

Maternal Responses to Having a Child Taken into Care

By

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Abstract

Objective: Although many children are placed in care of child protection services each year, very little is known about how having a child placed in care affects the health and well-being of biological mothers. This study aims to address this gap in knowledge.

Methods: The linkable administrative data housed at the Manitoba Centre for Health Policy were used to create several cohorts of mothers whose children were born in Manitoba, Canada, identified through child protection case files. Maternal health and social outcomes in the years before and after having a child taken into care were compared using generalized estimating equations. Poisson regression models were used to obtain relative rates of mental health-related outcomes for mothers whose children were taken into care and mothers whose children died. Incidence rate ratios of suicide attempts and completions were obtained using fixed-effects Poisson regression models. Finally, Cox proportional hazard regression models determined rates of avoidable and unavoidable mortality among mothers whose children were taken into care.

Results: Compared with mothers whose children were not placed in care, mothers whose children were taken into care have significantly higher rates of anxiety, substance use, physician visits, hospitalizations, prescriptions, and income assistance use in the years before their children were taken into care; rates increased significantly in the years after. These mothers also had significantly higher rates of depression, anxiety, substance use, physician visits for mental illness, hospitalizations for mental illness, and psychotropic medication use in the years after custody loss compared with mothers who experienced the death of a child. Rates of suicide attempts, death by suicide, avoidable mortality and unavoidable mortality were also higher among mothers whose child was taken into care.

Conclusion: Mothers whose children are taken into care often face many challenges in the years leading up to custody loss; the loss of custody often creates new challenges or exacerbates existing challenges. To address these outcomes, more preventative services should be implemented to keep families together and more supports should be in place to ensure timely family reunification. Meaningful supports need to be provided for mothers who are not reunified with their children.

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List of Abbreviations

aIRR	Adjusted Incidence Rate Ratio
ARR	Adjusted Relative Rate
ATC	Anatomical Therapeutic Chemical
CFS	Child and Family Services
CFSIS	Child and Family Services Information System
CPS	Child Protection Services
DPIN	Drug Program Information Network
DR	Differential Response
hdPS	High-Dimensional Propensity Scores
HIPC	Health Information Privacy Committee
HR	Hazard Ratio
HREB	University of Manitoba Health Research Ethics Board
ICD	International Classification of Diseases
ICD-9-CM	International Classification of Diseases, 9 th Revision, Clinical Modification
ICD-10-CA	International Classification of Diseases, 10 th Revision, Canada
IPTW	Inverse probability of treatment weights
IRR	Incidence Rate Ratio
MCHP	Manitoba Centre for Health Policy
PHIN	Personal Health Identification Number
PY	Person years
Repository	Population Health Research Data Repository
RHA	Regional Health Authority

SAMIN Social Assistance Management Information Network

SEFI Socioeconomic Factor Index

SES Socioeconomic Status

Authorship Declaration

This thesis contains work that has been published in peer-reviewed journals. All studies in this dissertation were conceptualized and executed by the candidate (Elizabeth Wall-Wieler) in collaboration with her thesis advisory committee and thesis advisor: Dr. Leslie L. Roos, Dr. Nathan Nickel, Dr. Dan Chateau, Dr. Marni Brownell. Additional collaborators are Dr. James Bolton and Dr. Deepa Singal. Elizabeth Wall-Wieler takes full responsibility for the accuracy of this thesis and was responsible for statistical analysis and interpretation. All authors on the manuscripts included in this thesis provided intellectual input on the study design, participated in the interpretation of results, and assisted with preparation of manuscript drafts. All authors approved final manuscripts.

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Chapter 1: Introduction

Mother-child attachment is generally examined from the child's point of view; the mother's role is often seen as either facilitating or disrupting attachment. This holds true when examining separation due to involvement with child protection services (CPS). The outcome of children has been examined in great detail, but the impact of this separation on the mother's life is largely overlooked (Ainsworth & Hansen, 2011; Clausen, Landsverk, Ganger, Chadwick, & Litrownik, 1998; Cosgrove, Frost, Chown, & Anan, 2013; Kapp & Vela, 2004; Leslie et al., 2014; Pelton, 2011; Putnam-Hornstein & Needell, 2011; Schen, 2005). Failing to consider the impact of this event on the lives of mothers has led to a very narrow view of the dynamics involved; the possibility that such separation may further deteriorate mother's health and well-being and family circumstances has not been acknowledged. This study aims to address this gap and examine the outcomes of mothers whose children have been placed in care. This is a pressing issue, as having a child taken into care affects many mothers across the world, with rates increasing in the past decade (Brownell et al., 2015). In Canada, more than 62,000 children spent time in care (in 2013), and in the United States, more than 671,000 children spent time in care (in 2015) (Jones, Sinha, & Trocme, 2015; U.S. Department of Health and Human Services, 2016). This is a particularly pressing issue in Manitoba; with over three percent of children in care, Manitoba has one of the highest rates of children in out-of-home care in the developed world (Gilbert et al., 2012).

Literature Review

When children are placed in care of CPS, responses by biological mothers are often overlooked, as they are perceived to have failed society's ideals of good parenting (McKegney,

2003). Most mothers losing custody of their children to CPS experience a great deal of pain, both as a result of loss of contact with their child, and due to the public rebuff of their identity as a mother (Hollingsworth, 2005; Kielty, 2006). To maintain some sense of self-identity as a good mother, mothers tended to declare CPS as poor judges of their parenting. This often leads to combative behaviors to distance themselves from the accusations against them, and a reluctance to participate in parenting interventions (as this participation would imply that changes in parenting were needed in the first place) (Sykes, 2011). Others devalued their identities as mothers to evade feelings of worthlessness; this disengagement from attachment to their child made it less likely for mothers to fight for reunification (McKegney, 2003; Wells, 2011).

Several qualitative studies have identified an association between custody loss to CPS and a deterioration of maternal health and social circumstances. A qualitative study of 19 women who had children placed in care and self identified as using illicit drugs in Toronto, Canada found that these women had persistent post-traumatic stress disorder symptoms, increased mental health conditions, substance use, and heightened structural vulnerability after their children were placed in care (Kenny, Barrington, & Green, 2015). Another qualitative study consisting of in-depth interviews of four birthmothers who experienced permanent custody loss of their children to CPS found that mothers were left with feelings of frustration, disempowerment and injustice (McKegney, 2003). A narrative analysis of one mother who had lost and regained custody of her children to CPS found that the shame of having her children placed in care of CPS further complicated existing mental health conditions (Wells, 2011). Finally, a quantitative study of 7,378 mothers whose children were taken into care in Finland (compared with 58,864 mothers in the general population and 2,414 mothers on social assistance) demonstrated that mothers' social situation deteriorated after her child was placed in care; specifically, these mothers had higher

rates of unemployment, greater use of social assistance, and more disability pension use after their child was placed (Hiilamo & Saarikallio-Torp, 2011).

Modern child protection systems, although differing in their specifics across jurisdictions, have the common goal of reunifying children with their families whenever possible (Fernandez, 2012). The damage to a mother's self-identity and self-efficacy when her child is taken into care as well as the resulting anger, depression, and grief can profoundly impact the mother in negative ways; the time it takes for her to be deemed stable enough to be reunified with her child may be lengthened. In fact, the trauma of having a child taken into care "may compromise women's capacity to parent their children during supervised visits with them or when their children are returned permanently to them and may put their children at further risk of maladjustment" (Nixon et al., 2013, p. 186).

Approach

The outcomes of mothers after having their children are taken into care are examined from the perspectives of filial deprivation and disenfranchised grief. This approach is important as it allows us to look at the impact of having a child placed in care from the mother's perspective.

Filial deprivation. The concept of filial deprivation was developed in response to 'maternal deprivation', which occurs when children are institutionalized and do not have the opportunity to interact with a mother figure (Brearley, Guttridge, Hall, Jones, & Roberts, 1980; Britton, 1955). Maternal deprivation is shown to cause distress in a child but does not account for the distress felt by the parent during this separation. Britton addressed the needs of the parents in this setting by recognizing that when parents failed to maintain custody of their child, they often

felt paralyzed by grief, guilt, and depression (Britton, 1955). Several studies done in the 1970s examined the separation experience of parents whose children were placed in care. One study on grief suggested that the feelings mothers experience when separated from their children are similar to those seen in the bereavement experience (Parkes, 1971). Another study identified six dimensions of filial deprivation for mothers: interpersonal hostility, separation anxiety with sadness, self-denigration, agency hostility, concerned gratitude, and self-involvement (Jenkins & Norman, 1972). This research found that most mothers felt sadness, worry, and nervousness following the placement of their child; in the five years following the placement, these feelings changed very little (Jenkins & Norman, 1972). This work was replicated in Montreal in 1978 with similar findings overall but found that maternal responses differed depending on socioeconomic status (SES). Mothers with higher SES were more likely to experience relief after the placement and mothers with lower SES were more likely to experience worry and nervousness (Vachon, 1978). A negative relationship has also been found between maternal guilt and sadness and how often the mother interacts with the social worker after her child is placed in care (Rejent, 1991). These studies show that most mothers have a negative response to having a child taken into care, but responses differ among mothers depending on characteristics and circumstance.

Disenfranchised grief. Although grief and bereavement are often associated with death, women who are forcibly separated from their children often experience many symptoms of grief, such as denial, despair, disturbance of sleep, appetite, and vigor (Blanton & Deschner, 1990). The permanent loss of custody of a child is often experienced by parents as a living death, with responses characterized by ambiguous loss. When mothers are involved with child protective services, ambiguous loss exists because mothers both experience the physical loss of a child, but

are often able to visit their children with state or court involvement (Zeman, 2004). The ambiguity of this freezes the grief process and prevents cognition, blocking both coping and decision-making processes (Boss, 2007). Grief by mothers who have lost custody of their children is often overlooked as they are deemed to have failed the ideals of good parenting, making them unworthy of expressing their loss (McKegney, 2003). Since the grief experiences of the birthmother are not openly acknowledged, publicly mourned or socially supported, they are considered disenfranchised (Doka, 1999). Individuals who experience disenfranchised grief often have additional problems of grief, such as intensified emotional reactions (for example, anger, guilt, or powerlessness) (Corr, 2004). The impact of grief on an individual is far-reaching; physiological, emotional and physical health effects are common (Parkes, 1998). Reactions to grief include suicidal ideation, loneliness, insomnia, depression, anxiety, distress, somatic symptoms, social dysfunction, impaired memory function, nutritional problems, work and relational difficulties, and difficulties concentrating (Stroebe, Schut, & Stroebe, 2007). Individuals who repress their grief – such as those whose grief has been disenfranchised – are more likely to experience these symptoms (Parkes, 1998).

Purpose of the Study

The purpose of this study is to fill the gap in knowledge around maternal outcomes after a child was taken into care. Manitoba's rich administrative data provide a unique opportunity to study the potential impact of having a child taken into care at a population level. The following research questions were examined:

Question 1 (Chapter 2): Do mothers experience changes to their health and social circumstance after having a child taken into care by CPS?

Question 2 (Chapter 3): How do mental health related outcomes in the years after loss differ between mothers who lost custody of their child through involvement with CPS and mothers who experienced the death of a child?

Question 3 (Chapter 4): Do mothers whose children are taken into care have higher rates of suicide attempts and completions compared to their counterparts whose children were not taken into care?

Question 4 (Chapter 5): Do mothers whose children are taken into care have higher rates unavoidable or avoidable mortality compared to mothers whose children were not taken into care?

Context

Legislation. In Canada, outside of First Nations reserves, each province and territory has its own CPS responsible for ensuring the children in their jurisdiction are protected from harm (Brownell et al., 2015). On First Nations reserves, the federal Canadian government is responsible for child welfare (Government of Canada, 2018). Legislation in each province defines the situations in which intervention is needed to protect a child, and the appropriate intervention for that situation. These circumstances include children who have been “orphaned, deserted, physically, sexually or emotionally abused, or whose guardians cannot provide adequate care, or those children whose behavior is such that they are considered a risk to themselves or to those around them” (Albert & Herbert, 2006, para. 12). In Manitoba, the agency responsible for the protection of children is Child and Family Services (CFS).

The fundamental piece of legislation around child protection in Manitoba is the *Child and Family Services Act*, which was passed in 1985. In addition to ensuring child well-being, the *Child and Family Services Act* stated the “families are entitled to receive preventive and supportive services directed at preserving the family unit” and declared families to be “entitled to services which respect their cultural and linguistic heritage”, which had specific implications for the provision of services to Indigenous children (Government of Manitoba, 1985, p. 2). While acknowledging the improvements made by the Child and Family Services Act to ensure Aboriginal heritage be respected, the 1991 Report of the Aboriginal Justice Inquiry recommended the Government of Manitoba take the additional step of creating a separate Aboriginal Authority within CFS (Government of Manitoba, 1991). This report was shelved by the Conservative government, but was picked up again by the NDP government when they came into office in 1999. The new administration moved forward on the recommendations from the inquiry and fundamentally changed the governance and delivery of CPS in Manitoba (MacKinnon, 2010; Milne, Kozlowski, & Sinha, 2014). In 2003, four new corporate bodies called Child and Family Services Authorities were created through the *Child and Family Authorities Act* - three Aboriginal Authorities and one General Authority. These Authorities were created to “ensure that families have access to the programs and services that reflect their values, beliefs, customs and ethnic, spiritual, linguistic, familial and cultural factors” (Milne et al., 2014, p. 2). To date, the Child and Family Services Act, and the Child and Family Authorities Act remain the primary pieces of legislation that govern child protective services in Manitoba.

Legislation around CFS has not changed in the past 14 years; however, a series of reviews and inquiries have shaped changes to service delivery. In 2006, an external review of CFS was requested by the Minister of Family Services and Housing to “examine and provide

recommendations for improvements in standards, processes and protocols surrounding the opening, transfer and closing of cases in child and family services, as well as the caseloads managed by front line workers” (Hardy, Schibler, & Hamilton, 2006, p. 1). Among a series of other recommendations, this report emphasized the need to strengthen families and provide preventative and supportive services to families to reduce apprehension rates. To address this recommendation, the Government of Manitoba committed to implementing Differential Response (DR) into CFS in 2007 (McKenzie, Taylor, & Maksymyk, 2011). DR is a model that offers two separate streams of services – child protection and family enhancement; the intent is to support families early in their involvement with child welfare agencies and prevent the need for more intrusive child protection interventions later on (Child and Family Services Standing Committee, 2007). A series of pilot programs were carried out and evaluated within each Authority in 2009 and 2010, with a full roll out of DR occurring in 2011 (McKenzie et al., 2011). The death of Phoenix Sinclair, a child with a history of involvement with CPS whose death went unnoticed for nine months, prompted an inquiry to examine the processes in place that led to this tragedy and to provide recommendations to prevent such events in the future (Hughes, 2013). The recommendations of this inquiry became available in 2013, with recommendations again focusing on the need to implement preventative measures to “reduce the need to remove children from their homes by decreasing the risk that maltreatment will occur or reoccur” (Hughes, 2013, p. 30). The Truth and Reconciliation Commission, which shed light on the harmful legacy of the Indian Residential Schools in Canada, also put forth recommendations around child welfare, specifically calling on the federal, provincial, territorial, and Aboriginal governments to reduce the number of Aboriginal children in care (Truth and Reconciliation Commission of Canada, 2015). On October 12, 2017, the Conservative Government in Manitoba announced that they

would be conducting a full review of the *Child and Family Service Act*, including a revamp of the current system to provide more support for families and communities, and more transparency and co-ordination across the child welfare system (Government of Manitoba, 2017b).

Practice. Children are placed in care for many different reasons, including abuse (physical, emotional, sexual), neglect, death of a parent, conflict in the family (such as intimate partner violence), abandonment, and conditions of the child, such as developmental, emotional, or behavioural difficulties (Brownell et al., 2015). Placements are either voluntary or involuntary. Voluntary placements occur when a parent enter into a voluntary placement agreement with an agency without transferring guardianship; in involuntary placements, the parent's guardianship rights are suspended by the court (Children's Advocate, n.d.). In Manitoba, approximately 16 percent of placements have voluntary placement agreements. In 2016, the Province of Manitoba changed how it counts the number of children in care, excluding those who were placed under voluntary placement agreements (Puxley, 2016). This led to a lot of outrage as child advocates as parents are often faced with the hard decision to sign voluntary placement agreements (resulting in more visitation rights) or have the child place in care involuntarily, and often face many challenges regaining custody of their children after signing voluntary placement agreements (CBC News, 2016). Additionally, medical care in Canada is provided through the provincial government to individuals not living in First Nations communities, and provided through the federal government for individuals living in First Nations communities; there are differences in the medical coverage provided by these two jurisdictions (National Collaborating Centre for Aboriginal Health, 2013). Children in First Nations communities have been voluntarily placed in care to access medical care not covered through the federal government (King, 2012). Thus, the

circumstances around voluntary placement in care are diverse and often include situations where parents did not want to place their children into care.

When a child enters care, they can reside in one of a number of different placement types. Many children live in foster homes, which are homes approved by the Foster Homes Licensing Regulation, while others live in kinship care, in which children live with a caregiver who was involved in the child's life before the child entered into care by CFS (Brownell et al., 2015). Some children are placed in a 'place of safety', which is a short-term living situation, and includes hotels, apartments, and shelters. After a series of headline-making incidents regarding the safety and appropriateness of placing children in hotels, in 2015, the Manitoba government ended placement of foster children in hotels (Blaze Baum, 2015; Manitoba Family Services, 2015).

Children in care are either in temporary or permanent guardianship of a CFS agency. In a temporary guardianship, the rights of the parents or guardians are suspended for a period of time, whereas, in a permanent guardianship, the rights of a child's parent(s) are terminated (Children's Advocate, n.d.). When a child is placed in care under temporary guardianship, there is a limited amount of time for the parent to regain custody before the child is placed under permanent guardianship. Section 41(1) of the *Child and Family Services Act* states that temporary guardianship can not exceed "(a) 15 months with respect to a child under 5 years of age; or (b) 24 months with respect to a child 5 years of age or older and under 12 years of age" (Government of Manitoba, 1985, p. 80). In 2014, 57 percent of children in care were permanent wards of a CFS agency (Office of the Children's Advocate, 2015). While it is not impossible for parents to regain custody of their children after they become permanent wards of the government, doing so is a long and difficult process (Manitoba Courts, 2016).

Many children were placed in care at a very early age. In Manitoba, 15 percent of children in care entered care in their first week of life, and approximately one third of all child welfare placements began before a child's first birthday (Brownell et al., 2015). Of those who entered care before their first birthday, a quarter stayed in care for at least 12 years; a quarter of those entering care at age five or older were in care for at least three years (Brownell et al., 2015).

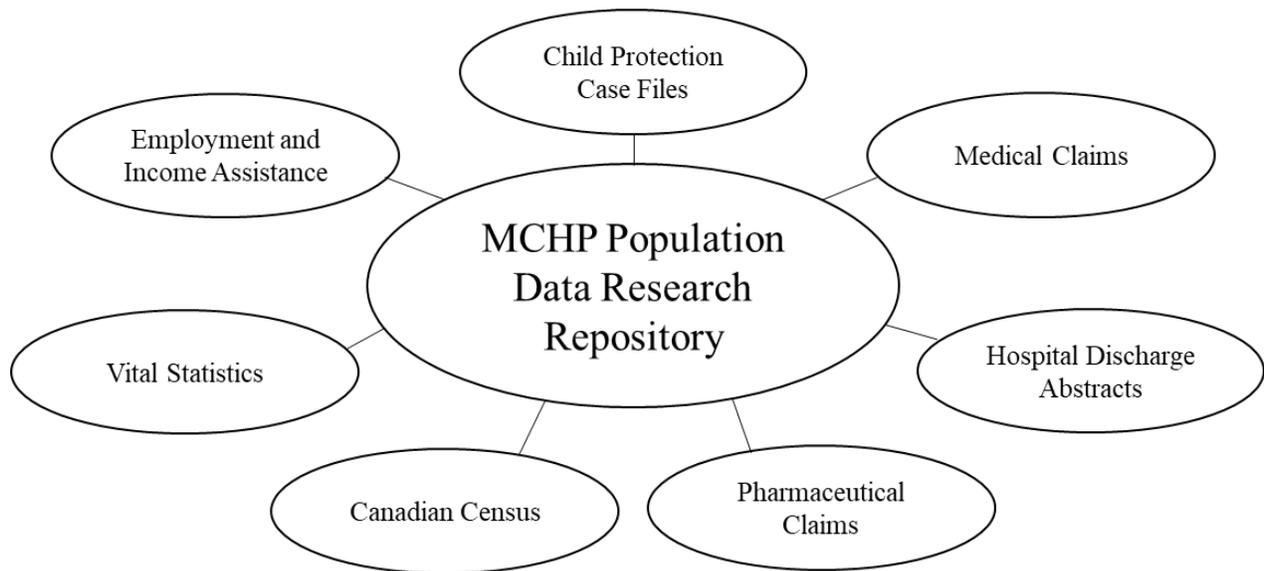
Population. In many developed countries (e.g. England, New Zealand, and the United States, Sweden, and Western Australia) less than one percent of children are in care; in Manitoba, almost three percent of children in care (Gilbert et al., 2012). This rate reflects a substantial increase in the number of children in care in Manitoba over the past 15 years; the number of children in care increasing from 5,495 in 2002 to 10,501 in 2015 (Brownell et al., 2015; Manitoba Family Services, 2016).

In Manitoba, Indigenous children compose approximately 26 percent of the child population; these children are overrepresented in the child welfare system in Manitoba, with over-representation growing in the past 15 years. In 2014, Indigenous children composed 87 percent of the child welfare population, up from 81 percent in 2002 (Brownell et al., 2015). This overrepresentation is attributed to historical disadvantage, including colonization, and the residential school system (Gough, Trocme, Brown, Knoke, & Blackstock, 2005). While we did not have access to an Indigenous identifier for this research, given that almost 90 percent of children are of Indigenous heritage, it is likely that the vast majority of mothers interacting with the child welfare system are also of Indigenous heritage.

Data Sources

The analyses conducted in this dissertation used existing data contained in the Population Research Data Repository (Repository), which is housed at the Manitoba Centre for Health Policy (MCHP) at the University of Manitoba. The Repository is a comprehensive collection of administrative, registry, survey, and other data primarily relating to residents of Manitoba, developed to describe and explain patterns of healthcare use and profiles of health and illness, facilitating inter-sectoral research in areas such as healthcare, education, and social services. All data are de-identified before being transferred to MCHP. All datasets contain a scrambled version of the Personal Health Identification Number (PHIN), which allows for person-level, anonymous linkage across datasets and over time. In total, eight datasets were linked for this study (Figure 1).

Figure 1. Administrative Datasets Linked for this Study



Data were used from the following sources:

1. Manitoba Families: for information on services from Child and Family Services and Employment and Income Assistance.
 - a. Child and Family Services: for information on children in care and mothers receiving protection or support services. All information on children in care and children in families receiving services from CFS comes from the Child and Family Services Information System (CFSIS) (Manitoba Centre for Health Policy, 2017d). Although CFSIS data are available from 1992 onward, they are incomplete because not all agencies entered data into the system. The data become more complete after 1998/99; however, previous reports have found that undercounting of children, particularly those living in the North, is still an issue with CFSIS (Brownell et al., 2012). For this reason, the results presented in these studies may not include all mothers who have had children placed in care and may particularly undercount First Nations mothers.
 - b. Employment and Income Assistance (EIA): for information on maternal receipt of EIA. All information on receipt of EIA comes from the Social Assistance Management Information Network (SAMIN) database (Manitoba Centre for Health Policy, 2016c). SAMIN data are available from 1995 onward.
2. Manitoba Health, Seniors and Active Living: for Manitoba Health Insurance Registry data, Hospital Abstracts data, Medical Services data, and Drug Program Information Network (DPIN) data.
 - a. The Manitoba Health Insurance Registry data: to identify the cohort of mothers whose children were born in Manitoba, and to identify biological mother-infant relationships; available from 1970 onward (Manitoba Centre for Health Policy, 2017f).

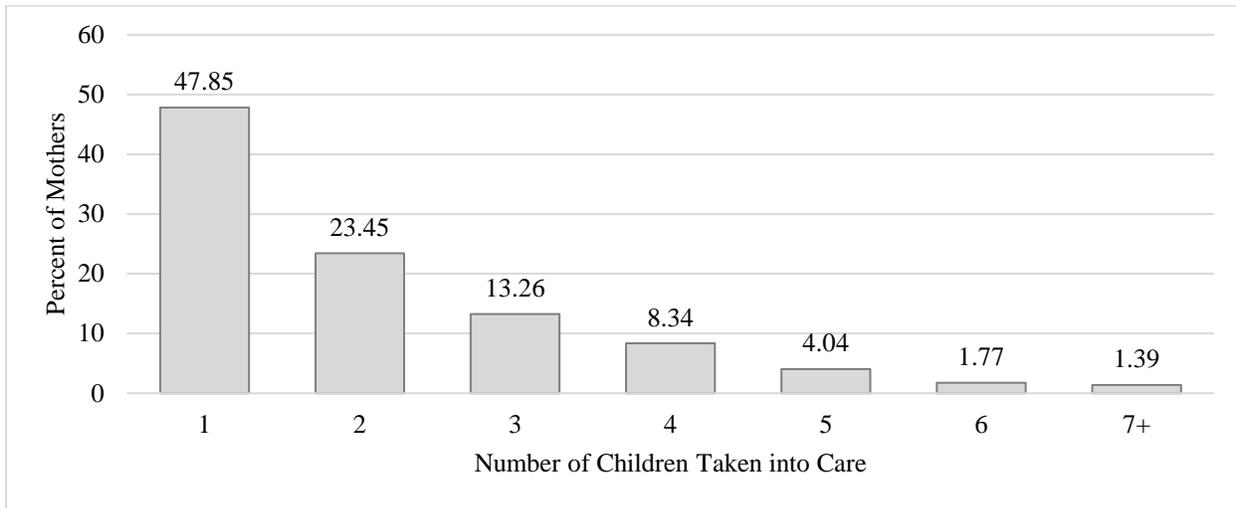
- b. **Pharmaceutical Claims:** to identify maternal pharmaceutical use; available from 1995 onward (Manitoba Centre for Health Policy, 2017b). Prescriptions are identified using Anatomical Therapeutic Chemical (ATC) classification system.
 - c. **Hospital Discharge Abstracts:** to identify maternal diagnoses and number of hospitalizations; available from 1970 onward (Manitoba Centre for Health Policy, 2017c). International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) coding was used from 1979-2003 and International Classification of Diseases, 10th Revision, Canada (ICD-10-CA) coding was used from 2004 onward.
 - d. **Medical Services:** to identify maternal diagnoses and number of ambulatory care visits; available from 1970 onward (Manitoba Centre for Health Policy, 2017e). All claims are coded using ICD-9-CM.
3. **Vital Statistics:** for maternal cause of death (Manitoba Centre for Health Policy, 2017g); mortality data are available from 1970 onward.
 4. **Statistics Canada Census:** to generate area-level SES and income quintiles (Manitoba Centre for Health Policy, 2017a).

Description of the Cohort

As mentioned above, information on involvement with CPS is available beginning in 1992, with more complete information starting in 1998. A brief overview of the characteristics of mothers whose first child was born between April 1, 1998 and March 31, 2015 is presented including the number of children taken into care, information on the age of the mother, and the income and location of the neighborhood she lived in the first time a child was placed in care. There were 97,555 mothers in the cohort; 5,590 (5.73 percent) had at least one child taken into care before April 1, 2015.

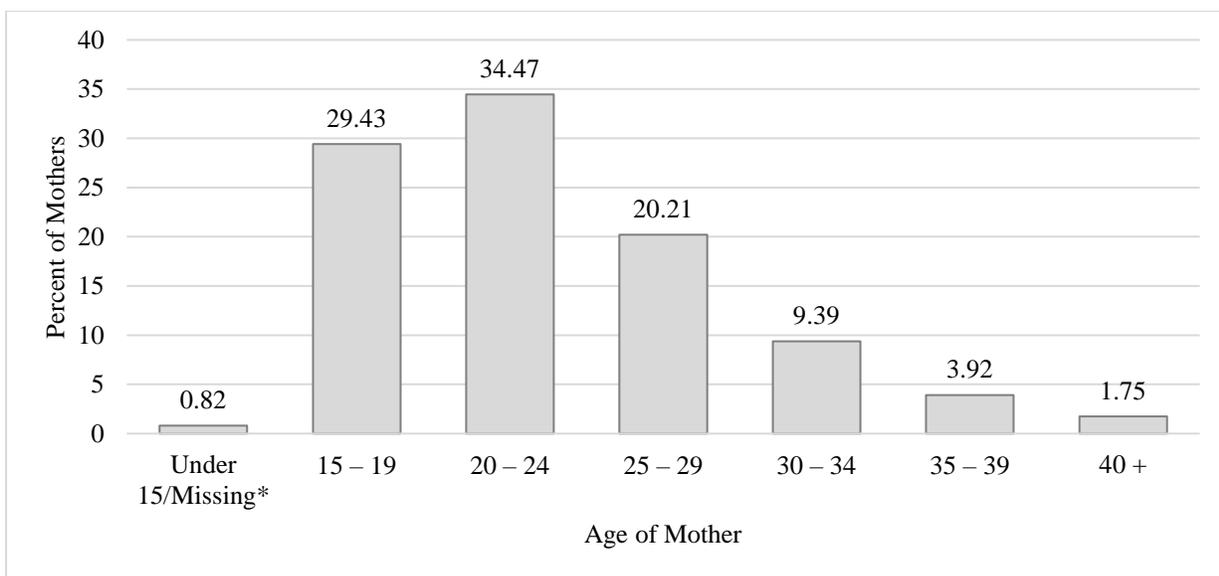
Number of children taken into care. Of the 5,590 mothers having a child taken into care, the majority (52.15 percent) had more than one child taken into care before April 1, 2015 (Figure 2).

Figure 2. Number of Children taken into Care among mothers who had at least one child taken into care (n = 5,590)



First child taken into care. More than 60 percent of mothers are younger than 25 when their first child is taken into care (Figure 3).

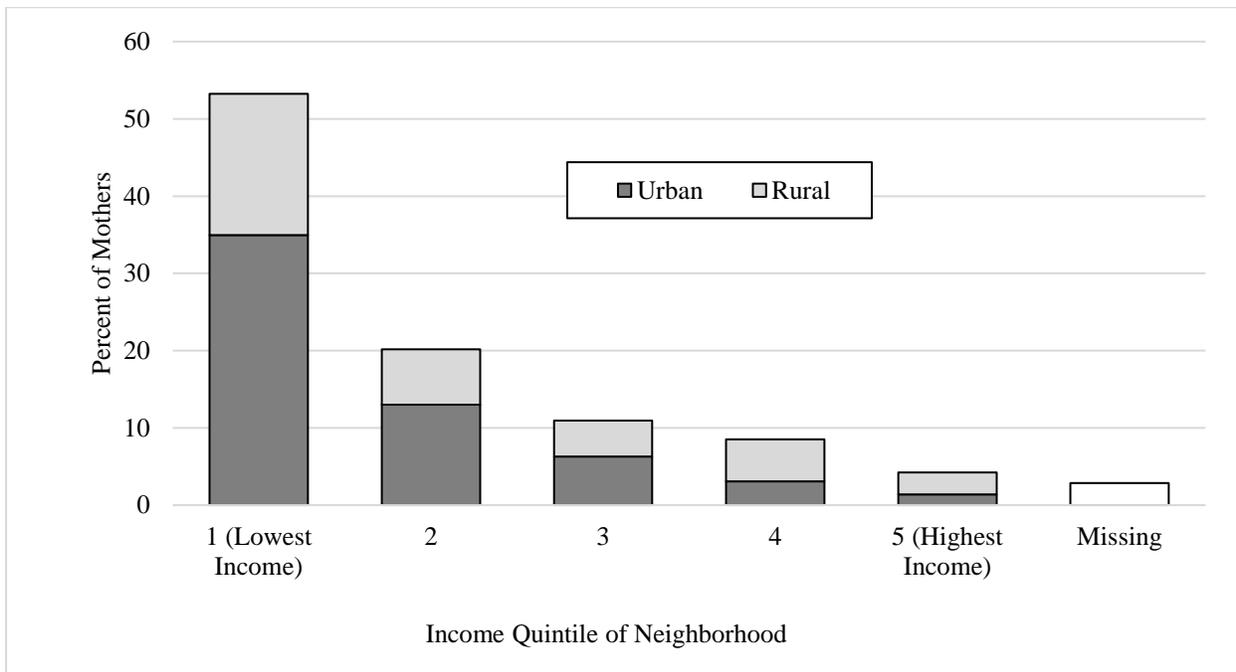
Figure 3. Mother's age when first child was taken into care (n = 5,590)



Note: missing < 6

An income quintile is a measure of neighbourhood SES that divides the population into 5 income groups (from lowest income (Q1) to highest income (Q5)) so that approximately 20 percent of the population is in each group. Income quintiles are created for two distinct population groups: urban (Winnipeg and Brandon) and rural (other Manitoba areas) (Manitoba Centre for Health Policy, 2016a). Most mothers lived in the lowest income neighborhoods (Q1) when their first child was taken into care (Figure 4).

Figure 4. Income quintile of neighborhood mothers lived in when first child was taken into care (n = 5,990)



The region of Manitoba that mothers lived in when they had their first child taken into care is defined by the Regional Health Authority (RHA) in which they resided. These boundaries were used in Manitoba from July 2002 to June 1, 2012; neighborhoods before and after these dates were converted into fit into the boundaries defined by these RHAs to make rates comparable over time.

Most mothers who had a child taken into care lived in an urban neighborhood (60.48 percent). The percent of mothers with a child taken into care in each RHA were compared with the population of mothers in the cohort (at the birth of their first child); this provided a comparison to determine whether women in specific RHAs were overrepresented in our cohort. Approximate equal proportions of mothers who had a child placed in care and women in the whole population lived in the two urban RHAs (ratio = 0.98) (Table 1). Women living in the South Eastman RHA are most underrepresented among mothers who had a child taken into care (ratio = 0.32), and women living in the Burntwood RHA were most overrepresented among mothers who had a child taken into care (ratio = 1.54).

Table 1. Region of Residence

RHA	Mothers who had a child taken into care ^a (N = 5,990)	All Mothers ^b (N = 97,555)	Measures of inequality	
	n (%)	n (%)	Difference (percentage points)	Ratio
<i>Urban</i>	3,381 (60.48)	59,956 (61.46)	-0.98	0.98
Winnipeg	3,144 (56.24)	55,066 (56.45)	-0.21	1.00
Brandon	237 (4.24)	4,890 (5.01)	-0.77	0.85
<i>Rural South</i>	698 (12.49)	18,272 (18.73)	-6.24	0.67
South Eastman	101 (1.81)	5,433 (5.57)	-3.76	0.32
Assiniboine	226 (4.04)	4,578 (4.69)	-0.65	0.86
Central	371 (6.64)	8,261 (8.47)	-1.83	0.78
<i>Rural Mid</i>	800 (14.41)	10,998 (11.27)	3.14	1.28
North Eastman	317 (5.67)	2,839 (2.91)	2.76	1.95
Interlake	246 (4.40)	5,179 (5.31)	-0.91	0.83
Parkland	237 (4.24)	2,980 (3.05)	1.19	1.39
<i>Rural North</i>	658 (11.77)	8,323 (8.53)	3.24	1.38
Nor-Man	138 (2.47)	2,407 (2.47)	0	1.00
Churchill	8 (0.14)	113 (0.12)	0.02	1.17
Burntwood	512 (9.16)	5,803 (5.95)	3.21	1.54
Missing	53 (0.95)	6 (0.00)	0.95	-

^a Region of Residence when First Child was Placed in Care

^b Region of Residence at Birth of First Child

Based on the characteristics of mothers who had a child taken into care presented above, we see that young mothers, those living in low-income neighborhoods, and those living in northern Manitoba are disproportionately represented.

Ethical Considerations and Approvals

This study used de-identified administrative data; this reduces possible ethical issues as no direct contact with human subjects was made. In Manitoba, the administrative files from various government departments are anonymized by Manitoba Health, Seniors and Active Living, and these anonymized files are housed and linked at MCHP, which acts as a steward for these data. Ethics were approved by the University of Manitoba Health Research Ethics Board (HREB; project #HS19739 (H2016:182)), and approval was obtained from the Health Information Privacy Committee (HIPC; project #2016/2017-09) at Manitoba Health, Seniors and Active Living. Approvals were also obtained from Manitoba Families, Manitoba Justice, Healthy Child Manitoba, Manitoba Education and Training, and Vital Statistics. A researcher agreement was signed between the study author and the University of Manitoba. Changes to the study protocol and co-investigators were approved by all affected departments and ethics boards. The required annual renewal of the HREB approval was completed, as was the annual accreditation through MCHP. All data providers were notified of presentations and manuscripts submitted for publication. See Appendix D and E for all approvals.

Chapter 2 Preface

The first objective of this dissertation was to examine whether mothers experience changes to their health and social circumstances after having a child placed in care by CPS. Grief, guilt, depression, and anxiety often accompany filial deprivation; thus, we would expect to see changes in health and social circumstances among mothers after custody loss. Using population-level administrative data to compare rates of mental illness, treatment use, and social stability in the years before and after a child is placed in care provides important information regarding mother's health and well-being. Comparing these rates with matched mothers who did not have a child placed in care over these same time periods will determine whether or not the changes that mothers whose children are placed in care are similar to what you would expect to see among mothers whose children were not placed in care. One previous study using administrative data showed that mother's social situation deteriorated after a child was placed in care, however, this study only examined receipt of income assistance, unemployment, and disability pension receipt (Hiilamo & Saarikallio-Torp, 2011). Aside from this study, changes to mother's health and well-being have not been examined using a population-based cohort.

Publication Details:

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**Chapter 2: Maternal Health and Social Outcomes after Having a Child Taken into Care:
Population-based Longitudinal Cohort Study using Linkable Administrative Data**

Abstract

The objective of this study was to investigate whether mothers experience changes to their health and social situation after having a child taken into care by CPS, then compared these outcomes with those found in mothers whose children were not taken into care. The cohort includes mothers whose first child was born in Manitoba between April 1, 1998 and March 31, 2011. Mothers whose children were taken into care after age 2 (n = 1,591) were compared with a matched group of women whose children were not taken into care (n = 1,591). The rates of mental illness diagnoses, treatment use, and social factors were significantly higher for mother whose children were taken into care, both in the two years before and in the two years after the index date. These adjusted relative rates (ARR) increased significantly for anxiety (before ARR = 2.71, after ARR = 3.55), substance use disorder (3.77 to 5.95), physician visits for mental illness (2.83 to 3.66), number of prescriptions (psychotropic: 4.35 to 5.86; overall: 2.34 to 2.95), number of different prescriptions (psychotropic: 2.70 to ARR = 3.30; overall: 1.62 to 1.70), residential mobility (1.40 to 1.63), and welfare use (2.07 to 2.30). The health and social situation of mothers involved with CPS deteriorates after their child is taken into care. Mothers would benefit from supports during this time period to ensure that the outcomes they experience after the loss of their child do not become another barrier to reunification.

Introduction

Considerable research has examined the implications of separation of children from their parents by child protective services on children's health and well-being (Clausen et al., 1998; Cosgrove et al., 2013; Katz et al., 2011; Leslie et al., 2014; Putnam-Hornstein & Needell, 2011). With few exceptions, the perspective of parents accused of child abuse or neglect has not been taken (Pelton, 2011). This narrow view has resulted in a lack of acknowledgement of the effect that such separations may have on parental health, well-being, and family circumstances. The few studies published on this topic have used qualitative methods to gather stories of mothers' experiences with having a child taken into care (Kenny et al., 2015; Nixon et al., 2013; Novac, Paradis, Brown, & Morton, 2006; Wells, 2011). Some mothers indicated the development or intensification of mental health conditions after their child was removed (Kenny et al., 2015). Mothers have also reported turning to drugs and alcohol to cope with the trauma of having their child taken into care (Kenny et al., 2015; McKegney, 2003). Their mechanisms for coping often resulting in more instability, such as frequent moves or homelessness, and exposure to intimate partner violence (Kenny et al., 2015).

This study has two objectives. First, we investigated mental illness diagnoses, treatment use, and social outcomes among mothers whose child was taken into care by CPS, comparing changes in health and social outcomes from the two years before to the two years after the child was taken into care. Second, we compared changes seen in mothers whose children were taken into care with changes in mothers not experiencing that event. Previous examinations of this question are limited to qualitative studies of a small number of mothers. The use of administrative data to examine this question from a population perspective will provide better understanding of the effect of this event on mothers would allow for more holistic approaches to

improve family stability. If this event results in a worsening of the health and wellbeing among biological mothers, specific supports and services should be implemented to ensure that these outcomes do not create another barrier to reunification and the likelihood of a stable mother-child relationship.

Methods

Setting. Manitoba is a central Canadian province with approximately 1.2 million residents in 2011 (Statistics Canada, 2014). Residents of Manitoba receive universal healthcare coverage (physician and hospital visits) and financial assistance for pharmaceuticals if prescription drug costs seriously affect their income (Manitoba Health Seniors and Active Living, n.d.). Canada has one of the highest rates of children placed in out-of-home care; within Canada, these rates are among the highest in Manitoba (Brownell et al., 2015). Between 2004 and 2009, the average annual rate of infants placed in out of home care in Manitoba was 2,913 per 100,000 children, much higher than the rates (per 100,000) seen in Sweden (276), Australia (287.2), New Zealand (596.7), and the United States (631.4), and England (696.4) (Gilbert et al., 2012). In Canada, the most frequent categories of substantiated child maltreatment investigations are exposure to intimate partner violence, neglect, and physical abuse (Trocme et al., 2010).

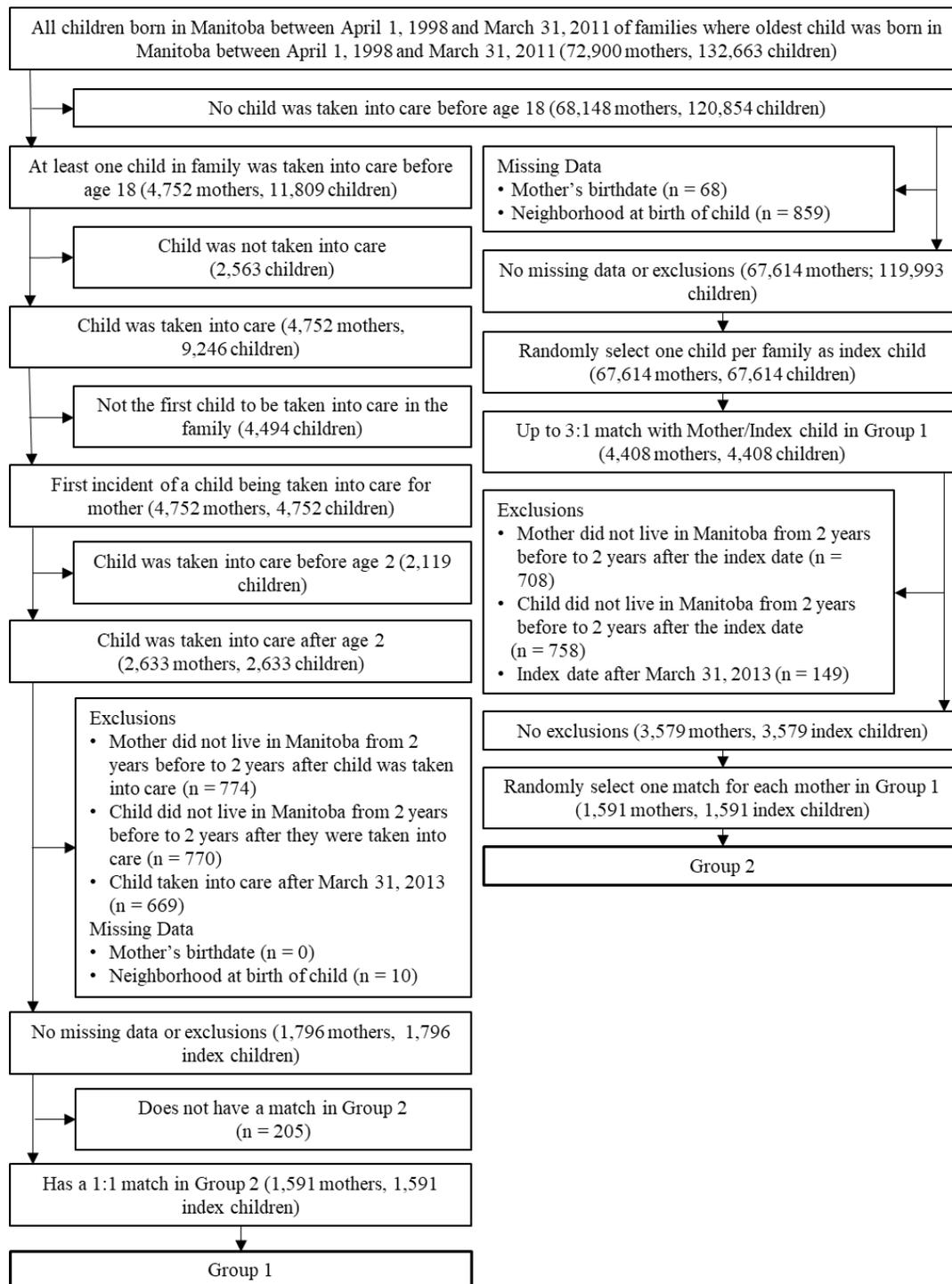
Data. This study used linkable administrative data found in the Repository housed at MCHP; this Repository contains province-wide, routinely collected individual data for each Manitoba resident (Nickel et al., 2014). Births, deaths, arrival, and departure dates are identified for each resident, with follow-up comparable to that of the largest cohort studies based on primary data (Power, Kuh, & Morton, 2013). Data from the registry were linked at the

individual-level with physician claims, hospital discharge abstracts, pharmaceutical claims, CFS case reports, EIA case reports, and the Canadian Census. A scrambled personal health number linked these de-identified datasets. Information on linkage methods, confidentiality/privacy, and validity is provided elsewhere (Roos, Gupta, Soodeen, & Jebamani, 2005; Roos & Nicol, 1999). Children are linked to mothers using hospital birth record information (Currie, Stabile, Manivong, & Roos, 2010).

Cohort Formation. This study included individuals drawn from the whole population of women whose first child was born in Manitoba between April 1, 1998 and March 31, 2011. The start date was selected as the beginning of highly reliable information on children being taken into care and the end date as the last date of information for at least two years after the child was taken into care for events occurring on or before March 31, 2013 (child had to be at least two years old, data availability ends March 31, 2015). The cohort was divided into two groups. Group 1 included all women whose children were taken into care between ages 2 and 16. We included children at least two years old when taken into care to ensure that all mothers and children were together in the two-year ‘before’ period. For mothers with multiple children removed from her home, the oldest child was selected as the index child; see Appendix A.2 for number of children taken into care during the first incident. For Group 1, the index date is selected as that when the index child was taken into care. Group 2 included one randomly selected (using simple random sampling without replacement) child from mothers not having any children placed in care. Mothers in Group 2 were initially matched 3:1 to those whose child was taken into care (Group 1). Matching was based on mother’s age at birth (<20, 20-24, 25-29, 30+), child’s birth year, child’s birth order (1, 2, 3, 4+), child’s sex, region of residence at birth of child (based on RHAs), income quintile of neighborhood at birth of child, and whether the

mother was diagnosed with a developmental disability or had a suicide attempt any time before the birth of the index child (see Appendix A.1 for definitions).

Figure 5. Cohort Formation



Mothers whose children are taken into care have characteristics and health histories that are quite different from mothers in the general population; matching variables were selected based on availability of data and to ensure mother/child pairs in both groups had similar sociodemographic characteristics (McConnell & Llewellyn, 2002; Putnam-Hornstein & Needell, 2011; Zuravin & DePanfilis, 1997). For mothers whose children were not taken, the index date was selected as the date that their child turned the age that their matched child was when they were taken into care. For example, if a mother had a child placed in care at age 3, the index date of her matched mother would be the date that her child turned 3, and her outcomes would be examined in the years before and after that date. Any mother-child dyads in Group 2 not living in Manitoba from two years before to two years after the index date were excluded. Of the matches remaining in Group 2, one match was randomly selected for the cohort.

Figure 5 diagrams the cohort formation.

Outcomes of interest. A series of mental diagnoses, treatment use, and social factors were measured in the two years before and two years after a mother had a child taken into care. The mental disorders were defined using ICD codes in hospital discharge abstracts and physician claims; disorders included depression, anxiety, and substance use disorder. Treatment use examined physician visits and hospitalizations for mental illness and for any illness, and pharmaceutical use. ATC codes identified in the pharmaceutical claims defined pharmaceutical use, measured by the total number of prescriptions and the number of different prescriptions, both for overall prescription use and psychotropic prescriptions specifically. Social factors included residential mobility and receiving EIA (analogous to welfare). Mental health and social factors were handled as dichotomous outcomes, and health service use treated as counts. Two-year periods were chosen based on previous work demonstrating a rise in depression incidence

among bereaved parents in the second year after death (Brent, Melhem, Donohoe, & Walker, 2009). Definitions were based on earlier work using the same data sets (see Appendix A).

Covariates. Each model adjusted for a series of covariates at the index date: year (2000 – 2004, 2005 – 2009, 2010 – 2013), mother’s age (<20, 20-24, 25-29, 30+), child’s age (2-4, 5-10, 11+), income quintile of neighborhood, location of neighborhood (urban, rural south, rural mid, rural north), and the number of children the mother had (1, 2, 3, 4+).

Statistical analyses. ARR for each of the outcomes were obtained from generalized estimating equation regression models applying a Poisson distribution. These models account for correlated observations using an independent correlation matrix (Bolton, Au, Leslie, et al., 2013). The log of the population was also included as an offset to ensure modelling of relative rate as opposed to a relative count of events. Each model adjusted for all listed covariates.

Two sets of analyses were conducted. The first analysis examined outcomes in mothers with children taken into care, compares ARRs of the outcomes in the two-years before the child was taken into care with the two years after the child was taken. The second analysis compares differences in outcomes for mothers whose children were taken into care with matched mothers whose children were not taken. All data management, programming and analyses used SAS® version 9.4.

Results

Table 2 lists characteristics of the two groups of mothers at the index date. Mothers were matched on similar covariates at the birth of the index child (such as income quintile of neighborhood and number of children); as there were at least two years between the birth of the

child and the index date, some of these variables changed. The mother's mean age was 26, and their children averaged 5 years old when taken into care. Given the 2000 – 2013 range of dates for children going into care, less than 11 percent of children were older than age 10 when taken. More than half of mothers lived in a neighborhood in the lowest income quintile; a similar percentage resided in urban neighborhoods.

Table 2. Maternal Characteristics

Characteristics at the Index Date	Child was taken into care	Child was not taken into care
	(n = 1,591) n (%)	(n = 1,591) n (%)
<i>Age of Mother</i>		
Mean (SD)	25.94 (5.33)	26.37 (5.18)
Median	24.92	25.45
< 20	121 (7.61)	90 (5.66)
20 – 24	685 (43.05)	640 (40.23)
25 – 29	508 (31.93)	547 (40.23)
≥ 30	277 (17.41)	314 (19.74)
<i>Age of Child</i>		
Mean (SD)	5.53 (2.92)	5.53 (2.92)
Median	4.71	4.71
2 – 4	853 (53.61)	853 (53.61)
5 – 10	571 (35.89)	571 (35.89)
≥ 11	167 (10.50)	167 (10.50)
<i>Income Quintile of Neighborhood</i>		
Lowest Quintile/Missing*	937 (58.89)	672 (42.24)
Second Lowest Quintile	319 (20.05)	366 (23.00)
Middle Quintile	164 (10.31)	240 (15.08)
Second Highest Quintile	130 (8.17)	207 (13.01)
Highest Quintile	41 (2.58)	106 (6.66)
<i>Location of Neighborhood</i>		
Urban	952 (59.84)	892 (56.07)
Rural South	238 (14.96)	245 (15.40)
Rural Mid	222 (13.95)	235 (14.77)
Rural North	179 (11.25)	219 (13.76)
<i>Number of Children in Family</i>		
1	386 (24.26)	769 (48.33)
2	559 (35.14)	565 (35.51)
3	361 (22.69)	183 (11.50)
4+	285 (17.91)	74 (4.65)
<i>Year</i>		
Mean (SD)	2008.6 (3.11)	2008.5 (3.12)
Median	2009	2009
2000 – 2004	216 (13.58)	214 (13.51)
2005 – 2009	652 (40.98)	629 (39.53)
2010 – 2013	723 (45.44)	747 (46.95)

* fewer than 0.5% of income quintile values are missing

Mothers whose Children were Taken into Care. Table 3 displays outcomes of mothers whose child had been taken into care after age 2, comparing rates in the 2 years after with the 2-year period before the child was taken. These mothers have high rates of mental illness, treatment use, residential mobility, and receiving welfare in the two years before their child was taken into care; most of these rates increased in the two years after their child was taken. After adjusting for covariates, the pre-post comparisons showed a 19 percent (95% CI: 10-29 percent) increase in depression, a 36 percent (23-50 percent) increase in anxiety, and a 97 percent (74-123 percent) increase in substance use disorder. Physician visits increased by 6 percent (2-10 percent); visits specific to mental illness increased by 51 percent (37-66 percent). Overall rates of hospitalizations decreased but rates specific to mental illness increased by 54 percent (12-111 percent). The number of all prescriptions increased by 42 percent (33-53 percent) and the number of different drugs prescribed by 8 percent (5-12 percent); the number of psychotropic prescriptions increased by 86 percent (59-118 percent) and the number of different psychotropic prescriptions by 40 percent (32-48 percent). Residential mobility and receiving EIA remained unchanged over these two time-periods.

We also examined whether treatment use after the child was taken were a result of an intensification of treatment-seeking behaviour among mothers already receiving treatments before their child was taken into care (existing patients) or whether these were new women seeking treatment (new patients). The majority of mothers having a physician visit (any illness or mental illness), hospitalizations for any illness, and had prescriptions after their child was taken into care also sought these treatments beforehand (i.e. were existing patients). Most mothers being hospitalized for mental illness after their child was taken into care were new patients (Table 4). Mothers who were hospitalized or visited a physician for any illness before their child

was taken into care did not seek significantly more treatment of that type after their child was taken. There was an intensification of physician visits for mental illness and prescription use among mothers receiving those treatments before their child was taken into care.

Table 3. Mental disorders, treatment use, and social factors among 1,591 mothers before and after their child was taken into care

Outcome	n (%)		ARR (95% CI)
	2-year prevalence before their child was taken into care	2-year prevalence after their child was taken into care	
<i>Mental Health</i>			
Depression	442 (27.78)	527 (33.12)	1.19 (1.10, 1.29) ^a
Anxiety	272 (17.10)	370 (23.26)	1.36 (1.23, 1.50) ^a
Substance Use Disorder	227 (14.27)	447 (28.10)	1.97 (1.74, 2.23) ^a
<i>Treatment Use^b</i>			
Physician visit for mental illness	3,999 (2.51)	6,024 (3.79)	1.51 (1.37, 1.66) ^a
Hospitalization for mental illness	87 (0.05)	134 (0.08)	1.54 (1.12, 2.11) ^a
Physician visit for any illness	27,081 (17.02)	28,673 (18.02)	1.06 (1.02, 1.10) ^a
Hospitalization for any illness	1,895 (1.19)	1,580 (0.99)	0.83 (0.78, 0.89) ^a
Number of psychotropic prescriptions	12,964 (8.14)	24,173 (15.19)	1.86 (1.59, 2.18) ^a
Number of different psychotropic prescriptions	1649 (1.04)	2302 (1.45)	1.40 (1.32, 1.48) ^a
Number of prescriptions	51,750 (32.53)	73,648 (46.29)	1.42 (1.33, 1.53) ^a
Number of different drugs	15,755 (9.90)	17,087 (10.74)	1.08 (1.05, 1.12) ^a
<i>Social Factors</i>			
Moved	848 (53.30)	882 (55.44)	1.04 (0.99, 1.09)
Received EIA	1,131 (71.09)	1,118 (70.27)	0.99 (0.96, 1.01)

Note: Adjusted rate in 2 years after the child was taken into care compared with 2 years before the child was taken into care. Model covariates at the index date: year, mother’s age, child’s age, income quintile of neighborhood, location of neighborhood, number of children in family

^a $P < .01$

^b Treatment use variables are measured as a summarized count of treatment contacts, with the mean number of physician visits, hospitalizations, prescriptions per person in parentheses.

Table 4. Treatment Use and Prescription Use after Child was Taken into Care among Existing and New Patients

Treatment Use After Child was Taken into Care	n (%)	2 years before their child was taken into care	2 years after their child was taken into care	Difference p-value
		mean (SD)	mean (SD)	
Physician visit for mental illness (N = 933)				
Existing	631 (67.6)	5.84 (7.12)	8.07 (11.14)	<.0001
New	302 (32.4)	0.00 (0.00)	3.10 (4.50)	<.0001
Hospitalization for mental illness (N = 96)				
Existing	19 (19.8)	1.47 (0.70)	1.89 (1.37)	0.2430
New	77 (80.2)	0.00 (0.00)	1.27 (0.68)	<.0001
Physician visit for any illness (N = 1,555)				
Existing	1532 (98.5)	17.59 (14.75)	18.62 (16.71)	.0722

New	23 (1.5)	0.00 (0.00)	6.65 (8.39)	.0010
Hospitalization for any illness (N = 912)				
Existing	677 (74.2)	1.87 (1.36)	1.78 (1.07)	.1567
New	235 (25.8)	0.00 (0.00)	1.61 (0.92)	<.0001
Number of psychotropic prescriptions (N = 881)				
Existing	603 (68.4)	20.78 (48.91)	35.50 (81.85)	.0002
New	278 (31.6)	0.00 (0.00)	9.95 (22.82)	<.0001
Number of prescriptions (N = 1,518)				
Existing	1475 (97.2)	34.88 (74.64)	49.69 (128.3)	.0001
New	43 (2.8)	0.00 (0.00)	8.14 (8.36)	<.0001

Comparing mothers who had a child taken into care and mothers in the general population. The same outcomes are used to compare mothers whose children had been taken into care with those whose children had not been taken (Table 5). For all outcomes, both before and after the index date, the ARR was greater among mothers with children taken into care. For many of the outcomes, mothers whose children were taken into care had significantly increased adjusted rates after the index date relative to mothers not having a child taken into care (significant period X group interactions). The ARR of anxiety diagnoses increased from 2.71 before the index date to 3.55 after this date ($p=0.03$) and the ARR of substance use disorder increased from 3.77 to 5.95 ($p < 0.01$). ARRs of physician visits for mental illness increased from 2.83 to 3.66 ($p < 0.01$) and the ARR of the number of prescriptions increased from 2.34 to 2.94 ($p < 0.01$). Specifically, there were increases in the ARR of number of psychotropic prescriptions (4.35 to 5.86; $p < 0.01$), the number of different psychotropic prescriptions (2.70 to 3.30; $p < 0.01$), and the number of different prescriptions (1.62 to 1.70; $p = 0.04$). The ARR of residential mobility (1.40 to 1.63; $p < 0.01$) and receiving EIA (2.07 to 2.30; $p < 0.01$) also increased significantly. Although the two groups of mothers were very different before the child was taken into care, these differences increased after the child was taken.

Additional Analyses. The linkable administrative data allowed controlling for many important confounders, however, we did not account for maternal education. This variable was

only available for approximately 12 percent of mothers. To assess the impact of maternal education, we conducted a sub-analysis of the 383 mothers for whom educational data were available; graduating from high school did not impact our outcomes. Two analyses stratified the results by specific characteristics: age of child (<5, ≥5) and the number of children taken into care at the index date (1, 2+). When stratifying by age of child, associations tended to be stronger if the child was younger when taken into care. Stratifying by number of children taken showed stronger associations for mental illness when mothers had one child taken, and stronger associations for psychotropic medication use when mothers had multiple children taken into care. Appendix A show these additional analyses.

Table 5. Comparisons before and after the index date of mothers whose children were taken into care with mothers whose children were not taken into care

Outcome	Child taken into care (n = 1,591) vs child not taken into care (n = 1,591 (Reference))		
	2 Year before index date ARR (95% CI)	Period x Group Interaction P Value	2 Year after index date ARR (95% CI)
<i>Mental Health</i>			
Depression	2.33 (2.00, 2.72) ^a	.7989	2.38 (2.07, 2.74) ^a
Anxiety	2.71 (2.17, 3.39) ^a	.0250	3.55 (2.87, 4.38) ^a
Substance Use Disorder	3.77 (2.85, 4.99) ^a	.0083	5.95 (4.67, 7.56) ^a
<i>Treatment Use</i>			
Physician visit for mental illness	2.83 (2.35, 3.40) ^a	.0034	3.66 (3.02, 4.43) ^a
Hospitalization of mental illness	17.13 (7.18, 40.83) ^a	.3472	10.55 (4.83, 23.07) ^a
Physician visit for any illness	1.49 (1.40, 1.58) ^a	.1387	1.55 (1.45, 1.65) ^a
Hospitalization of any illness	1.74 (1.58, 1.91) ^a	.0003	1.39 (1.26, 1.54) ^a
Number of psychotropic prescriptions	4.35 (3.33-5.69) ^a	.0092	5.86 (4.49-7.63) ^a
Number of different psychotropic drugs prescribed	2.70 (2.36-3.08) ^a	.0009	3.27 (2.91-3.69) ^a
Number of prescriptions	2.34 (2.03, 2.70) ^a	<.0001	2.94 (2.48-3.47) ^a
Number of different drugs prescribed	1.62 (1.53, 1.72) ^a	.0444	1.70 (1.60, 1.80) ^a
<i>Social Factors</i>			
Moved	1.40 (1.20-1.51) ^a	.0021	1.63 (1.50-1.76) ^a
Received EIA	2.07(1.91, 2.30) ^a	.0008	2.30 (2.11, 2.50) ^a

Note: Adjusted rate among mothers whose children are taken into care compared with mothers whose children were not taken into care within each period. Model covariates at index date: year, mother's age, child's age, income quintile of neighborhood, location of neighborhood, number of children in family

Note: For children taken into care, the index date is the date of apprehension; for children not apprehended, the index date was selected as the age of their matched child was taken into care.

^a $P < .01$

Discussion

Although previous qualitative studies examined the health and social impacts on mothers after their child was taken into care by CPS, to our knowledge this is the first population-based study using linkable administrative data. In the literature, separation from a child has been correlated with the development or intensification of mental health conditions (Kenny et al., 2015). We found mothers whose children had been taken into care showed significantly increased rates of anxiety and substance use disorder diagnoses in the two years after separation. Although significantly higher rates of mental illness diagnoses are observed in mothers before and after their child was taken, the observed increases often reflected increased treatment use rather than new conditions.

Many mothers sought treatment before their child was taken into care; these mothers showed a significant increase in physician visits for mental illness and pharmaceutical use after custody loss. Although mothers sought primary care to address their mental health, hospitalizations increased. Of the mothers hospitalized for mental illness after their child was taken into care, over 80 percent did not have such a hospitalization before their child was taken. This suggests not only a worsening of mental illness among mothers already having a diagnosis, but also a development of mental illness requiring hospitalization. This increased treatment use could reflect help-seeking as result of increased distress, or could be a means of regaining custody (Gavrilovic, Schützwohl, Fazel, & Priebe, 2005).

When compared with mothers in the general population whose children were not in care, mothers having a child taken into care had significantly different diagnosis, social, and treatment use patterns, both before and after the index date. Differences before the index date are not

surprising; mental illness, substance use disorder, welfare use, and residential instability are strong predictors of having a child taken into care (Adam, 2004; Canfield, Radcliffe, Marlow, Boreham, & Gilchrist, 2017; Fong, 2016; Hollingsworth, 2004). For many outcomes, these differences became larger after the index date. Not providing mothers with adequate supports after their child is taken into care can result in worse health and social conditions. Mental illness, substance use, and poverty (as indicated by EIA use and housing instability) are often cited as impeding or preventing family reunification (Hoffman & Rosenheck, 2001; U.S. Department of Health and Human Services, 2011).

The population-based repository at MCHP has significant strengths, such as a large sample size, minimal attrition, and a substantial number of predictors over many years. This study's limitations concern the measurement and availability of variables. Since mental illness is measured from diagnoses, and many women experiencing mental illness don't seek treatment, rates may be underestimated (Wang et al., 2007). If mothers whose children are taken into care are more or less likely to seek treatment, estimates of relative rates may be misleading. Additionally, for mothers diagnosed both before and after the index date, we are unable to determine changes to that condition after the index date; the increased physician visits and pharmaceutical use among existing patients would indicate worsening conditions. As with all observational studies, our results are susceptible to unobserved confounding. Failing to adjust for confounders such as maternal history of abuse and neglect, low educational attainment, and Indigenous identity likely overestimates the observed relationships seen for the mental illness outcomes. Several predictors, such as how often she is able to visit her children, or whether her children were placed in a home of a family of the same culture – are also lacking. The changes to health and social outcomes could reflect a downward spiral in mothers resulting in their having a

child taken into care, and continued thereafter. More than half of mothers sought treatment (physicians, prescriptions) both before and after their child was taken into care, and that treatment use intensified. These mothers may be experiencing a downward spiral. This may not be true for the mothers not seeking treatment before their child was taken into care. Future research studying outcomes over a longer period before and after the index date could examine this complex issue. The setting of this study has one of the highest rates of children in care in the world; the social policies and demographics contributing to this may also contribute to how mothers respond to this event. These findings need to be replicated in settings with lower rates of children in care and settings without universal access to health care to ensure generalizability.

In conclusion, this paper provides novel findings on the mental health, health service use, and social outcomes of mothers with children taken into care. Mothers who lose custody of their children have numerous mental health and social issues; these issues worsen in the two years after their child is taken into care. Mothers would benefit from supports during this time period to ensure that the outcomes experienced after the loss of their child do not become another barrier to reunification.

Chapter 3 Preface

In the introduction, we introduced the concept of disenfranchised grief. This occurs when the grief someone experiences is not openly acknowledged, publicly mourned or socially supported. We saw in the previous chapter that mother's health and well-being - specifically mental health - deteriorates after children are placed in care. In the next study we wanted to examine whether the disenfranchised grief that mothers whose children are placed in care results in worse mental health-related outcomes than the acknowledged grief of experiencing the death of a child. Mothers whose children are placed in care differ a great deal from mothers whose children die, however, the rich administrative databases available in Manitoba allowed us to adjust for a large number of health and social variables, making these groups of mothers very similar at the time of their loss.

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Chapter 3. Maternal Mental Health after Custody Loss and Death of Child: A Retrospective Cohort Study using Linkable Administrative Data

Abstract

The purpose of this study was to compare mental illness diagnoses and treatment use in the years after their loss among mothers who lost custody of their child through involvement with CPS and those seen in mothers dealing with the death of a child. We studied mental health outcomes of a cohort of women whose first child was born in Manitoba, Canada between April 1, 1997, and March 31, 2015. Of these women, 5,792 had a child taken into care, and 1,143 mothers experienced the death of a child (<18 years old) before March 31, 2015. ARR of three mental health diagnoses and three mental health treatment use outcomes between these two groups were examined. Mothers with a child taken into care had significantly greater ARR of depression (ARR = 1.90; 95% CI 1.82-1.98), anxiety (ARR = 2.51; 95% CI = 2.40-2.63), substance use (ARR = 8.54; 95% CI 7.49-9.74), physician visits for mental illness (ARR = 3.01; 95% CI = 2.91-3.12), and psychotropic medication use (ARR = 4.95; 95% CI 4.85-5.06) in the years after custody loss compared with mothers who experienced the death of a child. Losing custody of a child to CPS is associated with significantly worse maternal mental health than experiencing the death of a child. Greater acknowledgement and supportive services should be provided to mothers experiencing the loss of a child through child protection service involvement.

Introduction

The loss of a child is traumatic for mothers (Prigerson et al., 1999). The grief associated with the death of a child, and the health and social implications of this grief, are well documented. Mothers experiencing the death of a child have worse mental health than mothers who did not lose a child (Hendrickson, 2009; Li, Laursen, Precht, Olsen, & Mortensen, 2005; Rogers, Floyd, Seltzer, Greenberg, & Hong, 2008). Another type of loss parents can experience is loss of custody of a child due to involvement with CPS. This is often experienced as a living death, characterized by ambiguous loss, since parents no longer have control of how and when they can interact with their children; parents may go for long periods without being able to see their children (Zeman, 2004). Distress experienced by mothers losing custody of their children is often overlooked, since they have failed society's ideal of good parenting (McKegney, 2003).

Maternal mental health after experiencing the death of a child has been frequently examined, but research on the health of mothers who have lost custody of a child due to involvement with CPS is limited to a few qualitative studies (McKegney, 2003). Women who lose custody of their child due to involvement with CPS have been shown to have many of the same feelings as mothers who undergo the death of a child (Kenny et al., 2015); however, outcomes seen in these two groups of mothers have never been compared. This study addresses this gap in knowledge by comparing the ARR of mental illness diagnoses and treatment use for mothers having a child taken into care with those of mothers experiencing the death of a child. This study provides a first-ever population comparison of mental health between these two groups of mothers.

Methods

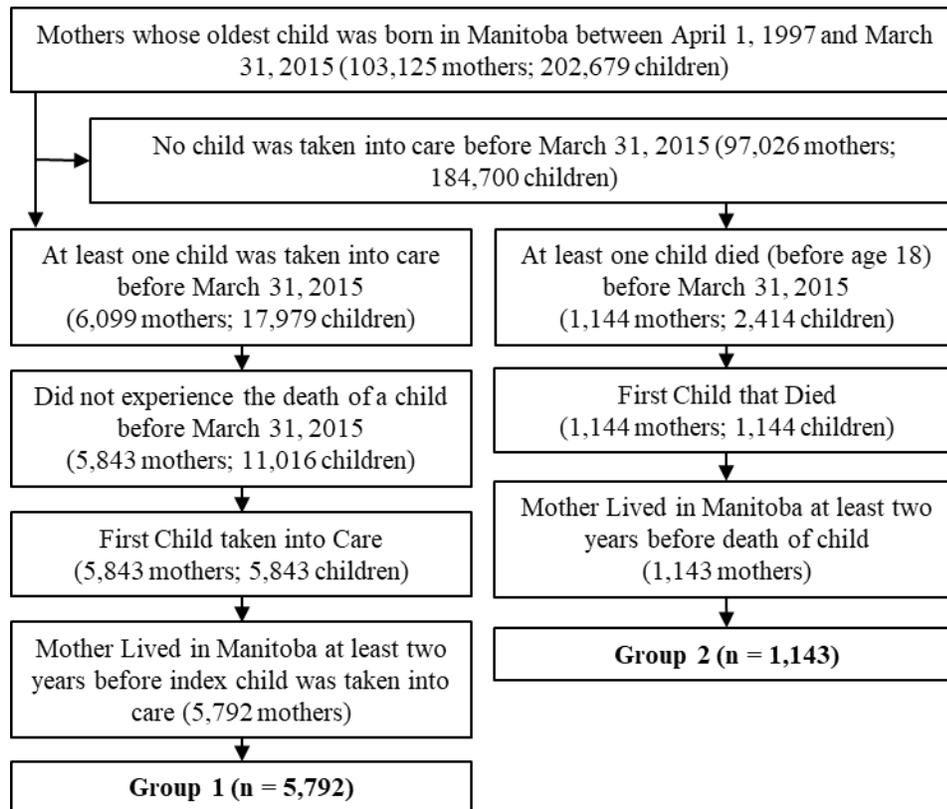
Setting. Manitoba is a central Canadian province; at the time of the 2011 census, there were approximately 1.2 million residents. Residents of Manitoba receive universal healthcare coverage. While Manitoba is representative of Canada in many aspects, ranking in the middle for several health indicators and slightly below average on education indicators, rates of children placed in out-of-home care and infant mortality are among the highest in the country (Brownell et al., 2015; Government of Canada, 2015; O’Grady, Deussing, Scerbina, Fung, & Muhe, 2016). With approximately 3 percent of children in care, Manitoba has one of the highest rates of children in care in the world (Gilbert et al., 2012). Although Manitoba does have the highest rates of children in care among the provinces, several provinces and territories also have similar high rates; Canadian provinces with relatively low rates have higher rates than many other countries around the world (Thoburn, 2007).

At over 16 percent of the population, Manitoba has the highest proportion of residents of Indigenous descent among Canadian provinces (Statistics Canada, 2015). In Canada, Indigenous children are over-represented both in the child welfare system and in child mortality. In 2014, 90 percent of Manitoba children in care were Indigenous; in the population, only 26 percent of children are Indigenous (Brownell et al., 2015). Infant mortality rates in Indigenous communities ranged from 1.7 to over 4 times the overall Canadian and/or non-Indigenous rates (Smylie, Fell, Ohlsson, & Joint Working Group on First Nations, Indian, Inuit, 2010). This over-representation is often attributed to historical social and health inequalities and injustices, including the legacy of residential schools (Gough et al., 2005).

Data. This study uses the linkable administrative data found in the Repository housed at MCHP, which contains province-wide, routinely collected individual data over time and across geographic space for each Manitoba resident (Nickel et al., 2014). Births, deaths, arrival, and departure dates are identified for each resident (Roos & Nicol, 1999). This study includes data from the population registry, linked at the individual-level with physician claims, hospital discharge abstracts, pharmaceutical claims, CFS case reports, vital statistics, and the Canadian Census. An encrypted personal health number was used to link these de-identified datasets. Information on linkage methods, confidentiality/privacy, and validity can be found elsewhere (Roos et al., 2005). Children are linked to biological mothers using hospital birth record information (Currie et al., 2010).

Cohort Formation. Individuals included in this research were drawn from the whole Manitoba population of women whose first child was born in Manitoba between April 1, 1997 and March 31, 2015. The cohort was divided into two groups. Group 1 included all women who had a child taken into care before the age of 18 years old. For these mothers, the index child is the date their first child was taken into care; when more than one child was taken into care during this first incident, the oldest child was selected as the index child. Mothers in Group 1 were followed for a total of 35,228 PY after the index date. Group 2 included all mothers with a child who died before the age of 18. For mothers experiencing more than one death before age 18, the index child was the first child who died before March 31, 2015. The index date for these mothers is the date their index child died; mothers in Group 2 were followed for a total of 8,290 PY after this date. All mothers lived in the province for at least two years before the index date. Figure 6 diagrams the cohort formation.

Figure 6. Cohort Formation of Mothers Who Experienced the Loss of a Child



Outcomes of Interest. A series of mental illness diagnoses and treatment use outcomes were measured between the index date and the study end date (March 31, 2015). Mental illness diagnoses examined are depression, anxiety, and substance use. Treatment use for mental illness included physician visits for any mental illness, hospitalizations for any mental illness, and psychotropic prescriptions. Each outcome is measured as a count to examine the number of diagnoses or events experienced. Definitions were based on pre-existing work using the same data sets. Definitions of all variables are presented in Appendix B.

Statistical Analyses. Mothers who experience the death of a child and mothers who lose custody of a child may be quite different in the years leading up to their loss; these differences may contribute to the mental health outcomes of the mothers following their loss. To make these

two groups of mothers more comparable, we used statistical methods to balance baseline characteristics.

For each of the six outcomes, a multistep algorithm applied high-dimensional propensity score (hdPS) adjustments to balance differences between the two groups mothers (Schneeweiss et al., 2009). We used hdPS adjustments as this method is better at adjusting for confounding by indication resulting in effect estimates closer to randomized control trial findings than standard covariate adjustment (Guertin, Rahme, Dormuth, & LeLorier, 2016; Schneeweiss et al., 2009). Unlike traditional propensity score methods, which are limited to investigator-specified covariates, the multistep algorithm used to derive hdPSs identifies potential confounders from a database by selecting variables correlated to both the exposure and each of the outcomes, prioritizing covariates by prevalence and potential for bias (Schneeweiss et al., 2017).

Covariates were drawn from data collected during the two years prior to loss of child, which included: (1) medical service tariff codes; (2) physician diagnostic codes; (3) hospital procedure codes; (4) hospital diagnostic codes; (5) prescription medication claims. These data are a set of proxies describing the health status of the women in our study (Schneeweiss et al., 2017). Examining health care use, physician diagnoses and medications dispensed within these five data dimensions before the index date makes use of many proxy covariates to control for co-morbid conditions, concurrent medication use, and disease severity. In addition to the health variables obtained from these data, a series of sociodemographic variables were included in the models. In the two years prior to the loss of the child, we included whether the mother had moved and whether the mother had received EIA (analogous to welfare). We also included the mother's age and the child's age at the loss of the child, as well as the child's birth order, neighborhood income (low/high) and the neighborhood location (urban/rural). See Appendix B

for definitions of low neighborhood SES, residential mobility, and welfare receipt.

The five datasets used to assess the health status in the two years before a mother's loss are extremely large. For example, the physician diagnoses are claimed as ICD-9-CM codes; these include approximately 17,000 different diagnostic codes. For each outcome, hdPSs were constructed including all sociodemographic variables and the top 500 health covariates. The algorithms used to create the hdPSs select variables correlating to both exposure and outcomes; given the six different outcomes, the variables selected could differ for each outcome model. We excluded mothers with extreme weights; weights were trimmed at the value corresponding to the 2.5th and 97.5th percentile. Balance was assessed using standardized differences (see Appendix B).

We adjusted for the confounders included in the hdPS models using Inverse Probability of Treatment Weights (IPTWs). Each outcome model used a summarized data set of for the total number of events produced for the two groups of mothers. IPTW-ARRs for each of the outcomes of interest were obtained from Poisson regression models. The log of the total number of PY at risk was included as an offset to ensure the modelling of relative rate as opposed to a relative count of events.

Using IPTWs is a good way of reducing confounding, but does not account for unobserved confounders that may impact our findings. The most important issue is whether bias from an unobserved confounder would make our relationships seem significant when they in fact are not. To estimate how large any remaining bias would have to be to change our study's findings, we used a gamma sensitivity analysis. The gamma sensitivity analysis uses both the magnitude of the estimated effect as well as its precision to determine how large the effect of an

unobserved confounder would need to be - over and above the balancing of all the observed characteristics in the hdPS – to make our significant relationships non-significant (Jiang, Foster, & Gibson-Davis, 2011). All data management, programming and analyses were performed using SAS® version 9.4.

Results

Our cohort included 6,935 women suffering the loss of a child between 1997 and 2015; 5,792 had a child taken into care, and 1,143 experienced the death of a child. Table 6 displays the frequencies of the sociodemographic covariates of mothers in each group; sociodemographic characteristics were different in the two groups of mothers.

Table 6. Characteristics of Mothers Losing a Child

	Mothers who had a child taken into care (n = 5,792)	Mothers who experienced the death of a child (n = 1,143)
	n (%)	n (%)
<i>Characteristics at the Index Date</i>		
Age of Mother		
< 20	1,735 (29.96)	131(11.46)
20 – 29	3,106 (53.63)	601 (52.58)
≥ 30	951 (16.42)	411 (35.96)
Child is Younger than 1	2,396 (41.37)	960 (83.99)
Birth Order of Child		
1	4,830 (83.89)	619 (54.16)
2	645 (11.14)	319 (27.91)
3	202 (3.49)	119 (10.41)
4+	115 (1.99)	86 (7.52)
Lived in a Low-Income Neighborhood	3,080 (53.28)	344 (30.10)
Urban Neighborhood	3,548 (61.26)	588 (51.44)
<i>Maternal Event in the 2 years before the index date</i>		
Changed Residence	3,166 (54.66)	424 (37.10)
Received EIA (Welfare)	3,599 (62.14)	165 (14.44)

The health variables included in the hdPS differed as they were selected based on correlations to the exposure and the outcome; this resulted in mothers receiving different weights for each outcome. For each outcome, mothers with extreme weights were excluded; therefore, each outcome had a slightly different sample size. The resulting trimmed samples did not differ significantly on observed sociodemographic and health covariates (see Appendix B for the

weighted and unweighted standardized differences of the top covariates in each model).

Applying the weights obtained from the IPTWs meant that based on their observed characteristics, these two groups of mothers were equally likely to experience either type of loss.

Mothers whose children were taken into care have much higher rates of mental illness diagnoses and mental illness treatment use than mothers whose children were not taken (see Appendix B), and mothers who experienced the death of a child (Table 7). Compared with mothers whose children died, there were 25 additional depression diagnoses, 36 additional anxiety diagnoses, 24 additional substance use diagnoses, 83 additional physician visits for mental illness, and 405 additional psychotropic prescriptions per 100 PY among mothers having children taken into care.

Table 7 shows IPTW-adjusted rates and IPTW-ARRs for each of the outcomes for both groups of mothers. Mothers with a child taken into care had significantly greater ARR (at $p < 0.001$) of depression, anxiety, and substance use diagnoses, as well physician visits for mental illness and psychotropic prescriptions compared with mothers who experienced the death of a child. The biggest differences were seen for substance use (ARR = 8.54) and number of psychotropic prescriptions (ARR = 4.95).

Table 7. IPTW-Adjusted Rates and Relative Rates of Outcomes among Mothers Losing a Child

Outcome	Mothers who had a child was taken into care		Mothers who experienced the death of a child		IPTW-ARR (95% CI)	P	Sensitivity to Unmeasured Confounding ^a
	N	IPTW-adjusted rate per 100 PY	N	IPTW-adjusted rate per 100 PY			
<i>Diagnoses</i>							
Depression	4,439	52.81	936	27.81	1.90 (1.82-1.98)	<0.0001	93.5
Anxiety	4,005	60.68	902	24.18	2.51 (2.40-2.63)	<0.0001	94.9
Substance Use	4,080	27.35	936	3.20	8.54 (7.49-9.74)	<0.0001	93.9
<i>Treatment Use</i>							
Physician Visit for Mental Illness	4,564	124.41	932	41.25	3.01 (2.91-3.12)	<0.0001	96.7
Hospitalization for Mental Illness	4,663	2.86	936	2.75	1.03 (0.90-1.19)	0.6078	NA
Psychotropic Prescriptions	4,401	507.58	936	102.45	4.95 (4.85-5.06)	<0.0001	98.7

^a Analyzed using a γ sensitivity test

The associations of type of loss with all significant outcomes were robust to unmeasured confounding based on γ sensitivity test values greater than 90 (Table 7). After adjusting for the variables included in the hdPS, there would need to be an unmeasured confounder that both perfectly predicted the type of loss (death or custody loss) and accounted for more than 90 percent of the relationship between type of loss and each outcome. The likelihood of such a confounder existing, after adjusting for variables included in the hdPS, is very small.

Discussion

The outcomes of mothers who lost custody of a child due to involvement with CPS have not previously been examined at a population-level, and have never been compared with outcomes of mothers who suffered the death of a child. When comparing outcomes for mothers experiencing these two types of loss, we reduced differences in baseline characteristics using IPTWs. Mothers whose children were taken into care were shown to have significantly more mental illness diagnoses and greater mental health treatment use than those experiencing the death of a child.

Losing custody of a child was associated with worse mental health outcomes for the biological mother than was the death of a child. This could be due to several factors. Both groups of mothers may experience a spiraling decline after the loss of their child that can result in worse mental health. For instance, experiencing the death of a child can result in loss of income or marital breakdown, and mothers who have a child taken into care are more likely to have subsequent children taken into care (Broadhurst & Mason, 2013; Field & Behrman, 2003). These additional outcomes could lead to worse outcomes for mothers whose children were taken into care. Differing levels of social support and public acknowledgement of these two types of loss

may be contributing to these differences in outcomes. Mothers who experience the death of a child are able to publicly mourn this event and are likely to receive a wide range of social supports (Laakso & Paunonen-Ilmonen, 2002). Mothers' grief on losing custody of their child is considered disenfranchised as it is not acknowledged, publicly mourned, or socially supported (Doka, 1999). Individuals repressing their grief – such as those whose grief is disenfranchised – are more likely to express suicidal ideation, loneliness, insomnia, depression, anxiety, distress, somatic symptoms, social dysfunction, impaired memory function, nutritional problems, work and relational difficulties, and difficulties concentrating (Parkes, 1998; Stroebe et al., 2007). Finally, mothers who lost a child to death were generally older, lived in neighborhoods of higher SES, and were less likely to receive welfare before the loss of their child (see Table 15); these mothers may be better resourced to access support outside of the public health system following their loss (Cacciatore, Killian, & Harper, 2016; Doornbos, Zandee, DeGroot, & Warpinski, 2013).

The population-based repository at MCHP has some significant strengths, such as a large sample size, minimal attrition, and a large number of predictors over many years. The use of linkable administrative data also minimised the risk of surveillance bias, as the data were collected independently of the research hypothesis. The modeling used to create the IPTWs generated excellent discrimination between outcomes. Study limitations concern potential confounders and the measurement of variables. Mental illness before and after the loss of the child are measured using claims data; these data may not be adequately capturing mental illness as we are only capturing those who seek treatment and may be missing undiagnosed mental illnesses (Wang et al., 2007). However, over 98 percent of women in this sample visited a primary care physician in the follow-up period, increasing the likelihood of diagnosis of mental

illness. While unobserved confounding is a threat to all observational studies, the use of IPTWs minimizes this bias. A possibly important confounder not included in the primary analysis is Indigenous status; access to this identifier requires permissions from federal agencies, is not guaranteed, and is likely to take one to two years to obtain. To examine the possible impact of this confounder on our results, a discordant sibling analysis was performed (see Appendix C). When comparing the mental health outcomes of a mother who had a child taken into a care with her sister who experienced the death of a child (controlling for many baseline covariates and stable family characteristics), we saw that mothers having child taken into care still had significantly higher rates of substance use diagnoses and psychotropic prescriptions. For anxiety diagnoses and hospitalizations for mental illness, the estimates were like those seen in the original analysis but with larger confidence intervals, making the results non-significant. This could be due in part to the much smaller sample size of the cohort. The results depression diagnoses and physician visits for mental illness were no longer significant, with estimates very different than those seen in the original analysis. Other unmeasured confounders that could affect our conclusions include stressful events in the mother's life, such as divorce/separation, intimate partner violence, and financial stability. Finally, these findings need to be replicated in other settings to ensure generalizability.

The outcomes seen in mothers who lost custody of a child have been shown to be worse than those found among mothers suffering the death of a child. This is likely in part due to the differing levels of support and acknowledgement available to these two groups of mothers. While the death of a child may be unavoidable, having a child taken into care often is. Recent studies have found better outcomes to be achieved by strengthening resources and capabilities of parents rather than focusing solely on the child (Chartier et al., 2017; Fisher, Frenkel, Noll,

Berry, & Yockelson, 2016; Shonkoff & Fisher, 2013). Supporting mothers at risk of having a child taken into care would result in better outcomes for her child(ren), and modify the health and social outcomes associated with having a child taken into care. Where children do need to be taken into care of CPS, the grief their mothers experience needs to be acknowledged, and more supportive services should be provided. Mothers whose children are taken into care face significant issues prior to the removal of their children; the stress of losing custody can add to these challenges. Providing adequate supports for mothers to address mental illness can prevent these additional challenges from becoming another barrier to being reunited with their children. In situations where mothers are not reunified with their children, receiving supports to stabilize mental illness could benefit the maternal-child relationship in adulthood.

Chapter 4 Preface

From the previous chapter we saw that a mother's health and well-being deteriorate significantly after her child is placed in care, and the mental health of these mothers is much worse than the mental health of mothers who experienced the death of a child. Mental health outcomes that we did not examine in the previous chapter are suicide attempts and completions. For most mothers, caring for their child(ren) is a big part of their identity and gives them a sense of purpose. When a child is placed in care, mothers have no control over how they interact with that child, which can be very traumatic. The filial deprivation resulting from the loss of custody, and the disenfranchised grief they experience can lead to a deterioration of mental health and lack of purpose, which can increase the risk of suicide attempts and completions for these mothers. In the next study, we wanted to see whether mothers whose child(ren) are taken into care have higher rates of suicide attempts and completions. We first compared them with their sisters who did not have a child placed in care, then compared them with mothers who received services from CPS but whose child was not placed in care. These two comparison groups allowed us to account for potential confounders – stable family characteristics, and maternal instability.

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Chapter 4: Suicide and suicide attempts among mothers whose children were taken into care by child protection services: a cohort study using linkable administrative data

Abstract

The objective of this study is to examine suicide attempts and completions among mothers who had a child taken into care by CPS. These mothers were compared with their biological sisters who did not have a child taken into care and with mothers who received services from CPS but did not have a child taken into care. A retrospective cohort of mothers whose first child was born in Manitoba, Canada between April 1, 1992 and March 31, 2015 is used. Rates among discordant biological sisters (1,872 families) were compared using fixed effects Poisson regression models, and mothers involved with CPS (children in care (n = 1,872) and received services (n = 9,590)) were compared using a Poisson regression model. Compared with their biological sisters and mothers who received services, the adjusted incidence rate ratio (aIRR) of death by suicide was greater among mothers whose child was taken into care by CPS (aIRR = 4.46, 95% CI 1.39-14.33), and ARR = 3.45, 95% CI 1.61-7.40, respectively). Incidence rates of suicide attempts were higher among mothers with a child taken into care compared with their sisters (aIRR = 2.15; 95% CI 1.40-3.30) and mothers receiving services (aIRR = 2.82; 95% CI 2.03-3.92). Mothers who had a child taken into care had significantly higher rates of suicide attempts and completions. When children are taken into care, physician and social workers should inquire about maternal suicidal behaviours and provide appropriate mental health.

Introduction

The impact of being placed in care of CPS on children has been examined extensively. These children have worse health and social outcomes than those of children in the general population (Clausen et al., 1998; Cosgrove et al., 2013; Katz et al., 2011; Leslie et al., 2014; Putnam-Hornstein & Needell, 2011). Several population-based studies have also identified these children as being at higher risk for suicide and suicide attempts (Hjern, Vinnerljung, & Lindblad, 2004; Katz et al., 2011; Vinnerljung, Hjern, & Lindblad, 2006). Less known are the outcomes of mothers whose children are placed in care by CPS. While mothers with mental illness have significantly greater involvement with CPS, women have reported that they developed mental health conditions, or their existing mental health conditions worsened, after custody loss (Hollingsworth, 2004; Kenny et al., 2015). Being a mother has been identified as being protective against suicide; however, experiencing the death of a child increases this risk, particularly if the child is young (Qin & Mortensen, 2003). Parents who lose custody of their children have been shown to experience this situation as a living death (Zeman, 2004). The purpose of this study is to examine whether mothers who lost custody of their children due to involvement with CPS have higher rates of suicide attempts and completions than mothers not separated from their children.

Previous observational studies investigating rates of suicide in at risk populations have controlled for individual mental health, SES, and various demographic variables, as these factors have been linked to suicide and suicide attempts (Agerbo, Mortensen, & Erickson, 2001; Blakely, 2003). Mothers whose children are taken into care often have very different life circumstances than mothers in the general population. To account for some of these differences, we used two comparison groups. The first comparison is between mothers who had a child taken

into care and their biological sisters who did not have a child taken into care. This was done because suicide attempts and completions often cluster within families due to shared genetic and environmental factors, and family fixed-effects models of discordant siblings account for stable family characteristics (Agerbo, Qin, & Mortensen, 2006; Kim, 2005; Qin, 2002). The second comparison was between mothers who had a child taken into care and mothers who received services from CPS but were not separated from their child(ren). This comparison was made as the instability that resulted in involvement with CPS may also contribute to differences in suicide attempts and completions. While the comparison groups are imperfect, both capture important similarities (D’Onofrio, Lahey, Turkheimer, & Lichtenstein, 2013).

Methods

Setting. Manitoba is a central Canadian province with approximately 1.2 million residents at the time of the 2011 census (Statistics Canada, 2014). Manitoba residents receive universal healthcare coverage. While Manitoba is representative of Canada in many aspects, ranking in the middle for several health indicators and slightly below average on education indicators, rates of children placed in out-of-home care are among the highest in the country (Brownell et al., 2015; O’Grady et al., 2016). With approximately three percent of children in care, Manitoba has the highest rates of children in care among Canadian provinces and one of the highest rates in the world (Gilbert et al., 2012). Several Canadian provinces and territories have similarly high rates, however, provinces with rates lower than those seen in Manitoba still have higher rates than many other countries (Thoburn, 2007). Suicide is a leading cause of death among young Canadians, with a rate of 4.8 per 100,000 in the female population in 2012 (Navaneelan, 2015; World Health Organization, 2016). This is above the rate of 2.6 in the United Kingdom, and below the rate of 5.6 seen in the United States (World Health Organization, 2016).

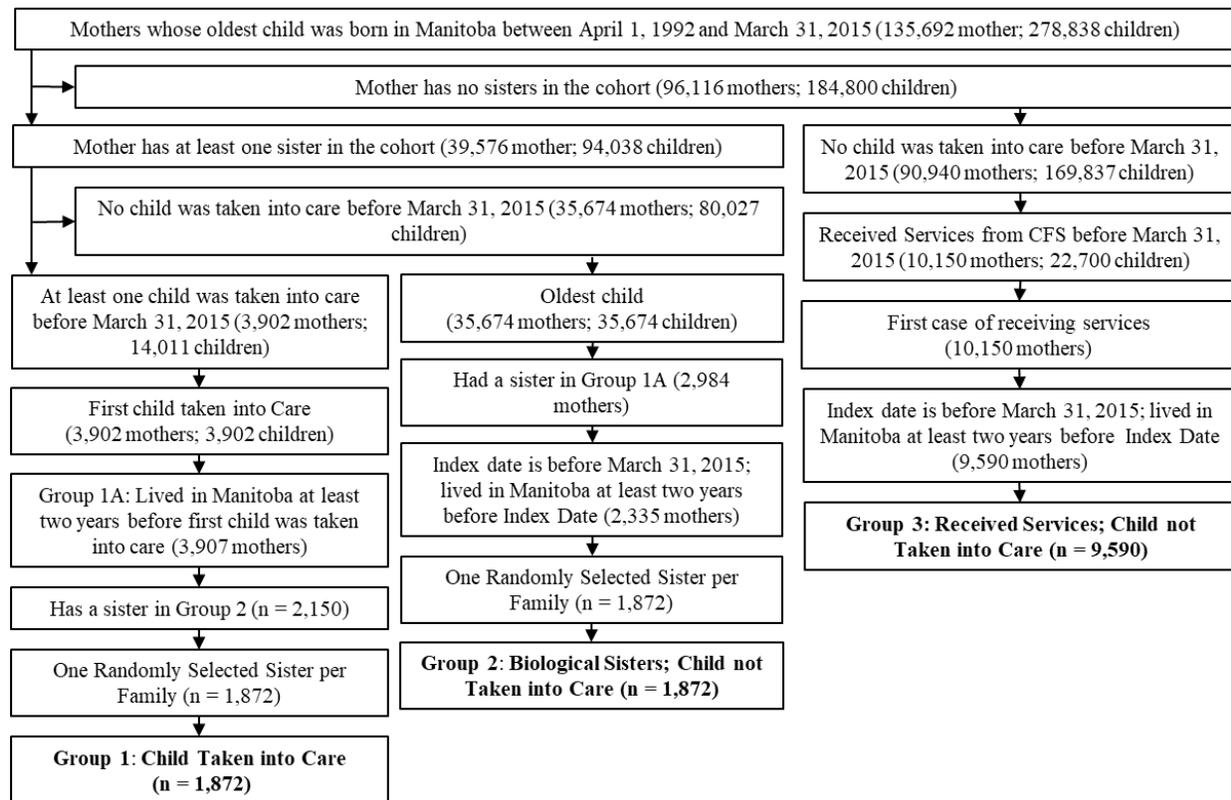
Manitoba ranks in the middle of suicide rates among Canadian provinces and territories (The Conference Board of Canada, 2017).

Data. This study uses linkable administrative data found in the Repository housed at MCHP. This Repository contains province-wide, routinely collected individual data over time and across geographic space for each provincial resident (Nickel et al., 2014). Births, deaths, arrival, and departure dates are identified for each resident, with follow-up comparable to that of the largest cohort studies based on primary data (Power et al., 2013). This research links data from the population registry with individual-level information from physician claims, hospital discharge abstracts, vital statistics, CFS case reports, and the Canadian Census. An encrypted personal health number linked these de-identified datasets. Information on linkage methods, confidentiality/ privacy, and validity can be found elsewhere (Roos et al., 2005; Roos & Nicol, 1999). Children are linked to mothers using hospital birth record information; mothers are noted in essentially all cases (Currie et al., 2010).

Cohort Formation. Individuals included in this study were drawn from the whole Manitoba population of women whose first child was born in Manitoba between April 1, 1992 and March 31st, 2015. The cohort was divided into three groups. Group 1 included all women having at least one child taken into care before March 31, 2015. For mothers having multiple children removed from her home, the oldest child was selected as the index child; the index date is the date the index child was first taken into care. Mothers in Group 1 may have sisters who also had a child taken into care; to ensure independence, one sister is randomly selected in Group 1. Group 2 included biological sisters of mothers in Group 1, who did not have a child taken into care. The index date for these mothers is the date their oldest child is the age that their sister's index child was taken into care. Again, one sister per family was randomly selected when

families had more than one sister in Group 2. Group 3 is a group of mothers without a sister in the cohort; these women received other protection or support services from CPS but did not have a child taken into care. Other protection or support services are provided to resolve family matters, with the children not removed from the home; these services include counselling, guidance, support, education, and emergency shelter services (Family Services and Housing, 2009; Manitoba Centre for Health Policy, 2007). The index date for mothers in Group 3 is the date they first began receiving services from CPS. Mothers not living in Manitoba for at least two years before the index date, or those for whom the index date was after March 31, 2015, were excluded. Figure 7 diagrams the cohort formation.

Figure 7. Cohort Selection



Variables.

Outcomes. For each mother, we examined suicides attempts and completions from the index date up to December 31, 2015 (see Table 8 for definitions). Both variables were defined using administrative data, with definitions based on previous work using these data.

Table 8. Definition of Variables

Variable	Definition
Suicide Completion after Index Date	Death due to suicide as recorded in the vital statistics database any time between the index date and December 31, 2015, including ICD-10 codes X40-X42, X46, X47, X60-X84 (Katz et al., 2011).
Suicide Attempt after Index Date	Hospitalization between the index date and December 31, 2015 with ICD-9-CA diagnosis code E950 – E959 (before April 1, 2004) or ICD-10-CA diagnosis code X60–X84 (after April 1, 2004) (Manitoba Centre for Health Policy, 2016b).
Suicide Attempt before Index Date	Hospitalization in the two years before the index date with ICD-9-CA diagnosis code E950 – E959 (before April 1, 2004) or ICD-10-CA diagnosis code X60–X84 (after April 1, 2004) (Manitoba Centre for Health Policy, 2016b).
Substance Use Diagnosis before Index Date	Hospitalizations in the two years before the index date with ICD-9-CM diagnosis code 291, 292, 303 - 305 (before April 1, 2004) or ICD-10-CA diagnosis code F10-F19, F55 (after April 1, 2004), or a physician visit in the four years before the index date with ICD-9-CM diagnosis code 291, 292, 303-305 (Chartier et al., 2016).
Mood and Anxiety Disorder Diagnosis before Index Date	In the two years before the index date, the mother has: 1) a hospitalization with a diagnosis of ICD-9-CM codes 296.1–296.8, 300.0, 300.2–300.4, 300.7, 309, 311 (before April 1, 2004) or ICD-10-CA codes F31, F32, F33, F34.1, F38.0, F38.1, F40, F41.0–F41.3, F41.8, F41.9, F42, F43.1, F43.2, F43.8, F45.2, F53.0, F93.0 (after April 1, 2004; OR 2) a physician visits with a diagnosis of ICD-9-CM codes 296 and 311; OR 4) at least three physician visits with diagnosis of ICD-9-CM code 300 or 309 (Kisely et al., 2009; Manitoba Centre for Health Policy, 2015c).
SES of Neighborhood	The SES of the neighborhood of birth was measured by the Socioeconomic Factor Index (SEFI) score (higher score corresponds with lower SES) generated using small census dissemination areas and classified by urban/rural status (Chateau, Metge, Prior, & Soodeen, 2012). This score was standardized at the provincial level (before removing exclusions and missing values).

Covariates. Potential confounders were selected based on clinical relevance; among the best predictors of suicide or suicide attempts are previous suicide attempts and mental illness (Wenzel et al., 2011). Each model adjusted for a series of maternal mental health conditions in the two years before the index date: suicide attempts (yes/no), number of substance use diagnoses (0, 1, 2+), and number of mood and anxiety disorder diagnoses (0, 1, 2+). We included the number of diagnoses in the two years before the index date to estimate the severity of the diagnosis. SES, mother’s age, and child’s age have also been identified as predictors of suicide

attempts and completions (McGirr et al., 2008; Rehkopf & Buka, 2006). Each model adjusted for SES and location of neighborhood (urban, rural south, rural mid, rural north), age of mother, and age of child at the index date. See Table 8 for definitions of covariates.

Statistical analysis. Two analyses were conducted. First, mothers having a child taken into care (Group 1) were compared with their biological sisters who did not have a child taken into care (Group 2). Adjusted IRRs for each outcome were obtained from family fixed-effects Poisson regression models. This reduced the potential for confounding, as this approach helps account for shared familial characteristics, environment, and genetic predisposition (Donovan & Susser, 2011). The second analysis compared mother with a child taken into care with mothers who received other protection or support services from CPS (but did not have a child taken into care). Adjusted IRRs for each of the outcomes were obtained using Poisson regression models. For each analysis, the log of the total number of person years (PY) at risk was included as an offset to ensure modeling of a rates as opposed to a counts of events. Data management, programming and analyses were performed using SAS® version 9.4.

Results

Overall, 13,334 mothers were included in this study. Of these mothers, 1,872 had a child taken into care, 1,872 were biological sisters not having a child taken into care, and 9,590 mothers received services from CPS but did not have a child taken into care. Mothers were followed from the index date until their coverage ended or December 31, 2015 (whichever came first), resulting in a total of 131,582 PY of follow-up. Those in Group 1 were followed for an average of 8.96 years, their sisters (Group 2) were followed for an average of 8.38 years, and the mothers (Group 3) receiving services were followed for an average of 10.34 years. Mothers

whose children were taken into care were younger and lived in neighborhoods of lower SES at the index date. These mothers were also more likely to have had a suicide attempt and had more substance use diagnoses in the two years before the index date (Table 9). Almost all mothers (99 percent) had contact with a physician after the index date.

Mothers whose children were taken into care had 286 additional suicide attempts and 76 suicide completions per 100,000 PY compared with their sisters who did not have a child taken into care (Table 10). Compared with mothers who received services, mothers whose children were taken into care had 352 additional suicide attempts and 77 suicide completions per 100,000 PY.

Compared with sisters and mothers who received services, the incidence rate of suicide attempts and completions were significantly higher among mothers having a child taken into care by CPS (Table 11). The sister comparison helps control for shared familial and genetic confounding, whereas the comparison with mothers who received services controls for maternal instability requiring CPS involvement.

Table 9. Characteristics of Mothers, Manitoba, Canada, 1992-2015

Covariates	Group 1: Had a Child Taken into Care (n = 1,872)	Did not Have a Child Taken into Care	
	mean (SD)/ n(%)	Group 2: Biological Sisters (n = 1,872) mean (SD)/ n(%)	Group 3: Received Services (n = 9,590) mean (SD)/ n(%)
<i>At the Index Date</i>			
Age of Child	3.97 (4.50)	4.19 (4.56)	3.42 (4.31)
Age of Mother	24.82 (6.77)	25.33 (6.57)	27.18 (8.81)
SES of Neighborhood *	1.18 (1.13)	1.13 (1.24)	0.37 (1.05)
<i>Location of Neighborhood</i>			
Urban	950 (50.75)	842 (44.98)	6,296 (65.65)
Rural South	239 (12.77)	272 (14.53)	1,410 (14.70)
Rural Mid	296 (15.81)	318 (16.99)	1,164 (12.14)
Rural North	387 (20.67)	440 (23.50)	720 (7.51)
<i>Maternal Diagnoses in the 2 years before the Index Date</i>			
Suicide Attempts	27 (1.44)	8 (0.43)	34 (0.35)
Number of Mood and Anxiety Disorder Diagnoses			
0	1,133 (60.52)	1,426 (76.18)	6,052 (63.11)
1	258 (13.78)	189 (10.10)	1,326 (13.83)
2+	481 (25.69)	257 (13.73)	2,212 (23.07)
Number of Substance Use Disorder Diagnoses			
0	1,548 (82.69)	1,743 (93.11)	9,039 (92.25)
1	178 (9.51)	85 (4.54)	355 (3.70)
2+	146 (7.80)	44 (2.35)	196 (2.04)

*SES is measured by the SEFI; higher values correspond with lower SES (Chateau et al., 2012)

Table 10. Rates (per 100,000 PY) of Suicide Attempts and Completions, Manitoba, Canada, 1992-2015

Outcome	Group 1: Had a Child Taken into Care	Did not have a Child Taken into Care			
	Incidence Rate ^a (95% CI)	Group 2: Sisters Incidence Rate ^a (95% CI)	Rate Difference ^b (95% CI)	Group 3: Received Services Incidence Rate ^a (95% CI)	Rate Difference ^b (95% CI)
Suicide Attempt	470.9 (377.7-387.1)	184.8 (128.4-265.9)	286.1 (234.6-337.6)	118.0 (98.5-141.5)	352.9 (305.4-400.4)
Suicide Completion	95.4 (58.4-155.7)	19.1 (6.2-59.3)	76.3 (24.8-127.8)	18.2 (11.4-28.8)	77.2 (29.7-124.7)

^a per 100,000 PY

^b Compared with Mothers in Group 1; per 100,000 PY

Table 11. Unadjusted and Adjusted IRRs of Suicide Attempts and Completions, Manitoba, Canada, 1992-2015

Outcome	'Child Taken into Care' vs 'Sisters'		'Child Taken into Care' vs 'Received Services'	
	Unadjusted IRR (95% CI)	Adjusted * IRR (95% CI)	Unadjusted IRR (95% CI)	Adjusted * IRR (95% CI)
Suicide Attempt	2.55 (1.68-3.86)	2.15 (1.40-3.30)	3.99 (3.00-5.31)	2.82 (2.03-3.92)
Suicide Completion	4.99 (1.55-16.02)	4.46 (1.39-14.33)	5.25 (2.68-10.30)	3.45 (1.61-7.40)

* Adjusted for all variables in Table 12

Discussion

To our knowledge, this study is the first to examine suicide attempts and completions among mothers who had a child taken into care by CPS. Mothers who have a child placed in care have much higher rates of suicide attempts and completions than their biological sisters and mothers who received services, even when adjusting for many risk factors.

These results of our study are concordant with, and may be explained by, earlier findings indicating that mothers losing custody of their child to CPS have increased distress and psychiatric problems (Kenny et al., 2015). Most mothers experience a great deal of pain when they lose custody of a child, which often leads to a loss of self-worth and confidence (Hollingsworth, 2005; Nixon et al., 2013). Regardless of their situation, mothers want to be seen as good mothers, and when a woman associates being a good mother with being a good person, the involvement with child protective services will place in question her mothering and her identity (Wells, 2011). Feelings of guilt, responsibility, shame, stigmatization, and loss of self-worth often associated with this type of custody loss may also contribute to the increased rates of suicide attempts and completions (Hollingsworth, 2005; Lester, 1997; Nixon et al., 2013).

Mothers whose children are taken into care often have existing mental health conditions that contributed to the loss of custody of their children (O'Donnell et al., 2015). Mothers have reported the development and worsening of mental health conditions after separation from their

child (Hollingsworth, 2004; Kenny et al., 2015). Strengthening resources and capabilities of mothers who are at risk of having a child taken into care may result in better outcomes for both mother and child (Chartier et al., 2017; Fisher et al., 2016; Shonkoff & Fisher, 2013). In situations where a child does need to be removed from the home, service providers ensure that the biological mothers are receiving adequate mental health supports. This could both prevent the deterioration of mental health in these mothers, and ensure that the stresses associated with the separation do not become another barrier to reunification.

The use of the population-based repository at MCHP offers significant strengths, including: a large sample size, minimal attrition, and a large number of predictors over many years (Roos, Walld, Burchill, Nickel, & Roos, 2017). Study limitations concern unmeasured confounders and the measurement of variables. This study only captures physician treated mental illness. Therefore, we may be missing women who experience mental illness but do not seek treatment or treatment from physicians, resulting in an underestimation of history of mental illness in our cohort (Wang et al., 2007). Additionally, for both mood and anxiety disorders and substance use disorders before the index date, we do not know the severity of the disease, its duration or resulting disability. Suicide is often under-coded in administrative data, as physicians may list underlying mental illness as the diagnosis or not accurately chart the occurrence of suicidal behaviour (Randall, Roos, Lix, Katz, & Bolton, 2017). These data have low sensitivity in tracking the prevalence of suicide outcomes; using hospital and physician claims data to identify suicidal outcomes in patients may undercount one half to two thirds of these outcomes (Randall et al., 2017). Only women who received physician treatment owing to a suicide attempt or whose death has been classified as a suicide were included. Our definition of suicide using vital statistics files excludes deaths related to motor or other vehicle collisions, which could

potentially be suicide related deaths (particularly in rural areas). These limitations may result in the underestimation of the burden of suicide among our study population. As in many observational studies, the results of this paper may be biased by unmeasured confounders. Variables that have been linked with suicide attempts and completion and were not accounted for in this study include maternal education, domestic violence, maternal history of abuse and neglect, and Indigenous status (Olfson, Blanco, & Wall, 2017; Vijayakumar, 2015; Vinnerljung et al., 2006). In Manitoba, Indigenous individuals are more likely to be involved with CPS, and also have higher rates of suicide and suicide attempts (Brownell et al., 2015; The Aboriginal Healing Foundation, 2007). While this confounder was not adjusted for in the analysis comparing mothers whose children were taken with mothers who received services, the discordant sibling analysis takes Indigenous status into account (because it is a stable family characteristic). Methodologically, this work builds on efforts to incorporate family variables into cohort studies (Li, McKeague, & Lumey, 2014). The setting of this research – Manitoba, Canada – has a very high rate of children in care (Gilbert et al., 2012). To ensure generalizability, this study needs to be replicated in other settings with different policies around child welfare.

Women who have children taken into care have increased psychological distress and are at greater risk for suicide and suicide attempts. For mothers whose children are taken into care, greater mental health supports should be provided to minimize the impact of this event and to address any underlying mental health issues contributing to the child being taken into care.

Chapter 5 Preface

The previous chapter identified mothers whose children were taken into care as a group at high risk of death by suicide. Given the high rate of physician visits, hospitalizations, and all prescriptions seen in Chapter 2, it is likely that filial deprivation resulting from custody loss to CPS results not only in higher rates of mental illness, but also high rates of physical illness. Additionally, these mothers are often living in low income neighborhoods and are more transient, which may result in worse access to medical care. Underlying conditions and poor access to medical care could result in higher rates of death due to avoidable and unavoidable causes. This final study compares mothers who had at least one child placed in care with their sisters who did not have a child placed in care to examine whether mothers whose children were placed in care are at higher risk of avoidable or unavoidable mortality. We compared discordant sisters to account for shared stable family characteristics (such as genetics and shared environments when they were children).

Publishing Details:

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Chapter 5: Mortality among mothers whose children were taken into care by child protection services: A discordant sibling analysis

Abstract

This study examines whether mothers who had a child taken into care by CPS have higher mortality rates compared with rates seen in their biological sisters who did not have a child taken into care. We conducted this retrospective cohort study with 3,948 mothers whose oldest child was born in Manitoba, Canada between April 1, 1992 and March 31, 2015 using linkable administrative data. These mothers were from 1,974 families where one sister had a child taken into care and one sister did not. We computed rate differences and hazard ratios (HR) of all-cause, avoidable, and unavoidable mortality. There were an additional 24 deaths per 10,000 PY among mothers who had a child taken into care. Mothers having a child taken into care had higher rates of mortality due to avoidable causes (HR = 3.46; 95% CI 1.41-8.48) and unavoidable causes (HR = 2.92; 95% CI 1.01-8.44). The number of children taken into care did not affect mortality rates among mothers with at least one child taken into care. The higher mortality rates – particularly avoidable mortality – among mothers who had a child taken into care indicate a need for more specific interventions for these mothers.

Introduction

When children are taken into care by CPS, the safety and well-being of the child are the highest priority. This process often overlooks the health and well-being of the mother. We focus on mother as most children are not living with their fathers when they go into care (Berger, Paxon, & Waldfogel, 2009). Previous studies have found that mothers who had a child taken into care often have more health issues and social instability than mothers in the general population; these challenges worsen after their child is taken (Kenny et al., 2015; Wall-Wieler et al., 2017). The distress that a mother faces after a different type of loss – the death of a child – is publicly acknowledged, and has been linked with many health consequences, such as increased mental illness and heightened mortality (Espinosa & Evans, 2013; Li et al., 2005). Recent findings indicate that mothers who had lost custody of a child to CPS have higher rates of mental illness following separation from their child than mothers who experienced the death of a child (Wall-Wieler, Roos, Bolton, et al., 2018). While mothers who had a child taken into care have higher rates of suicide attempts and completions, it is not known whether there is a higher rate of mortality among mothers from other causes after losing custody of a child (Wall-Wieler, Roos, Brownell, Nickel, Chateau, et al., 2018).

This study aims to fill this knowledge gap by examining all-cause mortality rates among mothers who had a child taken into care, and comparing these rates with those of their sisters who were also mothers but did not have a child taken. We compared mortality rates in discordant sisters because mortality clusters in families due to environmental and genetic factors; discordant sibling analyses account for these stable family characteristics (D’Onofrio et al., 2013; Sorensen, Nielsen, Andersen, & Teasdale, 1988). Mortality rates are often classified into avoidable causes of mortality and unavoidable causes; avoidable mortality is a death from a cause that could have

been prevented or treated (Canadian Institute for Health Information, 2012). Avoidable mortality include deaths due to infections, certain cancers, unintentional and intentional injuries.

Avoidable mortality rates are particularly high among individuals from low socioeconomic backgrounds and those with mental disorders; mothers involved with CPS often have one or both of these characteristics (Kinge, Vallejo-Torres, & Morris, 2015; Tidemalm, Waern, Stefansson, Elofsson, & Runeson, 2008; Wall-Wieler, Roos, Brownell, Nickel, & Chateau, 2018). Thus, we also examine whether mothers with a child taken into care have higher rates of avoidable and unavoidable mortality than mothers not having a child taken into care.

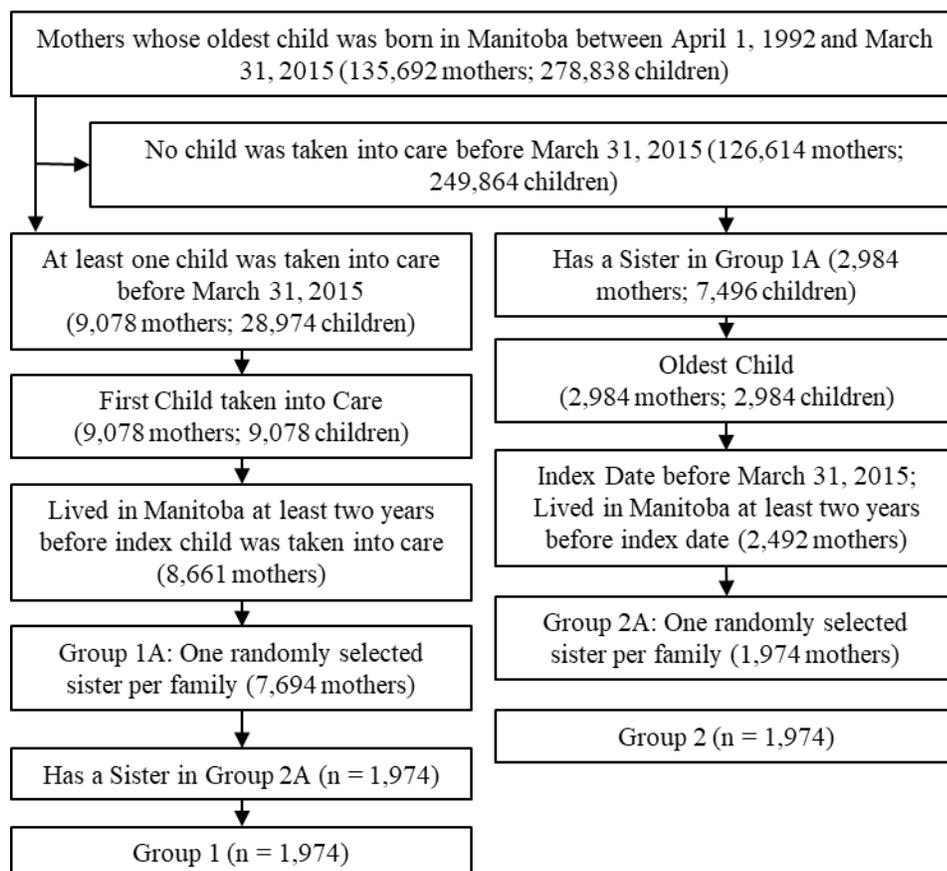
Methods

Setting and Data. Data for this study came from Manitoba, Canada, which is a central Canadian province with approximately 1.2 million residents (Statistics Canada, 2014). Manitoba residents receive universal healthcare coverage (physician visits and hospitalizations), and financial assistance for pharmaceuticals if high prescription drug costs seriously affect their income (Manitoba Health Seniors and Active Living, n.d.). Rates of children in care in Manitoba are among the highest in the world, with approximately three percent of children in care (Gilbert et al., 2012). Manitoba has among the highest rates of premature mortality among Canadian provinces, with 246.3 deaths per 100,000 people in 2008 (Statistics Canada, 2017). This is higher than the Canadian rate (203.9 per 100,000) and the United Kingdom (225 per 100,000), but lower than the premature mortality rate in the United States (271 per 100,000) (Canadian Institute for Health Information, 2012; Statistics Canada, 2017).

This paper uses the linkable administrative data in the Repository housed at MCHP. The population registry is linked at the individual-level with physician claims, hospital discharge abstracts, pharmaceutical claims, CFS case reports, EIA case reports, vital statistics, and the

Canadian Census. A scrambled personal health number was used to link these de-identified datasets. Information on linkage methods, confidentiality/privacy, and validity can be found elsewhere (Roos et al., 2005).

Cohort Formation. The cohort consisted of biological sisters whose first child was born between April 1, 1992 and March 31, 2015. Sisters are defined as having the same biological mother. This cohort was divided into two groups. Group 1 consisted of mothers whose children were taken into care before March 31, 2015. These mothers were identified through the child protection case files; child protection is delivered through CFS in Manitoba. The index date for these mothers was selected as the date that a child was first taken into care. Group 2 included mothers not having a child taken into care before March 31, 2015 and with a biological sister in Group 1. The oldest child was selected for mothers in Group 2 as the index child, and her index date was defined as the date the index child turned the age her sister's child was when that child was taken into care. Mothers who did not live in Manitoba for at least two years before the index date were excluded. Each mother was followed from the index date until end of coverage (date of death or move out of province) or December 31, 2015, whichever came first. For families with more than one sister in Group 1 or Group 2, one sister was randomly selected. Figure 8 details the cohort selection process.

Figure 8. Discordant Sibling Cohort Formation

Mortality among Mothers. Date of death and underlying cause of death were obtained from the Vital Statistics dataset. Cause of death is coded using ICD-9 for deaths before 2000 and ICD-10 for deaths in 2000 or later. The ICD-9 codes for primary cause of death for deaths occurring before 2000 were converted to ICD-10 codes (Manitoba Centre for Health Policy, 2015a). We examined all-cause mortality (any death between April 1, 1992 and December 31, 2015), and avoidable and unavoidable mortality. Avoidable mortality generally refers to deaths that could have been avoided through proper medical care, through inter-sectoral health policy interventions, or through public health programs (Pérez et al., 2014). A list of cause of death for avoidable mortality created by the Canadian Institute for Health Information was used to identify

avoidable mortality (see Appendix C); causes of deaths not included in this list are noted as unavoidable mortality (Canadian Institute for Health Information, 2012).

Statistical Analysis. Mortality rates (overall, avoidable, unavoidable) per 10,000 PY were first examined for each group of mothers, and rate differences are presented. Next, we investigated differences in mortality rates using unadjusted and adjusted Cox proportional hazard regression models.

Having a child taken into care differ from those not having a child taken; these individual and family-level differences may contribute to mortality among mothers. To account for differences, the Cox proportional hazard regression models were adjusted in three ways. First, individual-level differences (health and sociodemographic) were balanced for using IPTWs. Second, stable family covariates (such as genetics and environments) were accounted for by including a family fixed-effect in the regression model. Finally, both individual and family-level variables were accounted for using an IPT-weighted fixed-effects model.

IPTWs were obtained from hdPS. Unlike traditional propensity score methods, which are limited to covariates specified by the investigator, the multistep algorithm used to derive hdPSs identifies potential confounders from a database by selecting variables correlated to both the exposure and outcome, prioritizing covariates by prevalence and potential for bias (Schneeweiss et al., 2017). Covariates drawn from the two years before the index date were based on: (1) medical service tariff codes; (2) physician diagnostic codes; (3) hospital procedure codes; (4) hospital diagnostic codes. These data describe the health status of the women in our study (Schneeweiss et al., 2017). In our cohort, more than 97 percent of mothers had contact with a primary care physician in the two years before the index date. In addition to the health variables obtained from these data, a series of sociodemographic variables were included in the models. In

the two years before the index date, we noted whether the mother had moved and whether the mother had received EIA (analogous to welfare). We also included the mother's age, neighborhood SES, and neighborhood location (urban/rural) at the index date. The four datasets used to assess the health status in the two years before the index date are extremely large. For example, the physician diagnoses are claimed as ICD-9-CM codes; these include approximately 17,000 different diagnostic codes. The hdPSs were constructed including all sociodemographic variables and the top 500 health covariates. The unweighted and weighted standardized differences for the top 20 covariates are presented in Table 15; we consider a covariate to be balanced if the standardized difference is less than 0.25 (Harder, Stuart, & Anthony, 2010). Information on all 500 covariates included in the hdPS available on request. The kernel density plot of the distribution of propensity scores show sufficient common support for this analysis (see Appendix C).

The last analysis examined mortality rates among mothers who had a child taken into care, comparing rates among mothers who had one, two, or three or more children taken into care. Mortality rates were adjusted for mother's age, neighborhood location and SES at the death of her child, and whether she received welfare or moved in the two years before the index date. All data management, programming and analyses were performed using SAS® version 9.4.

Results

Table 12 displays the sociodemographic covariates and the top health covariates of mothers in each group. Mothers whose children were more likely to have received welfare, and to have worse health in the two years before the index date than their sisters not having a child taken.

Table 12. Comparison of Baseline Characteristics

	Had a child taken into care (n = 1,974) n (%) / mean (SD)	Did not have a child taken into care (n = 1,974) n (%) / mean (SD)	Unweighted Standardized Differences	IPT Weighted Standardized Differences
<i>Characteristics at the Index Date</i>				
Age of Mother				
< 20	547 (27.71)	452 (22.9)	0.111	0.082
20 – 29	1019 (51.62)	1116 (56.53)	0.099	0.178
≥ 30	408 (20.67)	406 (20.57)	0.003	0.131
SES of Neighborhood	1.17 (1.13)	1.12 (1.23)	0.045	0.014
Urban Neighborhood	1011 (51.22)	896 (45.39)	0.117	0.096
<i>Maternal Event in the 2 years before the Index Date</i>				
Changed Residence	954 (48.33)	767 (38.86)	0.192	0.011
Received Welfare	1076 (54.51)	683 (34.6)	0.409	0.045
<i>Maternal Health in the 2 years before the Index Date</i>				
Office visits, complete history and physical examination	373 (18.9)	212 (10.74)	0.231	0.006
Hospital care, subsequent care, 1 st and 2 nd week	57 (2.89)	26 (1.32)	0.110	0.062
Depressive Disorder	172 (8.71)	66 (3.34)	0.227	0.080
Disorders of function of stomach	38 (1.93)	13 (0.66)	0.112	0.035
Wounds, simple repair any location single	87 (4.41)	32 (1.62)	0.164	0.008
Psychotherapy by non-psychiatrist	70 (3.55)	23 (1.17)	0.157	0.182
Neurotic Disorders	155 (7.85)	87 (4.41)	0.144	0.121
Radiology, Chest, PA, and Lateral	85 (4.31)	52 (2.63)	0.091	0.038
Drug Dependence	56 (2.84)	11 (0.56)	0.177	0.096
Other Venereal Diseases	270 (13.68)	155 (7.85)	0.189	0.028
Office Visits, Regional of Subsequent Visit or Well Baby Care	417 (21.12)	271 (13.73)	0.196	0.018
Nondependent Abuse of Drugs	77 (3.9)	26 (1.32)	0.163	0.024
Electrocardiogram	85 (4.31)	37 (1.87)	0.141	0.041

Mothers in the cohort were followed for a total of 33,624 PY; mothers in Group 1 were followed for 17,487 PY (average of 8.9 years per person), and Group 2 mother for 16,137 PY (average of 8.2 years per person). A total of 86 deaths occurred in the cohort before December 31, 2015. There were 24 additional deaths per 10,000 PY among mothers who had a child taken into care (Table 13). Of the mothers who died in the follow-up period, those having a child taken into care were between 18 and 52 years old (average = 30.8) at the time of death, and mothers who did not have a child taken into care were between 19 and 54 years old (average = 31.3) at the time of death. For both mothers whose children were taken into care and those whose

children were not taken into care, the most common cause of death was unintentional injury; this cause of death accounted for approximately 25 percent of deaths (see Appendix C).

Table 13. Mortality Rates and Mortality Rate Difference, Manitoba, Canada, 1992-2015

Mortality	Had a child taken into care		Did not have a child taken into care		Rate Difference per 10,000 PY (95% CI)
	Number of Deaths	Rate per 10,000 PY (95% CI)	Number of Deaths	Rate per 10,000 PY (95% CI)	
All-Cause	65	37 (29, 47)	21	13 (9, 20)	24 (14, 35)
Avoidable	45	26 (19, 35)	15	9 (6, 15)	16 (8, 25)
Unavoidable	20	11 (7, 18)	6	4 (2, 8)	8 (2, 14)

The unadjusted HRs were almost three times greater among mothers who had a child taken into care (HR = 2.90) (Table 14). For both avoidable and unavoidable causes, mothers who had a child taken into care were about three times more likely to die during the follow-up period (HR 2.82, CI 1.57-5.06 for avoidable versus HR 3.08, CI 1.24-7.68 for unavoidable causes).

When accounting for individual differences (the IPTW-Adjusted HRs), mortality rates among mothers remained like those seen in the unadjusted analysis (Table 14). Accounting for stable family characteristics (such as genetics, ethnicity, and environment), mothers whose children were taken into care were 3.46 times more likely to die in the follow-up period, with avoidable mortality rates 3.86 times greater for mothers in this group. The final adjustment, which accounted for both individual differences (using IPTWs) and family characteristics (by including a fixed-effect) showed that mothers whose children were taken into care had 3.23 times greater mortality rates, with greater HRs for avoidable mortality (HR = 3.46) than unavoidable mortality (HR = 2.92). Tests of proportionality of hazard indicates that this increased risk is constant throughout the follow-up period (see Appendix C).

Table 14. Results from Cox Regression Model, Manitoba, Canada, 1992-2015

Mortality	Unadjusted HR (95% CI)	IPTW-Adjusted HR (95% CI)	HR with Family Fixed-Effect (95% CI)	IPTW-Adjusted HR with Family Fixed-Effect (95% CI)
All-Cause	2.90 (1.77, 4.74)	3.04 (1.80, 5.14)	3.46 (1.87, 6.42)	3.23 (1.62, 6.41)
Avoidable	2.82 (1.57, 5.06)	2.99 (1.62, 5.52)	3.86 (1.68, 8.86)	3.46 (1.41, 8.48)
Unavoidable	3.08 (1.24, 7.68)	3.19 (1.16, 8.78)	3.00 (1.19, 7.56)	2.92 (1.01, 8.44)

Most of the adjusted HRs were larger than the unadjusted HRs, indicating negative confounding. This means that failing to account for individual and family factors was underestimating the true association between having a child taken into care and mortality among mothers.

Additional Analyses.

Number of Children Taken into Care. The number of children taken into care may affect mortality rates. The final analysis examined all-cause mortality rates among mothers who had a child taken into care, comparing rates between mothers who had one child taken, two children taken, or three or more (between three and eleven) children taken into care. Among the 1,974 mothers with a child taken into care, 896 (45.4 percent) had one child taken, 453 (22.9 percent) had two children taken, and 625 (31.7 percent) had three or more children taken. HRs did not differ significantly between the three groups of mothers, suggesting that the number of children taken into care did not affect mortality rates among mothers with at least one child taken into care (Table 15).

Table 15. All-Cause Mortality Rates, and Results from Cox Regression Model among mothers who had a child taken into care, by number of children taken into care, Manitoba, Canada, 1992-2015

Number of Children Taken into Care	Number of Deaths	Rate per 10,000 PY (95% CI)	Unadjusted HR (95% CI)	Adjusted* HR (95% CI)
1	27	37 (26-54)	1.00 (Reference)	1.00 (Reference)
2	20	50 (32-77)	1.35 (0.76-2.42)	1.18 (0.65-2.16)
3+	18	29 (18-46)	0.78 (0.43-1.42)	0.73 (0.40-1.35)

*Adjusted for mother's age, SES and location of neighborhood at index date; whether mother received welfare or moved in the two years before the index date

Comparison with Mothers Who Experienced the Death of a Child. An additional analysis was conducted to compare mortality rates of mothers who lost custody of a child with mothers who experienced the death of a child. This comparison was made as both of these groups of mothers have experienced a loss; however, the type of loss, and how that loss is publicly acknowledged, differs a great deal. We found that mothers whose children were taken

into care had 2.81 times greater HRs for avoidable mortality, and significantly lower HRs for unavoidable mortality (HR = 0.21) (See Appendix C).

Discussion

To our knowledge, this is the first study to examine mortality among mothers who had a child taken into care. This research identifies mothers who had a child taken into care as a portion of the population with much higher rates of unavoidable and avoidable mortality. Two thirds of the excess deaths were due to avoidable causes. The higher rates of avoidable mortality indicate that their health attainment could potentially be influenced by health and social systems. These mothers have a great deal of contact with the health care system and the social services system, however, the treatment and services received did not sufficiently address their health and social issues leading to premature mortality. Possible reason for the increased mortality rate among mothers whose children are taken into care are the health risks associated with identified coping mechanisms (e.g. substance use), and a deterioration of mental health after custody loss (Kenny et al., 2015; Wall-Wieler et al., 2017). We do not take into account any changes to maternal health and well-being after the index date because these changes are on the causal pathway leading to the mortality outcome.

Children who spent time in care have been found to have much higher rates of mortality, specifically avoidable mortality (Hjern et al., 2004; Kalland, Pensola, Merilainen, & Sinkkonen, 2001). Other than work showing that mothers whose children were taken into care had higher rates of suicide attempts and completions, mortality rates for these mothers have not been examined (Wall-Wieler, Roos, Brownell, Nickel, Chateau, et al., 2018). Previous research has found that mothers who have a child taken into care have higher rates of mental illness than mothers dealing with the death of a child (Wall-Wieler, Roos, Bolton, et al., 2018). Our study

found higher rates of mortality for mothers who have a child taken into care (HR = 3.23) than a previous study examining mortality among mothers after the death of a child (HR = 1.43) (J. Li, Precht, Mortensen, & Olsen, 2003). In our supplemental analysis, we saw that avoidable mortality was much higher (HR = 2.81) and unavoidable mortality was much lower (HR = 0.21) among mothers whose children were taken into care than mothers who experienced the death of a child.

The population-based repository at MCHP has some significant strengths, such as a large sample size, minimal attrition, and potential for adjusting for a wide range of covariates. Mortality has been linked with both individual and family-level factors. The data housed MCHP facilitated the use of novel statistical techniques to account for differences seen both at the individual and at the family level. The rich longitudinal data allowed us to follow mothers whose children were born between 1992 and 2015, resulting in a sample of 1,974 families with discordant sisters (where one had a child taken into care and one did not). Comparisons of discordant siblings excludes confounding of having a child taken into care and the environmental factors shared by the sisters, and can also help rule out genetic confounding (D'Onofrio et al., 2013). The availability of information all physician visits (diagnoses and tariff codes) and hospitalizations (diagnoses and procedures) in the two years before the mother's index date and information on important sociodemographic characteristics allowed us to balance baseline covariates using hdPS adjustments. Using hdPS adjustments instead of standard covariate adjustment results in effect estimates closer to randomized control trial findings (Guertin et al., 2016; Schneeweiss et al., 2009). Combining the family-based approach with hdPS adjustments allows for robust estimates of the risk of mortality among mothers.

This study's primary limitations concern the availability of variables. We do not know the specific reason that a child was taken into care – this reason (such as intimate partner violence, involvement with the criminal justice system, etc.) could also be associated with mortality. In this study, we used children born between 1992 and 2015; information on child protection service involvement is available starting in 1992, however, not all agencies recorded case data in the provincial database in the early years. Data quality become more reliable starting in 1998. We also do not know the reason a child was placed in care. It is possible that poor health led to both the child being placed in care and increased rates of mortality. This is unlikely to be the reason for our results as we adjusted for all hospitalizations and physician visits in the two years prior to the index date using hdPS. Additionally, if mothers had very poor health prior to her child being taken into care, we would expect to see elevated mortality shortly after the removal, with diminishing HRs over time die sooner after the index date. We tested the proportional hazard assumption and found that this did not occur (Appendix C). Finally, these findings need to be replicated in other settings to ensure generalizability.

This study provides evidence that mothers whose children are taken into care have greater rates of mortality, specifically avoidable mortality. This excess mortality is not only a health care problem, but also a societal problem. These mothers often have specific health challenges, such as intellectual disability and mental health conditions, requiring more specific public health interventions (Hoffman & Rosenheck, 2001; McConnell & Llewellyn, 2002). Current population-based strategies focus on cardiovascular risk and lifestyle factors, which may also be important for these mothers, but do not address their specific health care needs. Mothers involved with CPS often face stigma; many have been accused of abuse or neglect, and have not met society's ideal of what constitutes good parenting (McKegney, 2003). Public health

interventions that provide more stability and address unique health care challenges of individuals (both mothers and children) involved with the CPS could reduce rates of premature mortality.

Chapter 6: Conclusions, Limitations, Policy and Practice Implications, Knowledge Translation, and Directions for Future Research

The impact of having a child placed in care on the mother has been largely overlooked. Such mothers have been accused of abuse or neglect, and thus failed western society's ideals of what constitutes good parenting. The objective of this dissertation was to examine outcomes of mothers whose children had been placed in care. Through the series of studies, I demonstrated that losing custody of a child to CPS has significant implications for the mother's health and well-being, and that the challenges a mother may have experienced before the child is taken into care are often exacerbated by the loss of custody.

Filial deprivation – the separation experiences of the parent when a child enters care – has significant consequences for maternal health and well-being. The study of filial deprivation in parents of children in foster care began in 1967, with researchers stating that “placement of progeny in settings outside their own homes under social agency care is likely to have serious implications for the placing parents” (Jenkins, 1967, p. 8). Using the concept of filial deprivation to guide my work, I examined the impact of having a child placed in care from the perspective of the birth mother. Previous research on filial deprivation has been qualitative, identifying feelings expressed by parents when their children enter foster care through structured and unstructured interviews (Jenkins & Norman, 1972; McKegey, 2003). The quantitative studies presented here were consistent with what the qualitative studies found, namely that filial deprivation in mothers of children placed in care of CPS resulted in a deterioration of mental health and social stability.

Previous studies have shown that mothers whose children are taken into care experience many symptoms of grief, but unlike mothers whose children die, their grief often remains

unresolved – i.e. disenfranchised grief (Blanton & Deschner, 1990; McKegney, 2003). To resolve grief, mothers must acknowledge the reality of their loss (Bowlby & Parkes, 1970). This can be very difficult for mothers losing custody of their children to CPS, as they often hold out hope of reunification with their child. Resolving grief also requires mourners to express their grief; this can be difficult for these mothers who are deemed to have failed the ideals of good parenting and unworthy of expressing their loss (McKegney, 2003; Worden, 2009). This disenfranchised grief can lead to additional problems of grief, such as increased suicidal ideation, depression, and anxiety (Stroebe et al., 2007). Our studies confirmed this; mothers whose children were taken into care had significantly higher rates of depression, anxiety, suicide attempts and completions in the years after custody loss (Wall-Wieler et al., 2017; Wall-Wieler, Roos, Brownell, Nickel, Chateau, et al., 2018). Mothers with mental illness and substance use are often at a higher risk of avoidable and unavoidable mortality; this was found to be true for mothers whose children were placed in care. Avoidable mortality includes causes of death such as unintentional injury, suicide, and homicide, while unavoidable mortality includes death such as transport accidents, diseases of the circulatory system, endocrine, nutritional, and metabolic diseases. The high rates of death due to unavoidable causes (compared with mothers not having a child placed in care) indicate that mothers who had a child placed in care have worse physical health; the higher rates of death due to avoidable causes indicate that these mothers have higher rates of mental illness and are more likely to be in risky situations resulting in homicide or unintentional injury.

In addition to the deterioration of maternal health, we also saw increased social instability. To cope with their loss of custody, mothers sometimes turn to drugs and alcohol, which can result in more frequent moves, loss of employment, sex work, and exposure to

intimate partner violence (Kenny et al., 2015; McKegney, 2003). We found that both in the years before and after custody loss, mothers had high rates of residential mobility and income assistance use; rates were significantly higher in the years after. Custody loss results in a deterioration of a mother's mental health and social stability, and can damage her self-identity and self-efficacy (Schofield et al., 2011). These maternal outcomes after having a child taken into care can ultimately lengthen the time it takes for her to be deemed stable enough for reunification with her child. Permanency planning guidelines limit the amount of time that a child may be in temporary care of CPS. The deterioration of mental health that results from the trauma of having a child placed in care can make it harder for mothers to engage with social workers to resolve underlying challenges. This can result in time running out for mothers to resolve these issues and, therefore, result in children being placed in permanent care of CPS.

Stable family functioning requires a materially favourable environment; in families with greater instability, policy interventions can provide supportive services, promoting family autonomy and integrity. Unfortunately, such services as adequate financial security, affordable housing, and high-quality child care are unevenly provided, causing extra stress which can contribute to family breakdown (McKegney, 2003). Adequate services are rarely available to prevent family breakdown, but when families are unable to function due to a variety of difficult circumstances, policies are in place to punish these families by removing children from the home. This paternalistic perspective taken by many child welfare agencies gives low priority to the parents and the importance of the family system. Recent research has found that a holistic approach to child welfare produces better outcomes; rather than focusing only on the child, family resources and capabilities are strengthened (Chartier et al., 2017; Fisher et al., 2016; Shonkoff & Fisher, 2013).

Policy and Practice Implications

Previous studies show that placement in care has long-lasting consequences for children, and the work presented here has demonstrated that mothers also suffer when their children are placed in care (Doyle, 2008; Katz et al., 2011). To better address these outcomes, a greater obligation should be placed on CPS to implement services that work with mothers to prevent children from being placed in the first place. In situations where children are placed in care, there should be a greater acknowledgement that losing custody of a child is often traumatic for mothers. Greater supports are needed to help mothers cope with the grief of being separated from their child(ren), and to support reunification as quickly as possible.

Prevention. The most common reason for children to be placed in care is neglect; abuse was reported in less than 12 percent of cases where children were taken into care in Manitoba (Brownell et al., 2015). To prevent children from being placed in care, CPS and other social structure need to do better in addressing and reducing child neglect. This can be done through economic supports to mothers, better access to mental health services, improved services to mothers who spent time in care and those experiencing intimate partner violence, and an acknowledgement and response to historical trauma.

Strengthen economic supports to mothers. Economic hardship is a key predictor of involvement with CPS; children from very poor families are almost twice as likely to be involved in a substantiated maltreatment investigation (Lefebvre, Fallon, Van Wert, & Filippelli, 2017). In a meta-analysis examining risk factors for child maltreatment, unemployment of the offending parent was shown to be more highly correlated with neglect ($r = 0.25$) than with abuse ($r = 0.15$) (Stith et al., 2009). Maltreatment due to neglect is very difficult to disentangle from

conditions of poverty (Roberts, 2007). A recent report examining changes to minimum wage and rates of child maltreatment reports found that a \$1 increase in the minimum wage corresponded with a 9.6 percent decline in neglect reports (Raissian & Bullinger, 2017). Strengthening household financial security can reduce maltreatment as this both allows parents to provide basic necessities for their children, and improves parental mental health (Fortson, Klevens, Merrick, Gilbert, & Alexander, 2016).

Mental health supports. A maternal diagnosis of persistent mental illness is often used to ‘fast track’ the process of taking a child into care, with rates of custody between 38 percent and 89 percent (Begley et al., 2009; Hollingsworth, 2004). Mothers with a substance use disorder before and during pregnancy had almost nine times greater odds and mothers with a schizophrenia diagnosis more than six times greater odds of having a child placed in care at birth (Wall-Wieler, Roos, Brownell, Nickel, & Chateau, 2018). Although mental illness can result in difficulties parenting, many mothers with mental illness can successfully care for their children when provided with appropriate supports and services (Mullick, Miller, & Jacobsen, 2001). In Manitoba, those wanting access mental health care and addictions treatments often have to wait more than six months to access to these services (Cooper, 2016). These long wait times can result in mental health problems or addictions worsening into a state of crisis, making it more likely that CPS will become involved. More timely and accessible mental health and addictions services could reduce CPS involvement and keep families together.

Supports for mothers who spent time in care. Mothers who spent time in care are much more likely to have a child placed in care (Mertz & Andersen, 2017; Putnam-Hornstein & Needell, 2011). The odds of having a child placed in care at birth were more than eleven times greater among mothers in care when they gave birth to that child (Wall-Wieler, Roos, Brownell,

Nickel, & Chateau, 2018). The transition to motherhood may be more challenging for mothers who spent time in care; they often experienced abuse or neglect, don't have a positive attachment to their primary caregiver, and frequently lived with many different caregivers (Stevens-Simon, Nelligan, & Kelley, 2001; Whitson, Martinez, Ayala, & Kaufman, 2011; Zuravin & DiBlasio, 1996). Additionally, these mothers may not have access to the financial and parenting supports other mothers often receive (Radey, Schelbe, McWey, Holtrop, & Canto, 2016). When mothers give birth while in care, placement with their child should be facilitated whenever possible; this provides the opportunity for secure infant attachment. Mothers who spent time in care have a unique set of challenges that other mothers often do not face; more and better services (financial, social support, housing, etc.) should be provided to assist these women in their transition to motherhood.

Intimate partner violence. A child's exposure to intimate partner violence is considered child maltreatment and often results in involvement with CPS. In fact, exposure to intimate partner violence is one of the most common reasons that children are placed in care in Canada (Public Health Agency of Canada, 2010). Abused mothers are often accused of failing to provide a safe environment to their children; however, research shows that mothers who experience abuse are no different in their parenting than mothers who are not abused (Letourneau, Fedick, & Willms, 2007; Sullivan, Nguyen, Allen, Bybee, & Juras, 2001). By separating mothers from their children when they are experiencing intimate partner violence, CPS is further traumatizing these mothers and fracturing relationships between mothers and children (Humphreys, Thiara, & Skamballis, 2011; Nixon et al., 2013). Instead of focusing on the challenges children may experience when exposed to intimate partner violence, CPS should

instead focus on mother's strengths and work with mothers to ensure that they and their children are protected (Nixon et al., 2013).

Parenting supports. Parenting skills can be enhanced through a variety of programs. A systematic review found early childhood home visiting programs to be particularly effective in reducing maltreatment (Mikton & Butchart, 2009). These programs send trained personnel to visit families in their homes and provide support to improve child health and parenting skills (Mikton & Butchart, 2009). In Manitoba, the Families First Home Visiting program is provided through Healthy Child Manitoba. This program is available to families for up to three years after the birth of a child. An evaluation of the Families First Home Visiting Program showed both decreased injury hospitalizations due to maltreatment and decreased apprehension by CFS (Chartier et al., 2015). When visiting families, case workers assess risk and connect families with services to address these risk factors. One of the challenges in the Manitoba program is that case workers may refer families to services like psychological services, but the wait times to access these services may be very long or not available in specific locations (Healthy Child Manitoba, 2010).

The final call to action in the Truth and Reconciliation Commission report regarding child welfare was for governments to “develop culturally appropriate parenting programs for Aboriginal families” (Truth and Reconciliation Commission of Canada, 2015, p. 1). To develop such parenting programs, policy makers need to ensure that cultural knowledge shapes both the structure of the service and the specific practices and strategies. Community members need to be involved in the planning and delivery of these services, and such services need to be delivered in a flexible manner that is responsive to the community (Price-Robertson & McDonald, 2011). These programs and social services need to be delivered by competent and capable staff. The

Truth and Reconciliation Commission recommends that “all service providers be educated and trained about the history and impacts of residential schools”, and that “decision makers consider the impact of residential school experience on children and their caregivers” (Truth and Reconciliation Commission of Canada, 2015, p. 1).

Standards for Removal. The placement of a child in care is done to ensure the best interest of the child, however, the removal itself can be traumatizing, and can have serious implications on health and well-being, for both child and parent. Since removing a child from their parent’s home is such a serious event, the province should have to demonstrate that they have exhausted all options for supporting families to remain together, that the ‘good’ that the removal will do for the child’s well-being and development will outweigh the harm – to both child and parents – done by the removal, and that they will be better surrogate parents than the biological family. If the province cannot guarantee that they will be better surrogate parents than the biological family, there is a double standard whereby the standard for acceptable parental care is higher than that expected of the province as the surrogate parent (Ainsworth & Hansen, 2011, 2012).

Working with mothers when children are placed in care. The objective of child protection agencies is to reunify families whenever possible, however the process for reunification can be very complex. To improve reunification rates, relationship-based models of care should be used, advocates should be provided to parents, and parents should have access to more and better services.

Relationship-based Models of Care. Current child welfare practice in Manitoba is heavily influenced by a forensic/ investigative/ prosecutorial model of child protection practice; the child is made the sole focus of concern and potential future contributions parents could

provide if they had adequate support are almost completely ignored (Lonne, Parton, Thomson, & Harries, 2009). Parents have reported that the communications they have with their child protection case workers are not clear, honest, or direct (Ivec, 2013). Productive working relationships between parents and caseworkers should be based on empathy, respect, genuineness, and optimism (Scott, Arney, & Vimparni, 2010). This is the aim of Signs of Safety, which “integrates professional knowledge with local family and cultural knowledge, and balances a rigorous exploration of danger/harm alongside indicators of strengths and safety” (Signs of Safety, 2015, p. 1). One of the advantages of this approach is that it simplifies conversations between child protective workers and families to identify specific steps required to move toward reunification. By framing discussion around how specific actions or scenarios result in risk to their child rather than just identifying risk factors, and by making harm specific and measurable, parents are better able to connect to why their child was placed in care and how they can regain custody.

Advocates for Mothers. Maternal satisfaction with child welfare services is routinely neglected or ignored (Kapp & Propp, 2002; Kapp & Vela, 2004). Some mothers fear that if they criticize or question the child welfare system, that it will reflect poorly on them and may reduce the likelihood of being reunified with their children. Clear information regarding the child protection process is often lacking for mothers, leaving them feeling bewildered, confused, and distrustful of the legal process (Douglas & Walsh, 2009). These challenges make it difficult for mothers to advocate for themselves when dealing with the child welfare system. To address this, an independent office should be created to advocate for parents whose children are placed in care. As with the Office of Children’s Advocate in Manitoba, whose mission to “ensure the voices of children and youth involved with the child welfare system are heard”(Office of the

Children's Advocate, n.d., para. 1), the office responsible for parent's rights should ensure that the voices of mothers whose children are involved with the child welfare system are also heard. These advocates would assist mothers in working with child protection case workers, ensure that there are clear steps to reunification, that timely services are made available if required for reunification, and that mothers fully understand their rights and how to navigate the legal aspects of the system.

Services for Mothers. Mothers of children in care often have complex and adverse histories, which result in them being at higher risk for mental illness, drug and alcohol misuses, and violence in the home. When services are made available to mothers whose children are in care, they are provided with the objective to improving a mother's ability to care for their child, but often fail address underlying challenges, specifically challenges that may not directly affect their ability to parent. The supports that are available to mothers are often very limited (Kapp & Propp, 2002; Kapp & Vela, 2004).

Very little clarity exist around the expectations of the child welfare system in relation to the mothers of the child. Since the primary role of social workers is to ensure the child's well-being, they may not be able to justify spending their already limited time with mothers to help them resolve their challenges and promote well-being (Schofield et al., 2011). By virtue of being human worthy of being treated with dignity, mothers deserve support, even if it does not directly affect relate to how she interacts with her children. In other countries, including England, Norway, and Sweden, legislation is in place to ensure that parents have the right to have their own needs recognized and for support to be offered. This legislation should also be implemented in Manitoba. Ensuring the well-being of mothers – who often are already in vulnerable situations

– increases the likelihood of reunification and could decrease risk of avoidable mortality (Wall-Wieler, Roos, Brownell, Nickel, Chateau, et al., 2018).

Time to Reunification/Permanency Planning. For children to develop healthy attachments, they need to have contact with a permanent caregiver, thus, finding safe, supportive, permanent homes is a major objective of child welfare agencies. To aid in this goal, many child welfare agencies have put a limit on the amount of time that a child can be under temporary guardianship of an agency before they become permanent wards. In Alberta, Canada, for example, the child welfare legislation mandates that the total cumulative time a child under the age of six can be in care in nine months (Bareeta, 2016). Manitoba legislation allows up to 15 months of temporary guardianship for children under the age of five (Government of Manitoba, 1985). This means that mothers whose young children were put in care have a very limited time to address any challenges identified by the social worker. This can be a significant challenge, as losing custody of a child can exacerbate personal situations (e.g. damaging women's mental health). Many mothers who are involved with CPS also receive EIA, but the amount of money that a mother gets from EIA may decrease after custody loss, and housing subsidies may decrease with fewer children living in the house. This means that losing a custody of a child can also result in significant social instability. The deterioration of both personal situations and the increase in social instability can result in it taking longer for mothers to engage with social workers and meet the requirements to regain custody of their child. More flexibility and support is needed to ensure that mothers who want to regain custody of their child(ren) have adequate time and resources to do so.

Study Limitations

Linkable administrative data allowed me to examine maternal outcomes after having a child placed in care at the population level. However, the use of these data does have limitations, primarily around the quality, measurement, and availability of variables. In each of the studies, placement in care is identified as a yes/no variable, however, there are many nuances to placements that I did not take into consideration – reason for placement, whether the placement was temporary or permanent, and the type of home the child was placed in (e.g. kinship vs foster care), and whether the placement was voluntary or involuntary. There are several reasons why I did not take these factors into account. First, the quality of data on reason for removal are not very good – broadly, they are defined as ‘conditions of the parent’ and ‘conditions of the child’. Second, each study focused on the first time that a child was placed in care, and in most cases, a child is initially placed in care under temporary guardianship. Third, even when a child is placed with a voluntary placement agreements, parents often do not want to place the child into care and have little control of when they can regain custody. The overall objective of this dissertation was to examine the outcomes of mothers who lost custody of their children to CPS. While the reasons and conditions around the placement may vary, each placement is similar in that mothers no longer have control over how and when they can interact with their children.

Several of the studies focused on mental illness. The use of administrative data to define mental illness underestimates the overall prevalence, as we identify diagnosis and not underlying conditions. Given the stigma around mental illness, many women don’t seek treatment (Wang et al., 2007). Additionally, mothers involved with CPS may be more hesitant to seek treatment, as maternal mental illness is often seen as a sign of instability within CPS and may result in mothers being more likely to have a child placed in care and less likely to regain custody (Begley

et al., 2009; Hollingsworth, 2004). We also cannot determine the severity of mental illness, its duration, or resulting disability. In one study, we examine suicide attempts and completions, which are often under-coded by more than one half in administrative data; physicians may list underlying mental illness as the diagnosis or not accurately chart the occurrence of suicidal behaviour (Randall et al., 2017). Finally, not all deaths by suicide are accurately coded within vital statistics; in our definition, we excluded deaths related to motor or other vehicle collisions, which could potentially be suicide related deaths (particularly in rural areas).

As with all observational studies, our results are susceptible to unobserved confounding. The linkable administrative data do allow for controlling of many potential confounders, but we cannot adjust for many social variables. It is well known that mothers who were in care as children are more likely to have their own children placed in care; however, we do not have access to this information or maternal history of abuse and neglect (Mertz & Andersen, 2017). Poverty and low educational attainment are also strong predictors of involvement with CPS (Fong, 2016; Putnam-Hornstein & Needell, 2011). While we have information on neighborhood income and receipt of income assistance, we do not have individual income. Data on educational attainment becomes available in Manitoba in 1995, and high school completion is based on credits obtained between grades 9 and 12, so high school completion information is only fully available for those finishing in 1999 and later; most mothers finished high school before this date. Many children going into care live with single mothers; Manitoba does not have data on parental living situations. A primary reason for children being placed in care in Canada is intimate partner violence, which we also do not have information on.

Although we know that Indigenous children are overrepresented in care in Manitoba, this study did not account for Indigenous status. Literature around children in care indicates that

marginalized populations are more often involved with CPS; in Manitoba, the Indigenous population is particularly marginalized. Gaining access to the Indigenous identifier for research purposes can be challenging. In Canada, access to this identifier requires permissions from federal agencies, but these agencies do not have a defined process for granting permissions. This process is possible; however, it requires significant co-ordination from provincial and Indigenous groups (such as the Assembly of Manitoba Chiefs), and typically takes more than a year to obtain permissions. While the cohort used is not representative of the Manitoba population, cohort members are representative of mothers whose children are placed in care. Failing to adjust for these confounders potentially overestimated the relationships that I identified.

While the administrative data available in Manitoba is very rich, there are many aspects of a mother's life that are likely affected by having her child placed in care that we simply could not examine. For example, questions around psychosocial function, social identity and belonging, and economic and cultural aspects cannot be answered using the administrative data. Understanding how custody loss affects these domains of life and wellbeing is very important, and fortunately, are starting to be examined using qualitative research methods (Kenny, 2017; Kenny & Barrington, 2018; Kenny et al., 2015; Wells, 2011).

The final limitation is that maternal mental health and mortality after having a child placed in care has not been examined at a population level in other jurisdictions, and therefore we do not know whether conditions specific to Manitoba led to these outcomes. Manitoba has one of the highest rates of children in care in the world; the social policies and demographics contributing to this may also contribute to how mothers respond to this event. These findings need to be replicated in settings with lower rates of children in care and settings without universal access to health care to ensure generalizability.

Knowledge Translation

A variety of methods have been used to disseminate the findings of these studies. To ensure that researchers in this and related fields are aware of this work, this research has been published in peer-reviewed academic journals. Findings were also presented to Braids of Strength (at the West Central Women's Resource Centre in Winnipeg, Manitoba), at the Women's Health Research Council of Canada Annual Gala, and at the retirement reception at the University of Manitoba. In 2017, the Government of Manitoba announced that it would be reviewing and reforming child welfare legislation (Government of Manitoba, 2017a). Dr. Marni Brownell was asked to provide a written submission to Child Welfare Legislation Review Committee, with specific revisions or addition to Manitoba's child welfare legislation. I worked with Dr. Brownell and several others to put together a document for this submission, which included several findings from the studies presented here. Additionally, findings from Chapter 2 and Chapter 4 were turned into a short articles for *The Conversation*; these articles were re-published in several newspapers, including The National Post and The Winnipeg Free Press (Wall-Wieler, 2017, 2018). Findings from Chapter 2 were also discussed during an on-air interview with Ismaila Alfa on CBC Radio Manitoba's *Up to Speed*; this interview was also turned into an online news article for CBC News (CBC News, 2017). Findings on maternal substance use were included in a news story by Wency Leung in the Globe and Mail; findings that maternal mental health is worse after custody loss than after the death of a child were included in a news article by Tara Williamson for CBC (Leung, 2017; Williamson, 2017). These results have also been presented at a seminar on child welfare at the Centre for Health Equity Studies in Stockholm, Sweden, and will be presented at the International Population Data Linkages Network Conference in September 2018.

Directions for Future Research

The studies presented in this dissertation begin to fill a large gap in knowledge around maternal outcomes after having a child placed in care, however, a great deal of work is yet to be done to fully understand the consequences of current child welfare policies on the health and well-being of mothers. Future research should address some of the limitations of this work, including examining the nuances around the placement to understand whether the reasons for placements (abuse, neglect, etc.), types of placement (temporary, permanent), and where children are placed (kinship care, foster care, place of safety, etc.) affect maternal responses. The research presented here focused primarily on mental health and mortality outcomes; social outcomes should also be examined. While most children live only with their mothers when they are placed in care, future research should also consider the potential implications on the health and well-being of fathers.

Conclusion

The studies in this dissertation demonstrate that while mothers whose are involved with CPS have much higher rates of mental illness, treatment use, and social instability in the years leading up to their involvement, these outcomes increase significantly after she becomes involved. The underlying health issues, and the deterioration of health after placement of a child, result in these mothers being at much higher risk of death due to unavoidable and avoidable (specifically death due to suicide) mortality. Much is still unknown about the impacts of having a child placed in care on mothers and what changes to policy and practice are required to address the outcomes seen in this dissertation.

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Appendix A: Supplemental Material for Chapter 2

Appendix A.1: Definitions

Table A1. Definitions

Variable	Definition
History of Developmental Disability	If at any time before the birth of the index child, the mother had <ul style="list-style-type: none"> At least one hospitalization with ICD-9-CM codes 317, 318, 319, 299, 758.0, 759.82-759.89, 760.71 OR At least one physician visit with ICD-9-CM code of 317, 318, 319, or 299 (Manitoba Centre for Health Policy, 2015b).
History of Suicide Attempt	If at any time before the birth of the index child, the mother had at least one hospitalization with a diagnosis for suicide or self-inflicted injury (ICD-9-Codes E950-E959) (Manitoba Centre for Health Policy, 2016b).
Depression	If in a two-year period, the mother had <ul style="list-style-type: none"> One or more hospitalization with a diagnosis for depression (unipolar and bipolar); ICD-9-CM codes: 296.2-296.3, 296.5, 300.4, 309, and 311; ICD-10-CA codes: F31.3-F31.5, F32, F33, F341, F380, F381, F432, F438, and F530 One or more physician visit with a diagnosis for depression; ICD-9-CM code 309, 311 (Bolton, Au, Walld, et al., 2013).
Anxiety	If in a two-year period, the mother has <ul style="list-style-type: none"> One or more hospitalization with a diagnosis for anxiety disorders; ICD-9-CM code 300.0, 300.2, 300.3; ICD-10-CA codes F40, F41.0, F41.1, F41.3, F41.8, F41.9, F42, F431 One or more physician visit with a diagnosis for anxiety disorders; ICD-9-CM code 300 (Bolton, Au, Walld, et al., 2013).
Substance Use Disorder	If in a two-year period, the mother has <ul style="list-style-type: none"> One or more hospitalization with a diagnosis for alcohol or drug psychoses, alcohol or drug dependence, or nondependent abuse of drugs; ICD-9-CM codes 291, 292, 303, 304, 305; ICD-10-CA code F10-F19, F55 One or more physician visits with a diagnosis for alcohol or drug psychoses, alcohol or drug dependence, or nondependent abuse of drugs; ICD-9-CM codes 291, 292, 303, 304, 305 (Chartier et al., 2016).
Residential Mobility	If in a two-year period, the mother moves at least once. Moving is defined by a change in six-digit postal code.
Receipt of EIA	If in a two-year period, the mother receives at least two consecutive months of EIA (Wall-Wieler, Roos, Chateau, & Roos, 2016).
Physician visits for mental illness	The number of ambulatory visits to a physician in a two-year period for a mental health related condition, identified by any diagnosis from Chapter 5 (Mental Disorders) in the ICD-9-CM code book (ICD-9-CM codes 290 – 319) (Ruth et al., 2015).
Physician visits for any illness	The number of ambulatory visits to a physician in a two-year period; this includes physician visits for mental illness.
Hospitalizations for mental illness	The number of hospitalizations (of at least one day) in a two-year period for a mental health related condition, where the primary diagnosis is for a mental health condition, which is identified by any diagnosis from Chapter 5 (Mental Disorders) in the ICD-9-CM code book or the ICD-10-CA code book
Hospitalizations for any illness	The number of hospitalizations (of at least one day) in a two-year period for any condition; this includes hospitalizations for mental illness.
Total number of prescriptions	The number of prescriptions filled; this includes psychotropic prescriptions. This does not include prescriptions written but not filled (Morgan, Kozyrskyj, Metge, & Roos, 2003).

Number of different prescriptions	The number of different drugs dispensed to each mother within a two-year period; this includes psychotropic prescriptions. Each pharmaceutical agent that falls under a different fourth-level ATC class is counted as a new drug for each mother (Fransoo et al., 2009).
Total number of psychotropic prescription	The number of psychotropic prescriptions filled by each mother within a two-year period. These are all prescriptions that fall antidepressants (ATC codes N06AA, N06AB, N06AX), antipsychotics (N05A), and Anxiolytics and sedatives (ATC codes N05BA, N05BB, N05BE, N05CF, N05CD) (Lupattelli et al., 2015).
Number of different psychotropic prescriptions	The number of different drugs dispensed to each mother within a two-year period. Each pharmaceutical agent that falls under antidepressants, antipsychotics, and sedatives and under a different fourth-level ACT class is counted as a new drug for each mother (Lupattelli et al., 2015).

Appendix A.2: Number of Children taken into care

We examined the first incident of having a child taken into care. Table A2 presents the number of children taken into care at the first incident of having a child taken into care; 50.38 percent only had one child taken into care during this incident.

Table A2. Number of Children taken into Care at the First Incident for Mothers who had at least one child taken into care (n = 4,752)

Number of Children	n (%)
1	2,394 (50.38)
2	1,155 (24.31)
3	620 (13.05)
4	344 (7.24)
5	159 (3.35)
6	56 (1.18)
7+	24 (0.50)

Appendix A.3: Additional Analyses

Adjustment for high school graduation. A sub-analysis was conducted examining the impact of adjusting for graduation from high school on the outcomes. High school graduation status is available for all mothers who lived in the province between grades 9 and 12, and graduated from high school in 1995 or later. Only 383 (24 percent) of mothers and their matches both had information on high school graduation. Table A3 show the ARR for this sub-population; the first ARR presented does not adjust for high school graduation and the second ARR adjusts for high school graduation. These two analyses had the exact same results.

Table A3. Mental disorders, treatment use, and social factors among 383 mothers before and after their child was taken into care

	n (%)		ARR (without High School Graduation) (95% CI)	ARR (with High School Graduation) (95% CI)
	2-year prevalence before their child was taken into care	2-year prevalence after their child was taken into care		
<i>Mental Health</i>				
Depression	121 (31.59)	131 (34.20)	1.08 (0.92, 1.27)	1.08 (0.92, 1.27)
Anxiety	64 (16.71)	94 (24.52)	1.47 (1.20, 1.79) ^a	1.47 (1.20, 1.79) ^a
Substance Use Disorder	50 (13.05)	124 (32.38)	2.48 (1.89, 3.26) ^a	2.48 (1.89, 3.26) ^a
<i>Treatment Use^c</i>				
Physician visit for mental illness	1,054 (2.75)	1,442 (3.77)	1.37 (1.07, 1.75) ^a	1.37 (1.07, 1.75) ^a
Hospitalization for mental illness	12 (0.03)	17 (0.04)	1.42 (0.61, 3.29)	1.42 (0.61, 3.29)
Physician visit for any illness	7,010 (18.30)	7,365 (19.23)	1.05 (0.97, 1.13)	1.05 (0.97, 1.13)
Hospitalization for any illness	436 (1.14)	349 (0.91)	0.80 (0.70, 0.92)	0.80 (0.70, 0.92)
Number of psychotropic prescriptions	2941 (7.68)	4532 (11.83)	1.54 (1.10-2.15) ^a	1.54 (1.10-2.15) ^a
Number of different psychotropic prescriptions	395 (1.03)	587 (1.53)	1.49 (1.33-1.67) ^a	1.49 (1.33-1.67) ^a
Number of prescriptions	11,582 (30.34)	14,860 (38.80)	1.28 (1.13, 1.45) ^a	1.28 (1.13, 1.45) ^a
Number of different drugs	3,092 (10.19)	4,326 (11.30)	1.11 (1.05, 1.17) ^a	1.11 (1.05, 1.17) ^a
<i>Social Factors</i>				
Moved	234 (61.10)	239 (62.40)	1.02 (0.93-1.13)	1.02 (0.93-1.13)
Received EIA	319 (83.29)	313 (81.72)	0.98 (0.94, 1.03)	0.98 (0.94, 1.03)

Note: Adjusted rate in 2 years after the child was taken into care compared with 2 years before the child was taken into care. Model covariates at the index date: year, mother's age, child's age, income quintile of neighborhood, location of neighborhood, number of children in family

^a $P < .05$

^c Treatment use variables are measured as a summarized count of treatment contacts, with the mean number of physician visits, hospitalizations, or prescriptions per person in parentheses.

The sub-analysis also examined whether mothers whose children were taken into care had different outcomes than mothers whose children were not taken into care. The first analysis (Table A4) used the same adjustment covariates as were used in the primary analysis. These results differed slightly from the results in the paper; this is likely due to the smaller sample size, and the fact that mothers who had information on high school graduation may not be representative of all mothers in the original cohort. When the analysis also adjusted for high school graduation (Table A5), the p-values of the period X group interaction remained the same. Since none of the analyses changed when high school graduation was added as a covariate, we can conclude that high school graduation does not impact the outcomes, and if it did, the impact that does have is already accounted for by the covariates in the original model.

Table A4. Comparisons before and after the index date of mothers whose children were taken into care with mothers whose children were not taken into care; not adjusting for High School Graduation

	Child taken into care (n = 383) vs child not taken into care (n = 383) (Reference)		
	2 Year before index date ARR (95% CI)	Period x Group Interaction P Value	2 Year after index date ARR (95% CI)
<i>Mental Health</i>			
Depression	1.96 (1.48-2.58) ^a	0.6592	2.09 (1.59-2.74) ^a
Anxiety	2.54 (1.61-4.01) ^a	0.2246	3.34 (2.23-5.00) ^a
Substance Use Disorder	4.12 (2.20-7.01) ^a	0.3804	5.57 (3.60-8.63) ^a
<i>Treatment Use</i>			
Physician visit for mental illness	2.31 (1.56-3.43) ^a	0.1436	2.92 (2.06-4.14) ^a
Hospitalization of mental illness	6.00 (1.25-38.74)	0.4291	17.00 (2.25-128.58) ^a
Physician visit for any illness	1.39 (1.23-1.57) ^a	0.4141	1.45 (1.29-1.64) ^a
Hospitalization of any illness	1.71 (1.43-2.04) ^a	0.0110	1.27 (1.06-1.52) ^a
Number of psychotropic prescriptions	3.46 (2.05-5.83) ^a	0.2215	4.46 (2.77-7.20) ^a
Number of different psychotropic drugs prescribed	2.07 (1.61-3.67) ^a	0.0098	2.82 (2.22-3.57) ^a
Number of prescriptions	1.87 (1.51-2.31) ^a	0.0031	2.36 (1.93-2.89) ^a
Number of different drugs prescribed	1.42 (1.28-1.58) ^a	0.0047	1.62 (1.45-1.81) ^a
<i>Social Factors</i>			
Moved	1.30 (1.13-1.49) ^a	0.3906	1.40 (1.22-1.60) ^a
Received EIA	1.66 (1.47-1.87) ^a	0.0375	1.83 (1.61-2.08) ^a

Note: Adjusted rate among mothers whose children are taken into care compared with mothers whose children were not taken into care within each period. Model covariates at index date: year, mother's age, child's age, income quintile of neighborhood, location of neighborhood, number of children in family

Note: For children taken into care, the index date is the date of apprehension; for children not apprehended, the index date was selected as the age of their matched child was taken into care.

^a $P < .05$

Table A5. Comparisons before and after the index date of mothers whose children were taken into care with mothers whose children were not taken into care; Adjusting for High School Graduation

	Child taken into care (n = 383) vs child not taken into care (n = 383) (Reference)		
	2 Year before index date ARR (95% CI)	Period x Group Interaction <i>P</i> Value	2 Year after index date ARR (95% CI)
<i>Mental Health</i>			
Depression	1.99 (1.49, 2.65) ^b	0.6592	2.12 (1.61, 2.80) ^a
Anxiety	2.39 (1.52, 3.76) ^b	0.2246	3.14 (2.09, 4.71) ^a
Substance Use Disorder	3.91 (2.09, 7.31) ^b	0.3804	5.29 (3.39, 8.24) ^a
<i>Treatment Use</i>			
Physician visit for mental illness	2.29 (1.57, 3.33) ^b	0.1436	2.88 (2.05, 4.04) ^a
Hospitalization of mental illness	5.61 (1.13, 27.76)	0.4291	15.90 (2.12, 119.14) ^a
Physician visit for any illness	1.39 (1.24, 1.57) ^b	0.4141	1.46 (1.30, 1.64)
Hospitalization of any illness	1.64 (1.37, 1.97)	0.0110	1.22 (1.02, 1.47)
Number of psychotropic prescriptions	3.36 (2.02-5.58) ^b	0.2215	4.33 (2.63-7.13) ^a
Number of different psychotropic drugs prescribed	2.01 (1.56-2.61) ^b	0.0099	2.74 (2.15-3.49) ^a
Number of prescriptions	1.81 (1.47, 2.22) ^b	0.0031	2.29 (1.86, 2.81) ^a
Number of different drugs prescribed	1.40 (1.25, 1.56) ^b	0.0047	1.60 (1.43, 1.79) ^a
<i>Social Factors</i>			
Moved	1.29 (1.12,1.49) ^b	0.3906	1.39 (1.21,1.59) ^a
Received EIA	1.63 (1.44,1.84) ^b	0.0375	1.79 (1.57-2.05) ^a

Note: Adjusted rate among mothers whose children are taken into care compared with mothers whose children were not taken into care within each period. Model covariates at index date: year, mother's age, child's age, income quintile of neighborhood, location of neighborhood, number of children in family

Note: For children taken into care, the index date is the date of apprehension; for children not apprehended, the index date was selected as the age of their matched child was taken into care.

^a *P* < .05

Stratification by Age of Child at Index Date. We examined whether mothers whose children were younger when they were taken into care (between 2 and 4) had different outcomes than mothers whose children were older when they were taken into care (5+). In our cohort, 53.6 percent of index children were <5 years old and 46.39 percent of index children were 5+ years old at the index date.

Table A6. Mental disorders, treatment use, and social factors among 1,591 mothers before and after their child was taken into care according to child's age at index date

Outcome; Age of Child at Index	n (%)		ARR (95% CI)
	2-year prevalence before their child was taken into care	2-year prevalence after their child was taken into care	
<i>Mental Health</i>			
Depression			
Child ≤ 4	231 (27.08)	274 (32.12)	1.19 (1.06-1.33) ^a
Child ≥ 5	211 (28.59)	253 (34.28)	1.20 (1.07-1.35) ^a
Anxiety			
Child ≤ 4	129 (15.12)	181 (21.22)	1.40 (1.21-1.63) ^a
Child ≥ 5	143 (19.38)	189 (25.61)	1.32 (1.16-1.51) ^a
Substance Use Disorder			
Child ≤ 4	125 (14.65)	249 (29.19)	1.99 (1.69-2.35) ^a
Child ≥ 5	102 (13.82)	198 (26.83)	1.94 (1.60-2.36) ^a
<i>Treatment Use^b</i>			
Physician visit for mental illness			
Child ≤ 4	1957 (2.29)	3115 (3.65)	1.59 (1.41-1.80) ^a
Child ≥ 5	2042 (2.77)	2909 (3.94)	1.42 (1.23-1.66) ^a
Hospitalization for mental illness			
Child ≤ 4	48 (0.06)	74 (0.09)	1.54 (1.00-2.36) ^a
Child ≥ 5	39 (0.05)	60 (0.08)	1.54 (0.96-2.47)
Physician visit for any illness			
Child ≤ 4	14516 (17.02)	15785 (18.51)	1.09 (1.04-1.14) ^a
Child ≥ 5	13565 (17.03)	12888 (17.46)	1.03 (0.97-1.08)
Hospitalization for any illness			
Child ≤ 4	1078 (1.26)	900 (1.06)	0.83 (0.76-0.91) ^a
Child ≥ 5	817 (1.11)	680 (0.92)	0.83 (0.75-0.93) ^a
Number of psychotropic prescriptions			
Child ≤ 4	5967 (9.79)	12259 (13.20)	1.89 (1.51-2.36) ^a
Child ≥ 5	6998 (9.48)	12914 (17.50)	1.85 (1.48-2.30) ^a
Number of different psychotropic prescriptions			
Child ≤ 4	816 (0.96)	1162 (1.36)	1.42 (1.31-1.54) ^a
Child ≥ 5	833 (1.13)	1140 (1.54)	1.37 (1.27-1.48) ^a
Number of prescriptions			
Child ≤ 4	25069 (29.39)	36294 (42.55)	1.45 (1.32-1.59) ^a
Child ≥ 5	26681 (36.15)	37354 (50.62)	1.40 (1.26-1.55) ^a
Number of different drugs			
Child ≤ 4	8352 (9.79)	9220 (10.81)	1.10 (1.06-1.15) ^a
Child ≥ 5	7403 (9.48)	7867 (10.67)	1.06 (1.02-1.11) ^a
<i>Social Factors</i>			
Moved			
Child ≤ 4	490 (57.44)	500 (58.62)	1.02 (0.96-1.09)
Child ≥ 5	358 (48.51)	382 (51.76)	1.07 (0.98-1.16)
Received EIA			
Child ≤ 4	632 (74.09)	627 (73.51)	0.99 (0.96-1.03)
Child ≥ 5	499 (67.62)	491 (66.53)	0.98 (0.95-1.02)

Note: Adjusted rate in 2 years after the child was taken into care compared with 2 years before the child was taken into care. Model covariates at the index date: year, mother's age, child's age, income quintile of neighborhood, location of neighborhood, number of children in family

^a $P < .05$

^b Treatment use variables are measured as a summarized count of treatment contacts, with the mean number of physician visits, hospitalizations, or prescriptions per person in parentheses.

Table A7. Comparisons before and after the index date of mothers whose children were taken into care with mothers whose children were not taken into care according to the age the child was when taken into care according to child's age at index

Outcome; Age of Child at Index	Child taken into care (n = 1,591) vs child not taken into care (n = 1,591) (Reference)		
	2 Year before index date ARR (95% CI)	Period x Group Interaction P Value	2 Year after index date ARR (95% CI)
<i>Mental Health</i>			
<i>Depression</i>			
Child ≤ 4	2.23 (1.82-2.73) ^a	0.8002	2.29 (1.90-2.76) ^a
Child ≥ 5	2.42 (1.91-3.06) ^a	0.9199	2.45 (1.98-3.02) ^a
<i>Anxiety</i>			
Child ≤ 4	2.94 (2.12-4.07) ^a	0.0743	4.12 (3.02-5.62) ^a
Child ≥ 5	2.51 (1.84-3.43) ^a	0.1735	3.09 (2.30-4.15) ^a
<i>Substance Use Disorder</i>			
Child ≤ 4	3.66 (2.54-5.27) ^a	0.0522	5.63 (4.13-7.67) ^a
Child ≥ 5	3.90 (2.52-6.05) ^a	0.0731	6.35 (4.32-9.34) ^a
<i>Treatment Use</i>			
<i>Physician visit for mental illness</i>			
Child ≤ 4	2.49 (1.91-3.24) ^a	0.0035	3.60 (2.80-4.64) ^a
Child ≥ 5	3.19 (2.49-4.09) ^a	0.2550	3.66 (2.75-4.87) ^a
<i>Hospitalization of mental illness</i>			
Child ≤ 4	24.00 (5.69-101.32) ^a	0.2515	8.22 (2.90-23.31) ^a
Child ≥ 5	9.75 (3.40-27.95) ^a	0.9617	10.00 (3.17-31.50) ^a
<i>Physician visit for any illness</i>			
Child ≤ 4	1.50 (1.39-1.62) ^a	0.0858	1.60 (1.47-1.74) ^a
Child ≥ 5	1.47 (1.33-1.62) ^a	0.7320	1.49 (1.35-1.64) ^a
<i>Hospitalization of any illness</i>			
Child ≤ 4	1.76 (1.57-1.98) ^a	0.0004	1.34 (1.19-1.51) ^a
Child ≥ 5	1.70 (1.45-1.98) ^a	0.1356	1.47 (1.24-1.74) ^a
<i>Number of psychotropic prescriptions</i>			
Child ≤ 4	5.04 (3.26-7.81) ^a	0.0451	6.99 (4.85-10.06) ^a
Child ≥ 5	3.99 (2.88-5.53) ^a	0.0819	5.26 (3.64-7.61) ^a
<i>Number of different psychotropic drugs prescribed</i>			
Child ≤ 4	2.94 (2.42-3.58) ^a	0.0356	3.55 (2.98-4.23) ^a
Child ≥ 5	2.49 (2.07-3.00) ^a	0.0101	3.03 (2.57-3.58) ^a
<i>Number of prescriptions</i>			
Child ≤ 4	2.34 (1.88-2.92) ^a	<0.0001	3.15 (2.47-4.03) ^a
Child ≥ 5	2.35 (1.97-2.81) ^a	0.0222	2.77 (2.22-3.46) ^a
<i>Number of different drugs prescribed</i>			
Child ≤ 4	1.67 (1.54-1.80) ^a	0.0950	1.75 (1.62-1.90) ^a
Child ≥ 5	1.57 (1.44-1.72) ^a	0.2569	1.63 (1.49-1.79) ^a
<i>Social Factors</i>			
<i>Moved</i>			
Child ≤ 4	1.35 (1.22-1.48) ^a	0.0323	1.55 (1.40-1.71) ^a
Child ≥ 5	1.48 (1.31-1.68) ^a	0.0268	1.76 (1.55-2.01) ^a
<i>Received EIA</i>			
Child ≤ 4	1.97 (1.79-2.18) ^a	0.0128	2.18 (1.96-2.42) ^a
Child ≥ 5	2.22 (1.95-2.54) ^a	0.0237	2.48 (2.15-2.86) ^a

Note: Adjusted rate among mothers whose children are taken into care compared with mothers whose children were not taken into care within each period. Model covariates at index date: year, mother's age, income quintile of neighborhood, location of neighborhood, number of children in family

Note: For children taken into care, the index date is the date of apprehension; for children not apprehended, the index date was selected as the age of their matched child was taken into care.

^a P < .05

Stratification by number of children taken into care. We examined whether mothers who had multiple children taken into care (2+) had different outcomes than mothers who had one child taken into care at the index date. In our cohort, 33.3 percent of mothers had one child taken into care and 66.7 percent of mothers had multiple children taken into care at the index date.

Table A8. Number of Children taken into Care at the First Incident for Mothers who cohort (n = 1,591)

Number of Children	N (%)
1	2,120 (33.31)
2	1,940 (30.48)
3	1,128 (17.72)
4	712 (11.19)
5	340 (5.34)
6	92 (1.45)
7+	32 (0.50)

Table A9. Mental disorders, treatment use, and social factors among 1,591 mothers before and after their child was taken into care according to number of children taken into care at index date

Outcome; Number of Children Taken into Care	n (%)		ARR (95% CI)
	2-year prevalence before their child was taken into care	2-year prevalence after their child was taken into care	
<i>Mental Health</i>			
Depression			
1 Child	165 (31.13)	179 (33.77)	1.08 (0.95-1.24)
2+ Children	277 (26.11)	348 (32.80)	1.26 (1.13-1.39) ^a
Anxiety			
1 Child	84 (15.85)	112 (21.13)	1.33 (1.10-1.62) ^a
2+ Children	188 (17.72)	258 (24.32)	1.37 (1.22-1.54) ^a
Substance Use Disorder			
1 Child	74 (13.96)	128 (24.15)	1.73 (1.39-2.16) ^a
2+ Children	153 (14.42)	319 (30.07)	2.09 (1.79-2.43) ^a
<i>Treatment Use^b</i>			
Physician visit for mental illness			
1 Child	1460 (2.75)	1990 (3.75)	1.36 (1.12-1.66) ^a
2+ Children	2539 (2.39)	4034 (3.80)	1.59 (1.43-1.77) ^a
Hospitalization for mental illness			
1 Child	35 (0.07)	33 (0.06)	0.94 (0.51-1.74)
2+ Children	52 (0.05)	101 (0.10)	1.94 (1.35-2.80) ^a
Physician visit for any illness			
1 Child	8456 (15.95)	8869 (16.73)	1.05 (0.98-1.12)
2+ Children	18625 (17.55)	19804 (18.67)	1.06 (1.02-1.11) ^a
Hospitalization for any illness			
1 Child	430 (0.81)	413 (0.78)	0.96 (0.82-1.12)
2+ Children	1465 (1.38)	1167 (1.10)	0.80 (0.74-0.86) ^a
Number of psychotropic prescriptions			
1 Child	5611 (10.59)	8681 (16.38)	1.55 (1.22-1.96) ^a
2+ Children	7353 (31.26)	15492 (14.60)	2.11 (1.74-2.54) ^a
Number of different psychotropic prescriptions			
1 Child	553 (1.04)	725 (1.37)	1.31 (1.19-1.45) ^a
2+ Children	1096 (1.03)	1577 (1.49)	1.44 (1.34-1.54) ^a
Number of prescriptions			
1 Child	18584 (35.06)	26529 (50.05)	1.43 (1.26-1.62) ^a
2+ Children	33166 (31.26)	47119 (44.41)	1.42 (1.31-1.55) ^a
Number of different drugs			
1 Child	4784 (9.03)	5111 (9.64)	1.07 (1.01-1.12) ^a
2+ Children	10971 (10.34)	11976 (11.29)	1.09 (1.06-1.13) ^a
<i>Social Factors</i>			
Moved			
1 Child	264 (49.81)	278 (52.45)	1.05 (0.95-1.16)
2+ Children	584 (55.04)	604 (56.93)	1.03 (0.97-1.10)
Received EIA			
1 Child	347 (65.47)	342 (64.53)	0.99 (0.93-1.04)
2+ Children	784 (73.89)	776 (73.14)	0.99 (0.96-1.02)

Note: Adjusted rate in 2 years after the child was taken into care compared with 2 years before the child was taken into care. Model covariates at the index date: year, mother's age, child's age, income quintile of neighborhood, location of neighborhood, number of children in family

^a $P < .05$

^b Treatment use variables are measured as a summarized count of treatment contacts, with the mean number of physician visits, hospitalizations, or prescriptions per person in parentheses.

Table A10. Comparisons before and after the index date of mothers whose children were taken into care with mothers whose children were not taken into care according to the age the child was when taken into care according to number of children taken into care at index date

Outcome; Number of Children Taken into Care	Child taken into care (n = 1,591) vs child not taken into care (n = 1,591) (Reference)		
	2 Year before index date ARR (95% CI)	Period x Group Interaction P Value	2 Year after index date ARR (95% CI)
<i>Mental Health</i>			
Depression			
1 Child	2.38 (1.85-3.05) ^a	0.8215	2.31 (1.81-2.95) ^a
2+ Children	2.19 (1.76-2.72) ^a	0.6100	2.30 (1.90-2.79) ^a
Anxiety			
1 Child	2.16 (1.51-3.10) ^a	0.0201	3.55 (2.44-5.18) ^a
2+ Children	3.14 (2.26-4.35) ^a	0.2827	3.66 (2.73-4.91) ^a
Substance Use Disorder			
1 Child	2.82 (1.86-4.39) ^a	0.0278	5.08 (3.34-7.71) ^a
2+ Children	4.65 (3.14-6.88) ^a	0.1194	6.59 (4.78-9.07) ^a
<i>Treatment Use</i>			
Physician visit for mental illness			
1 Child	2.75 (2.03-3.73) ^a	0.0701	3.56 (2.59-4.89) ^a
2+ Children	2.94 (2.31-3.76) ^a	0.0163	3.83 (3.06-4.80) ^a
Hospitalization of mental illness			
1 Child	35.00 (4.69-261.55) ^a	0.0581	6.60 (2.47-17.60) ^a
2+ Children	10.40 (4.05-26.72) ^a	0.9625	10.10 (3.51-39.04) ^a
Physician visit for any illness			
1 Child	1.45 (1.31-1.61) ^a	0.2298	1.54 (1.39-1.71) ^a
2+ Children	1.50 (1.38-1.63) ^a	0.3351	1.55 (1.42-1.68) ^a
Hospitalization of any illness			
1 Child	1.59 (1.34-1.89) ^a	0.1617	1.36 (1.15-1.61) ^a
2+ Children	1.73 (1.53-1.94) ^a	0.0018	1.37 (1.21-1.55) ^a
Number of psychotropic prescriptions			
1 Child	5.02 (2.88-8.76) ^a	0.3517	5.81 (3.54-9.53) ^a
2+ Children	4.49 (3.28-6.15) ^a	0.0066	6.71 (4.90-9.19) ^a
Number of different psychotropic drugs prescribed			
1 Child	2.65 (2.13-3.31) ^a	0.0859	3.14 (2.53-3.89) ^a
2+ Children	2.84 (2.36-3.43) ^a	0.0042	3.50 (2.96-4.14) ^a
Number of prescriptions			
1 Child	2.48 (1.77-3.48) ^a	0.0035	3.15 (2.14-4.62) ^a
2+ Children	2.38 (2.04-2.77) ^a	0.0002	2.97 (2.53-3.49) ^a
Number of different drugs prescribed			
1 Child	1.58 (1.43-1.75) ^a	0.1936	1.67 (1.52-1.83) ^a
2+ Children	1.67 (1.54-1.82) ^a	0.1249	1.75 (1.61-1.89) ^a
<i>Social Factors</i>			
Moved			
1 Child	1.32 (1.16-1.50) ^a	0.0108	1.66 (1.43-1.92) ^a
2+ Children	1.49 (1.34-1.66) ^a	0.0509	1.67 (1.50-1.86) ^a
Received EIA			
1 Child	2.07 (1.79-2.38) ^a	0.0095	2.40 (2.05-2.81) ^a
2+ Children	2.09 (1.87-2.33) ^a	0.0227	2.27 (2.03-2.54) ^a

Abbreviations: ARR, adjusted relative rate

Note: Adjusted rate among mothers whose children are taken into care compared with mothers whose children were not taken into care within each period. Model covariates at index date: year, mother's age, income quintile of neighborhood, location of neighborhood, number of children in family

Note: For children taken into care, the index date is the date of apprehension; for children not apprehended, the index date was selected as the age of their matched child was taken into care.

^a P < .05

Appendix B: Supplemental Material for Chapter 3

Appendix B.1: Definitions

Table B1. Variable Definitions

Variable	Definition
Depression	The number of events after the index date where the mother has <ul style="list-style-type: none"> • A hospitalization with ICD-9-CM diagnosis code 296.2-296.3, 296.5, 300.4, 309, and 311 or ICD-10-CA diagnosis codes F31.3-F31.5, F32, F33, F341, F380, F381, F432, F438, and F530 OR • A physician visit with a ICD-9-CM diagnosis code 309, 311 (Bolton, Au, Walld, et al., 2013).
Anxiety	The number of events after the index date where the mother has <ul style="list-style-type: none"> • A hospitalization with ICD-9-CM diagnosis code 300.0, 300.2, 300.3 or ICD-10-CA diagnosis codes F40, F41.0, F41.1, F41.3, F41.8, F41.9, F42, F431 OR • A physician visit with a ICD-9-CM diagnosis code 300 (Bolton, Au, Walld, et al., 2013).
Substance Use Disorders	The number of events after the index date where the mother has <ul style="list-style-type: none"> • A hospitalization with ICD-9-CM codes 291, 292, 303, 304, 305 or ICD-10-CA diagnosis code F10-F19, F55 OR • A physician visit with ICD-9-CM diagnosis code 291, 292, 303, 304, 305 (Chartier et al., 2016).
Physician visits for mental illness	The number of ambulatory visits to a physician after the index date for a mental health related condition, identified by any diagnosis from Chapter 5 (Mental Disorders) in the ICD-9-CM code book (ICD-9-CM codes 290 – 319) (Ruth et al., 2015).
Hospitalizations for mental illness	The number of hospitalizations (of at least one day) after the index date for a mental health related condition, where the primary diagnosis is for a mental health condition, which is identified by any diagnosis from Chapter 5 (Mental Disorders) in the ICD-9-CM code book or the ICD-10-CA code book.
Psychotropic prescription	The number of psychotropic prescriptions filled by each mother after the index date. These are all prescriptions that fall under antidepressants (ATC codes N06AA, N06AB, N06AX), antipsychotics (N05A), and Anxiolytics and sedatives (ATC codes N05BA, N05BB, N05B#, N05CF, N05CD) (Lupattelli et al., 2015).
Low Income	Low income neighborhoods are defined as living in a neighborhood having an income in the lowest quintile. Income quintile is a measure of neighbourhood SES that divides the population into 5 income groups (from lowest income to highest income) so that approximately 20% of the population is in each group (Manitoba Centre for Health Policy, 2002).
Received EIA	If in the two years before the index date, the mother receives at least two consecutive months of EIA (Wall-Wieler et al., 2016).
Moved	If in the two years before the index date, the mother moves at least once. Moving is defined by a change in six-digit postal code.

Appendix B.2: Balancing of Covariates for IPTWs

Separate models were used to obtain high hdPS for each outcome. The balance of the selected variables was tested for each outcome using standardized differences.

Depression. Propensity scores were trimmed at the 2.5th and 97.5th percentile; the trimmed cohort used to examine the number of depression diagnoses after the index date had 936 mothers who experienced the death of a child and 4,439 mothers who had a child taken into care.

Standardized differences were used to assess the effect of the IPTW on the mean differences. Table B2 presents these standardized differences for the sociodemographic variables and the top 10 health variables (as selected by the hdPS – standardized differences for all health are available upon request).

Table B2. Comparison of Baseline Characteristics; Depression Outcome

	Mothers who had a Child taken into care (n = 4,439) n (%)	Mothers who Experienced the Death of a Child (n = 936) n (%)	Unweighted Standardized Differences	IPT Weighted Standardized Differences
<i>Characteristics at the Index Date</i>				
Age of Mother				
< 20	1298 (29.24)	129 (13.78)	0.38	0.09
20 – 29	2362 (53.21)	533 (56.94)	0.08	0.04
≥ 30	779 (17.55)	274 (29.27)	0.28	0.06
Child is Younger than 1	1998 (45.01)	754 (80.56)	0.79	0.27
Birth Order of Child				
1	3579 (80.63)	527 (56.30)	0.54	0.01
2	567 (12.77)	241 (25.75)	0.33	0.08
3	183 (4.12)	96 (10.26)	0.24	0.11
4+	110 (2.48)	72 (7.69)	0.25	0.01
Lived in a Low-Income Neighborhood	2244 (50.55)	320 (34.19)	0.34	0.01
Urban Neighborhood	2540 (57.22)	457 (48.82)	0.17	0.15
<i>Maternal Event in the 2 years before the index date</i>				
Changed Residence	2272 (51.18)	357 (38.14)	0.26	0.37
Received EIA (Welfare)	2474 (55.73)	157 (16.77)	0.88	0.04
<i>Maternal Health in the 2 years before the Index Date</i>				
Tylenol Regular Strength 325mg	430 (9.69)	34 (3.63)	0.24	0.09
Office Visit or Subsequent Visit or Well Baby Care	858 (19.33)	128 (13.68)	0.15	0.12
Consultation	985 (22.19)	374 (39.96)	0.39	0.17
Depressive Disorder	199 (4.48)	20 (2.14)	0.13	0.14
Hematology, Hemoglobin(Photoelectric)	518 (11.67)	202 (21.58)	0.27	0.07
PMS-Amoxicillin	767 (17.28)	115 (12.29)	0.14	0.17
Cytological Examination, Vaginal Smear	390 (8.79)	162 (17.31)	0.26	0.14
Tylenol with Codeine No.4	358 (8.06)	34 (3.63)	0.19	0.01
Biochemistry, Glucose, Quantitative	659 (14.85)	229 (24.47)	0.24	0.14
Neurotic Disorders	226 (5.09)	22 (2.35)	0.14	0.03

Anxiety. Propensity scores were trimmed at the 2.5th and 97.5th percentile; the trimmed cohort used to examine the number of anxiety diagnoses after the index date had 902 mothers who experienced the death of a child and 4,005 mothers who had a child taken into care.

Standardized differences were used to assess the effect of the IPTW on the mean differences. Table B3 presents these standardized differences for the sociodemographic variables and the top 10 health variables (as selected by the hdPS – standardized differences for all health are available upon request).

Table B3. Comparison of Baseline Characteristics; Anxiety Outcome

	Mothers who had a Child taken into care (n = 4,005) n (%)	Mothers who Experienced the Death of a Child (n = 902) n (%)	Unweighted Standardized Differences	IPT Weighted Standardized Differences
<i>Characteristics at the Index Date</i>				
<i>Age of Mother</i>				
< 20	1168 (29.16)	130 (14.41)	0.36	0.03
20 – 29	2089 (52.16)	508 (56.32)	0.08	0.17
≥ 30	748 (18.68)	264 (29.27)	0.25	0.20
Child is Younger than 1	1901 (47.47)	721 (79.93)	0.72	0.24
<i>Birth Order of Child</i>				
1	3205 (80.02)	511 (56.65)	0.52	0.09
2	529 (13.21)	233 (25.83)	0.32	0.16
3	167 (4.17)	90 (9.98)	0.23	0.13
4+	104 (2.60)	68 (7.54)	0.23	0.01
Lived in a Low-Income Neighborhood	1998 (49.89)	320 (35.48)	0.29	0.01
Urban Neighborhood	2269 (56.65)	446 (49.45)	0.14	0.08
<i>Maternal Event in the 2 years before the index date</i>				
Changed Residence	1998 (49.89)	347 (38.47)	0.23	0.01
Received EIA (Welfare)	2115 (52.81)	157 (17.41)	0.80	0.10
<i>Maternal Health in the 2 years before the Index Date</i>				
Tylenol Regular Strength 325mg	332 (8.29)	33 (3.66)	0.20	0.01
Tylenol with Codeine No.4	283 (7.07)	34 (3.77)	0.15	0.08
Office Visit or Subsequent Visit or Well Baby Care	723 (18.05)	120 (13.30)	0.13	0.01
Neurotic Disorders	182 (4.54)	20 (2.22)	0.13	0.07
PMS-Amoxicillin	639 (15.96)	111 (12.31)	0.11	0.05
Known or suspected fetal abnormality affecting management of mother	98 (2.45)	110 (12.20)	0.39	0.07
Acute Upper Respiratory Infections	324 (8.09)	46 (5.10)	0.12	0.08
Nu-Ibuprofen Tab 600mg	333 (8.31)	35 (3.88)	0.19	0.07
Prenavite Tablets	297 (7.42)	29 (3.22)	0.19	0.01
Depressive Disorder	269 (6.72)	36 (3.99)	0.12	0.08

Substance Use. Propensity scores were trimmed at the 2.5th and 97.5th percentile; the trimmed cohort used to examine the number of substance use diagnoses after the index date had 936 mothers who experienced the death of a child and 4,080 mothers who had a child taken into care.

Standardized differences were used to assess the effect of the IPTW on the mean differences. Table B4 presents these standardized differences for the sociodemographic variables and the top 10 health variables (as selected by the hdPS – standardized differences for all health are available upon request).

Table B4. Comparison of Baseline Characteristics; Substance Use Outcome

	Mothers who had a Child taken into care (n = 4,080) n (%)	Mothers who Experienced the Death of a Child (n = 936) n (%)	Unweighted Standardized Differences	IPT Weighted Standardized Differences
<i>Characteristics at the Index Date</i>				
Age of Mother				
< 20	1192 (29.22)	129 (13.78)	0.38	0.01
20 – 29	2138 (52.40)	526 (56.20)	0.08	0.12
≥ 30	750 (18.38)	281 (30.02)	0.27	0.15
Child is Younger than 1	1910 (46.81)	756 (80.77)	0.76	0.31
Birth Order of Child				
1	3267 (80.07)	519 (55.45)	0.55	0.04
2	537 (13.16)	247 (26.39)	0.34	0.10
3	171 (4.19)	96 (10.26)	0.24	0.11
4+	105 (2.57)	74 (7.91)	0.24	0.01
Lived in a Low-Income Neighborhood	2040 (50.00)	325 (34.72)	0.31	0.03
Urban Neighborhood	2308 (56.57)	454 (48.50)	0.16	0.16
<i>Maternal Event in the 2 years before the index date</i>				
Changed Residence	2055 (50.37)	352 (37.61)	0.25	0.08
Received EIA (Welfare)	2166 (53.09)	160 (17.09)	0.81	0.16
<i>Maternal Health in the 2 years before the Index Date</i>				
Known of suspected fetal abnormality affecting management of mother	97 (2.38)	112 (11.97)	0.38	0.06
Tylenol Regular Strength 325mg	353 (8.65)	35 (3.74)	0.20	0.03
Tylenol with Codeine No.4	304 (7.45)	35 (3.74)	0.16	0.13
Dynamic Ultrasound Foetal Risk Subsequent Assessment	121 (2.97)	83 (8.87)	0.25	0.07
Neurotic Disorders	192 (4.71)	22 (2.35)	0.13	0.08
Office Visit or Subsequent Visit or Well Baby Care	760 (18.63)	129 (13.78)	0.13	0.01
Nu-Ibuprofen 600mg	362 (8.87)	36 (3.85)	0.21	0.10
Prenavite Tablets	308 (7.55)	29 (3.10)	0.20	0.07
Consultation	903 (22.13)	381 (40.71)	0.41	0.21
Infertility, Female	16 (0.39)	27 (2.88)	0.20	0.03

Physician Visits for Mental Illness. Propensity scores were trimmed at the 2.5th and 97.5th percentile; the trimmed cohort used to examine the number of physician visits for mental illness after the index date had 932 mothers who experienced the death of a child and 4,564 mothers who had a child taken into care.

Standardized differences were used to assess the effect of the IPTW on the mean differences. Table B5 presents these standardized differences for the sociodemographic variables

and the top 10 health variables (as selected by the hdPS – standardized differences for all health are available upon request).

Table B5. Comparison of Baseline Characteristics; Physician Visits for Mental Illness Outcome

	Mothers who had a Child taken into care (n = 4,564) n (%)	Mothers who Experienced the Death of a Child (n = 932) n (%)	Unweighted Standardized Differences	IPT Weighted Standardized Differences
<i>Characteristics at the Index Date</i>				
<i>Age of Mother</i>				
< 20	1331 (29.16)	131 (14.06)	0.37	0.09
20 – 29	2423 (53.09)	525 (56.33)	0.07	0.05
≥ 30	810 (17.75)	276 (29.61)	0.28	0.17
Child is Younger than 1	2034 (44.57)	751 (80.58)	0.80	0.38
<i>Birth Order of Child</i>				
1	3699 (81.05)	527 (56.55)	0.55	0.14
2	568 (12.45)	238 (25.54)	0.34	0.10
3	187 (4.10)	93 (9.98)	0.23	0.11
4+	110 (2.41)	74 (7.94)	0.25	0.01
Lived in a Low-Income Neighborhood	2336 (51.18)	324 (34.76)	0.34	0.12
Urban Neighborhood	2637 (57.78)	457 (49.03)	0.18	0.16
<i>Maternal Event in the 2 years before the index date</i>				
Changed Residence	2357 (51.64)	351 (37.66)	0.28	0.33
Received EIA (Welfare)	2570 (56.31)	156 (16.74)	0.90	0.10
<i>Maternal Health in the 2 years before the Index Date</i>				
Tylenol Regular Strength 325mg	464 (10.17)	34 (3.65)	0.26	0.09
Office Visit or Subsequent Visit or Well Baby Care	896 (19.63)	123 (13.20)	0.17	0.08
Neurotic Disorders	255 (5.59)	22 (2.36)	0.17	0.14
Tylenol with Codeine No.4	389 (8.52)	35 (3.76)	0.20	0.14
PMS-Amoxicillin	816 (17.88)	112 (12.02)	0.16	0.37
Cytological Examination, Vaginal Smear	408 (8.94)	154 (16.52)	0.23	0.16
Biochemistry, Glucose, Quantitative	668 (14.64)	234 (25.11)	0.26	0.28
Hematology, Hemoglobin (Photoelectric)	532 (11.66)	202 (21.67)	0.27	0.22
Acute Upper Respiratory Infections	396 (8.68)	47 (5.04)	0.14	0.08
Depressive Disorder	212 (4.65)	23 (2.47)	0.12	0.22

Hospitalizations for Mental Illness. Propensity scores were trimmed at the 2.5th and 97.5th percentile; the trimmed cohort used to examine the number of hospitalizations for mental illness after the index date had 936 mothers who experienced the death of a child and 4,663 mothers who had a child taken into care.

Standardized differences were used to assess the effect of the IPTW on the mean differences. Table B6 presents these standardized differences for the sociodemographic variables

and the top 10 health variables (as selected by the hdPS – standardized differences for all health are available upon request).

Table B6. Comparison of Baseline Characteristics; Hospitalizations for Mental Illness Outcome

	Mothers who had a Child taken into care (n = 4,663) n (%)	Mothers who Experienced the Death of a Child (n = 936) n (%)	Unweighted Standardized Differences	IPT Weighted Standardized Differences
<i>Characteristics at the Index Date</i>				
<i>Age of Mother</i>				
< 20	1354 (29.04)	130 (13.89)	0.38	0.19
20 – 29	2490 (53.40)	526 (56.20)	0.06	0.38
≥ 30	819 (17.56)	280 (29.91)	0.29	0.28
Child is Younger than 1	2062 (44.22)	753 (80.45)	0.81	0.42
<i>Birth Order of Child</i>				
1	3793 (81.34)	537 (57.37)	0.54	0.14
2	576 (12.35)	231 (24.68)	0.32	0.11
3	184 (3.95)	94 (10.04)	0.24	0.15
4+	110 (2.36)	74 (7.91)	0.25	0.04
Lived in a Low-Income Neighborhood	2385 (51.15)	319 (34.08)	0.35	0.13
Urban Neighborhood	2723 (58.63)	464 (49.57)	0.18	0.01
<i>Maternal Event in the 2 years before the index date</i>				
Changed Residence	2430 (52.11)	352 (37.61)	0.29	0.02
Received EIA (Welfare)	2668 (57.22)	157 (16.77)	0.92	0.44
<i>Maternal Health in the 2 years before the Index Date</i>				
Known of suspected fetal abnormality affecting management of mother	104 (2.23)	111 (11.86)	0.38	0.06
Tylenol Regular Strength 325mg	511 (10.96)	35 (3.74)	0.28	0.14
Office Visit or Subsequent Visit or Well Baby Care	963 (20.65)	126 (13.46)	0.19	0.21
Consultation-Unassigned Patient	1012 (21.70)	385 (41.13)	0.42	0.65
Tylenol with Codeine No.4	393 (8.43)	34 (3.63)	0.20	0.14
Prenavite Tablets	366 (7.85)	30 (3.21)	0.20	0.16
PMS-Amoxicillin	847 (18.16)	112 (11.97)	0.17	0.38
Psychotherapy by Psychiatrist	100 (2.14)	8 (0.85)	0.11	0.16
Depressive Disorder	338 (7.25)	37 (3.95)	0.14	0.16
Neurotic Disorder	605 (12.97)	68 (7.26)	0.19	0.23

Psychotropic prescriptions. Propensity scores were trimmed at the 2.5th and 97.5th percentile; the trimmed cohort used to examine the number of psychotropic prescriptions after the index date had 936 mothers who experienced the death of a child and 4,401 mothers who had a child taken into care.

Standardized differences were used to assess the effect of the IPTW on the mean differences. Table B7 presents these standardized differences for the sociodemographic variables

and the top 10 health variables (as selected by the hdPS – standardized differences for all health are available upon request).

Table B7. Comparison of Baseline Characteristics; Psychotropic Prescriptions Outcome

	Mothers who had a Child taken into care (n = 4,401) n (%)	Mothers who Experienced the Death of a Child (n = 936) n (%)	Unweighted Standardized Differences	IPT Weighted Standardized Differences
<i>Characteristics at the Index Date</i>				
<i>Age of Mother</i>				
< 20	1308 (29.72)	131 (14.00)	0.39	0.07
20 – 29	2328 (52.90)	530 (56.62)	0.07	0.06
≥ 30	765 (17.38)	275 (29.38)	0.29	0.01
Child is Younger than 1	2021 (45.92)	755 (80.66)	0.77	0.41
<i>Birth Order of Child</i>				
1	3561 (80.91)	529 (56.52)	0.54	0.07
2	554 (12.59)	241 (25.75)	0.34	0.02
3	179 (4.07)	92 (9.83)	0.23	0.08
4+	107 (2.43)	74 (7.91)	0.25	0.01
Lived in a Low-Income Neighborhood	2234 (50.76)	318 (33.97)	0.34	0.12
Urban Neighborhood	2549 (57.92)	461 (49.25)	0.17	0.18
<i>Maternal Event in the 2 years before the index date</i>				
Changed Residence	2259 (51.33)	352 (37.61)	0.38	0.31
Received EIA (Welfare)	2431 (55.24)	157 (16.77)	0.87	0.01
<i>Maternal Health in the 2 years before the Index Date</i>				
Known of suspected fetal abnormality affecting management of mother	104 (2.36)	109 (11.65)	0.37	0.08
Tylenol Regular Strength 325mg	427 (9.70)	34 (3.63)	0.24	0.09
Office Visit or Subsequent Visit or Well Baby Care	841 (19.11)	127 (13.57)	0.15	0.17
Tylenol with Codeine No.4	347 (7.88)	34 (3.63)	0.18	0.07
Neurotic Disorders	215 (4.89)	22 (2.35)	0.14	0.16
PMS-Amoxicillin	766 (17.41)	113 (12.07)	0.15	0.29
Nu-Ibuprofen 600mg	400 (9.09)	35 (3.74)	0.22	0.18
Depressive Disorder	202 (4.59)	23 (2.46)	0.12	0.20
Prenavite Tablets	349 (7.93)	29 (3.10)	0.21	0.19
Teva-Naproxen	312 (7.09)	43 (4.59)	0.11	0.10

Appendix B.3: Discordant Sibling Analysis

To control for unmeasured stable family characteristics shared by siblings, we compared mental illness outcomes between sisters who experienced different types of loss using a sub-cohort of discordant sisters. This limited the sample to families in which at least one sister had a child taken into care (but did not experience the death of a child) and one sister experienced the death of a child (but did not have a child taken into care). In families where more than one sister had a child taken into care or experienced the death of a child, one such sister was randomly selected. The cohort consisted of sisters from 57 families, where 57 sisters had a child taken into care and 57 sisters experienced the death of a child.

Incident Rate Ratios (IRRs) for each outcome were obtained from family fixed-effects Poisson regression models. These models were adjusted for the sociodemographic variable included in the population analysis, as well as whether the mother had a depression, anxiety, or substance use diagnosis in the two years before the index date. The use of discordant siblings reduced the potential for confounding, as this approach helps account for shared familial characteristics, environment, and genetic predisposition (Donovan & Susser, 2011). Again, the log of the total number of PY at risk was included as an offset to ensure the modelling of relative rate as opposed to a relative count of events.

Table B8. Characteristics of Mothers Losing a Child, Discordant Sisters Sub-Cohort

	Mothers who had a Child taken into care (n = 57)	Mothers who Experienced the Death of a Child (n = 57)
	n (%) /	n (%) /
<i>Characteristics at the Index Date</i>		
Age of Mother		
< 20	*	17 (29.82)
20 - 29	45 (78.95)	33 (57.89)
≥ 30	<6 *	7 (12.28)
Child is Younger than 1	15 (26.32))	52 (91.23)
Birth Order of Child		
1	39 (68.42)	16 (28.07)
2	11 (19.30)	27 (47.37)
3	<6 *	*
4+	<6 *	<6 *
Lived in a Low-Income Neighborhood	32 (56.14)	37 (64.91)
Urban Neighborhood	21 (36.84)	14 (24.56)
<i>Maternal Event in the 2 years before the index date</i>		
Changed Residence	22 (38.60)	21 (36.84)
Received EIA (Welfare)	30 (52.63)	24 (42.11)
Depression Diagnosis	10 (17.54))	<6 *
Anxiety Diagnosis	20 (35.09)	16 (28.07)
Substance Use Diagnosis	7 (12.28)	<6 *

* Suppressed to ensure privacy

Sisters who had a child taken into care had significantly greater (at $p < 0.05$) ARR of psychotropic prescriptions.

Table B9. Rates and Adjusted Incident Rate Ratios of Outcomes among Mothers Losing a Child, Discordant Sisters Sub-Cohort

Outcomes	Rate per 100 PY		Adjusted * Incident Rate Ratios (95% CI)	P
	Mothers who had a Child was taken into care	Mothers who experienced the death of a child		
<i>Diagnoses</i>				
Depression	35.10	39.20	0.69 (0.28-1.70)	0.4198
Anxiety	83.73	51.17	1.54 (0.81-2.92)	0.1835
Substance Use	32.84	5.39	4.41 (1.36-14.37)	0.0137
<i>Treatment Use</i>				
Physician Visit for Mental Illness	114.06	73.91	1.29 (0.74-2.25)	0.3610
Hospitalization for Mental Illness	1.00	0.60	1.68 (0.17-16.82)	0.6610
Psychotropic Prescriptions	733.77	248.67	4.68 (1.65-13.26)	0.0037

*Adjusted for all covariates listed in Table S8

Appendix B.4: Comparisons of Rates with Mothers in the General Population

The mental health outcomes of mothers whose children were taken into care were compared with mothers whose children were not taken into care. Mothers whose children were not taken into care were initially matched up to 3:1 to mothers whose children were taken into care (Group 1) on mother’s age (<18, 18-24, 25-29, 30-34, 35+), income quintile (1 (lowest income),2,3,4,5 (highest income)) and location of neighborhood (urban, rural south, rural mid, rural north) at birth of child, and child’s birth order (1,2,3,4+). The index date for mothers in Group 2 is the date their child was the age that their matched mothers’ child was when taken into care. Of the remaining matches, one was randomly selected to remain in the cohort.

Figure B1. Cohort Selection for General Population Comparison

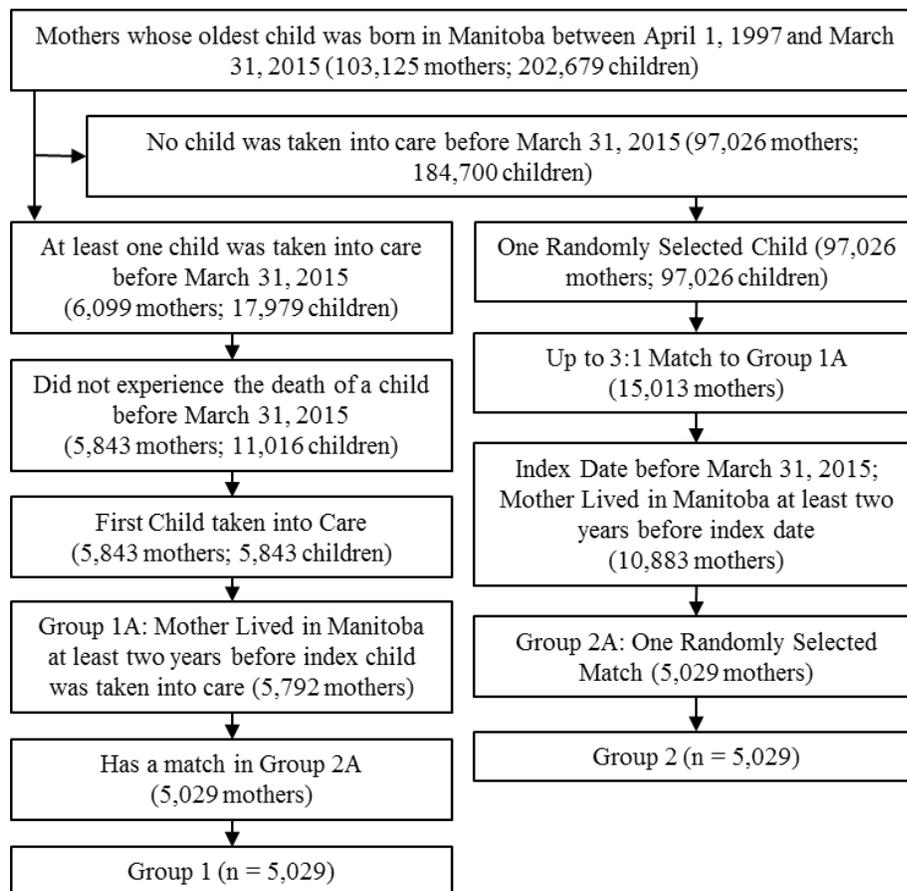


Table B10 highlights the significantly higher rates (per 100 PY) of each outcome when compared with mothers in the general population; there were 40 additional depression diagnoses, 53 additional anxiety diagnoses, 32 additional substance use diagnoses, 102 additional physician visits for mental illness, 3 additional hospitalizations for mental illness, and 624 additional psychotropic prescriptions per 100 PY among mothers whose children were taken into care.

Table B10. Rates of Outcomes per 100 PY among Mothers who did and did not have Child Taken into Care

Outcome	Incidence Rate per 100 PY		Rate Difference (per 100 PY)
	Mothers who had a Child was taken into care (n = 5,029)	Mothers who did not have Child taken into Care (n = 5,029)	
<i>Diagnoses</i>			
Depression	66.02	25.86	40.16
Anxiety	83.10	30.10	53.00
Substance Use	39.06	6.40	32.66
<i>Treatment Use</i>			
Physician Visit for Mental Illness	158.33	55.73	102.60
Hospitalization for Mental Illness	4.00	0.38	3.62
Psychotropic Prescriptions	769.60	144.68	624.93

Appendix C: Supplemental Material for Chapter 5

Appendix C.1: Definitions

Table C1. Definitions of Variables

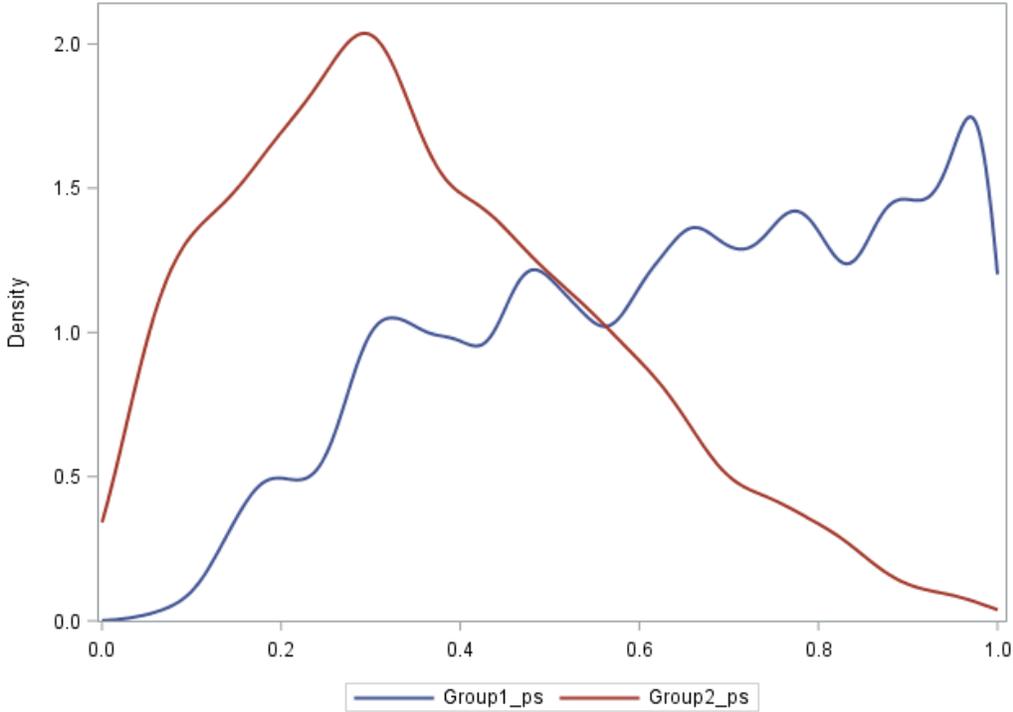
Variable	Definition
Avoidable Mortality	<p>Cause of death in the Vital Statistic record is indicated as (ICD-10 code) (Canadian Institute for Health Information, 2012):</p> <ul style="list-style-type: none"> • Infections: Enteritis and other diarrhoeal disease (A00-A09), Vaccine-preventable diseases (A35-A37, A39, A40.3, A41.3, A49.2 A80, B01, B05, B06, J09-J11, J13, J14, G00.0, G00.1), Selective invasive bacterial infections (A38, A48.1, A49.1), Sepsis (A40 (except A40.3), A41 (except A41.3)), Malaria (B50-B54), Meningitis (G00.2,3,8,9), Cellulitis (A46, L03), Pneumonia (J12, J15, J16, J18), Sexually transmitted infections, except HIV/AIDS (A50-A60, A63, A64), Viral hepatitis (B15-B19), HIV/AIDS (B20-B24) • Neoplasms: Lip, oral cavity or pharynx cancer (C00-C14), Esophageal cancer (C15), Stomach Cancer (C16), Colorectal cancer (C18-C21), Liver cancer (C22), Lung cancer (C33, C34), Melanoma skin cancer (C43), Non-melanoma skin cancer (C44), Malignant neoplasms of breast (C50), Cervical cancer (C53), Uterus cancer (C54, C55), Testicular cancer (C62), Bladder cancer (C67), Thyroid Cancer (C73), Hodgkin's disease (C81), Leukemia (C91.0, C91.1, C92.1), Benign neoplasm (D10-D36) • Diseases of the Circulatory System: Rheumatic heart disease (I01, I02, I05-I09), Hypertensive diseases (I10, I11-I13, I15), Cerebrovascular diseases (I60-I62, I63-I64, I67, I69), Ischaemic heart disease (I20-I25), Other atherosclerosis (I70, I73.9), Aortic aneurysm (I71), Venous thromboembolism (I26, I80, I82.9) • Diseases of the Respiratory System: COPD (J40-J44), Asthma and bronchiectasis (J45, J47), Acute lower respiratory infections (J20, J22), Upper respiratory infections (J00-J06, J30-J39), Lung diseases due to external agents (C45, J60-J64, J66-J70, J82, J92), Adult respiratory distress syndrome (J80), Pulmonary oedema (J81), Abscess of lung and mediastinum; prothorax (J85, J86), Other pleural disorders (J90, J93, J94), Other respiratory disorders (J98) • Diseases of the digestive system: peptic ulcer disease (K25-K28), diseases of appendix, hernia, disorders of gallbladder, biliary tract and pancreas (K35-K38, K40-K46, K80-K83, K85.0,1,3,8,9, K86.1,2,3,8,9) Chronic liver diseases (excluding alcohol-related disease) (K73, K74.0,1,2,6) • Infant and Maternal Causes: complications of prenatal period (A33, H31.1, P00-P96), congenital malformations, deformations, and chromosomal anomalies (Q00-Q99), pregnancy, childbirth, and the puerperium (O00-O99) • Unintentional Injuries: Transport accidents (V01-V99), falls (W00-W19), other external causes of accidental injury (W20-W64, W75-W99, X10-X39, X50-X59), drowning (W52-W74), fires and flames (X00-X09), accidental poisonings (X40-X49) • Injuries of Undetermined Intent (Y10-Y34) • Intentional Injuries: suicide and self-inflicted injuries (X60-X84, Y87.0), assault (X85-X99, Y00-Y09, Y87.1) • Alcohol and Drug Use Disorders: alcohol-related diseases, excluding external causes (F10, G31.2, G62.1, I42.6, K29.2, K70, K85.2, K86.0), drug use disorders (F11-F16, F18, F19) • Nutritional, Endocrine and Metabolic Disorders: nutritional deficiency anaemia (D50-D53), thyroid disorders (E00-E07), Diabetes mellitus (E10-E14), adrenal disorders (E24, E25, E27), congenital metabolic disorders (E74.0, E74.2) • Neurological Disorders: epilepsy (G40, G41)

	<ul style="list-style-type: none"> • Disorders of Musculoskeletal System: osteomyelitis (M86) • Adverse effects of medication and surgical care: drugs, medicaments and biological substance causing adverse effects in therapeutic use (Y40-Y59), misadventures to patients during surgical and medical care (Y60-Y66, Y69), medical devices associated with adverse incidents in diagnostic and therapeutic use (Y70-Y82), surgical and other medical procedures as the cause of abnormal reaction (Y83, Y84)
Received EIA	If in the year before the index date, the mother received at least two consecutive months of EIA (Wall-Wieler et al., 2016).
Moved	If in the two years before the index date, the mother moved, which is defined as a change in 6-digit postal code.
Mother's Age	The age the mother is at the index date; this is divided into three groups: <20, 20-29, 30+
Standardized neighborhood SEFI at the birth of the child	Neighborhood SES at the birth of the index child is measured by the SEFI (higher SEFI score corresponds with lower SES), which is generated using Manitoba (Statistics Canada) dissemination areas.(Chateau et al., 2012) This index combines neighborhood information on income, education, employment, and family structure. These neighborhoods typically include between 400 and 700 urban individuals and are somewhat larger in rural areas.
Location of Neighborhood at the birth of the child	Neighborhood location at the birth of the child was divided into urban (in a city of more than 40,000 residents) and rural.

Appendix C.2: Propensity Scores

Figure C1 shows substantial overlap in the distributions of propensity scores for the two groups of mothers, indicating sufficient common support for our analysis.

Figure C1. Kernel Densities of Propensity Scores



Appendix C.3: Cause of Death**Table C2.** Cause of Death, Manitoba, Canada, 1992-2015

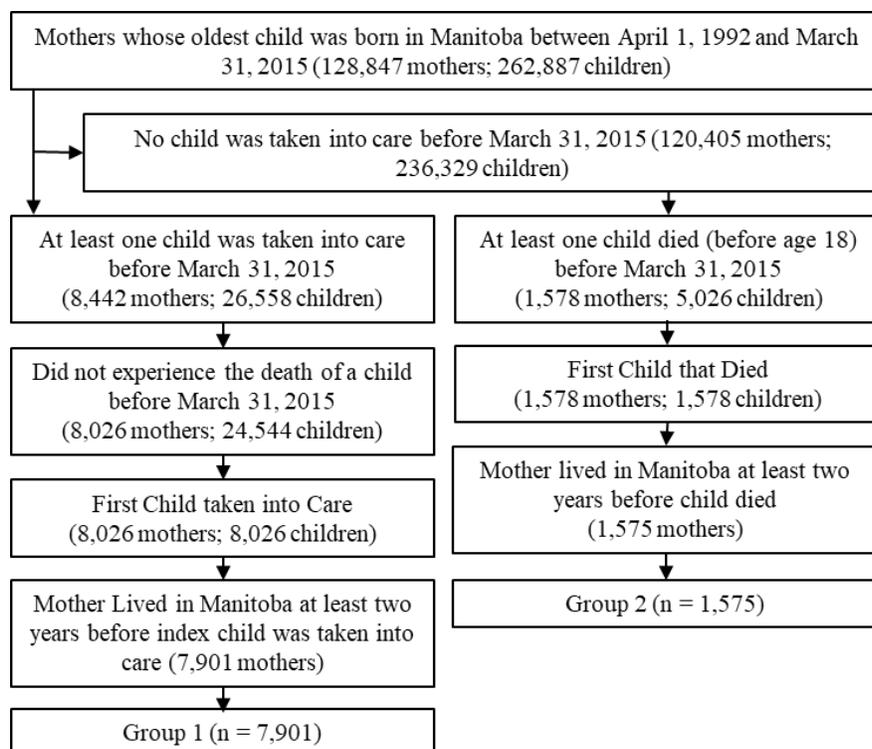
Mortality	Had a child taken into care	Did not have a child taken into care
	n (%)	n (%)
Avoidable	45 (69.2)	15 (71.4)
Unintentional Injury	15 (23.1)	6 (28.6)
Suicide	10 (15.4)	*
Other	20 (30.8)	*
Unavoidable	20 (30.8)	6 (28.6)
Transport Accidents	6 (9.2)	*
Endocrine, nutritional, and metabolic diseases/Diseases of the circulatory system	6 (9.2)	*
Other	8 (12.3)	*

* Cells with n < 6 are suppressed to maintain confidentiality

Appendix C.4: Comparisons of mortality among mothers who lost custody of a child and mothers who experienced the death of a child

An additional analysis was conducted to examine whether mothers whose children were taken into care had higher rates of mortality than mothers who experienced the death of a child. A total of 7,901 mothers had a child taken into care and 1,575 mothers experienced the death of a child (Figure C2).

Figure C2. Supplemental Cohort Formation



Mothers who experienced the death of a child and mothers whose child were taken into care are very different; therefore, we excluded mothers with extreme weights. Weights were trimmed at the value corresponding to the 5th and 95th percentile. This reduced the sample size to 8,114; 1,118 mothers who experienced the death of a child and 6,996 mothers who had a child taken into care.

Again, baseline characteristics were balanced using IPTWs, which were derived from hdPS. Table C3 presents the descriptive statistics, unweighted, and weighted standardized differences of the top 20 covariates.

Table C3. Comparison of Baseline Characteristics

	Had a child taken into care (n = 6,996)	Experienced the Death of a Child (n = 1,118)	Unweighted Standardized Differences	IPT Weighted Standardized Differences
	n (%) / mean (SD)	n (%) / mean (SD)		
<i>Characteristics at the Index Date</i>				
<i>Age of Mother</i>				
< 20	1,872 (26.76)	162 (14.49)	0.307	0.104
20 – 29	3,471 (49.61)	581 (51.97)	0.047	0.029
≥ 30	1,653 (23.63)	375 (33.54)	0.221	0.077
<i>SES of Neighborhood</i>				
Urban Neighborhood	4,046 (57.83)	530 (47.41)	0.210	0.069
<i>Maternal Event in the 2 years before the Index Date</i>				
Changed Residence	3,545 (50.67)	418 (37.39)	0.270	0.081
Received Welfare	3,889 (55.59)	207 (18.52)	0.831	0.249
<i>Maternal Health in the 2 years before the Index Date</i>				
<i>Known or suspected fetal abnormality affecting management of mother</i>				
Urine, Complete, Stick, Tape, or Tablet	814 (11.64)	209 (18.69)	0.200	0.017
Special Call – Home, Hospital, Emergency/Out Patient Department	1,171 (16.74)	99 (8.86)	0.238	0.100
Spontaneous Abortion	69 (0.99)	18 (1.61)	0.055	0.074
<i>Office visits, complete history and physical examination</i>				
Psychiatry, Consultation, Adult	206 (2.94)	13 (1.16)	0.126	0.043
Infertility, Female	66 (0.94)	37 (3.31)	0.165	0.058
<i>Acute Upper Respiratory Infections, Unspecified</i>				
Other Venereal Diseases	719 (10.28)	67 (5.99)	0.157	0.231
Hypertension complicating pregnancy childbirth and the puerperium	815 (11.65)	54 (4.83)	0.250	0.215
Alcohol Abuse	75 (1.07)	25 (2.24)	0.091	0.028
Wounds, simple repair any location, single	109 (1.56)	8 (0.72)	0.080	0.010
	211 (3.02)	21 (1.88)	0.074	0.072

Mothers whose children were taken into care had significantly higher rates of avoidable mortality (aHR = 2.81), and significantly lower rates of unavoidable mortality (aHR = 0.21) than mothers who experienced the death of a child.

Table C4. Mortality Rates, and Results from Cox Regression Model, Manitoba, Canada, 1992-2015

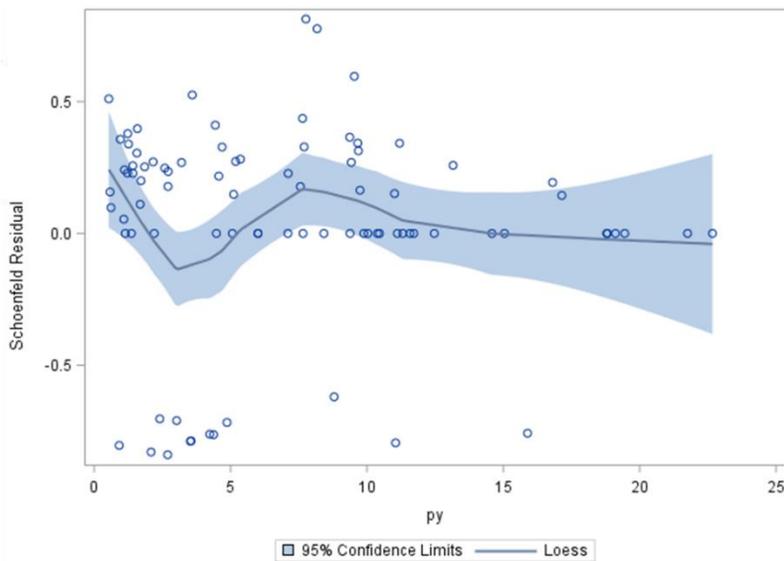
Mortality	Had a child taken into care		Experienced the Death of a Child		Unadjusted HR (95% CI)	IPTW-Adjusted HR (95% CI)
	Number of Deaths	Rate per 10,000 PY (95% CI)	Number of Deaths	Rate per 10,000 PY (95% CI)		
All-Cause	199	35 (31,40)	18	17 (11,28)	2.05 (1.27,3.32)	0.80 (0.60,1.07)
Avoidable	159	28 (24,33)	12	12 (7,21)	2.49 (1.39,4.48)	2.81 (1.62,4.87)
Unavoidable	40	7 (5,10)	6	6 (3,13)	1.18 (0.50,2.77)	0.21 (0.14,0.33)

Appendix C.5: Proportional Hazard Assumption

To test the proportional hazards assumption, we first plotted the Schoenfeld residuals. If proportionality holds, we should see no association between the residuals and time. (Schoenfeld, 1982) For each outcome, we also included an interaction between the predictor (having lost custody of a child or not) and the event time (death). The null hypothesis of proportionality is rejected if the interaction term is significant (Kleinman, 2010).

Death. Figure C3 presents the Schoenfeld residuals for overall mortality. The p-value of interaction term is 0.7123; the proportional hazard assumption holds.

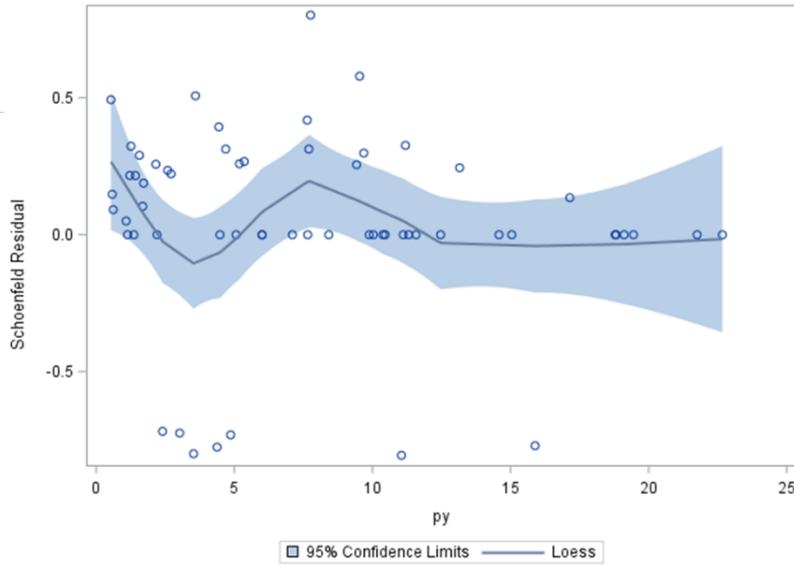
Figure C3. Schoenfeld Residuals for Overall Mortality



Avoidable Death. Figure C4 presents the Schoenfeld residuals for avoidable mortality.

The p-value of interaction term is 0.3423; the proportional hazard assumption holds.

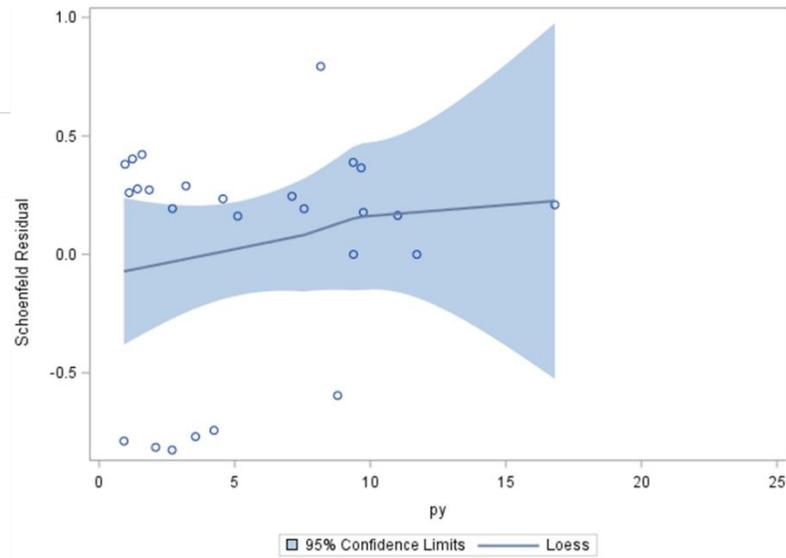
Figure C4. Schoenfeld Residuals for Avoidable Mortality



Unavoidable Death. Figure C5 presents the Schoenfeld residuals for unavoidable

mortality. The p-value of interaction term is 0.4798; the proportional hazard assumption holds.

Figure C5. Schoenfeld Residuals for Unavoidable Mortality



Appendix D: HREB Approvals

 <p>UNIVERSITY OF MANITOBA</p>		<p>P126-770 Bannatyne Avenue Winnipeg, Manitoba Canada, R3E 0W3 Telephone : 204-789-3255 Fax: 204-789-3414</p>	
<p>Research Ethics - Bannatyne Office of the Vice-President (Research and International)</p>			
<p align="center">HEALTH RESEARCH ETHICS BOARD (HREB) CERTIFICATE OF FINAL APPROVAL FOR NEW STUDIES Delegated Review</p>			
PRINCIPAL INVESTIGATOR: Elizabeth Wall-Wieler		INSTITUTION/DEPARTMENT: University of Manitoba and MCHP/College of Medicine	
		ETHICS #: HS19739 (H2016:182)	
APPROVAL DATE: May 6, 2016		EXPIRY DATE: May 6, 2017	
STUDENT PRINCIPAL INVESTIGATOR SUPERVISOR (If applicable): Dr. Leslie Roos			
PROTOCOL NUMBER: N/A	PROJECT OR PROTOCOL TITLE; Maternal Responses to Having a Child Taken Into Care		
SPONSORING AGENCIES AND/OR COORDINATING GROUPS: Western Regional Training Centre (WRTC) and Evelyn Shapiro Award MCHP			
Submission Date of Investigator Documents: April 28, 2016		HREB Receipt Date of Documents: May 1, 2016	
THE FOLLOWING ARE APPROVED FOR USE:			
Document Name	Version(if applicable)	Date	
Protocol: Proposal		April 28, 2016	
Consent and Assent Form(s):			
Other: Data Capture Sheet		April 28, 2016	
CERTIFICATION			
<p>The above named research study/project has been reviewed in a <i>delegated manner</i> by the University of Manitoba (UM) Health Research Board (HREB) and was found to be acceptable on ethical grounds for research involving human participants. The study/project and documents listed above was granted final approval by the Chair or Acting Chair, UM HREB.</p>			
HREB ATTESTATION			
<p>The University of Manitoba (UM) Research Board (HREB) is organized and operates according to Health Canada/ICH Good Clinical Practices, Tri-Council Policy Statement 2, and the applicable laws and regulations of Manitoba. In respect to clinical trials, the HREB complies with the membership requirements for Research Ethics Boards defined in Division 5 of the Food and Drug Regulations of Canada and carries out its functions in a manner consistent with Good Clinical Practices.</p>			
- 1 -			
umanitoba.ca/research			

QUALITY ASSURANCE

The University of Manitoba Research Quality Management Office may request to review research documentation from this research study/project to demonstrate compliance with this approved protocol and the University of Manitoba Policy on the Ethics of Research Involving Humans.

CONDITIONS OF APPROVAL:

1. The study is acceptable on scientific and ethical grounds for the ethics of human use only. ***For logistics of performing the study, approval must be sought from the relevant institution(s).***
2. This research study/project is to be conducted by the local principal investigator listed on this certificate of approval.
3. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to the research study/project, and for ensuring that the authorized research is carried out according to governing law.
4. **This approval is valid until the expiry date noted on this certificate of approval. A Bannatyne Campus Annual Study Status Report** must be submitted to the HREB within 15-30 days of this expiry date.
5. Any changes of the protocol (including recruitment procedures, etc.), informed consent form(s) or documents must be reported to the HREB for consideration in advance of implementation of such changes on the **Bannatyne Campus Research Amendment Form**.
6. Adverse events and unanticipated problems must be reported to the HREB as per Bannatyne Campus Research Boards Standard Operating procedures.
7. The UM HREB must be notified regarding discontinuation or study/project closure on the **Bannatyne Campus Final Study Status Report**.

Sincerely,



Chair, Health Research Ethics Board
Bannatyne Campus

Annual Review

 UNIVERSITY OF MANITOBA	Research Ethics - Bannatyne Office of the Vice-President (Research and International)	P126-770 Bannatyne Avenue Winnipeg, Manitoba Canada, R3E 0W3 Telephone : 204-789-3255 Fax: 204-789-3414
HEALTH RESEARCH ETHICS BOARD (HREB) CERTIFICATE OF ANNUAL APPROVAL		
PRINCIPAL INVESTIGATOR: Elizabeth Wall-Wieler	INSTITUTION/DEPARTMENT: U of M and MCHP/Medicine	ETHICS #: HS19739 (H2016:182)
HREB MEETING DATE (If applicable):	APPROVAL DATE: May 19, 2017	EXPIRY DATE: May 6, 2018
STUDENT PRINCIPAL INVESTIGATOR SUPERVISOR (If applicable): Dr. Leslie Roos		
PROTOCOL NUMBER: NA	PROJECT OR PROTOCOL TITLE: Maternal Responses to Having a Child Taken Into Care	
SPONSORING AGENCIES AND/OR COORDINATING GROUPS: Western Regional Training Centre (WRTC) and Evelyn Shapiro Award MCHP		
Submission Date of Investigator Documents: May 13, 2017		HREB Receipt Date of Documents: May 16, 2017
REVIEW CATEGORY OF ANNUAL REVIEW: Full Board Review <input type="checkbox"/> Delegated Review <input checked="" type="checkbox"/>		
THE FOLLOWING AMENDMENT(S) and DOCUMENTS ARE APPROVED FOR USE:		
Document Name(if applicable)	Version(if applicable)	Date
Annual approval <i>Annual approval implies that the most recent <u>HREB approved</u> versions of the protocol, Investigator Brochures, advertisements, letters of initial contact or questionnaires, and recruitment methods, etc. are approved.</i>		
Consent and Assent Form(s):		
CERTIFICATION The University of Manitoba (UM) Health Research Board (HREB) has reviewed the annual study status report for the research study/project named on this Certificate of Annual Approval as per the category of review listed above and was found to be acceptable on ethical grounds for research involving human participants. Annual approval was granted by the Chair or Acting Chair, UM HREB, per the response to the conditions of approval outlined during the initial review (full board or delegated) of the annual study status report.		
HREB ATTESTATION The University of Manitoba (UM) Health Research Board (HREB) is organized and operates according to Health Canada/ICH Good Clinical Practices, Tri-Council Policy Statement 2, and the applicable laws and regulations of Manitoba. In respect to clinical trials, the HREB complies with the membership requirements for Research Ethics Boards defined in Division 5 of the Food and Drug Regulations of Canada and carries out its functions in a manner consistent with Good Clinical Practices.		
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Appendix E. HIPC Approvals

Manitoba 
Health, Healthy Living and Seniors
Health Information Privacy Committee
4040-300 Carlton Street, Winnipeg, Manitoba, Canada R3B 3M9
T 204-786-7204 F 204-944-1911
www.manitoba.ca

August 12, 2016

Elizabeth Wall-Wieler
University of Manitoba
408-727 McDermot Ave
Winnipeg, MB R3E 3P5
wallwiee@myumanitoba.ca

HIPC No. 2016/2017 – 09
File number to be quoted on correspondence

Dear Elizabeth Wall-Wieler,

Re: Maternal Responses to having a child taken into care

The Health Information Privacy Committee has considered and *approved* your request for access to data for the purposes of the above named project.

Any significant changes to the proposed study design should be reported to the Chair/HIPC for consideration in advance of their implementation. Also, please be reminded that any manuscripts and presentation materials resulting from this study must be submitted to Manitoba Health, Healthy Living and Seniors for review. Specifically, manuscripts must be submitted *at least 30 calendar days* prior to the intended publication and presentation materials must be submitted *at least 10 calendar days* prior to the presentation.

Researcher Agreement will need to be completed before work on this project can commence. This will be initiated by MCHP. If you have any questions or concerns, please do not hesitate to contact [REDACTED] Committee Coordinator at [REDACTED]

Yours truly,

[REDACTED]

Chair, Health Information Privacy Committee

c.c. [REDACTED]

Manitoba
spirited energy