

**CHILD HEALTH, SES AND FAMILY SUPPORTS: AN APPLICATION OF THE
FAMILY STRESS MODEL AMONG TODDLERS IN CANADA**

by

Nicole Nohr Dawydiuk

B.Sc., Simon Fraser University, 2019

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF

MASTER OF SCIENCE

in

The Faculty of Graduate and Postdoctoral Studies

(Population and Public Health)

THE UNIVERSITY OF BRITISH COLUMBIA
(Vancouver)

April 2021

©Nicole Nohr Dawydiuk, 2021

The following individuals certify that they have read, and recommend to the Faculty of Graduate and Postdoctoral Studies for acceptance, the thesis entitled:

Child health, SES and Family Supports: An Application of the Family Stress Model Among
Toddlers in Canada

Submitted by Nicole Nohr Dawydiuk in partial fulfillment of the requirements for

the degree of Master of Science

in Population and Public Health

Examining Committee:

Dr. Martin Guhn, PhD, Assistant Professor, Faculty of Medicine School of Population and
Public Health, UBC

Supervisor

Dr. Eva Oberle, PhD, Assistant Professor, Faculty of Medicine School of Population and
Public Health, UBC

Supervisory Committee Member

Dr. Susan Dahinten, PhD, Associate Professor, School of Nursing, UBC

Supervisory Committee Member

Abstract

Background: The Family Stress Model suggests that socioeconomic status (SES) and family supports (e.g., social supports, community supports and resources) are key predictors of child health. However, it is recognized that there is a gap in the literature applying this knowledge to young children. In this study, a modified version, where there was only a focus on three components of the Family Stress Model is applied to test the main and moderating effects among these variables and their ability to predict overall health in toddlers (ages 12-24 months).

Purpose: The purpose of this study was to analyze and identify key findings from the *Toddler Development Instrument (TDI)* data regarding the associations between economic hardship (household income), social supports (access to family supports) and child health, using a modified Family Stress Model.

Methods: Binary logistic regression was used to perform analysis on 803 surveys collected from participating parents of toddlers aged 12-24 months as part of the TDI pilot project data collected through the *Human Early Learning Partnership (HELP)* at the University of British Columbia (UBC). Data were collected from families across British Columbia, Canada at family and community centers, using convenience sampling.

Results: Results showed that SES (household income) and access to family supports was significantly associated with child health. Additionally, access to family supports mediated the relationship between household income and child health. Moderating effects of access to family supports on the relationship of household income and child health were not found to be significant.

Conclusions: The study findings support the Family Stress Model and add evidence to the literature that SES and access to family supports are predictors of child health. Attention to these predictors can help researchers, policy makers and providers prioritize areas of support for families with young children.

Lay Summary

This study used parent-reported data collected from 12–24-month-old children to examine how socioeconomic status, measured using household income, and access to family supports influences child health. It was found that household income and access to family and community supports were positively associated with children’s health. Conversely, parental education level and child sex were not associated with differences in reported child health. These findings emphasize the importance of both socioeconomic status and community and family supports in supporting and promoting child health.

Preface

This thesis is original, unpublished work by the author, N. Nohr Dawydiuk, utilizing previously collected, unpublished data from the Toddler Development Instrument (TDI) Phase 2 Pilot Implementation Study conducted by the Human Early Learning Partnership at the University of British Columbia (UBC) (Principal Investigator: Dr. Martin Guhn).

The original Toddler Development Instrument Study received UBC Behavioural Ethics Research Board approval under the title *Harmonized Review Project TDI 2 version 16.0* (H16-02186).

Table of Contents

Abstract	iii
Lay Summary.....	iv
Preface.....	v
Table of Contents.....	vi
List of Tables	viii
List of Figures	ix
Acknowledgements	x
Chapter 1: Introduction.....	1
Background	1
Research Problem.....	2
Research Purpose	3
Chapter 2: Literature Review.....	5
Conceptual Model.....	5
The Family Stress Model.....	5
Economic Hardship	6
Economic hardship and child outcomes	7
Family Supports	10
Perceived social support	10
Social support and child outcomes	11
Child Outcomes	14
Measurements of child health.....	14
Summary of the Literature	14
Research Questions and Hypothesis.....	15
Chapter 3: Methods	17
Research Design.....	17
Sample	17
Data Collection Procedures.....	17
Access to Data.....	18
Ethical Considerations.....	18
Measures	18
Validation of Self-Construct	19
Economic Hardship- Household income.....	19
Access to Family Supports	20

Child Health.....	21
Control Variables.....	21
Data Analysis Procedure.....	21
Logistic Regression	21
Testing Main Effects	22
Testing Moderation & Mediation	22
Chapter 4: Results.....	24
Descriptive Statistics.....	24
Hierarchical Binary Logistic Regression.....	27
Logistic Regression Results.....	28
Statistical Power	29
Chapter 5: Discussion.....	35
Research Implications.....	38
Practice Implications	38
Strengths and Limitations.....	40
Conclusion	42
References.....	43
Appendices.....	49
Appendix A.....	49
Appendix B	50

List of Tables

<i>Table 1:</i> Hierarchical Binary Logistic regression analysis structure.....	22
<i>Table 2:</i> Demographic characteristics of study participants.....	24
<i>Table 3:</i> Descriptive statistics for key predictors, controls and child health.....	25
<i>Table 4:</i> Hierarchical binary logistic regression results.....	31

List of Figures

<i>Figure 1: Conceptual Model</i>	4
<i>Figure 2: Conceptual model 1 with results</i>	32
<i>Figure 3: Conceptual model 2 with results</i>	32
<i>Figure 4: Conceptual model 3 with results</i>	33
<i>Figure 5: Conceptual model 4 with results</i>	33

Acknowledgements

I would like to extend my gratitude and thanks to my supervisor, Dr. Martin Guhn, for allowing me to join his team at the Human Early Learning Partnership in the School of Population and Public Health at UBC, for his teaching and guidance, and for all of his support (even as I was constantly changing my thesis topic). I would also like to extend my gratitude and thanks to my wonderful committee members, Dr. S. Dahinten and Dr. E. Oberle, for their valuable advice and feedback. Thank you also to Barry Forer, for sharing his knowledge and statistical expertise throughout this project.

I would like to acknowledge that this work would not have been possible without the community partners and families throughout British Columbia, who shared their stories and supported the Toddler Development Instrument. My MSc was financially supported by the Canadian Institute of Health Research Graduate Scholarship and by UBC's Faculty of Medicine.

Lastly, I would like to thank my amazing family and friends, who have supported and encouraged me throughout my MSc degree.

Chapter 1: Introduction

Background

The strong positive association between socioeconomic status (SES) and child health has been thoroughly studied in public health literature, which often concludes that socioeconomic status is “a powerful factor that can alter lifetime developmental trajectories in cognitive, socioemotional and physical health outcomes” (Evans & Kim, 2013). The Human Early Learning Partnership's 2016-2019 Wave 7 Early Development Instrument (EDI) report shows increasing vulnerability among young children over the past few years, trending from 29.9% in the 2004-2007 wave report to 33.4% in the 2016-2019 report (Human Early Learning Partnership & Commission on Social Determinants of Health, 2007; 2020 BC Child Poverty Report Card, 2020). The report noted that "half of childhood vulnerability on the EDI can be explained by socioeconomic status characteristics" (2020 BC Child Poverty Report Card, 2020). Children living in low SES households face significant disadvantages in terms of cognitive development, behavior problems, and physical health (Newland, Crnic, Cox, & Mills-Koonce, 2013). The roots of this strong relationship can be explained with the concept of biological embedding (Hertzman, 2012; Miller, Chen, & Parker, 2011). The concept of biological embedding describes a process of how contextual and environmental exposures and experiences are able to biologically alter one's health, behavior and well-being (Hertzman, 2012). More importantly, the relationship between SES and health has repeatedly been shown to follow a gradient, with lower SES being associated with poorer short and long-term health (Evans & Kim, 2013).

Due to the cumulative impact of a child's exposure to a certain environment over time, the association between socioeconomic status and a child's health is especially important during the early stages of life (Hertzman, 2012). Specifically, experiences and environments associated with social position critically influence sensitive periods of brain development (Hertzman, 2012). In turn, this early brain development influences the formation of sensory pathways, which will directly determine development in areas such as coping, language and immune function (Hertzman, 2012). With 18.5%, or 1 in 5, children in BC living in poverty, it is important to address vulnerabilities associated with low SES at a young age, especially during times of fragile developmental periods (2020 BC Child Poverty Report Card, 2020). Furthermore, the promotion and maximization of positive experiences and emotions in children can help them develop a lifetime of healthy habits and behaviors (Landers-Potts et al., 2015).

The comprehensive Fair Society, Healthy Lives report (Marmot & Bell, 2012), which reviewed the effects of social inequities on health in England, does not only highlight that there is a social gradient in health, but that these differences become magnified over time, as children age (Marmot & Bell, 2012). This relationship is best demonstrated in the graph displayed in their report (see Appendix A), which displays how children who have low cognitive scores at 22 months of age but grow up in a high SES household improve their relative scores as they approach 10 years of age (Marmot & Bell, 2012). Alternatively, children who have a low cognitive score at 22 months of age, but who grow up in a low SES household, have worsening cognitive scores as they approach 10 years of age (Marmot & Bell, 2012). This example points to the importance of SES, especially as children age, and the effects that living within a low SES environment can have over time with regard to health. The Marmot report concluded that their highest priority recommendation for reducing health inequities is to provide every child the best start in life possible, across all income levels (Marmot & Bell, 2012).

Given the close relationship between SES and health, it is crucial to examine the contextual and environmental factors which may contribute to this association. The Family Stress Model provides us with a framework through which we can consider how these factors influence and interact with each other. The model proposes that child health outcomes can be influenced by key constructs, such as economic hardship and economic pressure. These factors can contribute to parental psychological distress, ultimately affecting children's mental and physical health through various pathways (Masarik & Conger, 2017).

Research Problem

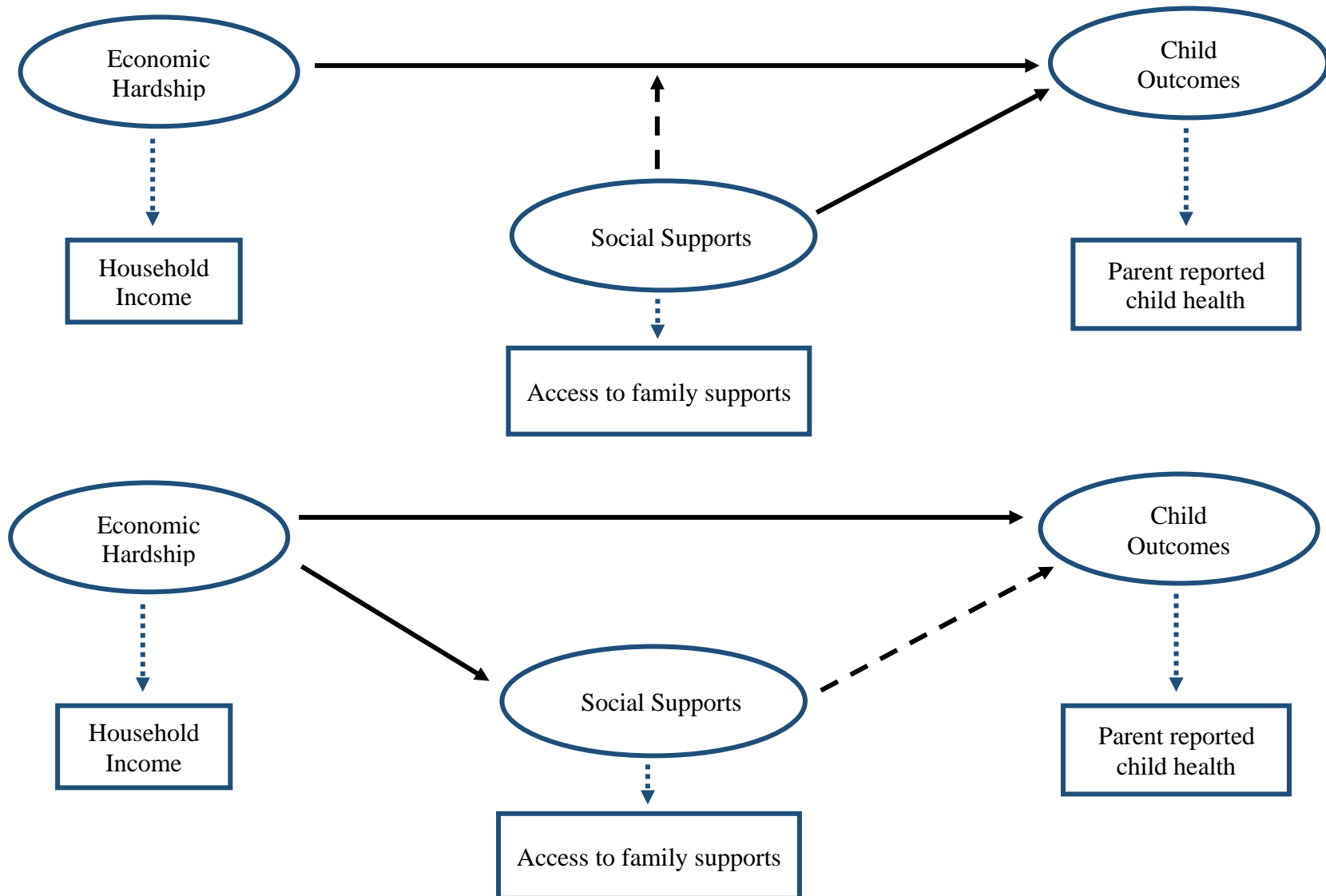
Numerous studies have demonstrated the association between socioeconomic status and child health (Cohen, Janicki-Deverts, Chen, & Matthews, 2010). However, as Bradley (2002) observed, it is not yet known if access to family supports acts as a protective factor between this association. In this study, the social support construct used within the Family Stress model has been modified and will be termed family supports, to better align with the Toddler Development Instrument questionnaire. Family supports will be a term used to include an array of services and resources for families and their children, such as recreation centres, childcare centres and community programs. A study by McConnell, Breitkreuz, & Savage (2013) found that in their sample of parents in Alberta, Canada, there was evidence to suggest that increased use of family

supports was associated with lower levels of parenting stress (McConnell et al., 2013). They emphasized the importance of further studying this relationship and hypothesized that the demand for family supports will likely increase, due to parents' continuous struggle of balancing work and family life in the modern day (McConnell et al., 2013). Furthermore, the normalization of the double income household leaves caregivers less time to utilize family supports and engage in informal social interactions and relationships, which can consequently leave them with decreased support from peers and less exposure to evidence-based parental training interventions (McConnell et al., 2013). Therefore, ensuring that parents are able to access family supports will benefit both their health and their child's through various pathways, as described in this study using the Family Stress Model (McConnell et al., 2013).

Research Purpose

The purpose of this study is to analyze data that has been collected from a survey completed by parents of toddlers, regarding the pathway and associations between household income, child health and access to family supports. The analysis was conducted to test hypothesis from a modified Family Stress Model (see Figure 1). Specifically, I will examine the relationship between SES and child health. Additionally, I aim to contribute to an understanding of the various pathways through which access to family supports can affect children's health, while testing if access to these support services also has the potential to modify or mediate the relationship between economic hardship and child health.

Figure 1. Conceptual Model adapted from the Family Stress Model by Masarik & Conger (2017)



Note: As indicated by the solid black lines, economic hardship and social support have direct positive relationships with child health. Social support has a positive mediation and moderation effect on child health, as indicated by the dotted black lines. This model has been adapted and excluded some of the concepts contained in the full model by Masarik & Conger (2017).

Chapter 2: Literature Review

Conceptual Model

The Family Stress Model

The Family Stress Model, as proposed by Masarik & Conger (2017) is being used as the conceptual model underlying this study. The Family Stress Model is based in stress theory and the “spillover hypothesis”, which hypothesizes that stress from relationships between family members, such as caregivers, can “spill” into other familial relationships, such as the parent child relationship (Zhang, Krishnakumar, & Narine, 2020). Consequently, this can result in psychological and physical health problems as a result of this stress in not only the caregiver, but also the child (Zhang et al., 2020). This model is an important framework for understanding how children’s environmental and economic stressors affect their development and wellbeing through various processes (Masarik & Conger, 2017). The model proposes that economic hardships, which can be classified by measures such as low family income and negative financial events, create economic pressures. These economic pressures can negatively affect parenting practices and parental well-being. For example, economic pressures may result in the development or exacerbation of psychological distress in parents, which may cause a reduction quantity and quality of time spent with their child. Psychological distress may generate other negative effects for children, such as intermarital conflict, contributing to stress felt by the child (Masarik & Conger, 2017). For example, studies have found that children have a significantly higher probability of developing an anxiety disorder if their mother has an anxiety disorder (Newland et al., 2013). Additionally, higher rates of parental depression have been found to be associated with lower SES, which can affect child health since children of mothers with depression have been found to be less likely to access appropriate health care (Cohen et al., 2010).

Past research has supported the relationships proposed in the Family Stress Model, finding that parental economic stress is linked to parental depression and other psychological problems, insensitive and unsupportive parenting practices, reductions in the quality and quantity of time spent with their children and less time spent engaging in social and cognitive activities with their children (Masarik & Conger, 2017). A longitudinal study of 422 families, applying the Family Stress Model, found that economic stress was associated with increased prevalence of depressive symptoms and conflict among caregivers, which ultimately had a negative impact on child outcomes (Landers-Potts et al., 2015). Past research recognizes the importance of studying

the processes through which the components of the Family Stress Model interact and how they promote or inhibit healthy child outcomes and development (Landers-Potts et al., 2015).

Since much of the past research has focused on families with older, adolescent children, there is a recognized need for applications of the Family Stress Model amidst families with younger children (Masarik & Conger, 2017). Masarik and Conger (2017) and Newland et al. (2013) also advocated for more research to be done on potential moderators that may protect or contribute to the family stress process, which may help in identifying risk factors that can be targeted through appropriate child and family interventions.

Economic Hardship

The concept of capital, which represents resources and assets, is considered by psychologists to best represent the idea and concept of socioeconomic status (Bradley & Corwyn, 2001). As described by Conger (2010), SES is a “construct that captures various dimensions of social position, including prestige, power, and economic well-being”. Socioeconomic status can be measured in a variety of ways in research, but the most common measures of SES are through quantification of family income, parental education and occupational status (Bradley & Corwyn, 2001). These measures are recognized to be “interrelated but not fully overlapping”, as they have comparable correlations with outcomes (Adler et al., 1994; Bradley & Corwyn, 2002). Adler (1994) recognized that although it is commonly understood that SES is associated with child health, it is a variable that is often controlled for rather than measured and, when it is measured, it is usually only measured in terms of poverty-level SES or is dichotomized into a poverty vs non-poverty measure. This study will address this gap by including all levels of SES so that a graded relationship along the continuum between SES and child health can be examined.

Research has shown that SES affects health and well-being on multiple levels through various pathways (Bradley & Corwyn, 2001). Many of those pathways bridge one’s societal economic position (SES) to material and social resources (Bradley & Corwyn, 2001). This is because capital, or SES, can directly determine access to other forms of capital, such as financial capital (material resources), social capital (social connections) and human capital (nonmaterial resources, such as education) (Bradley & Corwyn, 2001). Through these access mechanisms, SES is able to impact well-being through birth into adulthood (Bradley & Corwyn, 2001).

Newland et al. (2013) recognizes that most studies exploring the Family Stress Model use a measure of income or economic hardship from a single point in time or averaged across the span of the investigation. Since this study uses a cross sectional study design, household income was collected at a single point in time during survey collection. In this study, '*parental education level*' was chosen as a control because socioeconomic status is commonly measured in health research using either household income or parental education level (Bradley & Corwyn, 2002). Gershoff et al. (2007) also recognized that parental education level has been identified as a common predictor of both household income and child health. Since household income level is our chosen method of measuring socioeconomic status, as a way to measure capital, this model controlled for parental education level.

Economic hardship and child outcomes

It has long been recognized that socioeconomic status has been associated with health (Adler et al., 1995). This social gradient in health describes the phenomenon where individuals who are of a lower socioeconomic status have worse health (Institute of Health Equity, 2021). Childhood exposure to stresses associated with being in a low-income family has been shown to have long-term consequences on mental health, physical health and cognitive development (Morris et al., 2017). A commonly cited example of how SES can affect health is the Whitehall study (Marmot et al., 1984). The Whitehall study examined health outcomes for a large sample of British civil servants over the course of ten years (Marmot et al., 1984). This longitudinal study added to previous research, which has provided evidence that "the association of SES and health occurs at every level of the SES hierarchy, not simply below the threshold of poverty." (Adler et al., 1994; Marmot et al., 1984).

Socioeconomic status (SES) exposures during childhood are powerful predictors of adult cardiovascular morbidity, cardiovascular mortality, all-cause mortality, and mortality due to a range of specific causes (Cohen et al., 2010). Cohen et al. (2010) reviewed some of the pathways linking SES to child health and explored which health outcomes are influenced by childhood SES. In their review, they found that those who had a lower SES during childhood were at an increased risk of all-cause premature mortality compared to those who had a higher SES during childhood, regardless of their SES in adulthood (Cohen et al., 2010). For instance, men who had a lower SES during childhood had a greater risk of dying due to unintentional injuries, nervous

system conditions and alcohol cirrhosis (Cohen et al., 2010). Another study by Chen et al. (2004) used cross-sectional household survey data in the United States (n=33,911) to determine if childhood health disparities are influenced most by SES status, race or a combination of the two. They found that for the average aged child in their sample (9 years old), who has a low SES status, has a life expectancy that is about six years less than a child of the same age from a high SES household (Chen, 2004). These results demonstrate that childhood SES can act as a powerful predictor of not only childhood health, but also adult health outcomes.

Although the Family Stress Model can illustrate how economic hardship may affect health, there are various pathways through which this effect may occur (Chen, Martin, & Matthews, 2006; Cohen et al., 2010). These pathways have been presented in literature, which attempt to explain the relationship between SES and health. One important explanation for this relationship involves access to resources. For example, children from low SES households are less likely to access and receive preventative and necessary health care from health care professionals (Cohen et al., 2010). Chen (2006) witnessed this relationship in a study examining the role of SES on child health, where they found that children in low SES households are significantly less likely to visit the doctor and receive their vaccinations, compared to children in high SES households. This may result in an increase in health problems and risk for disease later in life (Chen et al., 2006; Cohen et al., 2010). An additional access barrier experienced by low SES households is limited access to healthy and cognitively stimulating environments (Cohen et al., 2010; Evans & Kim, 2013). This relationship can be explained using the Parent Investment model, which argues that family income often controls how parents decide to allocate their resources (Gershoff, Aber, Raver, & Lennon, 2007). For example, children living in poverty and lower SES households may have limited availability and a limited income to allocate towards important developmental resources, such as educational resources, age-appropriate toys and community and social supports (Evans & Kim, 2013, Gershoff et al., 2007).

Limited access to resources for children living in poverty includes not only physical resources but also resources such as time, energy and support (Gershoff et al., 2007). The Parent Investment model suggests that parents within a low SES household are more often limited in both the time and money they're able to invest in their children, which can inhibit healthy developmental outcomes (Gershoff et al., 2007). For example, it has been found that children in poverty often have increased exposure to television screens and spend less time reading with

their caregivers (Evans & Kim, 2013). Therefore, families in a low SES household are more limited in the time that they're able to spend with their children, which can negatively impact their child's lifelong cognitive skills and behaviors (Gershoff et al., 2007).

Another proposed pathway through which SES is related to child health is through the physical environment (Cohen et al., 2010). A child's physical environment can include their home environment and, on a larger scale, their neighborhood, school and community. The physical and social characteristics of communities are important, as they can promote or dissuade healthy child behaviors and development (Marmot, 2012). Within the home environment, children living in poverty may be at increased risk to a range of harmful environmental exposures, such as higher radon and lead levels, tobacco smoke, maternal depression, exposure to violence and a lack of healthy nutritional options (Cohen et al., 2010; Evans & Kim, 2013). Within the community environment, lower income children may have limited access to safe outdoor recreational facilities, good air quality and good schools, exposing them to increased risk of poor health outcomes (Cohen et al., 2010).

The biological pathway through which SES influences health is related to the Family Stress Model. Similar to the Family Stress Model, this pathway suggests that increased exposure to stressors in childhood can strain and damage children's biological and psychological systems (Evans & Kim, 2013). Past research has shown that lower socioeconomic status is related to higher levels of stress (Chen, 2004). This stress can manifest through physiological symptoms, increasing risk of disease and mortality (Chen, 2004). Compared to children in higher SES households, lower-income children show increased levels of sympathetic nervous system activity (higher blood pressure), dysregulated metabolic activity and inflammation (elevated cytokines) (Evans & Kim, 2013). Moreover, a decrease in family SES status is associated with an increase in conflict, neglectful relationships and inconsistent parenting, exposing the child to elevated risk of psychological and social dysfunction (Cohen et al., 2010). Chronic exposure to household stressors can create psychological stress in a child, putting them at increased risk for mental health disorders, such as anxiety and depression (Evans & Kim, 2013). Similar to the associations seen within physical environments, an increase in exposure to these psychosocial characteristics have been found to be associated with an increased risk of poor health and disease (Cohen et al., 2010). This could be attributed to the impact these psychosocial exposures have on children's psychological well-being and stress levels (Cohen et al., 2010).

Lastly, SES can influence the parent-child relationship by influencing their interactions. Lower income parents are more likely to use harsher discipline methods and engage less with their children (Evans & Kim, 2013). In a paper reviewing the relationship between SES and child health, Chen et al. (2004) explored the idea that the relationship between SES and health is most important during early childhood and weaken with age. Using the childhood limited model, it's argued that the link between SES and health are strongest during early childhood, when factors such as parental attachment, quality of childcare and housing conditions during this age are especially critical for development and lifelong trajectories (Chen, 2004).

Given that SES has been found to have a gradient effect on children's short and long-term health, Chen (2004) called for more research that study the societal level variables, family level variables and individual level variables, which may contribute to or mediate this relationship. Exploration into these factors is especially crucial for young children, where interventions can be targeted at an early age to promote lifelong health and well-being (Chen, 2004).

Family Supports

Perceived social support

The Family Stress Model states that there are risk or protective factors, which can modify the relationships between each model construct (Cohen et al., 2010). One of these protective factors is access to family supports, which has the ability to mitigate the effects of risk factors associated with economic hardships (Heberle, Krill, Briggs-Gowan, & Carter, 2015). Family supports include social supports, community supports and resources. With no official definition of social support, there are many different ways in which perceived social support is measured in research, which also may vary by context and discipline (Williams, Barclay, & Schmied, 2004). Morris et al (2017) clarified that "Social support is frequently conceptualized as having three primary components: sources of support (e.g., family, friends, partners, colleagues), types of support (i.e., emotional, appraisal, information, and instrumental), and the perceived quantity and/or quality of support". Social support can be further broken down into its structural and functional components (Gottlieb & Bergen, 2010; Morris et al., 2017). The functional components include emotional supports, instrumental supports (e.g., material needs) and informational assistance (e.g., advice from others) (Gottlieb & Bergen, 2010; Morris et al.,

2017). The structural components of social support consist of social connections with neighbors, friends, family and the community (Morris et al., 2017). This study focuses on both the access to supports that facilitate family's functional and structural supports, such as access to family resources, and the social support that parents consequently receive from accessing these resources.

The measurement of social support within research is commonly based on self-report, using surveys or interviews (Morris et al., 2017). Since each one person may have different personal meaning attached to the definition of social support, there is evidence to support that one's perceived social support may be more meaningful than their actual received level of social support when measuring outcomes (Sarason, Sarason, Shearin, & Pierce, 1987). Whether or not they are receiving less or more than the social support they feel they require may actually tell us more than strictly studying the concrete number of services and supports they are receiving (Sarason et al., 1987).

Social support and child outcomes

It is well recognized that human beings have a fundamental need for social interaction and belonging to a social group (Balaji et al., 2007). These social interactions and groups provide us with social connections, which can create meaningful relationships and support (Balaji et al., 2007). There has been an increasing interest in the role of access and use of social supports as a coping resource for stress for families (Armstrong, Birnie-Lefcovitch, & Ungar, 2005; Zimet, Dahlem, Zimet, & Farley, 1988). Stress mediators and coping resources are important because they can mitigate and support resiliency against stress and the adverse reactions associated with stress (Armstrong et al., 2005; Marmot, 2012). Informal social interactions through social support programs and community-based family supports can act as stress mediators, as they provide important opportunities for parents to interact and connect with other caregivers, while receiving both emotional and mental support (McConnell et al., 2013). Since more families are now living in a household where both parents are working, and potentially working longer hours, it may be more challenging for parents to find the time to receive support through interactions with other caregivers and community members (McConnell et al., 2013). Regular access to family-based services and programs supports parent and child well-being by increasing access to parental adaptive and supportive services (McConnell et al., 2013). Alternatively, limited access to

adaptive resources has shown to have detrimental effects on both parent and children health (McConnell et al., 2013). This can result in increased levels of parental stress, conflicts and harmful parenting habits, which ultimately effects the health of the child (McConnell et al., 2013). For example, low maternal social support has been significantly associated with perinatal complications, low birth weight, higher levels of post-natal depression, higher levels of parental stress and poorer child developmental outcomes (McConnell et al., 2011).

Morris et al. (2017) proposes that parental and child support programs that promote nurturing and stable relationships that support caregivers “can have a significant and positive impact on the development of at-risk children”. They propose that family supports impact parental and child well-being through two primary pathways: by strengthening parents social support and by increasing positive parent-child interactions (Morris et al., 2017). Strengthening parents’ social support by increasing their social network, which consists of their connections with the community and others, has been associated with decreased rates of maternal depression, a decrease in parental stress and higher maternal-child responsiveness (Morris et al., 2017). Encouraging parents to connect with other parents allows them to provide each other with informal support through the normalization of parental experiences, sharing of advice and ideas and increasing parental self-efficacy (Armstrong et al., 2005; McConnell et al., 2013). In turn, this can help to decrease parental stress and improve parenting practices, which supports healthy parental-child interactions (McConnell et al., 2013).

As Morris et al. (2017) explains, children rely on early positive parent-child interactions since “the development of adaptive biobehavioral responses to stress is dependent on the presence of nurturing relationships in infancy and early childhood”. Morris et al (2017) emphasizes that services and interventions that promote parental resilience to stress and strengthen the parent-child relationship “have the potential to yield long-term gains in social and emotional development, particularly in children at risk because of poverty and toxic stress”. Therefore, not only do caregivers benefit from increased social support, but so do their children.

Social support theory supports two main models through which social support can influence health, the main effect model and the buffering model (Armstrong, Birnie-Lefcovitch, & Ungar, 2005). The main effect model states that “social support has a beneficial effect on well-being, whether or not the person is under stress”. The buffering model proposes that “social support protects individuals from the potentially harmful effects of stressful events” and can

positively influence health outcomes (Armstrong et al., 2005). Many studies have tested this theory by studying both the main effect and buffering effects of social support on well-being (McConnell et al., 2011). The study done by McConnell et al. (2011), “*From financial hardship to child difficulties: main and moderating effects of perceived social support*”, examined the stress buffering effects of parent’s perceived social support in a sample of families from Alberta, BC. Although this study found that there was no statistically significant moderation effect, their study found that the relationship between SES and child outcomes were mediated by both parental stress and financial hardship (McConnell et al., 2011). Additionally, they found that higher levels of perceived social support were significantly associated with lower levels of parenting stress and difficult child behavior, regardless of family socioeconomic status (McConnell et al., 2011). They concluded that social support is crucial for caregiver’s and children’s well-being and that “highly stressed parents are more likely to report positive interactions with their children when they perceive higher levels of social support”. Therefore, by increasing positive parental-child interactions through social supports, you are positively influencing the health of both the parents and the child. It is further suggested that it is crucial to review parental satisfaction with social services within communities to ensure that the social services are meeting the parent’s needs and supporting theirs and their child’s health (McConnell et al., 2013).

Models that contain mediation and moderation effects on relationships can work together to deepen the understanding of variable relationships (Bradley & Corwyn, 2001). As Bradley & Corwyn (2001) recognize in their review, “mediator models are concerned with a process through which SES operates to influence children’s development [and] moderator models are concerned with the conditions in which the process operates”. Looking at both processes provide valuable insight as, “the discovery of a moderator often provides clues regarding a mediating process that underlies the relation between a predictor and outcome variable” (Bradley & Corwyn, 2011). Therefore, both mediation and moderation effects will be tested in this study to uncover pathways through which socioeconomic status and access to family supports may work to influence child health.

Child Outcomes

Measurements of child health

There have been changes in the types of measurements used to assess health (Ravens-Sieberer et al., 2009). Rather than typical clinical measures of health, such as laboratory measures, self-perceived or global measures of health has become a meaningful indicator to measure how one feels in all components of wellness, which includes one's subjective feelings of physical, psychological, social, behavioural and emotional health and well-being (Ravens-Sieberer et al., 2009). Furthermore, it considers more contextual factors of health, such as one's subjective experience of dealing with health issues and experiences accessing health care and other services being (Ravens-Sieberer et al., 2009). Many scales which include the measurement of child health uses proxy informants, which is when parents report their perceptions of the health status of their child (Jokovic, Locker, & Guyatt, 2004). Although it is recognized that the parent perspective of their child's health is important, it must also be recognized that their knowledge of their child can sometimes be limited, especially in regard to older children who participate in more activities and relationships external to the home (Jokovic et al., 2004). A study by Jokovic et al. (2004) found that even in instances where a child is available to self-report on their health, the perspective and reporting from their parent's is useful and can help to inform health care decisions with respect to the child. This study will be using parents and caregivers as proxy informants, as toddlers are too young to self-report on their own health.

Summary of the Literature

The first years of a child's life are a critical time for influencing a child's long-term health and development (Shahraki, Agheli, Arani, Sadeqi, & Ghaderi, 2018). Children living in low socioeconomic households encounter a wider variety of disparities and disadvantages related to their health, cognitive development and access to resources, compared to their peers living in higher socioeconomic households (Newland et al., 2013). The Family Stress Model provides us with a conceptual model through which we can begin to understand the various processes and pathways of how economic hardship and access to social supports can affect child health (Masarik & Conger, 2017).

Although numerous studies have focused on the association between main pathways in the Family Stress Model, less research has been devoted to understanding the effect that

predictors, mediators and moderators have on these associations (McConnell et al., 2013). One important question asked by McConnell et al. (2013) is, “who is benefitting from family supports and conversely, who is not?”. This study will attempt to answer this question by first observing the direct effects of the relationships between SES, child health and family supports and then by examining the mediating or moderating effect that access to family supports has with regard to this relationship. Studying the effects of these relationships on such a young age group is important since, according to the timing model, factors related to socioeconomic status have the largest impact on health during developmental periods, such as during infancy (Morris et al., 2017).

Research Questions and Hypothesis

In this study, the following research questions will be addressed:

1. What is the association between household income and parent-reported child health, controlling for child sex and parental education level?
2. What is the association between perceived access to family supports and child health, controlling for household income, child sex and parental education level?
3. Does perceived access to family supports modify the relationship between household income and child health?
4. Does perceived access to family supports mediate the relationship between household income and child health?

The hypotheses associated with these research questions are as follows (see Figure 1 for the conceptual model tested in this study):

1. There is a statistically significant positive association between household income and parent-reported child health, controlling for child sex and parental education level
2. There is a statistically significant positive association between access to family supports and child health, when controlling for household income, child sex and parental education level
3. Perceived access to family supports significantly modifies the association between household income and child health

4. Perceived access to family supports has a statistically significant mediation effect on the relationship between household income and child health

Chapter 3: Methods

Research Design

This study was a secondary data analysis, which utilized a descriptive correlational study design from a cross-sectional dataset, the TDI, to ask our research questions.

Sample

Data from the 2017-2020 Toddler Development Instrument Pilot, conducted by the Human Early Learning Partnership (HELP) at the University of British Columbia (UBC), was used for this study. Convenience sampling was used, with participant eligibility being a parent or caregiver from one of the participating communities, with a toddler aged 12-24 months of age. The Toddler Development Instrument survey was created with an aim to collect reliable and valid data on the early experiences and environments of children, their caregivers, and their families. The TDI includes questions about family, home and community environments, early physical, cognitive, social, and emotional development, as well as the supports and barriers families experience within these environments, in an effort to capture the experiences and outcomes of children and their families. Data collection for the TDI involved the Human Early Learning Partnership collaborating with a variety of communities across British Columbia to pilot the implementation of the questionnaire.

Prior to this study's analysis, the data was cleaned and any children outside of the required age range (12-24 months) were excluded from the analysis. Additionally, any surveys completed outside of the pilot communities were removed. This resulted in a total sample size of 803 surveys with children from five different communities across BC. These communities were diverse, with a variety of urban, rural and coastal communities. The mean child age from the sample was 17 months, with 46% children being identified as female and 54% of children being identified as male. More details regarding the demographic characteristics of study participants can be found in Table 2.

Data Collection Procedures

The Toddler Development Instrument was completed by parents or caregivers from the pilot communities either on paper or online. Overall, 65% of the surveys were completed online and 35% of the surveys were completed on paper. When approached, parents and caregivers were informed that the survey was completely voluntary and would take approximately 15

minutes in length. Surveys were completed by parents both from online at home, or on paper at early years services and programs such as immunization clinics, community centers and childcare centers. Each community facilitated the data collection process in different ways, depending on their preferences and characteristics of families within their community. For example, some communities approached parents with a hardcopy of the TDI survey to complete while they were participating in community services and programs, while other communities distributed bookmarks with the TDI information and link to the survey for parents to complete at home. Upon completion of the TDI, parents were entered in draws to win gift cards for grocery stores within each of the communities.

Access to Data

Data for this study was accessed through Population Data BC's secure access server. Prior to being granted access, completion of the Tri-Council Policy Statement 2 course and study approval from the UBC Behavioural Research Ethics Board were required. To gain access to Population Data BC's secure access server, users must be approved and receive a USB from Population BC, where their fingerprint is used to gain access into the server. All personal identifiers from the survey were removed from the dataset and data was only to be extracted from the server if it was reporting on group-level data (*i.e.* no cell counts under 5). All statistical analysis for this study was completed from within Population Data BC's secure access server.

Ethical Considerations

UBC *Behavioural Research Ethics Board* approval was granted for this study. As this study was a secondary data analysis using data collected in a previous project, there were no known risks or benefits to participants participating in this study or the original TDI pilot study.

Measures

The Toddler Development Instrument (TDI) was developed at the Human Early Learning Partnership (HELP) in 2017, with a newer version of the survey finalized later in 2019. The questionnaire consists of 39 questions related to child health and well-being, early social experiences, caregiver well-being, family support and community resources. Most survey questions were extracted from existing Canadian research tools, including the National

Longitudinal Survey on Children and Youth (Human Resources Development Canada, 1996; Statistics Canada, 1997) and the Quebec Longitudinal Study of Child Development (Institut de la statistique du Quebec, 2019).

Since only 3% of survey respondents were neither the mother or father of the child, the term “parent” will be used to include both parent and non-parent respondents in this study.

Validation of Self-Construct

As two of the variables included in this study are self-reported (i.e., parental reported child health and self-reported access to family supports), it is important to address and discuss the validity of self-construct variables in research. Self-construct may be defined as “our perceptions of ourselves; it is our attitudes, feelings and knowledge about our abilities, skills, appearance and social acceptability” and how our perceptions of ourselves is fabricated by our environments (Byrne, 1984). Construct validation of self-construct within a field requires studies to be conducted using methods, such as structural equation modelling (Byrne, 1984). The self-construct variables used in this study have been taken from widely used questionnaires, such as the National Longitudinal Survey on Children and Youth (Statistics Canada, 1997), which have been validated.

Economic Hardship- Household income

The TDI, asked respondents “*Which of the following is the best estimate of your overall household income last year, before taxes?*”. Consistent with literature, household income was used in this study to represent the economic hardship variable in the Family Stress Model (Masarik & Conger, 2017).

Responses to self-reported household income were measured on a 7-point scale with the following categories:

1. *Under \$20,000*
2. *\$20,000 to \$49,999*
3. *\$50,000 to \$74,999*
4. *\$75,000 to \$99,999*
5. *\$100,000 to \$149,999*
6. *\$150,000 to \$199,999*

7. \$200,000 or more

The TDI has various measures that could be used to measure financial hardship, including the question asking, “*How often do you experience any financial difficulties associated with raising this child/your family?*”. Post-analysis, a binary logistic regression was also conducted on this question, but it produced a statistically insignificant association between child health and self-reported financial difficulties.

Access to Family Supports

As the Family Stress Model illustrates, there are certain protective factors which can dampen or strengthen the family stress process (Conger & Masarik, 2017). One of these factors is access to family supports, which has been shown to be associated with both parental stress and child outcomes (Masarik & Conger, 2017). This study measures access to family supports by asking parents to self-report their access to family supports, such as playgrounds, playgroups, recreation facilities and other community resources. Since this project collected surveys from families living in both rural and urban communities across British Columbia, which may have differences in the access and availability of family supports, communities were regressed against the access to family supports variable to ensure that there were no statistically significant differences in access to resources across communities. The association between community and access to family supports was found to not be statistically significant, indicating that there are no significant differences in access to family supports between communities included in the data. Therefore, location was not controlled for within our model.

Sourced from the National Longitudinal Survey of Children and Youth (Cycle 8 Survey Instruments, 2008/2009), the TDI asks respondents, “*How would you rate the overall access to child/family resources in your community (e.g. playground, playgroup, child museum, gym, swimming pool, music/story group)?*”. Responses were measured on a 5-point scale with the following categories:

1. *Excellent*
2. *Very good*
3. *Good*
4. *Fair*

5. *Poor*

Child Health

The child health question on the TDI was sourced from the Canadian Health Survey on Children and Youth (Statistics Canada, 2020). As the children in this study are too young to rate their own health, proxy informants were used. In this case, the parents and caregivers were asked to report their perceptions of the child's health. The question asks parents "*In general, how is this child's health?*" and rates the answers on a 5-point response scale from *excellent, very good, good, fair* and *poor*.

This study used child health as our indicator of child outcomes. This variable was dichotomized into two categories, 1=*Good or less* health and 2=*Very good/excellent* health. These categories and cut-offs were chosen as the data had a strong negative skew, with 34% of parents reporting their child health as '*excellent*', and 2% of parents reporting their child's health as '*poor*' (see full *child health* 5-point scale distribution in Appendix B). With highly skewed variables, there is little information that can be modeled at one end of the distribution. Therefore, dichotomization allowed us to provide sufficient information for all valid data values.

Control Variables

Control variables in the model included '*child sex*' and '*parental education level*'. Taken from the Canadian Community Health Survey (CCHS, 2011-2012), the TDI survey asked about the highest parental education level in the household, with 8 responses ranging from '*less than high school completion*' to '*graduate or professional degree*'. Child sex was measured as 0=*male* and 1=*female*.

Data Analysis Procedure

Logistic Regression

Prior to data analysis, means plots with 95% confidence interval and error bars were graphed between the dependent variable and each of the independent variables to explore relationships. Next, descriptive statistics (frequencies and measures of central tendency, distributions) were examined to inspect characteristics of the key study variables. The purpose of examining the error bar plots was to ensure that there was not a large amount of error associated with the variable relationship and to flag any noteworthy data patterns, skews or abnormalities.

The data was analyzed in IBM SPSS (V.26). Hierarchical binary logistic regression was used to answer the research questions, using the binary dependent variable, child health. An alpha of 0.05 was used as the criterion for determining statistical significance. When conducting the analysis in a hierarchical fashion, the order of the blocks (see Table 1) was determined by aligning our research questions with our conceptual model, the Family Stress Model. Each additional variable that was added into the model was included as a new block into our analysis structure. Four models were run (as seen in Table 1), and the order of analysis aligns with the order of the research questions and hypothesis.

Testing Main Effects

The first two models tested the first and second research questions, examining the main effects of household income and access to family supports on child health. The logistic regression analysis structure for these analyses is displayed in Table 1.

Testing Moderation & Mediation

The third research question asks, “How does the perceived access to family supports modify the relationship between household income and child health?”. Here, I tested whether there is presence of effect modification with the addition of our moderating variable, access to family supports. A moderating variable is a variable which influences the relationship between a primary predictor variable and the dependent variable (McConnell, 2011). This variable may or may not cause a statistically significant change in association when it is added into the model. The moderating effect was tested by adding an interaction term (household income x access to family support services) into the full model, after the access to family supports variable. To answer the fourth research question, “Does access family supports mediate the relationship between household income and child health?”, mediation effects were tested using the PROCESS Macro extension (V3.4) within SPSS, and by adding the ‘access to family supports’ variable as the mediator.

Table 1. Hierarchical Binary Logistic regression analysis structure

Research Question	Block 1	Block 2	Block 3	DV
1) What is the association between household income and parent-reported child health, controlling for child sex and parental education level?	Parental education, child sex	Household income	N/A	Child health
2) What is the association between perceived access to family supports and child health, controlling for household income, child sex and parental education level?	Parental education, child sex	Household income	Access to family supports	Child health
3) Does perceived access to family supports modify the relationship between household income and child health?	Parental education, child sex	Household income	Moderation effect: Household income*access to family supports	Child health
4) Does perceived access to family supports mediate the relationship between household income and child health?	Parental education, child sex	Logistic regression path analysis modelling was used with PROCESS Macro		Child health

Chapter 4: Results

This chapter presents descriptive statistics for the sample and key study variables, and findings that answer the four research questions. I examined the relationships between household income, access to family supports and child health, while controlling for child sex and parental education. I also tested whether access to family supports has a statistically significant mediation and/or moderation effect on the relationship between income and child health. The study findings are presented below, in order of each research question.

Descriptive Statistics

The demographic characteristics of the study sample are displayed in Table 2 and the descriptive statistics of key study variables are shown in Table 3.

Table 2.
Demographic characteristics of study participants (N=803)

<i>Characteristic</i>	<i>N (%)</i>	<i>M (SD)</i>
Relationship to child		
Mother	714 (89%)	-
Father	68 (8%)	-
Other	21 (3%)	-
Parental Education level		
Less than high school completion	15 (2%)	-
High school completion (or equivalent)	75 (9%)	-
Some post-secondary education	71 (9%)	-
Post-secondary certification or diploma	226 (28%)	-
Undergraduate degree	222 (28%)	-
Graduate or professional degree	194 (24%)	-
Child Age (months)	-	17.2 (3.9)
Child Sex		
Male	367 (46%)	-
Female	436 (54%)	-

Table 3.
Descriptive statistics for key predictors, controls and child health (N=803)

<i>Predictors</i>	<i>N (%)</i>
Household Income	
Under \$20,000	35 (4%)
\$20,000 to \$49,999	137 (17%)
\$50,000 to \$74,999	175 (22%)
\$75,000 to \$99,999	162 (20%)
\$100,000 to \$149,999	198 (25%)
\$150,000 to \$199,999	79 (10%)
\$200,000 or more	17 (2%)
Access to Family Supports	
Poor	16 (2%)
Fair	53 (7%)
Good	183 (23%)
Very good	275 (34%)
Excellent	276 (34%)
Outcome Variable	
Child health	
Good or less	61 (8%)
Very good/excellent	742 (92%)

Hierarchical Binary Logistic Regression

Hierarchical binary logistic regression was used to test the first two research questions. The assumptions associated with binary logistic regression were tested and plotted prior to data analysis.

Absence of Multicollinearity: When predictors are too highly correlated, this results in multicollinearity, which can reduce the precision of the estimate coefficients and the power of the model. This assumption was tested using SPSS multiple regression collinearity diagnostics procedure, using the guideline that a Variance Inflation Factor (VIF) greater than 10 and a tolerance value $<.1$ are indicators for multicollinearity. All variables included in our model had a VIF factor <10 and tolerance values $>.1$. Therefore, the model satisfies the multicollinearity assumption for logistic regression.

Independence of cases: The independence of cases assumption states that cases of data should not be related, as this can result in overdispersion. This assumption is satisfied as our data cases are not related. This was a cross-sectional study design, so data was only taken at one point in time and all observations are independent.

Linearity: Logistic regression assumes that there is a linear relationship between any continuous predictors and the logit of the outcome variable. Each analysis was examined for outliers. When examining the saved standardized residual Z scores, there were found to be a few outliers with a Z score below -2.5 . It was hypothesized that these outliers are due to the skewed distribution of child health scores between the two categories. In this case, the outliers were kept in the analysis, as they accounted for just over 5% of total cases. To further check for outliers and their influence on the analysis, Cook's distance scores were examined. All scores were <1 , indicating that the outliers did not have a significant effect on the model.

Minimum Cell Counts

The guideline set by Field (2009), which follows the goodness-of-fit test in logistic regression, outlines that the expected frequencies in each cell of the cross-tabulation table should be greater than 1 and no more than 20% are less than 5. Using the SPSS crosstabs, all expected

cell frequencies were examined. It was found that all expected cell frequencies were greater than 1 and only 10% of the expected cells were less than 5, satisfying this assumption.

Logistic Regression Results

Logistic regression analysis results associated with each research question are displayed in Table 4.

Question 1: What is the association between household income and parent-reported child health, controlling for child sex and parental education level?

To test the first research question, I first entered the control variables, parental education and child sex, into the first block. The predictor variable, household income, was added, along with the dichotomous outcome variable, child health. Neither control variables were statistically significant predictors (Child sex, OR=1.16, 95% CI [.69, 1.95], $p=.58$]; Parental education, OR=.97, 95% CI [.79, 1.19], $p=.76$). In the second block, when household income was added, I observed that the goodness of fit test, the omnibus tests of model coefficients, had a statistically significant ‘step’ p-value ($X^2= 11.7$, $p=.001$), indicating that the model predicted the outcome significantly better than it did at the last step, when the model only contained the control variables. As hypothesized, household income was significantly associated with child health (OR= 1.39, 95% CI [1.15, 1.69], $p=.001$), when controlling for child sex and parental education.

Question 2: What is the association between perceived access to family supports and child health, controlling for household income, child sex and parental education level?

The second research question tested the association between self-reported access to family supports and child health. I hypothesized that there was a statistically significant association between access to family supports and child health, when controlling for household income. To test this hypothesis, I first entered the control variables, child sex and parental education into the first block, household income into the second block, and access to the family supports variable into the third block. Household income was added separately into its own block to test whether the addition of the access to family support variable significantly increases the predictive power of the model, compared to when only household income is in the model.

After running the binary logistic regression, the omnibus tests of model coefficients for our third block provided a statistically significant p-value ($p=.003$), indicating that the addition

of the access to family supports variable predicted the outcome variable, child health, significantly better than when only household income was in the model. Based on the model outputs, access to family supports was significantly associated with child health (OR= 1.46, 95% CI [1.15, 1.86], $p=.002$), when controlling for child sex, parental education and household income.

Question 3: Does perceived access to family supports modify the relationship between household income and child health?

The third research question tested whether the interaction term (household income*access to family supports significantly modified the association between household income and child health. For this research question, I hypothesized that access to family supports significantly modifies the association between household income and child health. After conducting a binary logistic regression, with the addition of the interaction term, I received a non-statistically significant result (OR= .94, $p=.46$). The omnibus test of model coefficients was also not significant ($p=.45$), meaning that the model with the interaction term did not significantly improve the predictiveness of our model.

Statistical Power

Determination of a required sample size to obtain enough statistical power to accurately detect relationships between variables is necessary prior to analysis (Bujang, Sa'At, Tg Abu Bakar Sidik, & Lim, 2018). To determine the minimum required sample size for this study, the recommendations by Bujang et al. (2018) of a minimum of 50 cases per predictor variable was used. This model used two predictor variables, which would require a sample size of 200 cases. Therefore, this study's sample size of 803 cases was determined to meet the requirements for statistical power.

Question 4: Does perceived access to family/community resources mediate the relationship between household income and child health?

To be able to test for a mediation effect, there must be established evidence of an association between the dependent and independent variables (Hayes, 2013). This analysis meets

this criterion, as there was found to be a statistically significant association between household income and child health, as displayed in Table 4.

To test for mediation, the Process Macro (Hayes, 2013) extension was downloaded (V3.4) and conducted in SPSS. The Process Macro is a path analysis modelling tool, which is used in health sciences for looking at direct and indirect effects in mediator models. In a simple mediation model, the direct effect component of the model tests the independent relationship, or effect size, that X has on Y. The indirect effect represents how Y is influenced by X through a causal sequence, where X influences M, which in turn influences Y. Essentially, mediation analysis allows us to “account for an effect” (Hayes, 2013). Therefore, the Process Macro extension allows users to easily test for mediation and moderation effects with single or multiple mediators/moderators.

As Hayes (2013) explains, in the PROCESS model, the “indirect effect quantifies how much two cases that differ by one unit on X are estimated to differ on Y as a result of X’s influence on M, which in turn influences Y”. This relationship is demonstrated in the mediation model in Figure 2, where the X variable represents household income, the X variable represents access to family supports and the Y variable represents our dichotomized child health measure.

The hypothesis for this research question was that access to family supports has a statistically significant mediation effect on the relationship between household income and child health, controlling for child sex and parental education level. In this model, the indirect effect, or mediation effect, is positive and statistically significant (1.03, CI 95% [1.01, 1.07]). Since the Process Macro extension uses a bootstrapping method to determine indirect effects, only a confidence interval is produced. This is because for indirect effects, confidence intervals provide the best estimates since, unlike p-values, they do not follow the strict assumptions of t-distributions (Hayes & Scharkow, 2013). Furthermore, Hayes & Scharkow (2013) found that bootstrapped confidence intervals are more likely to produce accurate results than any other method when testing for indirect effects, regardless of sample size.

As hypothesized, the model’s statistically significant confidence interval suggested that access to family supports mediated the relationship between household income and child health, when controlling for child sex and parental education level. Although the PROCESS model doesn’t provide a p-value for the indirect effects, statistical significance could be assumed, since

our confidence interval didn't include zero, which indicated that the indirect effect was statistically different from zero.

Table 4. Hierarchical binary logistic regression results

<i>Model #</i> <i>OR [95% CI, p value]</i>		Model 1	Model 2	Model 3	Model 4
<i>Controls</i>	Child's Sex	1.16 [.69, 1.95, p=.58]	1.23 [.72, 2.10, p=.44]	1.24 [.73, 2.12, p=.42]	1.24 [.73, 1.08, p=.43]
	Parental Education	.97 [.79, 1.19], p=.76	.88 [.71, 1.08, p=.22]	.88 [.71, 1.08, p=.23]	.87 [.71, 1.08, p=.21]
<i>Direct effects</i>	Household Income	1.39*** [1.15, 1.69, p=.001]	1.36** [1.12, 1.65, p=.002]	1.71 [.90, 3.27, p=.10]	1.35** [1.11, 1.64, p=.0024]
	Access to family supports	N/A	1.46** [1.15, 1.86, p=.002]	1.81 [.98, 3.36, p=.059]	N/A
	Household Income → Family supports	N/A	N/A	N/A	1.07* [1.02, 1.12, p=.004]
<i>Effect modification</i>	Household income*Access to family supports	N/A	N/A	.94 [.79, 1.11, p=.46]	N/A
<i>Mediation</i>	Mediation term	N/A	N/A	N/A	1.03* [1.01, 1.07]
	Nagelkerke Pseudo R2	.036	.062	.064	N/A

Note: CI= Confidence Interval. *= $p < .05$, **= $p < .01$, ***= $p < .001$

Figure 2: Conceptual model with results for Model 1

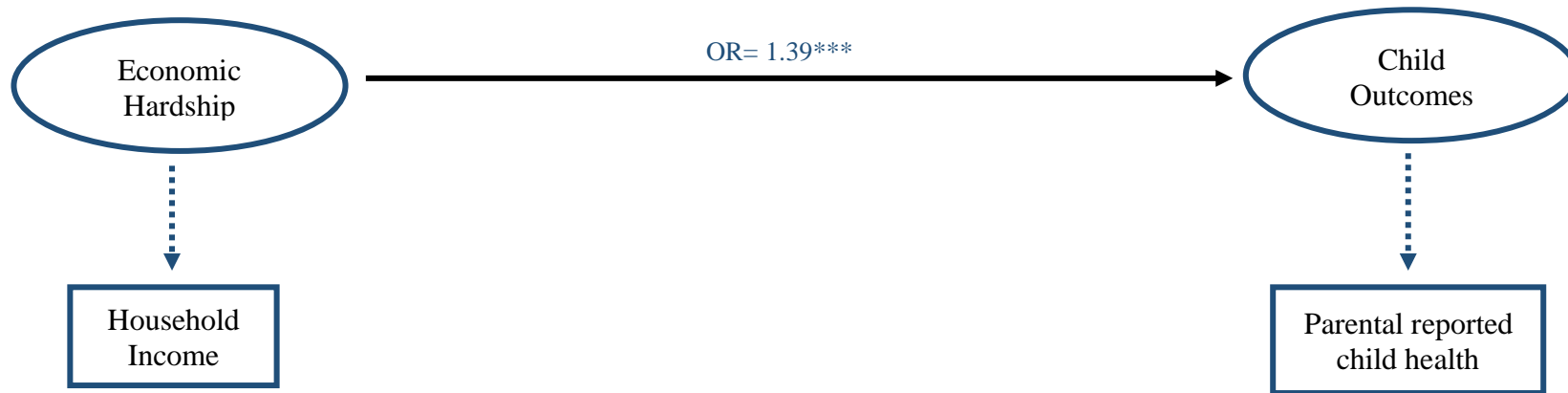
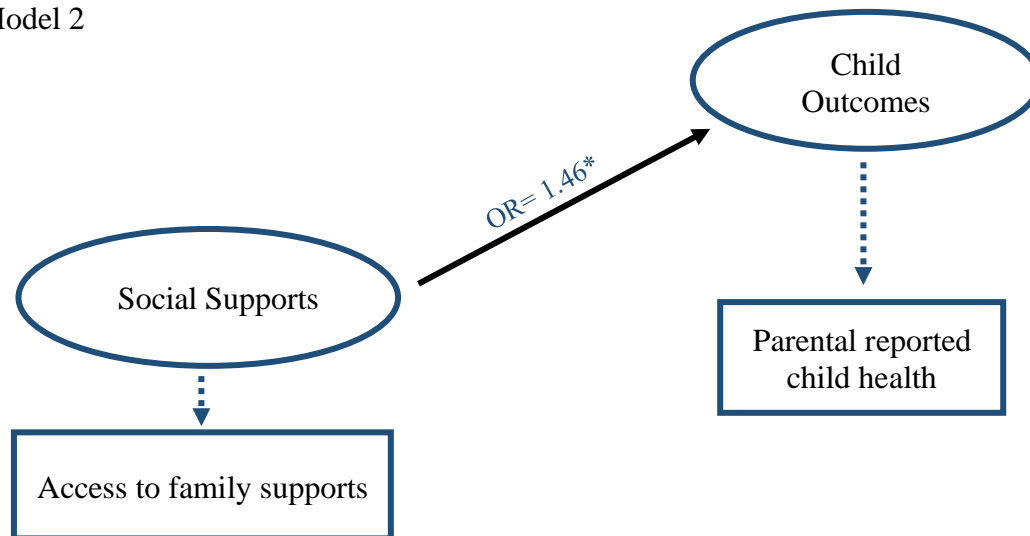


Figure 3: Conceptual model with results for Model 2



Note: NS= non-significant. Solid lines indicate direct relationships, dotted line indicates hypothesized effect modification and mediation. 'Parental education' and 'child sex' variables are included as covariates in all models. *= $p < .05$, **= $p < .01$, ***= $p < .001$

Figure 4: Conceptual model with results from Model 3

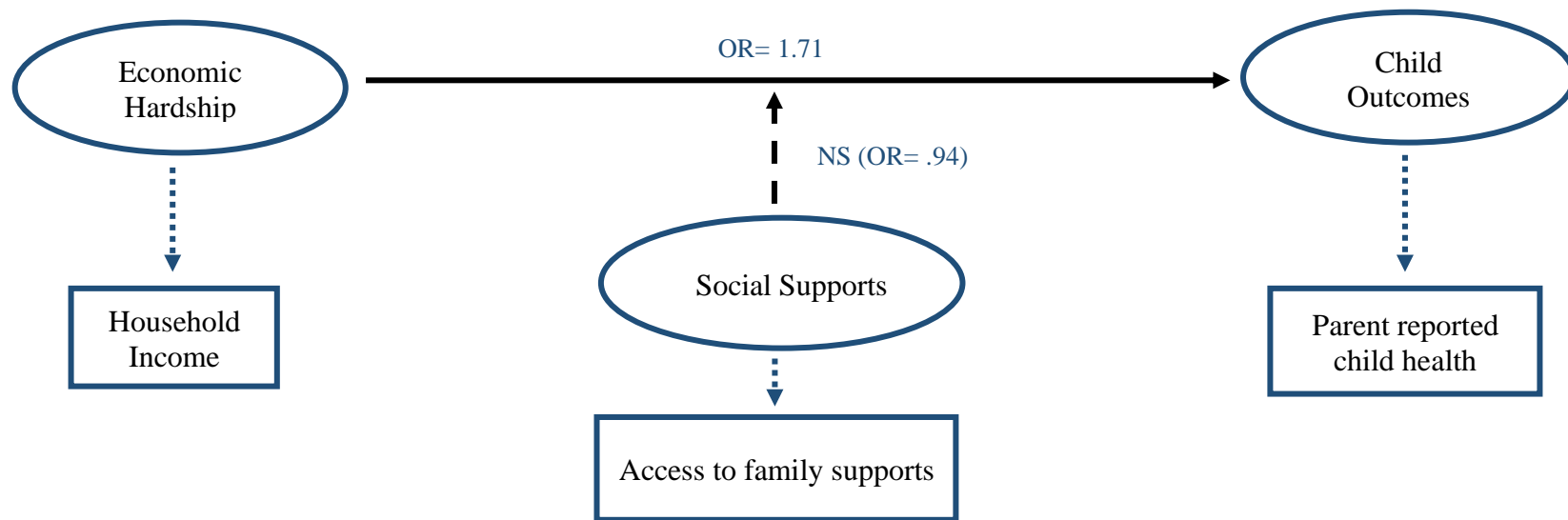
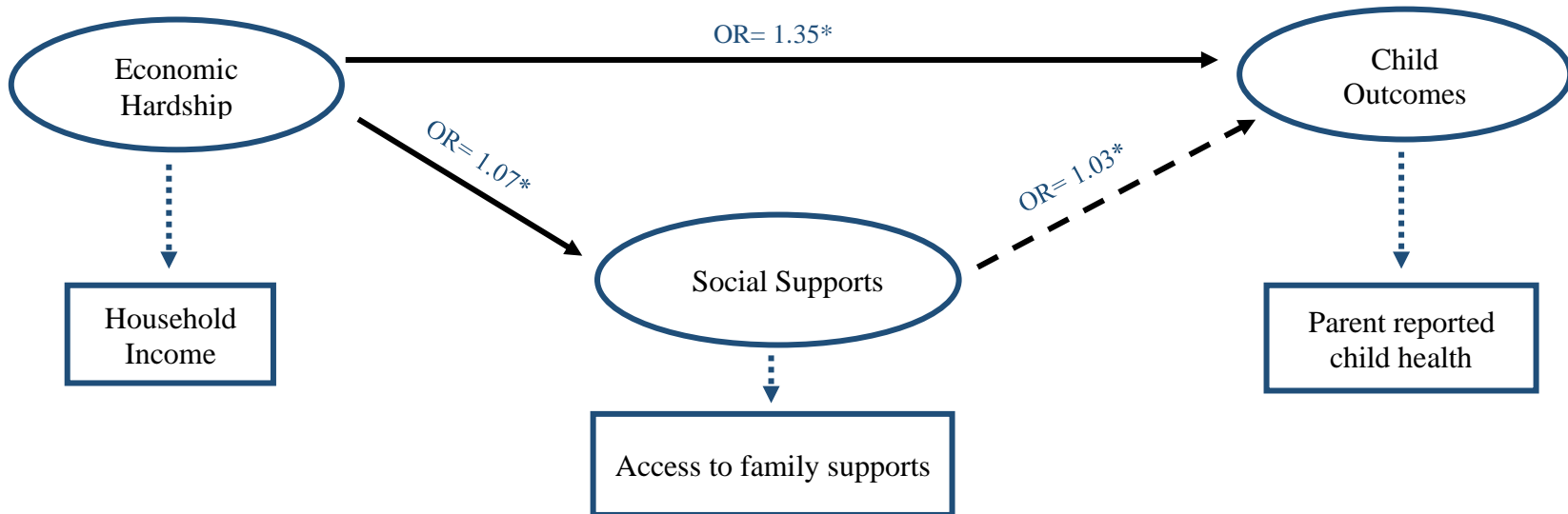


Figure 5: Conceptual model with results from Model 4



Chapter 5: Discussion

In this study the modified Family Stress Model was used to analyze and identify key findings from the TDI data regarding the pathways and associations between economic hardship (household income), child outcomes (child health) and social support (access to family supports) as a potential mediator or moderator.

In the analysis, it was found that household income and access to family supports were both significantly associated with child health. Data showed statistically significant support for the hypotheses relating to research questions 1, 2, and 4. Figure 3 displays the final conceptual model with the statistical results associated with each research question and hypothesis.

Although the moderation effect of access to family supports was not statistically significant, the mediation effect was. The following chapter will discuss the key study findings, research implications, study strengths and study limitations.

Question 1: What is the association between household income and parent-reported child health, controlling for child sex and parental education level?

Confirming the hypothesis, household income produced a statistically significant association with child health, when controlling for parental education level and child sex. These findings add to the literature confirming that measures of economic hardship have a strong effect on child health and well-being (Neppel, Senia, & Donnellan, 2016). Furthermore, the significant main effect between household income and child health confirms our hypothesized relationship in our modified Family Stress Model (Figure 1).

In this study's first model, neither of the controls were significantly associated with the outcome, child health. Interestingly, I found that parental education was not significantly associated with child health. Although other studies have found that either household income or parental education level can be used interchangeably as a predictor of child health, I did not find this to be the case with this sample. Child sex was also not found to be significantly associated with child health.

Question 2: What is the association between perceived access to family supports and child health, controlling for household income, child sex and parental education level?

In this study's second model, both household income and access to family supports were significantly associated with child health. When the '*access to family supports*' variable was added into the model, the omnibus tests of model coefficients for the third block produced a statistically significant p-value, indicating that the addition of this variable predicts the outcome variable, child health, significantly better than when only household income was in the model. As hypothesized, access to family supports was significantly associated with child health (OR= 1.46, 95% CI [1.15, 1.86], $p=.002$), when controlling for child sex, parental education and household income.

The results from this model match findings from literature, where studies such as McConnell (2013) have also found that access and use of social support has a strong main effect on child outcomes. These findings confirm the direct effect pathway from access to family supports to child health within this study's modified Family Stress conceptual model diagram. The findings also add to the literature supporting the association between child health and family supports.

Question 3: Does perceived access to family supports modify the relationship between household income and child health?

I hypothesized that access to family supports significantly modifies the association between household income and child health. After adding the effect modification term, containing household income and access to family supports, I received non-statistically significant results. Therefore, the findings suggest that access to family supports does not significantly moderate the association between household income and child health. Similar to the conclusion made in the McConnell et al. (2011) study, this study can conclude that the influence of family social supports appears to influence child health directly, rather than having a stress-buffering effect.

While the effect may not be present within this sample, it is possible that a significant relationship was not found due to bias within the sample, for example, sampling bias. This study was unique in the variables chosen to test this moderation effect, child health, SES and access to family supports, so it is not possible to compare these results to other study findings. Although a statistically significant effect was not found, there is a need for greater understanding of factors that may moderate the relationship between economic hardship and child outcomes. For

example, Landers-Potts et al. (2015) suggest that a potential moderation variable of interest may be ‘caregiver conflict’, as their study showed that higher caregiver conflict significantly moderated the relationship between economic hardship and child outcomes. It is hypothesized that caregiver conflict may be a key moderator in this relationship because of the ‘spillover effect’, which is when the negative emotions resulting from conflicts between caregivers’ spills into the relationship between the child and caregivers (Landers-Potts et al., 2015). Future research may consider including variables such as caregiver conflict in study analysis.

Question 4: Does perceived access to family supports mediate the relationship between household income and child health?

This study’s findings indicate that the relationship between household income and child health is mediated by access to family supports. As discussed in the literature review, it conceptually makes sense that this relationship would be present. Using the Family Stress Model, other studies have also found a mediation effect between these variables (McConnell, 2011), finding that higher levels of access and usage of social support were associated with lower levels of parental stress and, consequently, improved parental and child health.

We may consider different mechanisms through which access to family supports and services is mediating the relationship between household income and child health. Using the Family Stress Model reasoning, it may be that increased access to family supports mitigates the adverse reactions caused by economic stress. For example, Balaji et al., (2007) found that social support can have protective effects on mental health. This can benefit parental health and lead to more positive parent-child interactions, which can ultimately support child health. Future research may consider also collecting qualitative data to supplement quantitative data and better capture the pathways through which this process is occurring.

The interpretation and importance of effect sizes vary within and between disciplines (Schäfer & Schwarz, 2019). The meaningfulness of the effect size often depends on the effects previously found in the respective area of research (Schafer, 2019). However, comparing this study’s findings to others remains to be a challenge, as little research has been done on these specific variables and relationships, especially on toddler-aged children. Furthermore, since this study was limited to using logistic regression for data analysis, it creates difficulties comparing the results to previous research, where linear regression is more often used. It is also possible that

other unmeasured variables may be mediating the relationship between SES and child health, which may have a larger effect size. For example, Zhang et al. (2020) found that parental distress mediated the relationship between economic hardship and child well-being. These alternative relationships could be considered for future research.

Research Implications

This study adds to the body of literature addressing socioeconomic status, family supports and child health. It also aimed to address gaps in literature applying the Family Stress Model to toddlers, studying how access to family supports can modify and mediate the relationship of SES on child health. Future research may consider adding in more components addressing parental health, as it has been found that parental mental health, such as maternal depression, is a significant risk factor for children's adverse developmental outcomes (Newland et al., 2013).

Future research may also consider including a wider variety of definitions and conceptualizations of key constructs, such as health and well-being, since different cultures may view these constructs differently. For example, Indigenous Canadians may conceptualize health using the First Nations Health Authority's Wellness Wheel, which represents a more holistic model of health and well-being ("First Nations Perspective on Health and Wellness," n.d.). Furthermore, different populations and cultures may have varied understandings of what they may consider to be an accessible and effective family support. Therefore, questions including self-reported measures pertaining to the concepts of health and wellbeing may be interpreted differently, depending on respondents' cultural background and understandings.

As discussed in the introduction, the Marmot report emphasizes how inequalities and the socioeconomic gradient deepen throughout the life span (Marmot & Bell, 2012). Despite the fact that this study included children at a very young age group, there was still a statistically significant difference when looking at both household income and access to family supports in relation to child health. Therefore, we may consider how these main effects could become magnified over time as children age. Future research may consider observing these relationships over time, starting with toddler-aged children and following them into adolescence or adulthood.

Practice Implications

The findings from this study not only reinforce the strong association between SES and child health, but they also emphasize the importance of access to family supports. Our results demonstrated that increased access to family supports was associated with a significantly higher parental-reported child health and also mediated the relationship between SES and child health. A focus on family supports is important for many reasons. The identification of potential protective factors or coping mechanisms for families provides an important strategy for supporting healthy child development (Landers-Potts et al., 2015). Further, as McConnell et al. (2013) recognized, “the demand for community-based family services is likely to increase”, due to parents’ ever-increasing life and time demands.

Using the Family Stress Model, this study’s findings highlight the importance of mitigating the effects of economic hardship, as a way to alleviate parental stress and, ultimately, support child health and development. Consequently, service providers in the areas of education and public health for toddler-aged children should focus on supporting families through family support services and programs. This study also showed that higher income is significantly associated with higher parent-reported child health. Therefore, interventions aimed at increasing income for low-income families may support child health and development.

Recognizing that significant relationships were found for the direct effects of both SES and child health and access to family supports and child health, policy makers and service providers could focus services and allocate resources towards either, or both, of these constructs. The decision regarding where to direct resources may depend on the community and characteristics of the target population and families. For example, in some communities, it may be more beneficial to provide increased funding towards lower income families, rather than focus funding on increasing family supports. The opposite may be true in other communities, where it may be determined that distributing resources towards increasing the accessibility and availability of family supports may have a greater impact. Of course, increasing both financial support and increasing family supports would be ideal, but in some cases an analysis of the population may be required to determine the best allocation of resources.

The concept of proportionate universality may be a solution that can be used to determine the appropriate distribution of funding and resources for families and children. Proportionate universality is described in the Marmot report, where it is explained that to address inequalities and “to reduce the steepness of the social gradient in health, actions must be universal, but with a

scale and intensity that is proportionate to the level of disadvantage” (Marmot & Bell, 2012). This concept recognizes that although it is important to provide resources and supports for individuals in all income levels, the greatest difference can be made when supports and resources are distributed according to need. Therefore, an emphasis on providing resources and supports for families who are at a greater economic and social disadvantage can help to identify target populations for programs and policies.

Previously reported research validates the concepts and relationships proposed in this study (Armstrong et al., 2005). Further understanding of the role of family supports as a protective mechanism for child health, and as a mediator for SES, can significantly contribute to our understanding of effective prevention, assessment, and intervention models for families (Armstrong et al., 2005).

Strengths and Limitations

This study has multiple limitations which must be considered. First, child health and access to family supports were based on parental reporting, which may result in bias or misreporting. Since there is no standardized rubric or scale for parents to reference for either question within the survey, it was unlikely that each parent could accurately capture and report their child’s health in relation to all other children. Social desirability bias may also be of concern. Some caregivers may be reluctant to report that their child has poor health due to the fear that they will be judged. Although the TDI survey was anonymous, identifiers, such as postal code and the child’s health number were collected. Respondents may have been extra cautious if they thought that their survey was identifiable, promoting the likelihood for social desirability bias within their answers.

Another limitation of this study is due to the cross-sectional study design. Cross-sectional studies only allow relationships to be theoretically inferred, as the data may be interpreted differently, depending on who is reviewing it (McConnell et al., 2013). Sampling bias may also be another major limitation of this study. Since survey respondents were found through convenience sampling from locations such as community centers and childcare centers, many families who may not use these services could have been missed. For example, some lower income families may not have the time and resources to attend community centers or pay for

childcare. Therefore, it is important to consider that this data may not represent all of the income levels and families within each community.

Sampling bias may also be a limitation when considering study generalizability. Since this survey was administered in five communities across BC, a larger population would need to be surveyed to allow generalizability of findings. However, it is important to recognize that this sample did contain a relatively diverse sample of children from both large and small communities across BC. To minimize sampling bias for future TDI survey collection, a wider variety of participant recruitment and data collection methods could be considered. Another limitation to consider in regard to the study sample relates to language barriers from completing the survey. In this study, the TDI was offered in English and Simplified Chinese, so some caregivers or parents who were not able to complete the survey in those languages, and who did not have support from someone translating the survey, are not represented in the sample.

Since our predictor variable, parental-reported child health, was strongly negatively skewed, binary logistic regression was used to allow us to provide sufficient information for all valid data values. Although logistic regression doesn't make assumptions regarding the normality of distributions, it can reduce power and require larger sample sizes (Olvera Astivia, Gadermann, & Guhn, 2019). Since the outcome variable was dichotomized due to its skew, this may also have reduced its predictive power, as the reduction in information due to dichotomization lowers the statistical power (Altman & Royston, 2006).

Finally, the relationships in this study assumed a specific direction of effect. For example, a unidirectional relationship was assumed between household income and child health. However, it is also possible that this association is bi-directional and child health is influencing household income. For example, if a child has poor health and requires constant care, a parent may not be able to work as often or may need to pay for specialized childcare, leading to a decrease in their household income.

One of the strengths of this study was the use of the conceptual model, the Family Stress Model. The Family Stress Model has been carefully studied in literature and studies, which examined the direction and strength of associations between each key model construct. This study's data aligned well with this model, as it contained measures that identified with the key model constructs. Another strength of this study was the wide variety of variables available from the data. After reading the literature and identifying other potential variables that contribute to

the SES and child health association, I was able to either control for or test to ensure that the model variables were the best indicators associated with each key model construct. For example, the literature suggested that parental education level is sometimes used in place of household income to measure SES (Bradley & Corwyn, 2002). Since there was available data for both parental education level and household income, I was able to control for parental education level within the models.

Literature reviewing the associations between household income and child outcomes recognizes that SES is often studied with a focus on the effects of only low-income households, while recognizing the need to review the effects of income from all levels (Gershoff, Aber, Raver, & Lennon, 2007). This study's data allowed for the examination of the association and relationship of a complete income gradient, not just within a low-income measure, addressing this gap in the literature.

Conclusion

The early years are a critical time for child development, as this period sets trajectories for lifelong health and well-being. Using the Family Stress Model as a foundation for this study, it was found that child health was associated with both of our economic hardship and social support measures. Consistent with past research, this study found that access to family supports had both a mediation and main effect on child health. By identifying and including potential modifiers and mediators, we are able to strengthen our understanding of these associations and their pathways. Future studies may consider testing for additional potential mediators, such as parental health, to explore what other early childhood experiences may be mediating the relationship between SES and child health.

The findings from this study addressed gaps in the literature by applying the Family Stress Model to toddler-aged children, while also highlighting priority areas for policy makers and providers who support young children and their families. Considering the statistically significant relationship found between access to family supports and child health, service providers in communities may consider prioritizing funding towards ensuring that not only are family supports available within their community, but they are accessible for families.

References

- Adler, N. E., Boyce, T., Chesney, M. A., Cohen, S., Folkman, S., Kahn, R. L., & Syme, S. L. (1994). Socioeconomic Status and Health: The Challenge of the Gradient. *American Psychologist*, *49*(1), 15–24. <https://doi.org/10.1037/0003-066X.49.1.15>
- Adler, N. E., & Snibbe, A. C. (2003). *The Role of Psychosocial Processes in Explaining the Gradient Between Socioeconomic Status and Health*.
- Agler, R., & Boeck, P. De. (2017). On the Interpretation and Use of Mediation: Multiple Perspectives on Mediation Analysis. *Frontiers in Psychology*, *8*. <https://doi.org/10.3389/FPSYG.2017.01984>
- Altman, D. G., & Royston, P. (2006, May 6). The cost of dichotomising continuous variables. *British Medical Journal*, Vol. 332, p. 1080. <https://doi.org/10.1136/bmj.332.7549.1080>
- Armstrong, M. I., Birnie-Lefcovitch, S., & Ungar, M. T. (2005). Pathways between social support, family well being, quality of parenting, and child resilience: What we know. *Journal of Child and Family Studies*, *14*(2), 269–281. <https://doi.org/10.1007/s10826-005-5054-4>
- Balaji, A. B., Claussen, A. H., Camille Smith, D., Visser, S. N., Johnson Morales, M., & Perou, R. (2007). Social Support Networks and Maternal Mental Health and Well-Being. *JOURNAL OF WOMEN'S HEALTH*, *16*(10). <https://doi.org/10.1089/jwh.2007.CDC10>
- Bradley, R. H., & Corwyn, R. F. (2001). *SOCIOECONOMIC STATUS AND CHILD DEVELOPMENT*.
- Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology*, 371–400.
- Bujang, M. A., Sa'At, N., Tg Abu Bakar Sidik, T. M. I., & Lim, C. J. (2018). Sample size guidelines for logistic regression from observational studies with large population: Emphasis on the accuracy between statistics and parameters based on real life clinical

data. *Malaysian Journal of Medical Sciences*, 25(4), 122–130.
<https://doi.org/10.21315/mjms2018.25.4.12>

Byrne, B. M. (1984). The General/Academic Self-Concept Nomological Network: A Review of Construct Validation Research. In *Review of Educational Research Fall* (Vol. 54).

Canadian Health Survey on Children and Youth (CHSCY). (n.d.). Retrieved February 6, 2021, from <https://www.statcan.gc.ca/eng/survey/household/5233>

Chen, E. (2004). Why Socioeconomic Status Affects the Health of Children: A Psychosocial Perspective. In *Psychological Science* (Vol. 13).

Cohen, S., Janicki-Deverts, D., Chen, E., & Matthews, K. A. (2010). Childhood socioeconomic status and adult health. *Ann. N.Y. Acad. Sci.* <https://doi.org/10.1111/j.1749-6632.2009.05334.x>

Conger, R. D., Conger, K. J., & Martin, M. J. (2010). Socioeconomic status, family processes, and individual development. *Journal of Marriage and Family.* <https://doi.org/10.1111/j.1741-3737.2010.00725.x>

Crouch, E., Probst, J. C., Radcliff, E., Bennett, K. J., & McKinney, S. H. (2019). Prevalence of adverse childhood experiences (ACEs) among US children. *Child Abuse and Neglect*, 92(January 2019), 209–218. <https://doi.org/10.1016/j.chiabu.2019.04.010>

Evans, G. W., & Kim, P. (2013). Childhood Poverty, Chronic Stress, Self-Regulation, and Coping. *Child Development Perspectives*, 7(1), 43–48. <https://doi.org/10.1111/cdep.12013>

First Nations Perspective on Health and Wellness // . First Nations Perspective on Health and Wellness. (n.d.). <https://www.fnha.ca/wellness/wellness-and-the-first-nations-health-authority/first-nations-perspective-on-wellness>.

Gershoff, E. T., Aber, J. L., Raver, C. C., & Lennon, M. C. (n.d.). Income Is Not Enough: Incorporating Material Hardship into Models of Income Associations with Parenting and Child Development. In *Source: Child Development* (Vol. 78).

- Gottlieb, B. H., & Bergen, A. E. (2010). Social support concepts and measures. *Journal of Psychosomatic Research*, 69(5), 511–520. <https://doi.org/10.1016/j.jpsychores.2009.10.001>
- Hayes, A. F., & Ebooks Corporation. (2013; 2014;). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.
- Hayes, A. F., & Scharkow, M. (2013). The Relative Trustworthiness of Inferential Tests of the Indirect Effect in Statistical Mediation Analysis: Does Method Really Matter? *Source: Psychological Science*, 24(10), 1918–1927. <https://doi.org/10.1177/0956797613480187>
- Heberle, A. E., Krill, S. C., Briggs-Gowan, M. J., & Carter, A. S. (2015). Predicting Externalizing and Internalizing Behavior in Kindergarten: Examining the Buffering Role of Early Social Support. *Journal of Clinical Child and Adolescent Psychology*, 44(4), 640–654. <https://doi.org/10.1080/15374416.2014.886254>
- Hertzman, C., & Williams, R. (2009). Making early childhood count. *Canadian Medical Association Journal*, 180(1), 68–71. <https://doi.org/10.1503/cmaj.080512>
- Hertzman, C. (2012, October 16). Putting the concept of biological embedding in historical perspective. *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 109, pp. 17160–17167. <https://doi.org/10.1073/pnas.1202203109>
- Human Early Learning Partnership & Commission on Social Determinants of Health. (2007). *Early child development: A powerful equalizer: Final report for the World Health Organization's Commission on the Social Determinants of Health*. Human Early Learning Partnership. <https://apps.who.int/iris/handle/10665/69729>
- Human Resources Development Canada. (1996). *National longitudinal survey of children and youth (NLSCY): Overview report*. <https://doi.org/http://tinyurl.com/wqncy6z>
- Iaupuni, S. M. K., Donato, K. M., Thompson-Colón, T., & Stainback, M. (2005). Counting on kin: Social networks, social support, and child health status. *Social Forces*, 83(3), 1137–1164. <https://doi.org/10.1353/sof.2005.0036>

- Institut de la statistique du Quebec. (2019). *Quebec longitudinal study of child development*.
http://www.iamillbe.stat.gouv.qc.ca/informations_chercheurs/outils_collecte/outils_collecte_an.html
- Institute of Health Equity. (2021). Social gradient. Retrieved March 17, 2021, from
<http://www.instituteofhealthequity.org/in-the-news/articles-by-the-institute-team-/social-gradient>
- Jokovic, A., Locker, D., & Guyatt, G. (2004). How well do parents know their children? Implications for proxy reporting of child health-related quality of life. *Quality of Life Research, 13*(7), 1297–1307. <https://doi.org/10.1023/B:QURE.0000037480.65972.eb>
- Leahy-Warren, P., McCarthy, G., & Corcoran, P. (2012). First-time mothers: social support, maternal parental self-efficacy and postnatal depression. *Journal of Clinical Nursing, 21*(3–4), 388–397. <https://doi.org/10.1111/j.1365-2702.2011.03701.x>
- Marmot, M., & Bell, R. (2012). Fair society, healthy lives. *Public Health, 126*(SUPPL.1), S4. <https://doi.org/10.1016/j.puhe.2012.05.014>
- Masarik, A. S., & Conger, R. D. (2017). Stress and child development: A review of the Family Stress Model. *Current Opinion in Psychology, 13*, 85–90. <https://doi.org/10.1016/j.copsyc.2016.05.008>
- McConnell, D., Breitzkreuz, R., & Savage, A. (2011). From financial hardship to child difficulties: Main and moderating effects of perceived social support. *Child: Care, Health and Development, 37*(5), 679–691. <https://doi.org/10.1111/j.1365-2214.2010.01185.x>
- McConnell, D., Breitzkreuz, R., & Savage, A. (2013). Parent needs and family support service outcomes in a Canadian sample. *Journal of Social Work, 13*(5), 447–470. <https://doi.org/10.1177/1468017311434819>
- Miller, G. E., Chen, E., & Parker, K. J. (2011). Psychological Stress in Childhood and Susceptibility to the Chronic Diseases of Aging: Moving Toward a Model of Behavioral

and Biological Mechanisms. *Psychological Bulletin*, 137(6), 959–997.
<https://doi.org/10.1037/a0024768>

Morris, A. S., Robinson, L. R., Hays-Grudo, J., Claussen, A. H., Hartwig, S. A., & Treat, A. E. (2017). Targeting parenting in early childhood: A public health approach to improve outcomes for children living in poverty. *Child Development*, 88(2), 388–397.
<https://doi.org/10.1111/cdev.12743>

Neppl, T. K., Senia, J. M., & Donnellan, M. B. (2016). Effects of economic hardship: Testing the Family Stress Model over time. *Journal of Family Psychology*, 30(1), 12–21.
<https://doi.org/10.1037/fam0000168>

Newland, R. P., Crnic, K. A., Cox, M. J., & Mills-Koonce, W. R. (2013). The family model stress and maternal psychological symptoms: Mediated pathways from economic hardship to parenting. *Journal of Family Psychology*, 27(1), 96–105.
<https://doi.org/10.1037/a0031112>

Olvera Astivia, O. L., Gadermann, A., & Guhn, M. (2019). The relationship between statistical power and predictor distribution in multilevel logistic regression: A simulation-based approach. *BMC Medical Research Methodology*, 19(1). <https://doi.org/10.1186/s12874-019-0742-8>

Pallant, J. (2016). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS* (6th ed.). McGraw Hill Education.

Ravens-Sieberer, U., Torsheim, T., Hetland, J., Vollebergh, W., Cavallo, F., Jericek, H., ... Erginoz, E. (2009). Subjective health, symptom load and quality of life of children and adolescents in Europe. *International Journal of Public Health*, 54(2), 151–159.
<https://doi.org/10.1007/s00038-009-5406-8>

Sarason, I. G., Sarason, B. R., Shearin, E. N., & Pierce, G. R. (1987). A Brief Measure of Social Support: Practical and Theoretical Implications. *Journal of Social and Personal Relationships*, 4(4), 497–510. <https://doi.org/10.1177/0265407587044007>

Schäfer, T., & Schwarz, M. A. (2019). The meaningfulness of effect sizes in psychological research: Differences between sub-disciplines and the impact of potential biases. *Frontiers in Psychology, 10*(APR). <https://doi.org/10.3389/fpsyg.2019.00813>

Shahraki, M., Agheli, L., Assari Arani, A., Sadeqi, H., & Ghaderi, S. (2018). The relationship between mother's socioeconomic status and child health. *Journal of Research and Health, 8*(2), 143–151. <https://doi.org/10.29252/jrh.8.2.143>

Statistics Canada. (2020). *Canadian Health Survey on Children and Youth (CHSCY)*. <https://www.statcan.gc.ca/eng/survey/household/5233>

Statistics Canada. (1997). *National longitudinal survey on children & youth: Survey instruments*. Government of Canada; Statistics Canada. <http://publications.gc.ca/site/eng/337884/publication.html>

White, R. M. B., Liu, Y., Nair, R. L., & Tein, J. Y. (2015). Longitudinal and integrative tests of family stress model effects on Mexican origin adolescents. *Developmental Psychology, 51*(5), 649–662. <https://doi.org/10.1037/a0038993>

Williams, P., Barclay, L., & Schmied, V. (2004). *Defining Social Support in Context: A Necessary Step in Improving Research, Intervention, and Practice*. <https://doi.org/10.1177/1049732304266997>

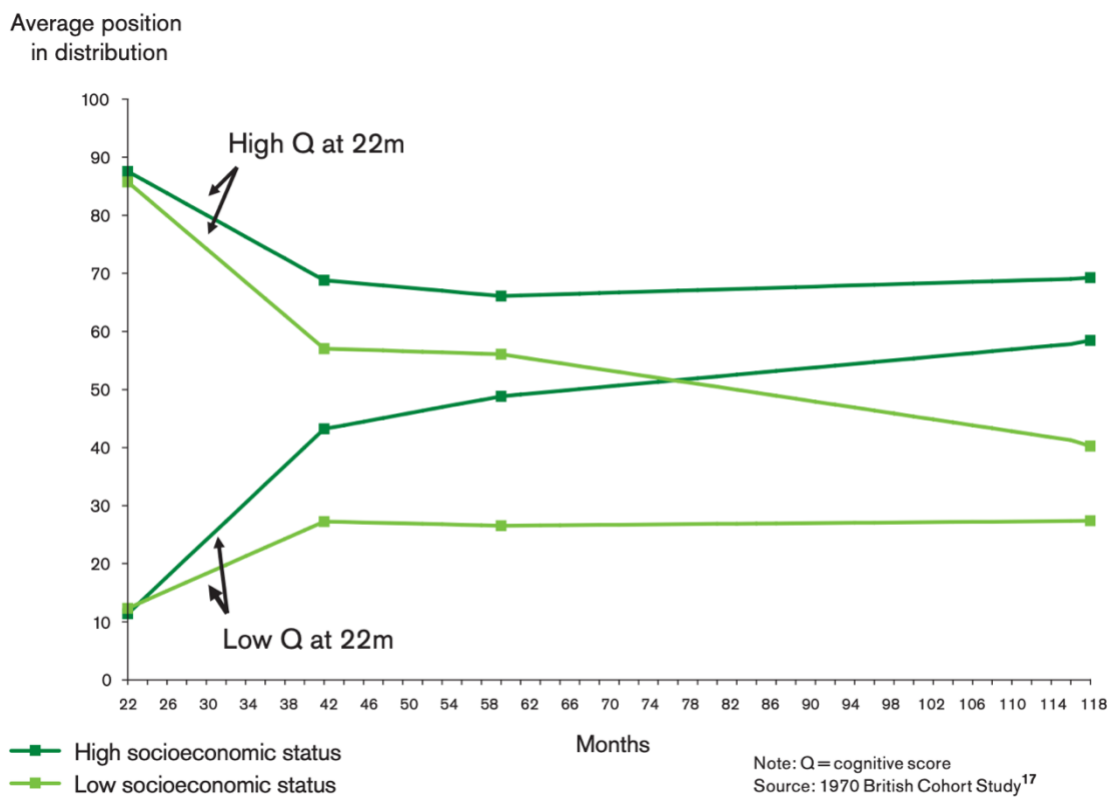
Zhang, X., Krishnakumar, A., & Narine, L. (2020). Family Economic Hardship and Child Outcomes: Test of Family Stress Model in the Chinese Context. *Journal of Family Psychology, 34*(1), 1–10. <https://doi.org/10.1037/fam0000670>

Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment, 52*(1), 30–41.

2020 BC Child Poverty Report Card. (2020). Retrieved December 19, 2020, from https://firstcallbc.org/wordpress/wp-content/uploads/2020/12/First_Call_Report_Card_2020_Dec_web_final.pdf

Appendices

Appendix A



Inequality in early cognitive development of children in the 1970 British cohort study, at ages 22 months to 10 years (Marmot & Bell, 2012).

Appendix B

	N
Fair/Poor	7
Good	54
Very good	200
Excellent	542
	803

Distribution of *child health* variable prior to dichotomization