these preliminary findings underscore the importance of a strong social support network in maintaining positive well-being for mothers of multiples.

“[Regarding] social support, I think that in Calgary it’s not as significant a stressor as the other ones, because there’s a really good social support network here; but then again, I think it’s up to the moms to make the initial contact.”

5.2.3 Return to employment

At the time of the follow-up study, mothers of multiples were less likely to work outside the home: only 65 percent had returned to employment compared to almost 90 percent of the mothers of singletons. These results are similar to those reported by Glazebrook and colleagues, who found that only 44 percent of mothers of multiples conceived by IVF had returned to work at one year postpartum, compared to 73 percent of mothers of singletons conceived by IVF and 74 percent of singletons conceived naturally (56). In addition, in the present study, for the women who did return to work after the birth of their child or children, the mean time to return to work was more than 14 weeks longer for the mothers of multiples compared to the mothers of singletons (68.85 ±

37.59 versus 54.24 ± 31.98 weeks), though this difference was not statistically significant. The hours per week worked by the two groups of mothers did not differ.

Results from a recently released Canadian longitudinal study, the Survey of Labour and Income Dynamics, indicate that more than 60 percent of Canadian mothers return to employment within five to seven months after the birth of their children, and 86 percent of all mothers have returned to work by one year postpartum (49). While this pattern is quite similar to what was reported in the present study for the mothers of singletons, it is not reflective of the pattern of employment for mothers of multiples, highlighting the possibility that, for mothers of multiples, the practical and economical difficulties of arranging childcare for twins may outweigh the benefits of returning to employment. However, the psychosocial benefits of returning to employment, including financial independence and increased social status, must not be overlooked. In an important study which examined the demographic and obstetric risk factors associated with the development of postpartum depression, Warner and colleagues reported that not returning to employment after childbirth was independently associated with the development of postpartum depression (67). A recent qualitative study by Ellison and colleagues also identified that many mothers of multiples equated giving up their careers to care for their children with losing part of their identity and independence (55). In a popular guide to twin pregnancy, birth, and early childhood, narrated by five mothers of multiples, the authors highlight the importance of weighing the potential stresses that will result from working with the amount of support and cooperation that can be expected from the partner and employer (68). In addition, the authors anecdotally describe how for some, the added stresses of a two working-parents life-style created too much pressure on

their families, while for others, the need to return to employment in order to have increased social contact was worth the increased stresses for the family (68). Mothers who participated in the focus group during the pre-testing phase of the present study also identified with these some of these feelings, making the following spontaneous comments during the focus group process:

“The career one--that was a huge one for me. You have to put your career on hold.”

“I made the choice to stay home with the twins, but even if I wanted to go back, childcare for three kids is more expensive and wouldn't be worth it.”

Interestingly, of the 11 women who had not returned to employment at the time of follow-up in the present study, four (two mothers of multiples and two mothers of singletons) rated themselves as having poor emotional health. Though caution must be exercised due to small sample sizes, the preliminary results of the present study suggest that the role of maternal employment is key in the relationship between parenting multiples and postpartum emotional health, and contribute to a very sparse body of published literature on this topic.

5.3 Comparison to the British Cohort Study

One of the objectives of the present study was to compare the results with those obtained by researchers in the British Cohort study, which involved data collected in the United Kingdom in 1970 by Thorpe and colleagues (23). In the latter, 139 mothers of twins and 12573 mothers of singletons completed a self-reported measure of emotional well-being, the Rutter Malaise Inventory (RMI), five years after the birth of their child or children. The investigators reported that five years after the birth of their children, 23.9

percent of the mothers of singletons and 34.4 percent of the mothers of multiples had RMI scores above the threshold indicative of clinical depression. Logistic regression analysis confirmed an association between parenting multiples and the development of depressive symptoms (OR 1.6, 95% CI 1.1 – 2.3), after adjusting for maternal age, social class, number of children in the household, and disability in the study child. In an effort to support comparability of results, the RMI was also used as part of the interview of mothers who participated in the present study. However, similar results were not produced. The median RMI score for the mothers of singletons in the British Cohort Study was 4 (interquartile range 2-6), and for the mothers of multiples was 4 (interquartile range 2-8). In the present study, the median scores for mothers of singletons and mothers of multiples were 3 (interquartile range 1-4) and 2 (interquartile range 1-4), respectively. In addition, in the present study, the proportion of mothers who had RMI scores above the threshold reported to be indicative of clinical depression ($RMI \geq 6$) was 15.8 percent for singletons and 10.0 percent for multiples. One possible explanation for such a difference in the results might be attributable to the psychometric properties of the Rutter Malaise Inventory: the focus of the RMI is on physical symptoms such as headaches, upset stomach, and sleeping difficulties (48). Therefore, it is feasible that the RMI is not indicative of depression specifically associated with caring for young children, but is rather more focused on capturing the general physical symptoms that accompany major depression in the general population. Another explanation might be that the mothers of multiples who participated in the present study may have had difference characteristics than those who did not participate, leading to a possible selection bias. The role of selection bias in the present study is discussed in depth below.

As a result of their logistic regression analyses, Thorpe and her colleagues also found that maternal youth, social class (particularly being an “unsupported mother”), number of children in the household, and disability in the study child or children were all independently predictive of higher maternal malaise (23). Although a logistic regression analysis was not used in the present study, several of the preliminary associations in the present study do seem to support Thorpe’s findings. First, as shown in Table 4.4, there was a statistically significant difference in the presence of additional children in the household at the time of the follow-up for mothers of singletons compared to mothers of multiples (57.9% versus 20.0%, $p < .01$). When this variable was considered in the classical stratified analysis, the presence of additional children in the household was found to be a confounder in the relationship between multiple births and a history of depression. In addition, in the present study, 45 percent of mothers of multiples reported receiving regular social support from at least two or more people at the time of the follow-up, compared to only 15.8 percent of mothers of singletons ($p < .05$).

5.4 Methodologic Issues

In this section the study findings will be interpreted in light of the possible influence of the methodologic issues of chance, confounding, and bias.

5.4.1 Issues of chance (statistical power)

Statistical power is defined as the ability of a study to demonstrate an association if one actually exists (58). The power of a study is influenced by: the frequency of the condition under study, the magnitude of the effect, the study design, and the sample size (58). In the present study, the factor that most influenced the power of the study was the low response rate and resulting small sample size. As indicated by the sample size

calculations in Chapter 3, the present study was originally designed to be sensitive enough to have an almost 98 percent chance of detecting significant differences in Parenting Stress Index (PSI) scores between mothers of multiples and mothers of singletons who participated in the follow-up study, if such differences actually existed. Although the mothers of multiples did score an average of 4.5 points higher on the Total Stress Score of the PSI compared to the mothers of singletons, the low response rates in both the mothers of multiples and the mothers of singletons (48.8% and 48.7%, respectively) increase the possibility of a Type II error; that is, declaring that a difference does not exist when it actually does (58).

More specifically, a power calculation was conducted using the final sample sizes obtained from the follow-up study (singletons $N=38$, multiples $N=20$), as well as the mean Total Stress Scores for the PSI; the resulting power was 25.6 percent. This suggests that under the conditions of the present study, the chance of observing a difference if one actually existed was only 25.6 percent. As an exercise, another calculation was conducted using the Total Stress Scores of the PSI that were obtained in this study (singletons 64.55 ± 19.41 , multiples 68.90 ± 13.75) and the sample sizes that would have resulted if there had been no loss to follow up (i.e., singletons $N=78$, multiples $N=41$); the resulting power was 42.3 percent. This suggests that if every participant who had been identified from the DC study had completed the follow-up study, the chance of observing the resulting 4.5 point difference in the Total Stress Score between mothers of singletons and mothers of multiples would have been 42.3 percent.

Taken together, the resulting low response rates and the additional sample size calculations stress the importance of not overlooking the possibility that real differences

in the outcome variables between singleton and multiple birth mothers existed but were not detectable with the final sample size. Future studies that incorporate a shorter time to follow-up as well as more rigorous recruitment methods to increase response rates are needed in order to confirm and expand on the present findings.

5.4.2 Issues of confounding

A confounding variable is defined as a variable that can cause or prevent the outcome of interest, is not an intermediate variable, and is associated with the factor under investigation (58). Unless an adjustment is made for a potential confounding variable, the effect of the confounder cannot be distinguished from that of the factor under investigation. In the present study, a classical stratified analysis was conducted in order to assess if any of the demographic or clinical variables were confounding the relationship between multiple birth and a history of depression in the mothers of multiples and mothers of singletons who participated in the follow-up study. Table 4.6 describes the differences between the crude and adjusted Odds Ratios for the relationship between multiple births and a history of depression in the mothers who participated in the follow-up study. Though not statistically significant, the results from Table 4.6 suggest mild confounding by additional children in the household as well as by employment status after pregnancy. These preliminary findings indicate that the relationship between bearing and parenting multiples and maternal well-being is not a straightforward one, and it is impacted by many stressors in the mother's life. In particular, caring for additional children, deciding whether to return to employment after childbirth and if so, balancing the demands of employment with the demands of parenting. Further research is needed to elucidate these stressors and their impact on maternal well-being.

5.4.3 Issues of bias

5.4.3.1 Information bias

Information bias, also known as measurement bias or misclassification bias, occurs when the true relationship between an exposure and an outcome is distorted by inaccuracies in the measurement of either or both of these characteristics (58). There are several potential sources of information bias that could have impacted the results of the present study. First, since self-reported measures were used in both the DC study population and the follow-up study population, there exists the potential for inaccuracies in self-reporting by the participants. If both the cases (i.e., the mothers of multiples) and the controls (i.e., the mothers of singletons) were equally likely to over- or under-emphasize their feelings of parenting stress, anxiety, or depression, then this would lead to non-differential misclassification, which would result in a conservative estimate of the true relationship between multiple births and well-being. If, on the other hand, mothers of multiples were more likely to report heightened feelings of parenting stress, anxiety, or depression compared to mother of singletons, then this would lead to differential misclassification. In this case, a bias would cause an over-estimation of the risk between multiple births and parenting stress, anxiety, and depression. It is difficult, however, to determine the actual degree of this possible misclassification: if the mothers of multiples who participated in this study were knowledgeable of the literature that exists reporting a heightened stress and depression in mothers of multiples compared to mothers of singletons, then they may have been more likely to report feelings of stress and poor well-being in order to further support this hypothesis.

Misclassification of the outcome is also a possibility in the present study. As the interviewer was not blinded to the group status of the mothers being interviewed, and was aware of the literature regarding heightened parenting stress and decreased well-being in mothers of multiples compared to mothers of singletons, there is the possibility that the interviewer was more likely to document heightened negative feelings in the mothers of multiples in the present study. This bias would lead to an underestimate of parenting stress, anxiety, and depression in the mothers of singletons relative to the mothers of multiples who participated in the follow-up study. It is unlikely, however, that this was a large source of bias in the present study, as a standardized interview protocol with standardized instruments was used for all study participants.

5.4.3.2 Selection bias

Selection bias is defined as error due to systematic differences in characteristics between those who take part in a study and those who do not (58). Selection bias can arise from multiple sources, therefore making it difficult to identify and quantify the direction and magnitude of this type of bias. A very common and commonly overlooked type of error, selection bias can also invalidate conclusions and generalizations that might otherwise be drawn from a study (58). In the present study, 38 out of the 78 mothers of singletons and 20 out of the 41 mothers of multiples from the Delayed Childbearing Study population completed the follow-up study. Despite the low response rate in the follow-up study, it does not appear that there was a strong selection bias by birth status, since mothers of singletons and mothers of multiples were equally as likely to respond to the follow-up study. A possible source of selection bias may have also occurred if women who participated in the follow-up study were more likely to have poorer emotional health

than those who did not respond to the follow-up study. This could explain the heightened depression rates reported in the present study. While there is a definite possibility that this type of selection bias occurred to some degree, the overall rates of depression and anxiety during pregnancy did not differ for respondents versus non-respondents, and neither did self-ratings of emotional health. It is unlikely, therefore, that this was a strong source of selection bias in the present study. Another possible source of selection bias may have occurred if mothers who responded to the present study experienced different infant health outcomes than the mothers who did not respond. Table 4.3 shows that non-respondents had statistically significantly lower gestational ages when compared to respondents (37.42 ± 3.20 versus 38.47 ± 2.53 weeks, $p=.05$), and also had higher rates of preterm birth (<37 weeks) (21/59 versus 8/58, $p<.01$). The long-term consequences for children who are born preterm include behavioural problems as well developmental problems such as speech and language difficulties (8-10). For the mothers, caring for an infant with health problems has been linked to increased depression rates and heightened perceived parenting stress. Selection bias would be introduced if the health outcomes, both short- and long-term, of the children of mothers who did not choose to participate in the present study were different than those of the children of mothers who did participate in the present study. A final source of selection bias may have occurred as a result of the sample of mothers who participated in the follow-up study. All women who participated in the present study were first-time mothers, therefore it is likely that many of their experiences cannot be generalized to women with older children in the household.

5.5 Study limitations

The present study was a nested follow-up study that used demographic data from a larger study, the Delayed Childbearing (DC) study. The objectives of the DC study were to describe the characteristics of women who became pregnant with different reproductive approaches and to describe the associated pregnancy and birth outcomes (57). As such, the scope of data collected during pregnancy was focused on information pertinent to the characteristics and outcomes of women who delay childbearing. In particular, information on diagnosed mental health disorders such as depression and anxiety were based on self-report, and were asked in the context of whether the decision to become pregnant was impacted by depression or anxiety disorders.

Because of the low response rate which introduced some apparent selection bias, the results of this study are not generalizable to all mothers of multiples. Future studies which follow mothers longitudinally from a specified point in pregnancy onward are needed to more clearly identify and predict risks associated with bearing and parenting multiples.

Finally, the potential of all studies involving self-reported measures to over- or under-represent levels of emotional distress underscores the importance of including in-depth and standardized interviews repeated at several points in time.

5.6 Study strengths

One of the strengths of the present study was the study design: as a large amount of data was available about the participants at the start of the study, the potential for recall bias was minimized, thereby also minimizing the effects of some potential confounding variables.

The present study was designed in part for comparability to the British Cohort Study by Thorpe and colleagues (23). The preliminary findings of the present study suggest that both the impact of caring for additional children in the household and the role of varying levels social support are important factors that must not be overlooked in the relationship between multiple births and well-being. Another strength of the present study, therefore, is that these results are similar to those reported by Thorpe and her colleagues, and lend support to the growing body of literature on the impact of multiple stressors on the emotional well-being of mothers of multiples.

The preliminary findings of the present study also help to contribute to the limited literature available regarding parenting stress and well-being *independent* from the impact of method of conception.

Finally, the collection of detailed information on employment is also a strength of the present study, as there is very sparse information available in the psychosocial literature regarding the impact of employment choices on the well-being of mothers of multiples.

5.7 Conclusions and recommendations

There are many modern stressors associated with caring for young children in today's society, and these stressors may be exaggerated for mothers of multiples. As many women are increasingly deciding to delay their childbearing until their mid- to late-thirties, due to their desire to achieve educational or financial goals, or to advance their careers, it is critical to examine the stress associated with balancing these goals with the role of parenting. Preliminary results of the present study suggest that the number of people providing regular support is important in the relationship between multiple births

and depression, therefore further study on the impact of social support and social networks for mothers of multiples is also warranted.

Future research should include prospective studies with large population-based samples in order to clarify and expand on the preliminary findings from the present study.

References

1. CANSIM website. [cited May 28, 2004]; Available from:
<http://cansim2.statcan.ca/cgi-win/CNSMCGI.EXE>
2. Millar WJ, Wadhera S, Nimrod C. Multiple births: trends and patterns in Canada, 1974-1990. *Health Reports* 1992;4(3):223-250.
3. Maternal risk factors and birth outcomes: Calgary Health Region 1994-2001: Alberta Health and Wellness.
4. Health Canada. Canadian Perinatal Health Report, 2003. Ottawa: Minister of Public Works and Government Services Canada; 2003.
5. Blondel B, Kaminski M. Trends in the occurrence, determinants, and consequences of multiple births. *Seminars in Perinatology* 2002;26(4):239-249.
6. Petterson B, Stanley F, Henderson D. Cerebral palsy in multiple births in Western Australia. *Am J Med Genetics* 1990;37:346-351.
7. Yokoyama Y, Shimizu T, Hayakawa K. Prevalence of cerebral palsy in twins, triplets and quadruplets. *Int J Epidemiology* 1995;24(5):943-948.
8. Bryan E. The impact of multiple preterm births on the family. *Br J Obstet Gynaecol* 2003;110 (Suppl 20):24-28.
9. Rutter M, Redshaw J. Growing up as a twin: twin-singleton differences in psychological development. *J Child Psychol Psychiatry* 1991;32:885-896.
10. Rutter M, Thorpe K, Greenwood R, Northstone K, Golding J. twins as a natural experiment to study the causes of mild language delay: I: Design; twin-singleton differences in language and obstetric risks. *J Child Psychol Psychiatry* 2003;44(3):326-341.

11. Colpin H, De Munter A, Nys K, Vandemeulebroecke L. Parenting stress and psychosocial well-being among parents with twins conceived naturally or by reproductive technology. *Human Reproduction* 1999;14(12):3133-3137.
12. Cook R, Bradley S, Golombok S. A preliminary study of parental stress and child behaviour in families with twins conceived by in-vitro fertilization. *Human Reproduction* 1998;13(11).
13. Ellison MA, Hall JE. Social stigma and compounded losses: quality-of-life issues for multiple-birth families. *Fertility & Sterility* 2003;80(2):405-414.
14. Garel M, Blondel B. Assessment at 1 year of the psychological consequences of having triplets. *Human Reproduction* 1992;7(5):729-732.
15. Garel M, Salobir C, Blondel B. Psychological consequences of having triplets: a 4-year follow-up study. *Fertility & Sterility* 1997;67(6):1162-1165.
16. Salami KK, Brieger WR, Olutayo L. Stress and coping among mothers of twins in rural southwestern Nigeria. *Twin Research* 2003;6(1):55-61.
17. Brown GW, Bifulco A, Harris TO. Life events, vulnerability, and onset of depression: some refinements. *Br J Psychiatry* 1987;150:30-42.
18. Brown GW, Harris TO. *Life Events and Illness*. New York, NY: Guilford Press; 1989.
19. Paykel ES. Recent life events in the development of depressive disorders: implications for the effects of stress. In: Depue RA, editor. *The Psychobiology of the Depressive Disorder*. New York, NY: Academic Press; 1979. p. 245-262.
20. Östberg M. Parental stress, psychosocial problems and responsiveness in help-seeking parents with small (2-45 months old) children. *Acta Paediatr* 1998;87:69-76.

21. Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. *Psychol Bull* 1985;98:310-357.
22. Östberg M, Hagekull B. A structural modeling approach to the understanding of parenting stress. *J Clin Child Psychology* 2000;29(4):615-625.
23. Thorpe K, Golding J, MacGillivray I, Greenwood R. Comparison of prevalence of depression in mothers of twins and mothers of singletons. *BMJ* 1991;302:875-878.
24. Ryff CD, Singer B. Psychological well-being: meaning, measurement, and implications for psychotherapy research. *Psychotherapy and Psychosomatics* 1996;65:14-23.
25. Rutter M. Psychosocial resilience and protective mechanisms. *Am J Orthopsychiatry* 1987;57:316-331.
26. Wagnild G, Young HM. Development and psychometric evaluation of the resilience scale. *J Nursing Measurement* 1993;1(2):165-178.
27. Crago M, Shisslak CM, Ruble A. Protective factors in the development of eating disorders. In: Striegel-Moore RH, Smolak L, editors. *Eating Disorders: Innovative Directions in Research and Practice*. Washington, DC: American Psychological Association; 2001. p. 75-89.
28. Beardslee WR. The role of self-understanding in resilient individuals: the development of a perspective. *Am J Orthopsychiatry* 1989;59:266-278.
29. Druss RG, Douglas CJ. Adaptive responses to illness and disability: healthy denial. *Gen Hosp Psychiatry* 1988;10:163-168.
30. Rutter M. Resilience in the face of adversity: protective factors and resistance to psychiatric disorder. *Br J Psychiatry* 1985;147:598-611.

31. McCubbin MA, McCubbin HL. Family coping with health crises: the resiliency model of family stress, adjustment, and adaptation. In: Danielson C, Hamel-Bissell B, Winsted-Fry P, editors. *Families, Health, and Illness*. New York, NY: Mosby; 1993.
32. Felton BS, Hall JM. Conceptualizing resilience in women older than 85: overcoming adversity from illness or loss. *J Gerontological Nurs* 2001;27(11):46-53.
33. Wagnild G, Young HM. Resilience among older women. *Image: J Nurs Scholarship* 1990;22:252-255.
34. Fisher J, Stocky A. Maternal perinatal mental health and multiple births: implications for practice. *Twin Research* 2003;6(6):506-513.
35. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision*. Washington, DC: American Psychiatric Association; 2000.
36. O'Hara MW, Swain AM. Rates and risk of postpartum depression - a meta-analysis. *Int Rev Psychiatry* 1996;8:37-54.
37. Troutman B, Cutrona C. Nonpsychotic postpartum depression among adolescent mothers. *J Abnorm Psychol* 1990;99:69-78.
38. Miller LJ. Postpartum depression. *JAMA* 2002;287(6):762-765.
39. Stowe ZN, Hostetter AL, Newport DJ. The onset of postpartum depression: implications for clinical screening in obstetrical and primary care. *Am J Obstetr Gynecol* 2005;192:522-526.
40. Kumar R, Robson KM. A prospective study of emotional disorders in childbearing women. *Br J Psychiatry* 1984;144:35-47.

41. Llewellyn AM, Stowe ZN, Nemeroff CB. Depression during pregnancy and the puerperium. *J Clin Psychiatry* 1997;58(Suppl 15):26-32.
42. O'Hara MW. Social support, life events, and depression during pregnancy and the puerperium. *Arch Gen Psychiatry* 1986;43:596-573.
43. Gotlib IH, Whiffen VE, Wallace PM, Mount JH. Prospective investigation of postpartum depression: factors involved in onset and recovery. *J Abnorm Psychol* 1991;100:122-132.
44. Cogill S, Caplan H, Alexandra H, Robson KM, Kumar R. Impact of postnatal depression on cognitive development in young children. *BMJ* 1986;292(1165-1167).
45. Murray L. The impact of postnatal depression on infant development. *J Child Psychol Psychiatry* 1992;33:543-561.
46. Murray L, Cooper PJ. Postpartum depression and child development. *Psychol Med* 1997; 27(2):253-260.
47. Stein A, Gath DH, J. B, Bond A, A. D, Cooper PJ. The relationship between postnatal depression and mother child interaction. *Br J Psychiatry* 1991;158:46-52.
48. Rutter M, Tizard J, Whitmore K. *Education, Health, and Behaviour*. London, UK: Longman; 1980.
49. Marshall K. *Employment after childbirth. Perspectives 1999*;Statistics Canada Catalogue no. 75-001-XPE:18-25.
50. Hirst MA, Bradshaw JR. Evaluating the malaise inventory: a comparison of measures of stress. *J Psychosomatic Research* 1983;27(3):193-199.
51. McGee R, Williams S, Silva PA. An evaluation of the malaise inventory. *J Psychosomatic Research* 1986;30(2):147-152.

52. Abidin RR. Parenting Stress Index, 3rd edition, professional manual. Odessa, FL: Psychological Assessment Resources, Inc.; 1995.
53. Goldberg DP, Hillier VF. A scaled version of the General Health Questionnaire. *Psychol Med* 1979;9(139-145).
54. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Measurement* 1977;1:385-401.
55. Ellison MA, Hotamisligil S, Lee H, Rich-Edwards JW, Pang SC, Hall JE. Psychosocial risks associated with multiple births resulting from assisted reproduction. *Fertility & Sterility* 2005;83(5):1422-1428.
56. Glazebrook C, Sheard C, Cox S, Oates M, Ndukwe G. Parenting stress in first-time mothers of twins and triplets conceived after in vitro fertilization. *Fertility & Sterility* 2004;81(3):505-511.
57. Tough S, Benzies K, Newburn-Cook C, Tofflemire K, Fraser-Lee N, Faber A, Sauve R. What do women know about the risks of delayed childbearing? *Can J Public Health* 2006;97(4):330-334.
58. Last JM (editor). A dictionary of epidemiology, fourth edition. New York: Oxford University Press; 2001.
59. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry* 1987; 150: 782-786.
60. Eberhard-Gran M, Eskild A, Tambs K, Opjordsmoen S, Samuelsen SO. Review of validation studies of the Edinburgh Postnatal Depression Scale. *Acta Psychiatr Scand* 2001; 104(4): 243-249.
61. Zung WWK. A rating scale for anxiety disorders. *Psychosomatics* 1971; 12: 371-379.

62. Wagnild, G. Resilience and successful aging: comparison among old and high income older adults. *J Gerontol Nursing* 2003;29(12):42-49.
63. Wagnild G, Young HM. Resilience among older women. *Image: J Nursing Scholarship* 1990;22:252-255.
64. StataCorp. *Stata statistical software: release 8.0*. College Station: Stata Corporation; 2003.
65. Rosner B. *Fundamentals of biostatistics*, 5th edition. California: Duxbury Thomson Learning; 2000.
66. Esposito, E, Wang JL, Adair CE, Williams JV, Dobson K, Schopflocher D, Sevcik M, Mitton C, Newman S, Beck C, Barbui C, Patten SB. Frequency and adequacy of depression treatment in Alberta, Canada. Accepted for publication, *Can J Psychiatry*.
67. Warner R, Appleby, Whitton A, Farragher B. Demographic and obstetric risk factors for postnatal psychiatric morbidity. *Br J Psychiatry* 1996; 168:607-611.
68. Albi L, Johnson D, Catlin D, Duerloo DF, Greatwood S. *Mothering twins: from hearing the news to beyond the terrible twos*. New York: Fireside; 1993.

Appendix A

Transcript from a Focus Group with Mothers of Twins

1. After learning that you were expecting twins, did you seek more information? From where or who? What kinds of information?

Mom #1: “I went to other mothers of twins, and the twin clubs in the city; I also tried to find books, but there weren’t too many out there”

Mom #2: “I have several friends that have twins, so they were a source of information too”

XK: “It looks like you guys have a pretty good support network through the twins club, so that’s obviously a source of information as well”

2. What are your greatest joys about parenting multiples?

Mom #1: “Watching them interact...there’s something neat about seeing kids the same age who are siblings and ... haven’t spent many moments apart; they’re going through the same things at the same time”

Mom #2: “One pregnancy, two babies!”

Mom #3: “It’s more efficient...if you have to wake in the middle of the night to feed one child, it usually ends up being both...but then you don’t have to do it again in two years. It’s more intense, but I think it’s neat because when they go to school together, I’ll have more free time, I hope, at that time.”

Mom #4: “I think it’s harder initially, like in those first few months – I have a singleton as well, so I have the double experience – but I think it was harder with the twins early on, but as they get older, it’s much easier. If you have one child, they don’t have anyone to play with, but now that you have two the same age, they can play better.”

Mom #5: “Mine are 19 months, so they’re both starting to crawl all over the furniture and are running everywhere. One talks a lot more than the other, and I’m just starting to notice that she’s teaching her sister, and vice versa. I see their personalities coming out in each other – they’re teaching each other things.”

Mom #6: “Watching them develop together is so much fun.”

Mom #7: “And yet, appreciating too the differences of development, and seeing one do something before the other, or one’s more chatty than the other. So just seeing their differences too.”

3. What are some significant stressors that you associate with taking care of multiples?

“Sleep!”

Mom #1: “With a singleton, with my first daughter, I got up on my own, I didn’t drag my husband out of bed just so he could change the diaper, I let him sleep so that he could spell me off during the day. But with twins, really both of you are fatigued, because in the early stages, you need help with the burping and the changing in the night, so you end up with two fatigued parents instead of just one.”

Mom #2: “And I think that that just dominoes into your relationship with your husband. You’re tired...so you’ve gotta have a solid foundation of husband and wife when you have twins.”

Mom #3: “Especially when they’re your first...it’s your first pregnancy and you don’t know anything besides you and your partner, and then all of a sudden, you can just imagine....I thought it would be stressful with the first one, but having two to begin with!”

Mom #1: “I feel the same way, but I almost feel lucky having a dry run with a singleton before the twins came along!”

Mom #4: “The first eight weeks were difficult, because nobody helped me. I wasn’t working at the time [before the pregnancy], so I didn’t really have friends that were new moms, or someone who could help me. My family wasn’t here, my husband’s family doesn’t live here; so I was alone with them, and just waking up, taking care of them, going to bed...my husband didn’t take any time off from work, because he couldn’t take any time off. I was thinking I was going insane...it was really really hard.”

Mom #3: “I still feel like that at the end of the day!”

Mom #4: “I go to bed and I’m just exhausted! I just want to sleep.”

Mom #5: “I think another stressor too is body image. I think I was just like a big blob for the first year.”

Mom #1: “It’s hard enough to find someone to look after one while you get back into a fitness routine. But when you have two, or in my case three, it’s hard to find somebody that wants to come and look after your kids for you when they’re so small, while you go out and go to the gym. Even my mom and dad have trouble with the three without feeling overwhelmed.”

Mom #3: “Just getting out with two is really hard. It’s just a lot of work.”

Mom #4: “One question I have for other moms is whether it’s hard for you to arrive on time? Is it hard or is it just me? I really plan to be on time, but it just doesn’t work out.”

Mom #6: “I have a friend that I get together with, she has just a singleton, and when we go to the park, I have to pull out the double jogger from the truck, put sunscreen and hats on three kids...and she’s looking at me, and she’s ready to go, and she’s watching me for 15 minutes as I get them ready, and she’s wondering I’m sure why I bother to go out anywhere!”

Mom #3: “I also find that my twins are more competitive with each other than just regular siblings.”

Mom #4: “It’s hard to get time to yourself, really hard. I take one night a week for myself and when I come home, my husband is angry and tired, and then I tell him that that’s what I deal with for the other 6 days of the week.”

Mom #7: “Another challenge is that I am that much more reluctant as far as babysitters go. I mean, one or two kids that are different ages, a teenager could handle. But with twins or three kids, no way.”

Mom #8: “Our twins are two and a half, and their sister is four, and we just in the last month started allowing a babysitter into our house. And even then, we’re picking not even a teenager, but our niece who is 21. And when you are picking from the teens, you look at the 16 and 17 year olds, rather than the 13 and 14 year olds, because it is a lot of work.”

4. What are some of the coping strategies that you use to deal with these stressors?

Mom #1: “The moms. Other moms!”

Mom #2: “I find that I eat more now, when I have quiet time.”

Mom #3: “Trying to find time for myself. It’s huge. You have to find that time. And trying to find help and support.”

Mom #3: “My husband and I also try to get a date night in once a month. We just started that, it was our New Year’s resolution, and the twins are two and a half.”

Mom #2: “Another thing that helps me is meditation; after my class, I’m very relaxed.”

Mom #4: “Anything that you can really do for yourself. I just started a yoga class. I’m just happy to have that hour to myself, and I don’t care if my angles aren’t perfect!”

Mom #5: “Dropping them off one day a week at the day home. Just to have the day to run my errands without having to take them in and out of the car-seats. I look forward to that day. It’s nice to have someone confirmed to take care of them every Tuesday afternoon.”

Mom #6: “We have no family in the city, so I’m always jealous when I see grandmas and grandpas that can help out. But we accessed the Children’s Cottage early on, and I had someone come in four hours a week, until the girls were 6 months old. And now we have someone from our church who comes once a week and picks my daughter up for the afternoon and takes her to the zoo or the symphony; we’ve been lucky that way.”

5. The literature tells us that the most significant stressors associated with caring for twins or triplets include: marital issues, managing the daily routines of family life, impact on career options, and lack of social support. Do you agree with these?

Mom #1: “The career one--that was a huge one for me. You have to put your career on hold.”

Mom #2: “I made the choice to stay home with the twins, but even if I wanted to go back, childcare for three kids is more expensive and wouldn’t be worth it.”

Mom #1: “Calgary has probably the best twins and triplets club, the most organized, professionally managed club. I compare it with Vancouver, and I’m blown away by the level of support here.”

Mom #1: “[regarding] social support, I think that in Calgary it’s not as significant a stressor as the other ones, because there’s a really good social support network here; but then again, I think it’s up to the moms to make the initial contact.”

6. What advice would you give to other parents who are expecting twins or triplets?

“Find help!”

Mom #1: “If people offer help, never refuse!”

Mom #2: “Cook while you’re pregnant.”

Mom #3: “Find other mothers with twins, they are a huge support.”

7. Is there anything that I’ve missed that would help me better understand the stresses associated with parenting multiples?

Mom #1: “It’s a different experience, but to be honest, I don’t find it as hard as I thought it would be. Everybody thinks it’s a lot worse, but it’s really not.”

Mom #2: “I agree. The first few months were tough, we had help from both sets of grandparents, and without that, I don’t know where I would be, because the lack of sleep was just incredible. But once you get some sleep, it’s really not that bad!”

Mom #3: “I’ve had two singletons prior to the twins, and it took my body much longer to recover [from the twins].”

Mom #4: “That’s what I think too. The pregnancy is a lot harder on the body. The doctors don’t prepare you for that. I popped ribs, I have scoliosis now due to the pregnancy.”

Mom #5: “The lost circulation in my toes that didn’t come back.”

Mom #4: “I got my grandmother’s varicose veins during pregnancy, and they’re still there.”

Mom #6: “You feel that your body ages a lot after the pregnancy, it’s just amazing. All of a sudden I have all these wrinkles!”

Mom #7: “I think the doctors are getting better during the last trimester. They will put you on rest even if you don’t have any serious conditions, not bed rest, but they took me off work at 24 weeks.”

Mom #5: “I was uncomfortable; I had more ailments [like] carpal tunnel, varicose veins.”

Appendix B

Telephone Interview Guide

Good morning/afternoon/evening. My name is Xanthoula, and I'm calling from the Parenting Stress and Well-Being study at the University of Calgary. I'm checking if you received the invitation letter we sent out last month, and if so, whether you are interested in participating in this study?

As noted in the letter, the interview will take about 45 minutes. Do you have some time right now to be interviewed? (IF NO: When would be a good time for me to call you back?)

Thank you again for agreeing to be interviewed. Your participation in this study is important and appreciated. In the interview about Childbearing in Alberta that you completed approximately two years ago, you answered many questions about your background as well as your pregnancy experience. In this interview, I will be asking you some questions about your experiences since becoming a parent. In order to save some time today, I will not be asking you the same background questions that you answered in the previous study; instead I will use the answers that you provided at that time.

Some of the questions that I am going to ask you today may seem personal and repetitious, and some will not apply to you, but your answers are important and will be kept completely confidential. If you do not feel comfortable answering any question, let me know and we will move on to the next question. Also, if you need to stop at any time, please let me know and we can continue at a later time or day if necessary.

1. How long have you lived in Alberta?

Years _____
Refused _____

2. How many children are currently living in your household?

Number _____
Refused _____

3. What are the birthdates of these children?

Child	_____	Birthday _____
Child	_____	Birthday _____
Child	_____	Birthday _____
Child	_____	Birthday _____
Refused	_____	

4. Did you return to work for pay after the pregnancy that you were interviewed about in the previous?

Yes _____
No _____
Refused _____

5. If yes, how many jobs do you work at?

Number —
 Not applicable —
 Refused —

6. How many hours per week do you currently spend working for pay?

Number —
 Don't know —
 Not applicable —
 Refused —

7. How long did you stay at home after the birth of your child or children that you were pregnant with during the previous study before returning to work?

Length of time (weeks) —
 Don't know —
 Not applicable —
 Refused —

8. What is your current marital status?

Married/ living with partner —
 Divorced —
 Separated —
 Single —
 Widowed —

9. Did you receive social assistance or welfare after your pregnancy that you were interviewed about in the previous study?

Yes —
 No —
 Don't Know —
 Refused —

10. Who currently provides the most support or help to you, and by help I mean day-to-day assistance with the children and other daily activities? You may choose as many people as you like. Is it your....

Spouse or partner —
 Mother —
 Father —
 Other family members —
 Neighbours —
 Health care provider —
 Counselor —
 Other (please specify) —
 Don't know —
 Refused —

The next set of questions concern your child or children's development I am referring to the child or children you were pregnant with when you participated in the previous study.

11. At birth, did your child/ children receive any care in an Intensive Care Unit (ICU) or premature nursery, not including lights for jaundice?

Yes _____
 No _____
 Don't know _____
 Refused _____

12. Did your child/ children have any of the following health conditions or problems diagnosed by a doctor within one week of birth?

Down Syndrome Yes ___ No ___
 Cleft lip or palate Yes ___ No ___
 Minor ear defects Yes ___ No ___
 Minor eye defects Yes ___ No ___
 Infections at birth Yes ___ No ___
 Any other defect/syndrome Yes ___ No ___ Specify _____

13. For the next items, please indicated whether you have been concerned about these characteristics in your child/ children:

Unclear speech Yes ___ No ___
 Stammering/ stuttering Yes ___ No ___
 Hearing Yes ___ No ___
 Delayed talking Yes ___ No ___
 Learning Yes ___ No ___
 Attention Yes ___ No ___
 Behaviour Yes ___ No ___
 Any other characteristic Yes ___ No ___ Specify _____

14. Has your child been referred to a specialist or received treatment or therapy for any of these characteristics?

Yes _____
 No _____
 Don't know _____
 Refused _____

15. Has your child/ children had any other long-term (> 6 months) health problems, disabilities, or handicaps that are serious or chronic enough to limit daily activities?

Yes _____
 No _____
 Don't know _____
 Refused _____

DC Study
 Questions

Thank you for your answers so far. The next set of questions is a bit more personal, and address how you currently feel about yourself. Please answer Strongly agree, Agree, Disagree, or Strongly disagree.

16. On the whole, I am satisfied with myself:

Strongly agree _____
 Agree _____
 Disagree _____
 Strongly disagree _____

Don't know —
 Refused —

17. At times I think I am no good at all:

Strongly agree —
 Agree —
 Disagree —
 Strongly disagree —
 Don't know —
 Refused —

18. I feel that I have a number of good qualities:

Strongly agree —
 Agree —
 Disagree —
 Strongly disagree —
 Don't know —
 Refused —

19. I am able to do things as well as most other people:

Strongly agree —
 Agree —
 Disagree —
 Strongly disagree —
 Don't know —
 Refused —

20. I feel I do not have much to be proud of:

Strongly agree —
 Agree —
 Disagree —
 Strongly disagree —
 Don't know —
 Refused —

21. I certainly feel useless sometimes:

Strongly agree —
 Agree —
 Disagree —
 Strongly disagree —
 Don't know —
 Refused —

22. I feel that I'm a person of worth, at least on an equal plane with others:

Strongly agree —
 Agree —
 Disagree —
 Strongly disagree —
 Don't know —
 Refused —

23. I wish I could have more respect for myself:

Strongly agree	—
Agree	—
Disagree	—
Strongly disagree	—
Don't know	—
Refused	—

24. All in all, I am inclined to feel that I am a failure:

Strongly agree	—
Agree	—
Disagree	—
Strongly disagree	—
Don't know	—
Refused	—

25. All in all, I take a positive attitude towards myself:

Strongly agree	—
Agree	—
Disagree	—
Strongly disagree	—
Don't know	—
Refused	—

The next set of questions is about your general physical and emotional health.

26. During the past 6 months, how would you describe your emotional health overall?

Poor	—
Fair	—
Good	—
Very Good	—
Excellent	—
Don't Know	—
Refused	—

27. Have you ever been diagnosed by a healthcare provider with depression?

Yes	—
No	—
Don't know	—
Refused	—

Rutter 28. Do you often have a backache?

Malaise	Yes	—
	No	—
Inventory	Don't know	—
	Refused	—

29. Do you feel tired most of the time?

Yes —
No —
Don't know —
Refused —

30. Do you often feel miserable or depressed?

Yes —
No —
Don't know —
Refused —

31. Do you often have bad headaches?

Yes —
No —
Don't know —
Refused —

32. Do you often get worried about things?

Yes —
No —
Don't know —
Refused —

33. Do you usually have great difficulty in falling asleep or staying asleep?

Yes —
No —
Don't know —
Refused —

34. Do you usually wake unnecessarily early in the morning?

Yes —
No —
Don't know —
Refused —

35. Do you wear yourself out worrying about your health?

Yes —
No —
Don't know —
Refused —

36. Do you often get into a violent rage?

Yes —
No —
Don't know —
Refused —

37. Do people often annoy and irritate you?

Yes —
No —
Don't know —
Refused —

38. Have you at times had a twitching of the face, head, or shoulders?

Yes —
No —
Don't know —
Refused —

39. Do you often suddenly become scared for no good reason?

Yes —
No —
Don't know —
Refused —

40. Are you scared to be alone when there are no friends near you?

Yes —
No —
Don't know —
Refused —

41. Are you easily upset or irritated?

Yes —
No —
Don't know —
Refused —

42. Are you frightened of going out alone or of meeting people?

Yes —
No —
Don't know —
Refused —

43. Do you suffer from indigestion?

Yes —
No —
Don't know —
Refused —

44. Do you often suffer from an upset stomach?

Yes —
No —
Don't know —
Refused —

45. Is your appetite poor?

Yes —
 No —
 Don't know —
 Refused —

46. Does every little thing get on your nerves and wear you out?

Yes —
 No —
 Don't know —
 Refused —

47. Does your heart often race like mad?

Yes —
 No —
 Don't know —
 Refused —

48. Do you often have bad pains in your eyes?

Yes —
 No —
 Don't know —
 Refused —

49. Are you troubled with rheumatoid arthritis or fibromyalgia?

Yes —
 No —
 Don't know —
 Refused —

50. Have you ever had a nervous breakdown?

Yes —
 No —
 Don't know —
 Refused —

Edinburgh *The next set of questions is specifically about your general outlook on life. Please answer how you have
 Postnatal been feeling during the PAST 7 DAYS. Once again, some of the questions are very personal, and some may
 not apply to you, but we need to ask them of everyone.*

Depression 51. I have been able to laugh and see the funny side of things:

As much as I always could —
 Not quite so much now —
 Definitely not so much now —
 Not at all —

52. I have looked forward with enjoyment to things:

As much as I ever did —
 Rather less than I used to —

Definitely less than I used to —
 Hardly at all —

53. I have blamed myself unnecessarily when things went wrong:

Yes, most of the time —
 Yes, some of the time —
 Not very often —
 No, never —

54. I have been anxious or worried for no good reason:

No, not at all —
 Hardly ever —
 Yes, sometimes —
 Yes, very often —

55. I have felt scared or panicky for no very good reason:

Yes, quite a lot —
 Yes, sometimes —
 No, not much —
 No, not at all —

56. Things have been getting on top of me:

Yes, most of the time I haven't been able to cope at all —
 Yes, sometimes I haven't been coping as well as usual —
 No, most of the time I have coped quite well —
 No, I have been coping as well as ever —

57. I have been so unhappy that I have had difficulty sleeping:

Yes, most of the time —
 Yes, sometimes —
 Not very often —
 No, not at all —

58. I have felt sad or miserable:

Yes, most of the time —
 Yes, quite often —
 Not very often —
 No, not at all —

59. I have been so unhappy that I have been crying:

Yes, most of the time —
 Yes, quite often —
 Only occasionally —
 No, never —

60. The thought of harming myself has occurred to me:

Yes, quite often —
 Sometimes —

Hardly ever —
Never —

Zung Anxiety

Self-
Assessment

*The next set of questions is about anxious feelings that some parents may experience. Please choose one of the following responses that best describes how you are **currently** feeling: None or a Little of the Time, Some of the Time, Good Part of the Time, or Most or All of the Time.*

61. I feel more nervous and anxious than usual:

None or a little of the time —
Some of the time —
Good part of the time —
Most or all of the time —

62. I feel afraid for no reason at all:

None or a little of the time —
Some of the time —
Good part of the time —
Most or all of the time —

63. I get upset easily or feel panicky:

None or a little of the time —
Some of the time —
Good part of the time —
Most or all of the time —

64. I feel like I'm falling apart and going to pieces:

None or a little of the time —
Some of the time —
Good part of the time —
Most or all of the time —

65. I feel that everything is alright and nothing bad will happen:

None or a little of the time —
Some of the time —
Good part of the time —
Most or all of the time —

66. My arms and legs shake and tremble:

None or a little of the time —
Some of the time —
Good part of the time —
Most or all of the time —

67. I am bothered by headaches, neck and back pains:

None or a little of the time —
Some of the time —
Good part of the time —
Most or all of the time —

68. I feel weak and get tired easily:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

69. I feel calm and can sit still easily:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

70. I can feel my heart beating fast:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

71. I am bothered by dizzy spells:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

72. I have fainting spells or feel faint:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

73. I can breathe in and out easily:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

74. I get feelings of numbness and tingling in my fingers and toes:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

75. I am bothered by stomachaches or indigestion:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

76. I have to empty my bladder often:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

77. My hands are usually dry and warm:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

78. My face gets hot and flushes:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

79. I fall asleep easily and get a good night's rest:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

80. I have nightmares:

None or a little of the time —
 Some of the time —
 Good part of the time —
 Most or all of the time —

Parenting

Stress Index

*Thank you for staying with me for a lot of detailed questions, even when many didn't apply to you. The next group of questions is about feelings and experiences that some new parents have. As you are answering these questions, please keep in mind that they are standardized questions, designed to cover **any** feelings that parents of young children around the world may experience at one time or another. For the next set of questions, please answer Strongly Agree, Agree, Not Sure, Disagree, or Strongly Disagree. If you would like, you can write down the answer choices to help you remember them.*

81. I often have the feeling that I cannot handle things very well:

Strongly agree —
 Agree —
 Not sure —
 Disagree —
 Strongly disagree —
 Refused —

82. I find myself giving up more of my life to meet my children's life than I ever expected:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

83. I feel trapped by my responsibility as a parent:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

84. Since having this child/children, I have been unable to do new and different things:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

85. Since having a child/children, I feel that I am almost never able to do things that I like to do:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

86. I am unhappy with the last purchase of clothing I made for myself:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

87. There are quite a few things that bother me about my life:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

88. Having a child/children has caused more problems than I expected in my relationship with my spouse (or male/female friend):

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

89. I feel alone and without friends:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

90. When I go to a party, I usually expect not to enjoy myself:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

91. I am not as interested in people as I used to be:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

92. I don't enjoy things as I used to:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

(For mothers of multiples ONLY): I am going to do a coin-toss right now to determine which child you should base the next set of answers on. Heads will represent the older twin, while tails will represent the younger twin.

93. My child rarely does things for me that make me feel good:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

94. Sometimes I feel my child doesn't like me and doesn't want to be close to me:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

95. My child smiles at me much less than I expected:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

96. When I do things for my child, I get the feeling that my efforts are not appreciated very much:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

97. When playing, my child doesn't often giggle or laugh:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

98. My child doesn't seem to learn as quickly as most children:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

99. My child doesn't seem to smile as much as most children:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

100. My child is not able to do as much as I expected:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

101. It takes a long time and it is very hard for my child to get used to new things:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

102. I expected to have closer and warmer feelings for my child than I do and this bothers me:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

103. Sometimes my child does things that bother me just to be mean:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

104. My child seems to cry or fuss more often than most children:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

105. My child generally wakes up in a bad mood:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

106. I feel that my child is very moody and easily upset:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

107. My child does a few things which bother me a great deal:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

108. My child reacts very strongly when something happens that my child doesn't like:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

109. My child gets upset easily over the smallest thing:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

110. My child's sleeping or eating schedule was much harder to establish than I expected:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

111. There are some things that my child does that really bother me a lot:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

112. My child turned out to be more of a problem than I had expected:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

113. My child makes more demands on me than most children:

Strongly agree	—
Agree	—
Not sure	—
Disagree	—
Strongly disagree	—
Refused	—

For the next statements, choose your response from the choices 1 to 5.

114. I feel that I am:

Not very good at being a parent	1
A person who has some trouble being a parent	2
An average parent	3
A better than average parent	4
A very good parent	5

115. I have found that getting my child to do something or to stop doing something is:

Much harder than I expected	1
Somewhat harder than I expected	2
About as hard as I expected	3
Somewhat easier than I expected	4
Much easier than I expected	5

116. Think carefully and count the number of things that your child does that bother you. For example, dawdles, refuses to listen, overactive, cries, interrupts, fights, whines, etc.:

10+	—
8-9	—
6-7	—
4-5	—
1-3	—

117. What is your favourite activity to do with your child or children?

Don't Know —
Refused —

Resiliency
Scale

Thank you for staying with me through this very detailed set of questions. I realize that many of the questions seem negative, and I appreciate your cooperation. I want to remind you again that these were standardized questions that were designed to cover any feelings that a wide variety of parents around the world may have felt at one time or another.

We are getting close to the end of the survey now. This last set of questions deals with your ability to cope with and recover from a wide variety of situations. Please base your answers on how you are currently feeling, and rate the statements on a scale of 1 to 7, where 1 is Strongly Disagree, and 7 is Strongly Agree.

118. When I make plans, I follow through with them:

1 2 3 4 5 6 7

Don't know —
Refused —

119. I usually manage one way or another:

1 2 3 4 5 6 7

Don't know —
Refused —

120. I am able to depend on myself more than anyone else:

1 2 3 4 5 6 7

Don't know —
Refused —

121. Keeping interested in things is important to me:

1 2 3 4 5 6 7

Don't know —
Refused —

122. I can be on my own if I have to:

1 2 3 4 5 6 7

Don't know —
 Refused —

123. I feel proud that I have accomplished things in my life:

1 2 3 4 5 6 7

Don't know —
 Refused —

124. I usually take things in stride:

1 2 3 4 5 6 7

Don't know —
 Refused —

125. I am friends with myself:

1 2 3 4 5 6 7

Don't know —
 Refused —

126. I feel that I can handle many things at a time:

1 2 3 4 5 6 7

Don't know —
 Refused —

127. I am determined:

1 2 3 4 5 6 7

Don't know —
 Refused —

128. I seldom wonder what the point of it all is:

1 2 3 4 5 6 7

Don't know —
 Refused —

129. I take things one day at a time:

1 2 3 4 5 6 7

Don't know —
 Refused —

130. I can get through difficult times because I've experienced difficulty before:

1 2 3 4 5 6 7

Don't know —
 Refused —

131. I have self-discipline:

1 2 3 4 5 6 7

Don't know —
 Refused —

132. I keep interested in things:

1 2 3 4 5 6 7

Don't know —
 Refused —

133. I can usually find something to laugh about:

1 2 3 4 5 6 7

Don't know —
 Refused —

134. My belief in myself gets me through hard times:

1 2 3 4 5 6 7

Don't know —
 Refused —

135. In an emergency, I'm someone people can generally rely on:

1 2 3 4 5 6 7

Don't know —
 Refused —

136. I can usually look at a situation in a number of ways:

1 2 3 4 5 6 7

Don't know —
 Refused —

137. Sometimes I make myself do things whether I want to or not:

1 2 3 4 5 6 7

Don't know —
 Refused —

138. My life has meaning:

1 2 3 4 5 6 7

Don't know —

Refused —

139. I do not dwell on things that I can't do anything about:

1 2 3 4 5 6 7

Don't know —

Refused —

140. When I'm in a difficult situation, I can usually find my way out of it:

1 2 3 4 5 6 7

Don't know —

Refused —

141. I have enough energy to do what I have to do:

1 2 3 4 5 6 7

Don't know —

Refused —

142. It's okay if there are people who don't like me:

1 2 3 4 5 6 7

Don't know —

Refused —

143. Do you have plans for your summer vacation?

Thank you very much for your time and cooperation. The information you have shared today is very valuable to this study, and will hopefully help us to better understand the stresses associated with parenting. Do you have any questions or comments?

Once all the interviews are completed, we will be entering all the answers into a database, without names, and analysing them as a group. Once this is all completed, we will be sending a general summary of the findings to all the participants in the study, as well as a list of local community resources. If you have any questions or concerns at any time, please feel free to contact me; once again, my name is Xanthoula, and you can reach me at 403-806-0307.