Maternal Exposure to Intimate Partner Violence and/or Family Violence and Children’s Developmental Health at Kindergarten: A Population-Based Retrospective Cohort Study

by

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MASTER OF SCIENCE

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### List of Acronyms

ARBD = Alcohol-Related Birth Defects  
ARND = Alcohol-Related Neurodevelopmental Disorder  
CCHS = Canadian Community Health Survey  
CI = Confidence Interval  
DPIN = Drug Program Information Network  
EDI = Early Developmental Instrument  
EFV = Exposure to Family Violence  
EIA = Employment and Income Assistance  
EIPV = Exposure to Intimate Partner Violence  
FAS = Fetal Alcohol Syndrome  
FASD = Fetal Alcohol Spectrum Disorder  
FDT = Family/Domestic Trouble  
FFS = Families First Screening  
FV = Family Violence  
ICD-9-CM = International Classification of Diseases, Ninth Revision, Clinical Modification  
ICD-10-CA = International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada  
IPV = Intimate Partner Violence  
MCHP = Manitoba Centre for Health Policy  
OR = Odds Ratio  
PRISM = Prosecution Information and Scheduling Management  
SAMIN = Social Allowances Management Information Network  
SDGs = Sustainable Development Goals  
UN = United Nations  
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Abstract

**Background/Objective:** When children are exposed to physical, sexual, or psychological harm to their mothers, or experience the aftermath of these assaults prenatally or postnatally, they are more likely to experience poorer developmental outcomes in their early years of life. Evidence on the nature and strength of the relationship between maternal exposure to intimate partner violence (EIPV)/exposure to family violence (EFV) and early childhood outcomes lacks consensus, due to methodological limitations and lack of Canadian-based evidence in the literature. The objective of this research was to provide evidence on the relationships between maternal intimate partner violence (IPV)/family violence (FV) victimization and children’s developmental health to bring the current literature to more of a consensus. The study examined developmental vulnerability at Kindergarten of children prenatally and/or postnatally exposed to maternal IPV/FV victimization as recorded in the Manitoba provincial justice system compared to unexposed counterparts.

**Methods:** Using linked longitudinal, whole-population administrative data from the Manitoba Population Research Data Repository housed at the Manitoba Centre for Health Policy (MCHP), three separate cohorts of children living in Manitoba, Canada were constructed based on the maternal IPV/FV victimization exposure periods and retrospectively followed. This work used a proxy of IPV/FV, Family/Domestic Trouble (FDT). In the provincial justice records, FDT victimization is defined as being victimized by perpetrators (i.e., partners or other family members) and recorded as a domestic/family trouble violation incident from the Winnipeg Police Services. Cohort 1 included children exposed to maternal FDT victimization during pregnancy. Cohort 2 was exposed to maternal FDT victimization from child age 0 to 5 years old. The exposure period of Cohort 3 was from pregnancy to age 5 years. Developmental vulnerability
was measured at Kindergarten in five separate domains (i.e., physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication skills and general knowledge). Multiple logistic regression models were constructed, adjusting for maternal and child characteristics between children exposed to maternal IPV/FV victimization and matched unexposed groups.

**Results:** Cohort 1 included 927 children, Cohort 2 comprised 5,321 children, and 5,874 children were included in Cohort 3. Prenatal exposure to maternal IPV/FV victimization and developmental vulnerability at Kindergarten did not show significant relationships with the developmental domains of interest after adjusting for maternal and child characteristics (Cohort 1). After adjusting for the covariates, children postnatally exposed to maternal IPV/FV victimization as well as those exposed prenatally and postnatally had higher odds of being developmentally vulnerable in social competence, emotional maturity, and two or more domains (Cohorts 2 and 3).

**Conclusion:** The observed relationships between early exposure to maternal IPV/FV victimization and developmental vulnerability at Kindergarten varied based on the timing of exposure periods and developmental domains. This study adds Canadian-based evidence to the currently existing knowledge and addresses methodological limitations in the literature by employing a robust longitudinal study design. Furthermore, this study is the first to examine prenatal exposure to maternal IPV/FV victimization and early childhood developmental outcomes at Kindergarten using Canadian population-based data. The current research will aid researchers’, various stakeholders’, and the public’s understanding of potential burdens of EIPV/EFV. The findings suggest the relevance of tailoring interventions and support systems for intergenerational victims of IPV/FV based on the timing of violence.
Chapter 1: Introduction

Women who experience intimate partner violence (IPV) or other types of family violence (FV) often face a range of health, social, and economic consequences, such as poor physical, mental, sexual, and reproductive health (Bacchus et al., 2018; Dillon et al., 2013; Han & Stewart, 2014; Miller & McCaw, 2019; Ouellet-Morin et al., 2015; Sugg, 2015; Tavoli et al., 2016), housing instability and homelessness (Gilroy et al., 2016; Montgomery et al., 2018), and costs of health and social services (Irish Consortium on Gender Based Violence, 2012). These consequences can extend to others around them; children often become secondary victims to their mothers’ victimization of IPV/FV (McTavish et al., 2016; Miller & McCaw, 2019; Vu et al., 2016). Social-cognitive theory (Bandura, 1986) and cognitive-contextual models (van Dijk, 1997) suggest that how children evaluate a situation impacts their responses to that particular event. Such responses can lead to moderating or mediating factors that may affect later child development (Baldwin, 1992; Chan & Yeung, 2009). These theories can also be applied to children’s response to their mothers’ victimization of violence; for example, how children evaluate and respond to violence between caregiving partners may associate with their subsequent development. Previous research has suggested that prenatal or postnatal exposure to intimate partner violence (EIPV)/exposure to family violence (EFV) is linked with children’s adverse development; for example, children may be born at preterm or with low birth weight (Berhanie et al., 2019; Donovan et al., 2016; Hill et al., 2016; Sigalla et al., 2017), come in contact with governmental systems such as child protective services (Afifi et al., 2015), struggle in school academically and socially (Holmes et al., 2015; Kiesel et al., 2016; Perkins & Graham-Bermann, 2012; Sonego et al., 2018), and/or experience poor mental health (Sonego et al., 2018; Vu et al., 2016). Although the consequences of EIPV/EFV on child development are well-
documented, methodological limitations in the literature, such as lack of longitudinal studies and the use of self-reported measures, have resulted in diverse findings. Additionally, current knowledge is primarily based on studies conducted in the United States (Hill et al., 2016; Silva et al., 2018), where political and cultural responses to this issue vary from the Canadian context (Jaffe & Crooks, 2004; Kaukinen & Powers, 2014).

The current research aimed to provide more rigorous evidence on the relationship between maternal IPV/FV victimization and childhood developmental vulnerability at Kindergarten. This study used linkable, whole-population administrative data from Manitoba, Canada and retrospectively followed a population-based cohort of children exposed to maternal IPV/FV victimization. The current study obtained information on maternal IPV/FV victimization from administrative records in the provincial justice system; those who were victims of a Family/Domestic Trouble (FDT) incident were considered as exposed individuals (Nesca et al., 2020; Nickel et al., 2018). The data allowed for the examination of a range of childhood developmental outcomes and add much-needed evidence from the Canadian perspective to the currently existing knowledge.
Chapter 2: Review of the Literature

2.1. Definition and Epidemiology of Violence Against Women

The United Nations’ (UN) Declaration on the Elimination of Violence against Women (1993) defined the term “violence against women” as: “any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life” (UN, 1993, p. 2). The UN’s Sustainable Development Goals (SDGs) acknowledge that violence against women is “a manifestation of historically unequal power relations between men and women, [and] one of the crucial social mechanisms by which women are forced into a subordinate position” (p. 190), and set an agenda committing to eliminating all forms of violence against women by the year of 2030 (UN, 2018). With global estimates of one in three women having experienced physical and/or sexual abuse, violence against women is considered a worldwide public health issue as well as a human rights violation (World Health Organization [WHO], 2013).

The WHO reported that one of the most common forms of violence against women is IPV (WHO, 2012). In many countries, the term “domestic violence” is used to indicate IPV (WHO, 2012). Domestic violence, however, encompasses all types of violence that occur in a household, including child abuse and elder abuse (WHO, 2012). IPV is defined explicitly as violent offences (i.e., physical, sexual, or psychological harm) between current or former legally married spouses, common-law partners, dating partners, as well as other types of intimate partners; the term can also be referred as dating violence when violence occurs between couples who are not married (Centers for Disease Control and Prevention, 2018; Public Health Agency of Canada, 2014; Statistics Canada, 2018). Women compared to men are overrepresented as
victims of IPV; for example, in Canada, eight in ten police-reported victims were female, and women were four times more likely to be victims in police-reported IPV than men (Statistics Canada, 2013, 2018). An international report by the WHO involving ten countries found that 15% to 71% of 24,000 women experienced IPV in their lifetime (García-Moreno et al., 2005). Of all Canadian police criminal reports in 2017, almost one-third (30%; approximately 96,000 people aged 15 to 89 years) resulted from IPV (Statistics Canada, 2013, 2018). In 2017, Canada’s female victim rate of IPV was 4.87 per 1,000 person-years; Manitoba ranked the second-highest amongst all Canadian provinces (Manitoba – 9.61 per 1,000; Saskatchewan was the highest – 10.99 per 1,000; Ontario the lowest – 3.51 per 1,000; Statistics Canada, 2018).

IPV against women during pregnancy is a severe public health and clinical problem for both mothers and children affected (Jasinski, 2004; WHO, 2017). A Canadian population-level surveillance report on abuse during pregnancy found 10.9% of the respondents (weighted \( N = 76,500 \)) reported experiencing any type of abuse (i.e., sexual, physical, and/or psychological) two years before the survey was administered; of the total respondents, 1.4% of the abuse occurred during pregnancy and 6% before pregnancy (Daoud et al., 2012). Additionally, a study based in Saskatoon, Canada found that 5.7% of their total sample of women receiving prenatal care in the Saskatoon District public health system (\( n = 728 \)) reported physical abuse during pregnancy; of these women, 63.3% said the perpetrator was their intimate partner (Muhajarine & D’Arcy, 1999). A New Zealand study indicated a slightly higher prevalence of violence during pregnancy (9%) than North American studies (Fanslow et al., 2008), and a Swedish cross-sectional survey found 1% of the sample reporting violence during pregnancy, similar to Canadian rates (Finnbogadóttir et al., 2014). There is no explicit agreement in the literature on whether pregnancy is associated with increased, stable, or decreased prevalence of IPV.
Maternal EIPV/EFV and Developmental Health at Kindergarten

(Finnbogadóttir et al., 2014; Jasinski, 2004; Van Parys et al., 2014). Past research found mothers’ IPV histories during pregnancy were negatively correlated with healthy maternal health and fetal development (Bailey, 2010; Jasinski, 2004; WHO, 2017).

2.2. Definition and Epidemiology of Exposure to Intimate Partner Violence (EIPV)/Exposure to Family Violence (EFV)

Exposure to intimate partner violence (EIPV) was previously defined as witnessing violence and threats between caregivers, but more recently, the definition includes the mere awareness of IPV or potential IPV between caregivers resulting in harmful outcomes in children (MacMillan & Wathen, 2014; McTavish et al., 2016). In this updated definition, even indirect exposure to IPV (i.e., not being physically present during IPV between caregivers) can still be linked with harmful outcomes in children (McTavish et al., 2016). Over the past few decades, EIPV has been recognized as a form of child maltreatment in the literature and many countries’ legislatures worldwide (Dubowitz, 2014; MacMillan & Wathen, 2014). According to the 2012 Canadian Community Health Survey (CCHS) data, 8% of the general population reported they saw their parents or guardians being physically violent to each other, or another adult, in their homes three or more times before the age of 16 years (Afifi et al., 2014). Each year, 15.5 million children ages 0 to 17 years in the United States are estimated to live in a household with IPV, and seven million reside in severely violent homes (McDonald et al., 2006). The United States’ national survey illustrated that 20.8% of the sample (age 0 to 17 years; n = 4503) were exposed to family assaults over their lifetime, and 17.3% have witnessed assaults between their parents (Finkelhor et al., 2013). Children can also experience mothers being maltreated psychologically in their households; in a community sample involving 181 children aged 6 to 12 years who experienced EIPV during the past year, 89% witnessed such psychological maltreatment.
incidences in their homes (Graham-Bermann et al., 2007). Children can also be also exposed to violence between other family members at home (i.e., EFV) other than EIPV. In Manitoba, police-reported IPV and non-IPV cases are recorded as FDT incidents. Examples of FDT include abuse between adult siblings, parents abusing their adult children, and adult children abusing their parents. In 2018, 12% of police-reported violence against female victims (15 to 89 years; \( N = 174,613 \)) in Canada were perpetrated by non-spousal family members (i.e., siblings, grandparents, uncles, aunts, cousins, and in-laws) (Statistics Canada, 2019).

2.3. Frameworks on Social Determinants of Prenatal/Postnatal Exposure to Intimate Partner Violence (EIPV)/Exposure to Family Violence (EFV)

The ecobiodevelopmental framework illustrates that when a young child experiences EIPV/EFV, subsequent development may be negatively affected by unresolved stress from exposure to the violence (Herman-Smith, 2013), and witnessing such violence at home in the early stages of a child’s life poses a threat to building a healthy caregiver-child relationship as well as child development. Using this framework, Herman-Smith (2013) argued that EIPV/EFV against children’s caregivers puts them at developmental risks in two ways. First, a child’s EIPV/EFV can lead to a heightened level of traumatic stress, which may have toxic effects on various aspects of development, such as learning and behaviour. Second, IPV/FV often becomes a barrier to caregivers’ capacity to relieve their children’s toxic stress caused by the exposure. Toxic stress is defined as “strong, frequent, and/or prolonged activation of the body’s stress-response systems” (Shonkoff et al., 2009). When a child’s caregivers are involved in IPV/FV and dealing with their distress, they may not be emotionally attentive or physically available to provide the appropriate support. This may also apply to a child’s relationship with their caregivers who are perpetrators of IPV/FV towards other family members; a child may no longer
perceive the perpetrating caregiver as a source of support or coping due to various reasons, such as loss of trust and fear.

A host of scientific evidence has supported the ecobiodevelopmental framework; neurodevelopmental, epigenetic, and ecological science research findings suggest that exposure to toxic stress during early childhood is harmful to developing healthy stress and coping responses (Bagot & Meaney, 2010; DeBellis et al., 2005; Herman-Smith, 2013; Roth et al., 2009; Shonkoff et al., 2012; Szyf, 2009). First, the dysregulated stress hormone and reactivity in a developing child’s brain are linked with chronic unavailability of caregivers (DeBellis et al., 2005; Roth et al., 2009; Szyf, 2009). This continued neglect hinders structural brain plasticity development, which allows children to adapt to stressful events later in their lives (Shonkoff et al., 2012). Next, epigenetic evidence illustrates that unresolved stress during early childhood alters biochemical processes, which can activate genetic predisposition; high nurturing care during early childhood was related to avoiding genetically linked health and behavioural problems (Bagot & Meaney, 2010; Shonkoff et al., 2012). Furthermore, the literature of ecological science supports that prenatal or postnatal exposure to maternal stress is a moderating factor for children’s responsiveness to stress and that early childhood adversity is associated with poor outcomes in subsequent development (Herman-Smith, 2013).

The fetal origins hypothesis by David J. Barker (1995) advocates the view that fetal undernutrition “programs” metabolic characteristics of the developing fetus that may latently impact future health outcomes (Almond & Currie, 2014; Barker, 1995). Similarly, a current perspective on this hypothesis suggests that prenatal exposure to other adverse events (e.g., maternal IPV/FV victimization) also has fetal origin effects on determining children’s health at birth and later development including both health and non-health outcomes (e.g., educational
attainment and income level; Almond & Currie, 2014). Aligning with the fetal origins hypothesis (Barker, 1995), past research demonstrated maternal stress during the prenatal period leads to neurodevelopmental changes in the fetus and later negatively affecting postnatal development during childhood (Glover et al., 2010).

The social-ecological model (Dahlberg & Krug, 2002) has identified several individual-, community-, and societal-level factors associated with violence against women (WHO and London School of Hygiene and Tropical Medicine, 2010). The model is recommended to guide many public health practices, as it describes how various individual and environmental characteristics that impact health outcomes interact with each other (Golden & Earp, 2012). Individual-level risk factors include low socioeconomic status, young age of women victims, divorced or separated marital status, past histories of child maltreatment (including EIPV), mental disorders, and substance abuse (McTavish et al., 2016). Community-level risk factors include poverty and weak community support, and at a societal level, traditional gender norms and social norms supportive of violence predict IPV (McTavish et al., 2016). Figure 1 provides a diagram of the social-ecological model for conceptualizing domestic violence against women presented by the WHO (García-Moreno et al., 2005).
Figure 1. Social-Ecological Model for Understanding Violence


2.4. Current State of Knowledge on the Relationship Between Exposure to Intimate Partner Violence (EIPV)/Exposure to Family Violence (EFV) and Developmental Vulnerability at Kindergarten

Substantial evidence links children’s EIPV/EFV with detrimental developmental trajectories, including physical, behavioural, social, emotional, and educational outcomes (Berhanie et al., 2019; Donovan et al., 2016; Hill et al., 2016; Holmes et al., 2015; Howell et al., 2016; Kiesel et al., 2016; Martinez-torteya et al., 2016; Pavey et al., 2014; Perkins & Graham-Bermann, 2012; Sigalla et al., 2017; Sonego et al., 2018; Udo et al., 2016; Vu et al., 2016). Previous studies have found that postnatal exposure is negatively correlated with healthy developmental outcomes in childhood; when children experience EIPV/EFV, they were at an increased risk for language and cognitive developmental delays (Perkins & Graham-Bermann, 2012; Udo et al., 2016), externalizing and internalizing mental health problems (Sonego et al.,
2018; Vu et al., 2016), poorer physical health and well-being (Howell et al., 2016), social and emotional impediments (Bayarri et al., 2011; Howell et al., 2016; Moylan et al., 2010), and overall academic underachievement (Holmes et al., 2015; Kiesel et al., 2016; Perkins & Graham-Bermann, 2012). Past research has also illustrated the association between EIPV/EFV during the prenatal period and short-term birth outcomes; babies who were prenatally exposed to maternal IPV/family violence victimization were likely to be born with adverse birth outcomes (e.g., premature birth and low birth weight) and health outcomes in early infancy (e.g., respiratory problems and neonatal hospitalization) (Berhanie et al., 2019; Donovan et al., 2016; Hill et al., 2016; Pavey et al., 2014; Sigalla et al., 2017). A recent meta-analysis of five studies (Silva et al., 2018) found the association between prenatal EIPV and long-term behavioural problems, as well as externalizing and internalizing problems in children and adolescents (age range: 10 months to 16 years).

2.5. Evidence Gap in the Current Literature

Although the existing knowledge on the relationship between childhood EIPV/EFV and developmental outcomes seems well-established, there are methodological limitations in the literature. First, various meta-analyses conducted in this area (Hill et al., 2016; Silva et al., 2018) indicated that there is a lack of Canadian-context research examining this topic, and the majority of existing evidence is from the United States. Canada’s political and cultural environment around domestic violence is different from the United States (Jaffe & Crooks, 2004; Kaukinen & Powers, 2014). For example, Canadian economic context provides greater availability of income-supplementing resources (e.g., social welfare programs, employment insurance, and family leave), which serves as a protective factor from violence by male intimate partners; cross-national data showed Canadian women are at lower risk to be victims of IPV than American
women (Kaukinen & Powers, 2014). Therefore, research tailored to the Canadian context is needed to aid further understanding of the topic. Second, there is a lack of large-scale longitudinal evidence in the area (Artz et al., 2014; Hill et al., 2016). Past research mostly focused on cross-sectional evidence that does not provide information across developmental trajectories. Longitudinal evidence is pertinent when examining childhood adversity, as it allows for comprehensive information on various risk factors and outcomes (Macmillan et al., 2007). Third, the frequent use of self-report measures in the literature raises concerns about potential biases associated with the methodology (Artz et al., 2014; Fraga, 2016; Hussain et al., 2015). For example, response biases may occur with measuring family/domestic violence with self-report tools due to many challenges (e.g., difficulty establishing an alone time with victims).
Chapter 3: Research Objectives and Questions

The overall aim of the research study is to further knowledge on the relationship between EIPV/EFV and children’s developmental health outcomes in the Canadian context using longitudinal, whole-population administrative data. This research used Manitoba provincial justice data to define maternal IPV/FV victimization. To determine the maternal exposure, this work used a proxy of IPV/FV, an FDT incident, as recorded in the provincial justice records. If a child’s mother was recorded as a victim of FDT in the administrative data, he/she was considered as a case in this study. The purpose of this study was to examine childhood developmental vulnerability at Kindergarten for children whose mothers were victims of IPV/FV compared to counterparts whose mothers were not identified as victims of IPV/FV in the province of Manitoba. In this study, the following research questions were addressed:

1. Do children of mothers who were victims of IPV/FV during pregnancy have different developmental vulnerability measured during the Kindergarten year (i.e., physical health and well-being, social competence, emotional maturity, language and cognitive development, communication skills and general knowledge) than those with mothers without IPV/FV victimization history?

2. Do children of mothers who were victims of IPV/FV from birth to school entry have different developmental vulnerability measured during the kindergarten year than those with mothers without IPV/FV victimization?

3. Do children of mothers who were victims of IPV/FV from pregnancy to school entry age have different developmental vulnerability measured during the kindergarten year than those with mothers without IPV/FV victimization?
It was hypothesized that maternal history of IPV/FV victimization is associated with a significantly increased likelihood of their children’s developmental vulnerability at Kindergarten across all measured developmental domains.
Chapter 4: Methods

4.1. Study Design, Setting, and Data Sources

To answer the research questions of this study, a retrospective cohort study was conducted using de-identified data from the Manitoba Population Research Data Repository (Repository) housed at the Manitoba Centre for Health Policy (MCHP). The record- and individual-level data held in the Repository can be linked within families over a longitudinal period. For example, children’s mental health records at age 6 years can retrospectively be linked with their family’s social service records at childbirth. See Figure 2 to overview the linkable administrative datasets of the Repository used in this study.

*Figure 2. The Manitoba Population Research Data Repository*

*Note. FASD = Fetal Alcohol Spectrum Disorder; Figure adapted and revised from http://umanitoba.ca/faculties/health_sciences/medicine/units/chs/departamental_units/mchp/protocol/media/Repository_circles.pdf*
The Repository contains comprehensive databases that can be assembled for conducting longitudinal research on maternal exposures and child development (Nickel et al., 2014). The Repository covers over 40 years of information on more than 99% of individuals residing in the province of Manitoba, and thus provides unique opportunities to conduct population-wide longitudinal research using various types of databases from health, social, justice, education, and registries. From the Repository, this study used the following databases to answer the research questions: the Prosecution Information and Scheduling Management (PRISM), Hospital Discharge Abstracts, Manitoba Fetal Alcohol Spectrum Disorder (FASD) Centre Data, Manitoba Health Insurance Registry, Medical Claims/Medical Services, Canadian Census, Employment Income Assistance (EIA)/Social Allowances Management Information Network (SAMIN), Families First Screening (FFS), Early Development Instrument (EDI), and Enrollment, Marks, and Assessment. Appendix 1 describes each data source linked at an individual level to address the research questions of the study. The quality of the data housed in the Repository has been well-established in previous studies (Roos et al., 2005; Roos et al., 2008; Roos & Nicol, 1999).

The study period was from April 1, 2003 to March 31, 2018. This time frame was selected because of data availability and completeness of the PRISM dataset in the Repository. PRISM is a data management system maintained by Manitoba Justice including information on incidents, charges, and involvements in the justice system in Manitoba. In the Repository, PRISM data are available from September 1, 2002 to April 30, 2017; however, data from the fiscal years of 2003/04 to 2016/17 were used, where most complete data are available. Datasets in the Repository have varying years of data availability. Figure 3 illustrates the years of data coverage for each dataset that was included.
Figure 3. Years of Data Availability

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</table>
4.2. Cohort Construction

The study included only singleton births to mothers over 18 years of age at childbirth between April 1, 2003 and March 31, 2018. The Hospital Discharge Abstracts were used to rule out stillborn births. Children who did not have coverage in the Manitoba Health Insurance Registry for three months or longer after their birth date were excluded to ensure the cohort did not include stillborn births, which were not captured by hospital records. Furthermore, mothers without a minimum of two years of continuous coverage in the Manitoba Health Insurance Registry when their child was born were further excluded.

The eligibility criterion to be included as ‘cases’ was that the child’s biological mother was a victim of FDT in the PRISM data (a proxy variable used for maternal IPV/FV victimization – see 4.3. Maternal Intimate Partner Violence/Family Violence Victimization for the definition) during three different time frames: a) during pregnancy only, b) during the first five years of a child’s life only, or c) from pregnancy to when the child turns five years old. These three cohorts were not mutually exclusive groups. For the unexposed groups, all residents registered with Manitoba’s universal health insurance program during the study period were considered, then were excluded based on the eligibility criteria of the cohort. If biological mothers did not have a record in the PRISM as a victim of FDT and also did not indicate a current or previous history of violence between parenting partners in the FFS form (see Appendix 1 for the description of the FFS), they were considered ‘controls’ of the study.

The comparison group was matched to cases by biological sex (male/female) and birthdate (+/- 3 months) of the child, as well as neighbourhood income quintile of mothers (Urban 1 to 5, Rural 1 to 5, Not Found). Neighbourhood income quintile was based on dissemination area-level average household income values from the Canadian Census. Income
quintiles are divided into five groups (quintiles) within each population, with approximately 20% of the population in each group. To minimize the geographical distance between a case and a match, they were matched based on the regional health authority where mothers lived at the time of childbirth (Winnipeg, Rural Central, Rural North, and Rural South). In the final cohorts, children with an eligible score of the EDI to measure developmental vulnerability at Kindergarten were included (see Appendix 1 for the description of the EDI). Figure 4 illustrates the flowchart of the cohort eligibility of exposed and unexposed groups.
Figure 4. Cohort Eligibility of Exposed and Unexposed Groups

Case

Yes

Mother has at least 1 record in PRISM as a victim of FDT

No

Public health nurse completed FFS and indicated ‘no’ for IPV question

Cases and Controls matched based on:
1) Child’s sex (male, female)
2) Child’s birthdate (+/- 3 months)
3) Mother’s neighbourhood income quintile (NF, U1-U5, R1-R5)
4) Regional Health Authority at the time of child birth (Winnipeg, Rural Central, Rural North, Rural South)

No

Yes

Control

Note. FDT = Family/Domestic Trouble; FFS = Families First Screening; IPV = Intimate Partner Violence; PRISM = Prosecution Information and Scheduling Management
4.3. Maternal Intimate Partner Violence/Family Violence (IPV/FV) Victimization

The Manitoba Health Insurance Registry and the Hospital Discharge Abstract Database were used to identify eligible mothers with childbirth/delivery records in the province of Manitoba. The merged dataset of the registry and hospital databases was linked with the PRISM database to select mothers who were victims of an FDT incident. Nesca et al., (2020) and Nickel et al.(2018) defines victims of FDT as those recorded as victims of a domestic/family trouble violation incident from the Winnipeg Police Services, where perpetrators could be their partners or other family members, including siblings, parents, and children. Following this definition, if a mother had at least one record in the PRISM data identifying her as a victim of FDT, she was considered a case eligible for this study. Cases included in this study were of children linked with their mothers with FDT victimization records according to the PRISM dataset.

4.4. Developmental Vulnerability at Kindergarten

Developmental vulnerability at Kindergarten was measured based on scores on the EDI in five domains: physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication skills and general knowledge (Janus et al., 2007). The 103-item questionnaire is administered by Kindergarten teachers across Manitoba once every two years, in February or March of the academic year (Healthy Child Manitoba, n.d.). Children are classified as developmentally vulnerable in a given EDI domain if they score below the 10th percentile for that domain based on national norms (Offord Centre for Child Studies, n.d.-a).

Drs. Dan Offord and Magdalena Janus from the Offord Centre for Child Studies at McMaster University, Canada, developed the EDI, a population-based measure designed to assess developmental health at school entry (Offord Centre for Child Studies, n.d.-b). The EDI
is a well-validated and reliable measurement tool for children’s developmental health (Forer & Zumbo, 2011; Guhn et al., 2007; Janus et al., 2007; Janus et al., 2011). EDI data are available in the Repository for six academic year cycles: 2005/06, 2006/07, 2008/09, 2010/11, 2012/13, and 2014/15. This study only included the last four periods to align with the first five years of maternal exposure in the PRISM data (this study used data from April 1, 2003).

The comparison between children exposed to maternal IPV/FV victimization and their matched counterparts was made by examining differences in developmental vulnerability at Kindergarten measured by the EDI (see Appendix 1 for the description of this data source). This work addressed whether children being exposed to maternal IPV/FV victimization was associated with adverse developmental outcomes in Kindergarten. Each developmental domain was dichotomously measured: developmentally vulnerable or not developmentally vulnerable. Along with individual domains of interest, the categories of developmentally vulnerable in one or more domains and developmentally vulnerable in two or more domains were examined.

4.5. Covariates Used

When examining maternal IPV/FV victimization and developmental vulnerability at Kindergarten in children, the following maternal characteristics were adjusted for: employment and income assistance at childbirth (yes/no), diagnosis of a mental health/developmental disorder at childbirth (yes/no), marital status at childbirth (yes/no), high school graduation (yes/no), inter-pregnancy interval (<1 year, 1-2 years, 2-3 years, 3+ years, first-born/missing), age at first birth (continuous in years), alcohol use during pregnancy (yes/no), drug use during pregnancy (yes/no), smoking during pregnancy (yes/no), social isolation (yes/no), and history of child abuse (yes/no). The covariates of child characteristics included birth order (1, 2, 3+) and a diagnosis of a developmental disorder from age 0 to 5 years (yes/no).
Several administrative datasets from the Repository were used to define the covariates. Mothers were considered to be receiving employment and income assistance if they received assistance for two or more consecutive months in the EIA/SAMIN data, or self-reported in the FFS that they were receiving social assistance at the time of childbirth. Using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM; used before April 1, 2004) and International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada (ICD-10-CA; used after April 1, 2004) codes in the Hospital Abstracts and ICD-9-CM codes in the Medical Services datasets, if a mother had at least one hospitalization or physician claim with a diagnosis for any mental health or developmental disorder during the exposure periods, she was considered to have a diagnosis. A mother was considered married or common-law at childbirth if it was indicated in the Registry data, or she self-reported in the FFS form. Enrollment, Marks, and Assessment, as well as the FFS, were used to determine whether a mother graduated from high school. Interpregnancy interval is defined as the duration between one pregnancy and subsequent pregnancy (Coo et al., 2017), and this information was obtained from the Hospital Abstracts database. Information on maternal age at first childbirth and a child’s birth order were retrieved from the Registry and Hospital Abstracts. Lastly, developmental disorder diagnoses of a child during the study period (child age 0 to 5) were defined by using the ICD-9-CM and ICD-10-CA codes in the Hospital Abstracts and Medical Services datasets, as well as the FASD clinic data. In the FASD clinic dataset, any of the following diagnoses were considered: Alcohol-Related Birth Defects (ARBD), Alcohol-Related Neurodevelopmental Disorder (ARND), ARND/ARBD, Fetal Alcohol Syndrome (FAS), FAS/ARBD or Partial FAS. Table 1 summarizes the definitions of covariates used in this study.
### Table 1. Definitions of Confounding Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Databases</th>
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<tbody>
<tr>
<td><strong>Maternal Characteristics</strong></td>
<td></td>
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</tr>
<tr>
<td>Received EIA at Childbirth</td>
<td>Mother received income assistance for two or more consecutive months; or self-reported receiving social assistance/income support.</td>
<td>EIA/SAMIN; FFS</td>
</tr>
<tr>
<td>Had a Diagnosis of Maternal Mental Health/Developmental Disorder at Childbirth</td>
<td>Mother has at least one following record: 1. 1+ hospitalization with a diagnosis for any mental health/developmental disorder (ICD-9-CM Codes: 290-319; ICD-10-CA Codes: F00-F99) 2. 1+ physician visits with a diagnosis for any mental health/developmental disorder (ICD-9-CM Codes: 290-319)</td>
<td>Hospital Abstracts; Medical Services</td>
</tr>
<tr>
<td>Married/Common-Law at Childbirth</td>
<td>Mother was married/common-law at the time of childbirth.</td>
<td>Manitoba Health Insurance Registry; Canada Census; FFS</td>
</tr>
<tr>
<td>Graduated High School</td>
<td>Mother graduated high school (completed Grade 12).</td>
<td>FFS; Enrollment, Marks, and Assessment</td>
</tr>
<tr>
<td>Alcohol Use During Pregnancy</td>
<td>Mother self-reported using alcohol during pregnancy.</td>
<td>FFS</td>
</tr>
<tr>
<td>Drug Use During Pregnancy</td>
<td>Mother self-reported using drug during pregnancy.</td>
<td>FFS</td>
</tr>
<tr>
<td>Smoking During Pregnancy</td>
<td>Mother self-reported smoking during pregnancy.</td>
<td>FFS</td>
</tr>
<tr>
<td>Social Isolation</td>
<td>Mother self-reported lack of social support and/or isolation related to culture, language, or geography.</td>
<td>FFS</td>
</tr>
<tr>
<td>History of Child Abuse</td>
<td>Mother self-reported own history of child abuse or neglect.</td>
<td>FFS</td>
</tr>
</tbody>
</table>
Interpregnancy Interval (Coo et al., 2017)

Mother’s interpregnancy interval is: less than 1 year, 1-2 year, 2-3 year, longer than 3 years, missing/unknown/not applicable (first-born).

Manitoba Health Insurance Registry; Hospital Abstracts

Child Characteristics

Developmental Disorder (from child age 0 to 5 years)

Child had a diagnosis of any of the following:

1. Hospital Abstracts/Medical Services: intellectual disabilities, pervasive developmental disorders, Down’s syndrome, autosomal deletion syndrome, Prader-Willi syndrome, or other specified anomalies (ICD-9-CM Codes: 317, 318, 319, 299; ICD-10-CA codes [After April 1, 2004]: F70.0, F70.1, F70.8, F70.9, F71.0, F71.1, F71.8, F71.9, F72.0, F72.1, F72.8, F72.9, F73.0, F73.1, F73.8, F73.9, F78.0, F78.1, F78.8, F78.9, F79.0, F79.1, F79.8, F79.9, F84.0, F84.1, F84.3, F84.4, F84.5, F84.8, F84.9, Q86.1, Q86.2, Q86.8, Q87.0, Q87.1, Q87.2, Q87.3, Q87.5, Q87.8, Q89.8, Q90.0, Q90.1, Q90.2, Q90.9, Q91.0, Q91.1, 91.2, Q91.3, 91.4, Q91.5, 91.6, Q91.7, Q93.0, Q93.1, Q93.2, Q93.3, Q93.4, Q93.5, Q93.6, Q93.7, Q93.8, Q93.9, Q99.2)

2. Manitoba FASD Clinic Dataset: ARBD, ARND, ARND/ARBD, FAS, FAS/ARBD or Partial FAS

Birth Order

Child was first-born, second-born, third-born and later, or unknown.

Manitoba Health Insurance Registry

Biological Sex

Determined from newborn’s birth hospitalization record (field labeled sex). In case of homebirths attended by a midwife, it is determined from the discharge summary report (field labeled gender).

Hospital Abstracts

ARBD = Alcohol-Related Birth Defects; ARND = Alcohol-Related Neurodevelopmental Disorder; EIA = Employment and Income Assistance; FAS = Fetal Alcohol Syndrome; FASD = Manitoba Fetal Alcohol Spectrum Disorder; FFS = Family First Screening; SAMIN = Social Allowances Management Information Network
4.6. Statistical Analysis

The Statistical Analysis Software (SAS) version 9.4 (SAS Institute Inc., 2013) was used to analyze the data. For descriptive statistics, between-group differences between exposed cases and unexposed controls using Chi-Square tests were conducted for binary and categorical covariates and developmental vulnerability outcomes. For continuous covariates, central tendency measures (mean and standard deviations) were reported. A series of multiple logistic regression models were conducted to test the hypotheses that children whose mothers were IPV/FV victims, as documented in administrative justice data, have increased odds of developmental vulnerability at Kindergarten when compared with their counterparts with mothers who were not IPV/FV victims as recorded in the provincial justice data.

In the multivariable analyses, maximum likelihood estimation techniques were used to generate the logit regression coefficients of the following model:

\[ \text{Logit}(Y) = \beta_0 + \beta_1 x_1 + \ldots + \beta_n x_n \]

In the above model, Y refers as a dichotomous outcome of interest (e.g., a child is developmentally vulnerable [yes/no]), while \( \beta_0 \) is the constant, \( x_1 \) to \( x_n \) are confounder variables, \( \beta_1 \) to \( \beta_n \) are the corresponding regression coefficients for each confounder (Peng et al., 2002). The model provides adjusted Odds Ratios (OR) for each outcome Y for both categorical and continuous confounders while adjusting for confounding effects of various maternal and child characteristics.

**Fit statistics.** To measure the accuracy and discrimination of the multiple logistic models in this study, the model fit was tested. For accuracy, the Brier scores of the models were assessed; the Brier score is defined as “the weighted squared difference between the predicted probabilities and their observed response level ” (Brier, 1950). The Brier score ranges from 0 to
2, 0 indicating a complete accuracy and 2 indicating a complete inaccuracy of the model (Green, 2004). A Brier Score of below 0.25 was considered a useful risk prediction model (Gerds et al., 2008). C-statistics were assessed to measure discrimination of the models. The C-statistics range from 0.5 to 1; when models have acceptable discrimination, it should have a C-statistic of at least 0.7 (Hosmer & Lemeshow, 2000). A C-statistic of 0.8 to 0.9 has excellent discrimination, and a C-statistic exceeding 0.9 is considered outstanding discrimination (Hosmer & Lemeshow, 2000).

4.7. Ethics and Data Access Approval

The current research required a feasibility review from MCHP as well as the Health Research Ethics Board (HREB) at the University of Manitoba. The Health Information Privacy Committee (HIPC) of Manitoba Health, Seniors, and Active Living (MHSAL) reviewed the proposal of this research to ensure the privacy and confidentiality of the research study (Manitoba Health, Seniors and Active Living, n.d.). Using de-identified administrative data did not require informed consent from participants. Data access approvals from each data provider were required and obtained.
Chapter 5: Results (Cohort 1 – Exposure to Maternal Intimate Partner Violence/Family Violence (IPV/FV)Victimization During Pregnancy)

5.1. Cohort Description

Cohort 1 included a total of 927 Kindergarten children with an EDI score; 229 children were exposed to maternal victimization of IPV/FV during pregnancy, and 698 children were not exposed to maternal IPV/FV during pregnancy. Figure 5 illustrates the study cohort selection steps for the exposed and unexposed groups of Cohort 1.
Figure 5. Study Cohort Selection of Exposed and Unexposed Groups (Cohort 1)

- Children born singleton between April 1, 2003 and March 31, 2018 in Manitoba ($N = 220,700$)
- Children who had 3 months coverage after birth date ($n = 219,354$)
- Mother had 2 years + coverage when child was born ($n = 197,101$)
- Mother had at least 1 victimization record of FDT in PRISM ($n = 13,852$)

- Maternal victimization of FDT occurred during mother’s pregnancy (Exposed $n = 1,117$)
- Child has an eligible EDI score (Cohort 1 Exposed $n = 229$)

- Yes
- Unexposed controls were matched to Exposed cases based on the matching variables* (Unexposed $n = 3,275$)
- No
- Child has an eligible EDI score (Cohort 1 Unexposed $n = 698$)**

*Exposed and Unexposed Groups matched based on:
1) Child’s sex (male, female)
2) Child’s birthdate (+/- 3 months)
3) Mother’s neighbourhood income quintile (NF, U1-U5, R1-R5)
4) Regional Health Authority at the time of child birth (Winnipeg, Rural Central, Rural North, Rural South)

**Cohort 1 Average Matched Ratio 1:3.05

Note. EDI = Early Development Instrument; FDT = Family/Domestic Trouble; FFS = Families First Screening; IPV = Intimate Partner Violence; PRISM = Prosecution Information and Scheduling Management
5.2. Cohort Characteristics

Chi-square testing of maternal characteristics in Cohort 1 shows that mothers exposed to IPV/FV victimization during pregnancy were more likely to receive EIA than those unexposed ($p < .0001$). Mothers in the exposed group were more likely to have had a mental/developmental health disorder than those in the unexposed group ($p < .0001$). Compared to those not victimized, mothers victimized of FDT during pregnancy were less likely to be married or in a common-law relationship ($p < .0001$) and to have graduated from high school ($p < .0001$), and more likely to use alcohol during pregnancy ($p < .0001$), use drugs during pregnancy ($p < .0001$), smoke during pregnancy ($p < .0001$), report social isolation ($p < .0001$), and have a history of child abuse ($p < .0001$). On average, exposed mothers were about 5.5 years younger when they had their first child than unexposed mothers.

Of the children in Cohort 1, 45.31% were male, and there was no statistically significant difference between the exposed cases and unexposed controls. More children in the exposed group were diagnosed with a developmental disorder than those unexposed ($p = 0.0324$). Children in the exposed group were more likely to be a subsequent born, whereas those in the unexposed group tended to be born first ($p < .0001$). Table 2 summarizes maternal and child characteristics of Cohort 1.
Table 2. Maternal and Child Information, by Exposure to Maternal Intimate Partner Violence/Family Violence Victimization During Pregnancy (Cohort 1)

<table>
<thead>
<tr>
<th>Covariates</th>
<th>All  (n = 927)</th>
<th>Exposed  (n = 229)</th>
<th>Unexposed  (n = 698)</th>
<th>p-value</th>
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<tr>
<td>Maternal Characteristics</td>
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<td>Received EIA at Childbirth</td>
<td>304 (32.79)</td>
<td>184 (80.35)</td>
<td>120 (17.19)</td>
<td>&lt;.0001</td>
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<td>Had a Diagnosis of Mental/Developmental Health Disorder at Childbirth</td>
<td>280 (30.20)</td>
<td>106 (46.29)</td>
<td>174 (24.93)</td>
<td>&lt;.0001</td>
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<td>Married/Common-Law at Childbirth</td>
<td>251 (27.08)</td>
<td>15 (6.55)</td>
<td>236 (33.81)</td>
<td>&lt;.0001</td>
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<td>Graduated High School</td>
<td>496 (53.51)</td>
<td>92 (40.17)</td>
<td>404 (57.28)</td>
<td>&lt;.0001</td>
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<td>Alcohol Use During Pregnancy</td>
<td>150 (16.18)</td>
<td>52 (22.71)</td>
<td>98 (14.04)</td>
<td>&lt;.0001</td>
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<td>Drug Use During Pregnancy</td>
<td>58 (6.26)</td>
<td>35 (15.28)</td>
<td>23 (3.30)</td>
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<td>Smoking During Pregnancy</td>
<td>236 (25.46)</td>
<td>95 (41.48)</td>
<td>141 (20.20)</td>
<td>&lt;.0001</td>
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<td>Social Isolation</td>
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<td>13 (5.68)</td>
<td>20 (2.87)</td>
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<td>History of Child Abuse</td>
<td>65 (7.01)</td>
<td>36 (15.72)</td>
<td>29 (4.15)</td>
<td>&lt;.0001</td>
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<td>Interpregnancy Interval</td>
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<td>&lt;.0001</td>
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<td>First-born/missing</td>
<td>681 (73.46)</td>
<td>150 (61.14)</td>
<td>541 (77.51)</td>
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<tr>
<td>&lt;1 year</td>
<td>79 (8.52)</td>
<td>42 (18.34)</td>
<td>37 (5.30)</td>
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<tr>
<td>1-2 year</td>
<td>99 (10.68)</td>
<td>27 (11.79)</td>
<td>72 (10.32)</td>
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<tr>
<td>2-3 year</td>
<td>50 (5.39)</td>
<td>14 (6.11)</td>
<td>36 (5.16)</td>
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</tr>
<tr>
<td>3+ year</td>
<td>18 (1.94)</td>
<td>6 (2.62)</td>
<td>12 (1.72)</td>
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</tr>
<tr>
<td>Age at First Birth&lt;sup&gt;a&lt;/sup&gt;</td>
<td>24.13 (5.50)</td>
<td>19.99 (3.48)</td>
<td>25.49 (5.36)</td>
<td></td>
</tr>
<tr>
<td>Child Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has a Developmental Disorder</td>
<td>35 (3.78)</td>
<td>14 (6.11)</td>
<td>21 (3.01)</td>
<td>0.0324</td>
</tr>
<tr>
<td>Birth Order&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>1</td>
<td>366 (39.48)</td>
<td>57 (24.89)</td>
<td>309 (44.27)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>293 (31.61)</td>
<td>53 (23.14)</td>
<td>240 (34.38)</td>
<td></td>
</tr>
<tr>
<td>3+</td>
<td>266 (28.69)</td>
<td>119 (51.09)</td>
<td>149 (21.35)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>420 (45.31)</td>
<td>102 (44.54)</td>
<td>318 (45.56)</td>
<td>0.7884</td>
</tr>
</tbody>
</table>

EIA = Employment and Income Assistance; <sup>a</sup>Mean (Standard Deviation); <sup>b</sup>Missing values are not reported due to small sample size.

5.3. Prevalence of Developmental Vulnerability Measures

Among the 927 children in Cohort 1, 31.07% were considered developmentally vulnerable in one or more domains, and 19.53% were developmentally vulnerable in two or more domains. Compared with children unexposed prenatally to maternal IPV/FV victimization, exposed children were more likely to be developmentally vulnerable in one or more domains (48.03% vs. 25.50%, p < .0001) as well as in two or more domains (31.44% vs. 15.62%, p
< .0001). Statistically significant differences were observed between the exposed and unexposed groups across all domains; more exposed children were developmentally vulnerable than unexposed children in Cohort 1 (e.g., language and cognitive development: 22.27% vs. 10.46%, p < .0001). The prevalence of developmental vulnerability measures by each developmental domain is summarized in Figure 6.
Figure 6. Prevalence and Chi-Square Testing of Developmental Vulnerability Measures for Children Exposed to Maternal Intimate Partner Violence/Family Violence Victimization During Pregnancy (Cohort 1)

Note. DV = Developmentally Vulnerable
5.4. Relationship Between Maternal Intimate Partner Violence (IPV)/Family Violence (FV) Victimization Exposure During Pregnancy and Developmental Vulnerability at Kindergarten

The odds of developmental vulnerability at Kindergarten (i.e., physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication skills and general knowledge, developmentally vulnerable in one or more domains, and developmentally vulnerable in two or more domains) when children were exposed to maternal IPV/FV victimization during pregnancy using unadjusted and adjusted regression models are summarized in Figure 7. All unadjusted comparisons examining the associations between maternal exposure and developmental vulnerability were statistically significantly different (see Figure 7). When adjusted for maternal and child characteristics, no statistically significant relationship was found for the overall measures of developmental vulnerability in Cohort 1. Appendix 2 includes unadjusted and adjusted ORs with 95% Confidence Intervals (CI) for each domain used for developmental vulnerability measures.
Figure 7. Odds Ratio and 95% Confidence Intervals for Developmental Vulnerability Measures of Children Exposed to Maternal Intimate Partner Violence/Family Violence Victimization During Pregnancy (Cohort 1)

*Reference Group: Unexposed to Maternal Victimization of IPV/FV

Note. DV = Developmentally Vulnerable; FV = Family Violence; IPV = Intimate Partner Violence; OR = Odds Ratio; Exposed $n = 229$; Unexposed $n = 698$; Exposed and Unexposed Groups were matched on child’s biological sex, child’s birth date, mother’s neighbourhood income quintile, and regional health authority at the time of childbirth; Adjusted for maternal characteristics (social assistance, mental/developmental health disorder, married/common-law at childbirth, high school graduation, alcohol use during pregnancy, drug use during pregnancy, smoking during pregnancy, social isolation, history of child abuse, interpregnancy interval, and age at first birth) and child characteristics (developmental disorders and birth order)
5.5. Fitness of the Adjusted Multiple Logistic Models

Table 3 summarizes model fit statistics of the adjusted multiple logistic models for each developmental vulnerability measures for Cohort 1. The models for all developmental vulnerability domains did not exceed a Brier Score of 0.25, indicating a reasonable accuracy. C-statistics for Cohort 1 showed acceptable discrimination (> 0.70). The adjusted model for the developmental vulnerability in two or more domains showed the best discrimination out of all domains (0.7654).

Table 3. Adjusted Model Fit Statistics, by Exposure to Maternal Intimate Partner Violence/Family Violence Victimization During Pregnancy (Cohort 1)

<table>
<thead>
<tr>
<th>DV Domain</th>
<th>Brier Score</th>
<th>C-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV in Physical Health and Well-Being</td>
<td>0.1128</td>
<td>0.7525</td>
</tr>
<tr>
<td>DV in Social Competence</td>
<td>0.1127</td>
<td>0.7559</td>
</tr>
<tr>
<td>DV in Emotional Maturity</td>
<td>0.1110</td>
<td>0.7414</td>
</tr>
<tr>
<td>DV in Language and Cognitive Development</td>
<td>0.1023</td>
<td>0.7505</td>
</tr>
<tr>
<td>DV in Communication Skills and General Knowledge</td>
<td>0.0935</td>
<td>0.7643</td>
</tr>
<tr>
<td>DV in One or More Domains</td>
<td>0.1790</td>
<td>0.7452</td>
</tr>
<tr>
<td>DV in Two or More Domains</td>
<td>0.1292</td>
<td>0.7654</td>
</tr>
</tbody>
</table>

DV = Developmentally Vulnerable
Chapter 6: Results (Cohort 2 – Exposure to Maternal Intimate Partner Violence (IPV)/Family Violence (FV) Victimization From Child Age 0 to 5)

6.1. Cohort Description

In Cohort 2, there were 5,321 eligible children aged 0 to 5 with mothers victimized of IPV/FV (exposed \( n = 1,365 \)) and children without the exposure during the study period (unexposed \( n = 3,956 \)). Figure 8 describes the cohort selection steps of Cohort 2.
**Figure 8. Study Cohort Selection of Exposed and Unexposed Groups (Cohort 2)**

Children born singleton between April 1, 2003 and March 31, 2018 in Manitoba (N = 220,700)

Children who had 3 months coverage after birth date (n = 219,354)

Mother had 2 years + coverage when child was born (n = 197,101)

Mother had at least 1 victimization record of FDT in PRISM (n = 13,852)

- **Yes**
  - Maternal victimization of FDT occurred during child age 0 to 5 (Exposed n = 5,728)
  - Child has an eligible EDI score (Cohort 2 Exposed n = 1,365)

- **No**
  - Unexposed controls were matched to Exposed cases based on the matching variables* (Unexposed n = 17,168)
  - Child has an eligible EDI score (Cohort 2 Unexposed n = 3,956)**

*Exposed and Unexposed Groups matched based on:
1) Child’s sex (male, female)
2) Child’s birthdate (+/- 3 months)
3) Mother’s neighbourhood income quintile (NF, U1-U5, R1-R5)
4) Regional Health Authority at the time of child birth (Winnipeg, Rural Central, Rural North, Rural South)

**Cohort 2 Average Matched Ratio 1:2.90

*Note. EDI = Early Development Instrument; FDT = Family/Domestic Trouble; FFS = Families First Screening; IPV = Intimate Partner Violence; PRISM = Prosecution Information and Scheduling Management
6.2. Cohort Characteristics

In Cohort 2, mothers with children aged 0 to 5 exposed to IPV/FV victimization were more likely to have received EIA than those unexposed ($p < .0001$). Over half of mothers in Cohort 2 had a diagnosis of a mental/developmental health disorder (60.23%); exposed mothers were diagnosed with a mental/developmental health disorder more often than mothers in the unexposed group ($p < .0001$). Similar to Cohort 1, exposed mothers were less likely to be married/common-law at childbirth ($p < .0001$) and to have graduated from high school ($p < .0001$) than unexposed mothers. Mothers in the exposed group were more likely to engage in substance use (i.e., drug, alcohol, cigarette) during pregnancy, be socially isolated, and have a history of child abuse than mothers in the unexposed group ($p < .0001$). Exposed mothers on average were five years younger at first childbirth than the unexposed.

Almost half of Cohort 2 included male children (49.43%), and there was no statistically significant biological sex difference between the exposed and unexposed groups. When comparing groups, unexposed children tended to be first-born, whereas exposed children were more likely to be third-born or later ($p < .0001$). Maternal and child characteristics and Chi-square testing outputs for Cohort 2 are summarized in Table 4.
Table 4. Maternal and Child Information, by Exposure to Maternal Intimate Partner Violence/Family Violence Victimization from Child Age 0 to 5 (Cohort 2)

<table>
<thead>
<tr>
<th>Covariates</th>
<th>All (n = 5,321)</th>
<th>Exposed (n = 1,365)</th>
<th>Unexposed (n = 3,956)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
</tr>
<tr>
<td><strong>Maternal Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Received EIA at Childbirth</td>
<td>2073 (38.96)</td>
<td>1186 (86.89)</td>
<td>887 (22.42)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Had a Diagnosis of Mental/Developmental Health Disorder at Childbirth</td>
<td>3205 (60.23)</td>
<td>10.70 (78.39)</td>
<td>2135 (53.97)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Married/Common-Law at Childbirth</td>
<td>1480 (27.81)</td>
<td>82 (6.01)</td>
<td>1398 (35.34)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Graduated High School</td>
<td>2854 (53.64)</td>
<td>558 (40.88)</td>
<td>2296 (58.04)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Alcohol Use During Pregnancy</td>
<td>837 (15.73)</td>
<td>315 (23.08)</td>
<td>522 (13.20)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Drug Use During Pregnancy</td>
<td>314 (5.90)</td>
<td>181 (13.26)</td>
<td>133 (3.36)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Smoking During Pregnancy</td>
<td>1401 (26.33)</td>
<td>627 (45.93)</td>
<td>774 (19.57)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Social Isolation</td>
<td>164 (3.08)</td>
<td>62 (4.54)</td>
<td>102 (2.58)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>History of Child Abuse</td>
<td>377 (7.09)</td>
<td>182 (13.33)</td>
<td>195 (4.93)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Interpregnancy Interval</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>First-born/missing</td>
<td>3752 (70.51)</td>
<td>884 (64.76)</td>
<td>2868 (72.50)</td>
<td></td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>507 (9.53)</td>
<td>217 (15.90)</td>
<td>290 (7.33)</td>
<td></td>
</tr>
<tr>
<td>1-2 year</td>
<td>596 (11.20)</td>
<td>135 (9.89)</td>
<td>461 (11.65)</td>
<td></td>
</tr>
<tr>
<td>2-3 year</td>
<td>276 (5.19)</td>
<td>72 (5.27)</td>
<td>204 (5.16)</td>
<td></td>
</tr>
<tr>
<td>3+ year</td>
<td>190 (3.57)</td>
<td>57 (4.18)</td>
<td>133 (3.36)</td>
<td></td>
</tr>
<tr>
<td>Age at First Birth&lt;sup&gt;a&lt;/sup&gt;</td>
<td>24.01 (5.61)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>20.16 (3.95)</td>
<td>25.35 (5.48)&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td><strong>Child Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has a Developmental Disorder</td>
<td>176 (3.31)</td>
<td>62 (4.54)</td>
<td>114 (2.88)</td>
<td>0.0031</td>
</tr>
<tr>
<td>Birth Order&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>1</td>
<td>2174 (40.86)</td>
<td>429 (31.43)</td>
<td>1745 (44.11)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1734 (32.59)</td>
<td>365 (26.74)</td>
<td>1369 (34.61)</td>
<td></td>
</tr>
<tr>
<td>3+</td>
<td>1401 (26.33)</td>
<td>567 (41.54)</td>
<td>834 (21.08)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2630 (49.43)</td>
<td>689 (50.48)</td>
<td>1941 (49.06)</td>
<td>0.3685</td>
</tr>
</tbody>
</table>

EIA = Employment and Income Assistance; <sup>a</sup>Mean (Standard Deviation); <sup>b</sup>All n = 5,317, Unexposed n = 3,952 (n = 4 missing information on maternal age at first birth due to discrepancy between the merged registry and hospital datasets); <sup>c</sup>Missing values are not reported due to small sample size.

6.3. Prevalence of Developmental Vulnerability Measures

In Cohort 2 (n = 5,321), 32.98% of children were developmentally vulnerable in one or more domains and 19.60% in two or more domains. The exposed group, compared to the unexposed, were more likely to be developmentally vulnerable in one or more domains (50.18% vs. 27.05%, p < .0001), as well as two or more domains (33.48% vs. 14.81%, p < .0001). Across
all individual domains, more children exposed to maternal IPV/FV victimization postnatally were developmentally vulnerable than the unexposed group (e.g., physical health and well-being: 28.35% vs. 12.74%, \( p < .0001 \)). Figure 9 summarizes the prevalence and Chi-square testing of developmental vulnerability outcomes by exposure to maternal victimization of IPV/FV from children aged 0 to 5.
**Figure 9.** Prevalence and Chi-Square Testing of Developmental Vulnerability Measures for Children Exposed to Maternal Intimate Partner Violence/Family Violence Victimization From Child Age 0 to 5 (Cohort 2)

Note. DV = Developmentally Vulnerable
6.4. Relationship Between Maternal Intimate Partner Violence (IPV)/Family Violence (FV) Victimization Exposure From Child Age 0 to 5 and Developmental Vulnerability at Kindergarten

When children were exposed to maternal IPV/FV victimization from ages 0 to 5 (Cohort 2), the exposure was significantly associated with a greater likelihood of being developmentally vulnerable in social competence (adjusted OR = 1.33, 95% CI: 1.07, 1.66) and emotional maturity (adjusted OR = 1.29, 95% CI: 1.03, 1.62). In Cohort 2, exposure to maternal IPV/FV victimization was also associated with increased odds of being developmentally vulnerable in two or more domains (adjusted OR = 1.42, 95% CI: 1.16, 1.73). Figure 10 shows the forest plots of the association between maternal exposure and developmental vulnerability outcomes for Cohort 2 (see Appendix 2 for ORs and 95% CIs presented in Figure 10).
Figure 10. Odds Ratio and 95% Confidence Intervals for Developmental Vulnerability Measures of Children Exposed to Maternal Intimate Partner Violence/Family Violence Victimization of From Child Age 0 to 5 (Cohort 2)

*Reference Group: Unexposed to Maternal Victimization of IPV/FV

Note. DV = Developmentally Vulnerable; FV = Family Violence; IPV = Intimate Partner Violence; OR = Odds Ratio; Exposed n = 1,365; Unexposed n = 3,952; Exposed and Unexposed Groups were matched on child’s biological sex, child’s birth date, mother’s neighbourhood income quintile, and regional health authority at the time of childbirth; Adjusted for maternal characteristics (social assistance, mental/developmental health disorder, married/common-law at childbirth, high school graduation, alcohol use during pregnancy, drug use during pregnancy, smoking during pregnancy, social isolation, history of child abuse, interpregnancy interval, and age at first birth) and child characteristics (developmental disorders and birth order)
6.5. Fitness of the Adjusted Multiple Logistic Models

Table 5 summarizes the adjusted model fit statistics for Cohort 2. Brier scores for all developmental vulnerability domains showed reasonable accuracy (< 0.25). C-statistics showed reasonable discrimination of the models (> 0.7), except for the emotional maturity outcome, which showed marginally acceptable discrimination (0.6822).

Table 5. Adjusted Model Fit Statistics, by Exposure to Maternal Intimate Partner Violence/Family Violence Victimization from Child Age 0 to 5 (Cohort 2)

<table>
<thead>
<tr>
<th>DV Domain</th>
<th>Brier Score</th>
<th>C-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV in Physical Health and Well-Being</td>
<td>0.1257</td>
<td>0.7338</td>
</tr>
<tr>
<td>DV in Social Competence</td>
<td>0.1185</td>
<td>0.7112</td>
</tr>
<tr>
<td>DV in Emotional Maturity</td>
<td>0.1160</td>
<td>0.6822</td>
</tr>
<tr>
<td>DV in Language and Cognitive Development</td>
<td>0.1131</td>
<td>0.7387</td>
</tr>
<tr>
<td>DV in Communication Skills and General Knowledge</td>
<td>0.1018</td>
<td>0.7365</td>
</tr>
<tr>
<td>DV in One or More Domains</td>
<td>0.1928</td>
<td>0.7157</td>
</tr>
<tr>
<td>DV in Two or More Domains</td>
<td>0.1386</td>
<td>0.7329</td>
</tr>
</tbody>
</table>

DV = Developmentally Vulnerable
Chapter 7: Results (Cohort 3 – Exposure to Maternal Intimate Partner Violence (IPV)/Family Violence (FV) Victimization From Pregnancy to 5)

7.1. Cohort Description

Cohort 3 included eligible children exposed to maternal IPV/FV victimization from pregnancy to child age 5 ($N = 5,874$; exposed $n = 1,494$; unexposed $n = 4,380$). Figure 11 describes the cohort selection steps of Cohort 3 with an average matched ratio between exposed and unexposed groups.
**Figure 11. Study Cohort Selection of Exposed and Unexposed Groups (Cohort 3)**

Children born singleton between April 1, 2003 and March 31, 2018 in Manitoba ($N = 220,700$)

- Children who had 3 months coverage after birth date ($n = 219,354$)
- Mother had 2 years + coverage when child was born ($n = 197,101$)
- Mother had at least 1 victimization record of FDT in PRISM ($n = 13,852$)

Maternal victimization of FDT occurred from pregnancy to child age 5 (Exposed $n = 6,415$)

- Child has an eligible EDI score (Cohort 3 Exposed $n = 1,494$)
- Unexposed controls were matched to Exposed cases based on the matching variables* (Unexposed $n = 19,268$)

*Exposed and Unexposed Groups matched based on:
1) Child’s sex (male, female)
2) Child’s birthdate (+/- 3 months)
3) Mother’s neighbourhood income quintile (NF, U1-U5, R1-R5)
4) Regional Health Authority at the time of child birth (Winnipeg, Rural Central, Rural North, Rural South)

**Cohort 3 Average Matched Ratio 1:2.93**

Note. EDI = Early Development Instrument; FDT = Family/Domestic Trouble; FFS = Families First Screening; IPV = Intimate Partner Violence; PRISM = Prosecution Information and Scheduling Management
7.2. Cohort Characteristics

Exposed mothers were more likely to receive social assistance compared to mothers in the unexposed group \((p < .0001)\). More mothers in the exposed group had a mental health/developmental disorder diagnosis than unexposed mothers \((p < .0001)\). In Cohort 3, exposed mothers were less likely to be married or in a common-law relationship at childbirth \((p < .0001)\) and to have graduated high school \((p < .0001)\) than unexposed mothers. Other maternal characteristics (i.e., alcohol use/drug use/smoking during pregnancy, social isolation, and history of child abuse) demonstrated a statistically significant difference between exposed and unexposed mothers \((p < .0001)\), with exposed mothers showing a higher likelihood than those unexposed. Also, exposed mothers were approximately five years younger than unexposed mothers.

For child characteristics, roughly half of the children in Cohort 3 were male \((49.25\%)\), but a child’s biological sex showed no statistical difference between the groups. Children in the exposed group were more likely to be diagnosed with a developmental disorder \((p = 0.0022)\). When compared between two groups, children unexposed to maternal IPV/FV victimization from pregnancy to age 5 were likely to be first-born children, whereas those exposed tended to be born subsequently. Table 6 summarizes information on maternal and child characteristics of Cohort 3.
Table 6. Maternal and Child Information, by Exposure to Maternal Intimate Partner Violence/Family Violence Victimization from Pregnancy to Child Age 5 (Cohort 3)

<table>
<thead>
<tr>
<th>Covariates</th>
<th>All (n = 5,874)</th>
<th>Exposed (n = 1,494)</th>
<th>Unexposed (n = 4,380)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Received EIA at Childbirth</td>
<td>2306 (39.26)</td>
<td>1294 (86.61)</td>
<td>1012 (23.11)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Had a Diagnosis of Mental/Developmental Health Disorder at Childbirth</td>
<td>3691 (62.84)</td>
<td>1189 (79.59)</td>
<td>2502 (57.12)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Married/Common-Law at Childbirth</td>
<td>1632 (27.78)</td>
<td>93 (6.22)</td>
<td>1539 (35.14)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Graduated High School</td>
<td>3163 (53.85)</td>
<td>616 (41.23)</td>
<td>2547 (58.15)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Alcohol Use During Pregnancy</td>
<td>920 (15.66)</td>
<td>341 (22.82)</td>
<td>579 (13.22)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Drug Use During Pregnancy</td>
<td>346 (5.89)</td>
<td>198 (13.25)</td>
<td>148 (3.38)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Smoking During Pregnancy</td>
<td>1538 (26.18)</td>
<td>674 (45.11)</td>
<td>864 (19.73)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Social Isolation</td>
<td>187 (3.18)</td>
<td>70 (4.69)</td>
<td>117 (2.67)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>History of Child Abuse</td>
<td>414 (7.05)</td>
<td>199 (13.32)</td>
<td>215 (4.91)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Interpregnancy Interval</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>First-born/missing</td>
<td>4166 (70.92)</td>
<td>961 (64.32)</td>
<td>3205 (73.17)</td>
<td></td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>549 (9.35)</td>
<td>238 (15.93)</td>
<td>311 (7.10)</td>
<td></td>
</tr>
<tr>
<td>1-2 year</td>
<td>654 (11.13)</td>
<td>152 (10.17)</td>
<td>502 (11.46)</td>
<td></td>
</tr>
<tr>
<td>2-3 year</td>
<td>304 (5.18)</td>
<td>81 (5.42)</td>
<td>223 (5.09)</td>
<td></td>
</tr>
<tr>
<td>3+ year</td>
<td>201 (3.42)</td>
<td>62 (4.15)</td>
<td>139 (3.17)</td>
<td></td>
</tr>
<tr>
<td>Age at First Birtha</td>
<td>24.03 (5.59)b</td>
<td>20.18 (3.95)</td>
<td>25.35 (5.45)b</td>
<td></td>
</tr>
<tr>
<td>Child Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has a Developmental Disorder</td>
<td>192 (3.27)</td>
<td>67 (4.48)</td>
<td>125 (2.85)</td>
<td>0.0022</td>
</tr>
<tr>
<td>Birth Orderc</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>1</td>
<td>2402 (40.89)</td>
<td>462 (30.92)</td>
<td>1940 (44.29)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1905 (32.43)</td>
<td>396 (26.51)</td>
<td>1509 (34.45)</td>
<td></td>
</tr>
<tr>
<td>3+</td>
<td>1555 (26.47)</td>
<td>632 (42.30)</td>
<td>923 (21.07)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2893 (49.25)</td>
<td>745 (49.87)</td>
<td>2148 (49.04)</td>
<td>0.5818</td>
</tr>
</tbody>
</table>

EIA = Employment and Income Assistance; aMean (Standard Deviation); bAll n = 5870, Unexposed n = 4376 (n = 4 missing information on maternal age at first birth due to discrepancy between the merged registry and hospital datasets); cMissing values are not reported due to small sample size.

7.3. Prevalence of Developmental Vulnerability Measures

Of 5,874 children in Cohort 3, 32.50% were developmentally vulnerable in one or more domains, and 19.44% were developmentally vulnerable in two or more domains. Greater likelihood of being developmentally vulnerable in one or more domain and two or more domains were observed in exposed children in Cohort 3 compared to unexposed children (one or more
domains: 49.46% vs. 26.71%, p < .0001; two or more domains: 32.86% vs. 14.86%, p < .0001). This pattern persisted when examined across all separate domains (e.g., communication skills and general knowledge: 20.82% vs. 9.84%, p < .0001). Figure 12 summarizes the overview of the prevalence and Chi-square testing of developmental vulnerability outcomes for Cohort 3.
**Figure 12.** Prevalence and Chi-Square Testing of Developmental Vulnerability Measures for Children Exposed to Maternal Intimate Partner Violence/Family Violence Victimization From Pregnancy to Child Age 5 (Cohort 3)

<table>
<thead>
<tr>
<th></th>
<th>All (n = 5874)</th>
<th>Exposed (n = 1494)</th>
<th>Unexposed (n = 4380)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV in Physical Health and Well-Being</td>
<td>16.53%</td>
<td>27.78%</td>
<td>12.69%</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>DV in Social Competence</td>
<td>15.22%</td>
<td>24.77%</td>
<td>11.96%</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>DV in Emotional Maturity</td>
<td>14.33%</td>
<td>22.02%</td>
<td>11.71%</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>DV in Language and Cognitive Development</td>
<td>14.42%</td>
<td>24.83%</td>
<td>10.87%</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>DV in Communication Skills and General Knowledge</td>
<td>12.63%</td>
<td>20.82%</td>
<td>9.84%</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>DV in One or More Domains</td>
<td>32.50%</td>
<td>49.46%</td>
<td>26.71%</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>DV in Two or More Domains</td>
<td>19.44%</td>
<td>32.86%</td>
<td>14.86%</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>

*Note. DV = Developmentally Vulnerable*
7.4. Relationship Between Maternal Intimate Partner Violence (IPV)/Family Violence (FV) Victimization Exposure From Pregnancy to Child Age 5 and Developmental Vulnerability at Kindergarten

Cohort 3 showed a similar pattern of the relationship between maternal IPV/FV victimization exposure and childhood developmental vulnerability as Cohort 2. Being exposed to maternal IPV/FV victimization from pregnancy to child age 5 was significantly associated with developmental vulnerability in social competence (adjusted OR = 1.29, 95% CI: 1.05, 1.59), emotional maturity (adjusted OR = 1.24, 95% CI: 1.01, 1.54). Developmental vulnerability in two or more domains (adjusted OR = 1.41, 95% CI: 1.16, 1.70) was also significantly higher when children were exposed to maternal victimization of IPV/FV during pregnancy to age 5. Figure 13 and Appendix 2 summarize the unadjusted and adjusted ORs of the relationship between maternal exposure and developmentally vulnerability outcomes for Cohort 3.
Figure 13. Odds Ratio and 95% Confidence Intervals for Developmental Vulnerability Measures of Children Exposed to Maternal Intimate Partner Violence/Family Violence Victimization From Pregnancy to Child Age 5 (Cohort 3)

*Reference Group: Unexposed to Maternal IPV/FV Victimization

Note. DV = Developmentally Vulnerable; FV = Family Violence; IPV = Intimate Partner Violence; OR = Odds Ratio; Exposed $n = 1,494$; Unexposed $n = 4,376$; Exposed and Unexposed Groups were matched on child’s biological sex, child’s birth date, mother’s neighbourhood income quintile, and regional health authority at the time of childbirth; Adjusted for maternal characteristics (social assistance, mental/developmental health disorder, married/common-law at childbirth, high school graduation, alcohol use during pregnancy, drug use during pregnancy, smoking during pregnancy, social isolation, history of child abuse, interpregnancy interval, and age at first birth) and child characteristics (developmental disorders and birth order)
7.5. Fitness of the Adjusted Multiple Logistic Models

The Brier scores and C-statistics of each model for Cohort 3 are summarized in Table 7. Same as model fit statistics of Cohort 1 and 2, Cohort 3 showed reasonable accuracy (< 0.25) across all developmental vulnerability domains. Similar to Cohort 2, C-statistics showed reasonable discrimination of the models (> 0.7) across all domains, except for the emotional maturity outcome, which showed marginally acceptable discrimination (0.6833).

*Table 7. Adjusted Model Fit Statistics, by Exposure to Maternal Intimate Partner Violence/Family Violence Victimization From Pregnancy to Child Age 5 (Cohort 3)*

<table>
<thead>
<tr>
<th>DV Domain</th>
<th>Brier Score</th>
<th>C-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV in Physical Health and Well-Being</td>
<td>0.1246</td>
<td>0.7298</td>
</tr>
<tr>
<td>DV in Social Competence</td>
<td>0.1182</td>
<td>0.7093</td>
</tr>
<tr>
<td>DV in Emotional Maturity</td>
<td>0.1151</td>
<td>0.6833</td>
</tr>
<tr>
<td>DV in Language and Cognitive Development</td>
<td>0.1117</td>
<td>0.7350</td>
</tr>
<tr>
<td>DV in Communication Skills and General Knowledge</td>
<td>0.0995</td>
<td>0.7351</td>
</tr>
<tr>
<td>DV in One or More Domains</td>
<td>0.1916</td>
<td>0.7140</td>
</tr>
<tr>
<td>DV in Two or More Domains</td>
<td>0.1378</td>
<td>0.7284</td>
</tr>
</tbody>
</table>

*Note. DV = Developmental Vulnerability*
Chapter 8: Discussion

8.1. Research Summary and Knowledge Added

This research examined the associations between maternal history of FDT victimization and developmental vulnerability at Kindergarten in three different exposure periods: during pregnancy, from child age 0 to 5, and from pregnancy to child age 5. The findings confirmed the hypotheses that exposure to maternal FDT victimization is associated with an increased likelihood of children’s developmental vulnerability at Kindergarten across multiple domains of development when children were exposed from birth to age 5 and from pregnancy to age 5. The hypothesis was not supported when the relationship was examined for the exposure period of pregnancy only.

In the current study, prenatal exposure to maternal FDT victimization alone did not show associations with developmental vulnerability in any of the developmental domains. This finding contradicts Barker’s fetal origins hypothesis, where fetal exposure to adverse events has effects on children’s later development (Almond & Currie, 2014; Barker, 1995; Glover et al., 2010). Previous research found a link between prenatal exposure to maternal IPV/FV victimization and adverse birth and infant health outcomes, as well as later behavioural problems (Donovan et al., 2016; McMahon et al., 2011; Silva et al., 2018), however, no studies have examined the specific developmental outcomes at Kindergarten using the EDI, where we found no statistically significant associations after adjusting for health and social characteristics of mothers and children. In the unadjusted analyses, however, prenatal exposure to maternal IPV/FV victimization was associated with developmental vulnerability across all developmental domains. Based on this finding, it can be speculated that rather than pregnancy exposure to maternal victimization of IPV/FV itself, other health and social factors (e.g., mothers on social
assistance, mothers diagnosed with mental/developmental health disorder, and/or childhood developmental disorder) appeared to play a more important role in developmental vulnerability of children at Kindergarten. These null findings could also be due to the limitations of using administrative data, which are detailed in the later section of this chapter. While adjusted analyses isolate the unique relationship between exposure and outcome, unadjusted relationships capture the holistic experience of these families. In the real world, children exposed to violence at home also have various social and health risk factors that compound and exacerbate their developmental health outcomes. Therefore, children prenatally affected by EIPV/EFV should not be disregarded from receiving support since they may be more vulnerable to poorer developmental health outcomes associated with various risk factors.

This study was one of the first studies at examining the relationship between prenatal exposure to maternal IPV/FV victimization and developmental vulnerability of children at Kindergarten using Canadian population-based data. Many previous studies looked at the impact of prenatal EIPV/EFV on adverse birth and/or infant outcomes (Donovan et al., 2016; McMahon et al., 2011; Shah & Shah, 2010), and poor mother-child attachment (Huth-Bocks et al., 2004) that could potentially lead to developmental vulnerability in later years. Furthermore, the current literature lacks rigorously-tested and population-based evidence on longer-term health outcomes followed by prenatal EIPV/EFV (Silva et al., 2018). Thus, the findings of this study examining the relationship between mothers’ IPV/FV victimization during pregnancy and developmental outcomes at Kindergarten are a valuable addition to the current state of knowledge. Also, this study can generate further questions about whether prenatal exposure to violence or other familial or social risk factors associated with domestic violence contribute to the later developmental health of children.
Postnatal exposure to maternal IPV/FV victimization demonstrated an association with children’s developmental vulnerability in social competence, emotional maturity, and two or more domains. Being vulnerable in social and emotional development at Kindergarten when exposed to maternal IPV/FV victimization confirms the current knowledge where the exposure is related to emotional impediments and difficulties in social functioning (Artz et al., 2014; Bayarri et al., 2011; Howell et al., 2016; Moylan et al., 2010). The study findings are in contrast with past studies that found the relationships between maternal history of IPV/FV victimization and other childhood developmental health domains (e.g., physical health and well-being, language and cognitive development) (Howell et al., 2016; Perkins & Graham-Bermann, 2012).

When maternal IPV/FV victimization occurred from pregnancy to child age 5 (Cohort 3), the observed relationships between the exposure and developmental vulnerability outcomes were similar to the associations observed for the child age 0 to 5 exposure period (Cohort 2); statistically significant relationships were detected for the outcomes of social competence, emotional maturity, and two or more domains. Two speculations can be made regarding these findings for Cohorts 2 and 3. First, given the shorter exposure period during pregnancy, the associations were possibly driven by postnatal exposure to maternal IPV/FV victimization rather than prenatal exposure. Also, the significant relationship found for two or more domains for Cohorts 2 and 3 may be driven by the observed associations for social competence and emotional maturity outcomes. The findings of Cohorts 2 and 3 exhibited similarities in the relationship between maternal IPV/FV victimization and developmental vulnerability. Since the cohorts were not mutually exclusive, with substantial overlap between Cohorts 2 and 3, this could have led to such similarities in the results.
8.2. Strengths and Limitations

The main strength of this research is addressing the methodological limitations of the current state of knowledge on this research topic, which was achieved by establishing a robust study design utilizing linked administrative data that allowed longitudinal examination. When studying child development, longitudinal analyses are a powerful and robust method that can untangle underlying complex mechanisms, and the use of administrative data is a valuable tool to achieve this goal (Macmillan et al., 2007). The strengths of administrative data include comprehensive longitudinal follow-up, large and unbiased samples, relatively low cost, and objective measures. (Brownell & Jutte, 2013) Administrative data can minimize response biases that are often present with self-report data. The comprehensiveness of the Repository also allowed for adjustment in statistical models for a range of relevant confounders. The current research also contributes Canadian-based evidence to the currently existing knowledge that is mostly based on evidence from the United States. This addition of knowledge is necessary when national- and regional-level socioeconomic factors predict the population prevalence of family/domestic violence against women (Heise & Kotsadam, 2015), and Canada’s social, economic, cultural, and political structures of responding to the issue differ from the United States’ despite some contextual similarities (Grandin & Lupri, 1997).

Although employing administrative data can be a powerful and validated research tool, it poses some limitations. Using reported administrative information compiled in the Repository did not allow representing all IPV/FV victims and cases, which resulted in potential external validity issues. Even though individuals in every sociodemographic group can experience IPV/FV (Heise et al., 1999), the Canadian national survey data show that the police reporting behaviour of IPV/FV victims varied amongst different sociodemographic groups; women living
with children (especially when children witnessed the violence), women of a racial minority, and unmarried women were more likely to report IPV/FV than women who were without children, White, and married (Akers & Kaukinen, 2009). Many experts also have spoken that the rates of IPV/FV are underestimated for reasons such as limited contacts outside of the family, lack of a safe place to confide, or social stigma associated with victimization (Government of Canada, 2018). Data confirms that when violence between spouses occurs, only 19% of victims report to police (Statistics Canada, 2016). This potential issue of underreporting and being unable to capture these unreported cases in administrative data may limit generalizability and lead to potential reporting biases.

Also, since the study only examined IPV/FV cases that were recorded in the administrative data held in the Repository, the comparison group may have included children experienced EIPV/EFV who were unreported. This limitation of using the administrative data could have introduced misclassification of exposure. To reduce the possibility of the comparison group including exposed individuals, this study excluded mothers who indicated IPV history in the FFS from the comparison group. This step, however, does not completely eliminate this possibility.

It is also important to note that information on IPV/FV incidents is only available for Winnipeg, Manitoba; therefore, cases of IPV/FV occurring outside of Winnipeg were not included. This is a limitation that should be carefully noted since police-reported IPV/FV is higher in rural than urban areas (Statistics Canada, 2018). Furthermore, information on past involvement with the justice system due to the victimization of IPV/FV in mothers was not considered due to limited years of data availability in the PRISM dataset. This limitation
imposed by data unavailability may have led to a potential attenuation of the true relationship between exposure and outcomes.

Furthermore, the use of the Repository only allowed for adjustment for measured and reported confounders while unable to account for other potential confounders, such as parenting style or stress, and the effect of other forms of co-occurring child maltreatment (i.e., physical abuse, sexual abuse, emotional abuse, or neglect). Past research indicated that EIPV often co-occurred with other types of child maltreatment (Afifi et al., 2015; Lefebvre et al., 2013). Due to data unavailability in the Repository, this variable was not accounted for, therefore, unable to assess the effect.

8.3. Future Research

Further examining the impact of prenatal and/or postnatal exposure to maternal IPV/FV victimization on children’s longer-term developmental health is recommended. The existing literature found adverse birth and short-term infant health outcomes following maternal prenatal EIPV/EFV (Donovan et al., 2016; McMahon et al., 2011). A recent meta-analysis synthesized five studies in the literature examining the relationship between IPV during pregnancy and behavioural problems from child age 10 months to 16 years and found the association with externalizing and internalizing problems from childhood to adolescence (Silva et al., 2018). It is important to note that the main limitations included its low quality of evidence and a small number of studies ($k = 5$). Such limitations warrant for further examination on longer-term developmental outcomes followed by prenatal EIPV/EFV to improve the quality of evidence examining the relationships in the literature.

Unlike past studies that found the relationships between postnatal EIPV/EFV and other childhood developmental health domains, such as cognitive and physical development (Howell
et al., 2016; Perkins & Graham-Bermann, 2012; Udo et al., 2016), this research found an increased likelihood of developmental vulnerability in only social competence and emotional maturity at Kindergarten when children were exposed to maternal EIPV/EFV victimization. A recent cohort study in British Columbia, Canada found social-emotional functioning profiles at Kindergarten (measured by the EDI) were associated with later physician-assessed mental health conditions (e.g., depression, anxiety, conduct disorder, attention-deficit hyperactivity disorder) from age 6 to 14 (Thomson et al., 2019). Based on the evidence from Thomson et al. (2019) and the current research, future research may further examine the impact of postnatal EIPV/EFV on children’s later mental health outcomes. All in all, it will be relevant to follow children who experienced EIPV/EFV and examine if later developmental health after Kindergarten is linked with prenatal and/or postnatal exposure and if so, what specific types of development are more likely to be associated.

8.4. Policy and Clinical Implications

Previous research on IPV/FV against women has emphasized responses from the legal or justice sectors (García-Moreno et al., 2015; Temmerman, 2015). This research confirms the hypothesis that experiencing maternal FDV victimization during the early years of childhood is associated with increased risk for adverse childhood social and emotional outcomes at Kindergarten. This highlights the need for requiring multisectoral responses from health, and education, and making evidence-based recommendations to these various government sectors responsible for decision and policy making regarding women’s victimization of family/domestic violence. The study findings may aid in raising awareness of decision-makers, healthcare professionals, justice and police departments, educators, as well as the public on the potential intergenerational health, social, and economic burdens associated with family/domestic violence.
and where investment should be made to develop effective early childhood development programs and support systems for this specific population of mothers and children. Based on the findings of this study, the following recommendations can be made:

1) At the provincial level, early childhood development programs to prevent long-term developmental health risks should be developed and implemented to support children affected by EIPV/EFV;

2) Social and emotional developmental health components should be included and emphasized in developing the interventions;

3) Further research on the timing of EIPV/EFV and its impact on different domains of childhood developmental outcomes is crucial for the development and improvement of support programs and interventions for the population;

4) Support programs and interventions for children affected by EIPV/EFV should continuously be evaluated and modified as needed based on scientific evidence.

This work also has some clinical implications for mothers and children affected by IPV/FV. When working with victims of IPV/FV in the healthcare setting, family doctors, obstetricians, and other healthcare providers should recognize and consider interventions for not only mothers but also their children who could potentially be intergenerational victims. It is also relevant for them to advocate for both short-term and long-term supports for the population of children affected by EIPV/EFV, and make sure these children are being supported longitudinally to reduce the risk for adverse developmental outcomes. As this study found the specific link between EIPV/EFV and social and emotional developmental vulnerability at Kindergarten, healthcare providers who provide psychological services to children should develop and/or provide population-specific interventions when working with children who are victims of
EIPV/EFV. They should also familiarize themselves with various resources to provide mothers and children affected by IPV/FV so that they can provide appropriate referrals and/or recommendations for social and counselling support. The Government of Manitoba provides information on community resources and includes specific resources for women and children affected by domestic violence, including mental health services for the victims (https://www.gov.mb.ca/justice/crown/victims/pubs/resource_map.pdf).

8.5. Knowledge Translation

Knowledge translation to a wide range of audiences, including stakeholders, policymakers, healthcare professionals, and academics, is planned. I will use multiple approaches to share the findings to academic communities, including conference proceedings and journal article publications. As a part of the process of obtaining access to the Repository, I will be required to distribute the findings to each data provider, which will provide an opportunity to share the knowledge from the findings and connect with policymakers from multiple sectors, including Manitoba Justice, Manitoba Education and Training, Manitoba Families, Manitoba Health, Seniors and Active Living, and Winnipeg Regional Health Authority. At the community-level, I plan to disseminate the summary of the study results (e.g., infographic) to agencies supporting women and children (e.g., Klinic Community Health, West Central Women’s Resource Centre, Fort Garry Women’s Resource Centre, Women’s Health Clinic, and Manitoba Advocate for Children and Youth), as well as mental health crisis services and hospitals (e.g., Crisis Response Centre, Health Sciences Centre, and St. Boniface General Hospital) This plan will be carried out with careful consultations with various community agencies providing support systems for the population of mothers and children affected by IPV/FV.
Chapter 9: Conclusion

The current research found the observed relationships between early EIPV/EFV and developmental vulnerability at Kindergarten varied based on the periods and timing of exposure and developmental domains. While carefully discussing the limitations of this study, two main findings should be emphasized: 1) prenatal exposure to maternal IPV/FV victimization alone was not associated with developmental vulnerability at Kindergarten, and 2) postnatal exposure to maternal IPV/FV victimization was associated with later social and emotional developmental vulnerability. Supporting children affected by maternal IPV/FV victimization requires the need to conduct further research on various timing of exposures and types of developmental health outcomes at varying developmental stages. This research emphasizes how various contexts of EIPV/EFV can contribute differently to children’s developmental health. Employing this evidence, policymakers may tailor their decisions to develop and/or implement interventions and support systems for mothers and children victimized by IPV/FV.
References


Hill, A., Pallitto, C., McCleary-Sills, J., & Garcia-Moreno, C. (2016). A systematic review and
meta-analysis of intimate partner violence during pregnancy and selected birth outcomes.


https://doi.org/10.1016/j.ijgo.2015.10.023


Lefebvre, R., Wert, M. Van, Black, T., Fallon, B., & Trocmé, N. (2013). A profile of exposure to intimate partner violence investigations in the canadian child welfare system: An examination using the 2008 Canadian Incidence Study of Reported Child Abuse and
MATERNAL EIPV/EFV AND DEVELOPMENTAL HEALTH AT KINDERGARTEN


Epidemiology, 43(5), 1438–1449. https://doi.org/10.1093/ije/dyu190


Sigalla, G. N., Mushi, D., Meyrowitsch, D. W., Manongi, R., Rogathi, J. J., Gammeltoft, T., &


### Appendix 1. Description of Data Sources

<table>
<thead>
<tr>
<th>Name of Dataset</th>
<th>Description</th>
<th>Data Years</th>
<th>Information Retrieved</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Justice Data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prosecution Information and Scheduling Management (PRISM)</td>
<td>Data management system maintained by Manitoba Justice including information on incidences, charges, and involvements in the justice system in Manitoba.</td>
<td>September 2002 to April 2017</td>
<td>Incident type, charges, disposition, warrants, calls for service, crime and crime type</td>
</tr>
<tr>
<td><strong>Health Data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital Abstracts</td>
<td>Health data maintained by Manitoba Health, Seniors and Active Living consisting of hospital forms/computerized records containing summaries of demographic and clinical information (e.g., gender, postal code, diagnoses and procedure codes) completed at the point of discharge from the hospital.</td>
<td>1995/96-2017/18</td>
<td>Hospitalizations, diagnoses, procedures, services, providers, length of stay, hospital &amp; case characteristics</td>
</tr>
<tr>
<td>Manitoba Fetal Alcohol Spectrum Disorder (FASD) Clinic Data</td>
<td>Clinical health data that provide details concerning Manitoba preschool children, school-aged children, adolescents, and adults with Fetal Alcohol Spectrum Disorder (FASD) identified through the Manitoba FASD Centre program. To be included, individuals must have known prenatal alcohol exposure, developmental and learning concerns, and consent of their legal guardian if under 18 years of age.</td>
<td>2003 to 2016</td>
<td>Reason for referral, history, growth parameters, developmental assessment, genetic assessment, diagnosis, and behavioural/OT concerns</td>
</tr>
<tr>
<td>Manitoba Health Insurance Registry</td>
<td>A registry maintained by Manitoba Health, Seniors and Active Living of all individuals who have been registered with Manitoba Health at some point.</td>
<td>1995/96- June 2018</td>
<td>Births, deaths, coverage status, sex, location of residence, marital &amp; family status</td>
</tr>
<tr>
<td>Medical Claims/Medical Services</td>
<td>Health data maintained by Manitoba Health, Seniors and Active Living consisting of claims for physician visits in offices, hospitals and outpatient departments; fee-for-service components for tests such as lab and x-ray procedures performed in offices and hospitals; payments for on-call agreements (e.g. anesthetists) that are not attributed to individual patients; as well as information about physicians’ specialties.</td>
<td>1995/96-2017/18</td>
<td>Services, diagnoses, facility, location, group, physician characteristics</td>
</tr>
<tr>
<td><strong>Social Data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canadian Census</td>
<td>Social data based on a population survey (census) that include aggregate demographic information.</td>
<td>DLI: 1995 and every 5 years since, up to 2016;</td>
<td>Neighbourhood income quintile</td>
</tr>
</tbody>
</table>

*Note: DLI = Data Liberation Initiative*
<table>
<thead>
<tr>
<th>Dataset</th>
<th>Description</th>
<th>CSDS:</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Employment Income Assistance (EIA) / Social Allowances Management Information Network (SAMIN)</strong></td>
<td>Social data maintained by the Manitoba Department of Families and provides information on Manitoba residents who receive financial help who have no other way to support themselves or their families.</td>
<td>2001, 2006, 2011</td>
<td>Client demographics, case level details and characteristics, education level, income, and employment details.</td>
</tr>
<tr>
<td><strong>Families First Screening</strong></td>
<td>Social data maintained by Healthy Child Manitoba that contain information concerning biological, social, and demographic risk factors that Manitoba families with children may be exposed to. The screen captures all families that have agreed to participate in the Families First Program (from 2003-present).</td>
<td>1995-2016</td>
<td>Parents’ ethnic background, alcohol and drug use, history of anxiety disorders and depression, child abuse, criminal involvement, and education, and physical and medical characteristics of the child.</td>
</tr>
<tr>
<td><strong>Education Data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Early Development Instrument (EDI)</strong></td>
<td>The Early Development Instrument (EDI) is designed to support healthy child development by assessing kindergarten children's developmental health at school entry in communities across Manitoba.</td>
<td>September 2005-June 2015</td>
<td>Assessment of children’s readiness to learn in five domains: physical health and well-being, social knowledge and competence, emotional health/maturity, language and cognitive development, and general knowledge and communication skills.</td>
</tr>
<tr>
<td><strong>Enrollment, Marks, and Assessment</strong></td>
<td>Education data maintained by Manitoba Education that provides information on enrollment, courses, marks, standard tests, assessments, graduation status, level of funding, and demographics for Manitoba students from Kindergarten to Grade 12.</td>
<td>1995/96-December 2016</td>
<td>Type of program, special status and high school completion.</td>
</tr>
</tbody>
</table>

*Fiscal years; April 1st, YYYY through March 31st, YYYY*
## Appendix 2. Odds Ratio for Developmental Vulnerability Measures, by Exposure to Maternal Intimate Partner Violence/Family Violence Victimization

<table>
<thead>
<tr>
<th>Developmental Vulnerability Domain</th>
<th>Cohort 1: Exposure to Maternal Victimization of FDT During Pregnancy (Exposed n = 229; Unexposed n = 698)</th>
<th>Cohort 2: Exposure to Maternal Victimization of FDT from Child Age 0 to 5 (Exposed n = 1365; Unexposed n = 3952)</th>
<th>Cohort 3: Exposure to Maternal Victimization of FDT from Pregnancy to Child Age 5 (Exposed n = 1494; Unexposed n = 4376)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted OR (95% CI)</td>
<td>Adjusted OR(^a) (95% CI)</td>
<td>Unadjusted OR (95% CI)</td>
</tr>
<tr>
<td><strong>Physical Health and Well-Being</strong></td>
<td><strong>Exposed</strong></td>
<td>2.83 (1.95, 4.10)*</td>
<td>1.16 (0.67, 2.01)</td>
</tr>
<tr>
<td></td>
<td><strong>Unexposed</strong></td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td><strong>Social Competence</strong></td>
<td><strong>Exposed</strong></td>
<td>2.27 (1.56, 3.31)*</td>
<td>1.06 (0.60, 1.88)</td>
</tr>
<tr>
<td></td>
<td><strong>Unexposed</strong></td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td><strong>Emotional Maturity</strong></td>
<td><strong>Exposed</strong></td>
<td>1.99 (1.35, 2.94)*</td>
<td>0.82 (0.46, 1.48)</td>
</tr>
<tr>
<td></td>
<td><strong>Unexposed</strong></td>
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<td>Reference</td>
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<tr>
<td><strong>Language and Cognitive Development</strong></td>
<td><strong>Exposed</strong></td>
<td>2.45 (1.65, 3.64)*</td>
<td>0.98 (0.53, 1.81)</td>
</tr>
<tr>
<td></td>
<td><strong>Unexposed</strong></td>
<td>Reference</td>
<td>Reference</td>
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<tr>
<td><strong>Communication Skills and General Knowledge</strong></td>
<td><strong>Exposed</strong></td>
<td>2.34 (1.55, 3.54)*</td>
<td>0.92 (0.47, 1.79)</td>
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<td></td>
<td><strong>Unexposed</strong></td>
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<tr>
<td><strong>Developmentally Vulnerable in One or More Domains</strong></td>
<td><strong>Exposed</strong></td>
<td>2.70 (1.98, 3.68)*</td>
<td>1.17 (0.72, 1.88)</td>
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<tr>
<td></td>
<td><strong>Unexposed</strong></td>
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<tr>
<td><strong>Developmentally Vulnerable in Two or More Domains</strong></td>
<td><strong>Exposed</strong></td>
<td>2.48 (1.75, 3.50)*</td>
<td>1.14 (0.67, 1.95)</td>
</tr>
<tr>
<td></td>
<td><strong>Unexposed</strong></td>
<td>Reference</td>
<td>Reference</td>
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</table>

*Statistically Significant; FDT = Family/Domestic Trouble; OR = Odds Ratio; CI = Confidence Interval; Exposed and Unexposed Groups were matched on child’s biological sex, child’s birth date, mother’s neighborhood income quintile, and regional health authority at the time of child birth; \(^a\)Adjusted for maternal characteristics (social assistance, mental health disorder, married/common-law at child birth, high school graduation, alcohol use during pregnancy, drug use during pregnancy, smoking during pregnancy, social isolation, history of child abuse, interpregnancy interval, and age at first birth) and child characteristics (developmental disorders, and birth order)
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