The association of a paraprofessional home visiting intervention with lower child maltreatment rates in First Nation families in Canada: A population-based retrospective cohort study

Mariette Chartier[a,*], Jennifer E Enns[a], Nathan C Nickel[a], Rhonda Campbell[b], Wanda Phillips-Beck[b], Joykrishna Sarkar[a], Janelle Boram Lee[c], Elaine Burland[a], Dan Chateau[a], Alan Katz[a], Robert Santos[d], Marni Brownell[a]

[a] Manitoba Centre for Health Policy, Department of Community Health Sciences, Rady Faculty of Health Sciences, University of Manitoba, Canada
[b] First Nations Health and Social Secretariat of Manitoba, Canada
[c] Department of Community Health Sciences, Rady Faculty of Health Sciences, University of Manitoba, Canada
[d] Ministry of Education and Training, Manitoba Government, Canada

ABSTRACT

Background: The Families First Home Visiting (FFHV) program aims to enhance parenting skills and strengthen relationships between parents and their children. Previous research found FFHV to be effective at decreasing child maltreatment in the general population of Manitoba, but whether it is beneficial specifically for First Nation families has not yet been investigated.
Methods: De-identified home visiting program data from 4010 First Nation families with children born 2003–2009 were linked to population-based administrative data housed at the Manitoba Centre for Health Policy. We applied inverse probability of treatment weights to adjust for confounders related to enrollment in FFHV, and then compared rates of children taken into care of child welfare, maltreatment-related hospitalization, and children witnessing or being a victim of a crime in FFHV-enrolled families to rates in families eligible for but not enrolled in FFHV.
Results: FFHV enrollment was associated with lower rates of children being taken into care before the age of 1 (adjusted Risk Ratio [aRR] 0.687; 95% Confidence Interval [CI] 0.576–0.819) and age 2 (aRR 0.763; 95% CI 0.611–0.881), lower rates of hospitalization for maltreatment-related injuries by age 3 (aRR 0.429; 95% CI 0.187–0.983), and lower rates of children witnessing or being a victim of a crime (aRR 0.591; 95% CI 0.385–0.907).
Conclusions: Families enrolled in FFHV had lower rates of maltreatment-related indicators compared to families eligible for but not enrolled in the program. Strategies for increasing enrollment through partnerships with First Nation organizations are recommended.

1. Introduction

Increasing awareness of and responsiveness to child maltreatment has recently led to more cases of abuse and neglect being reported to the child welfare system and a greater number of children been taken into out-of-home care (Mansell, 2007; Gilbert et al., 2012; Munro, 2010). In the Canadian province of Manitoba, the rates of children in out-of-home care are among the highest in the country, and Indigenous[1]

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* Corresponding author at: Manitoba Centre for Health Policy, 408-727 McDermot Ave, Winnipeg, Manitoba R3E 3P5, Canada.
E-mail addresses: Mariette_chartier@cpe.umanitoba.ca (M. Chartier), Jennifer_enns@cpe.umanitoba.ca (J.E. Enns),
Nathan_nickel@cpe.umanitoba.ca (N.C. Nickel), Rcampbell@fnhssm.com (R. Campbell), Wphillips-beck@fnhssm.com (W. Phillips-Beck),
Joykrishna_sarkar@cpe.umanitoba.ca (J. Sarkar), Janelle_lee@cpe.umanitoba.ca (J.B. Lee), Elaine_burland@cpe.umanitoba.ca (E. Burland),
Dan_chateau@cpe.umanitoba.ca (D. Chateau), Alan_katz@cpe.umanitoba.ca (A. Katz), Rob.santos@gov.mb.ca (R. Santos),
Marni_brownell@cpe.umanitoba.ca (M. Brownell).

[1] In Canada, the term Indigenous refers to First Nation, Métis and Inuit peoples. The province of Manitoba is home to the highest proportion of Indigenous residents of all the Canadian provinces, and particularly First Nation residents, who make up 11% of the provincial population The Social and Aboriginal Statistics Division of Statistics Canada (2016).

children make up a disproportionate 88% of the 10,000 children in care (Manitoba Families, 2016). The reasons for the overrepresentation of Indigenous children in the child welfare system are complex, and are rooted in the colonization of Canada by European settlers and the implementation of the residential school system (National Collaborating Centre for Aboriginal Health, 2017). In the mid-1900s, policies adopted by the Canadian government were designed to 'civilize' Indigenous peoples according to European standards, and were enacted through forceful removal of children from their families and communities. The term 'Sixties Scoop' describes the period in the 1960s (and beyond) when large numbers of children were removed from their homes to be placed in residential schools and/or fostered or adopted into non-Indigenous homes. The disruption of integral family structures contributed to extensive loss of language, culture and community ties in entire generations of Indigenous peoples whose well-being and ability to create caring, nurturing environments for their children continues to be negatively impacted by these historical wrongs (Greenwood & de Leeuw, 2012).

In addition to living with this multi-generational trauma, many Indigenous families experience higher rates of poverty than non-Indigenous families, and are more likely to live in sub-standard housing, experience food insecurity, be involved with the criminal justice system, and struggle with addiction and other mental health disorders (Chansonneuve, 2007; Collin, 2009; Department of Justice Canada, 2011). As well, family and social supports among Indigenous families are often lacking, with fewer opportunities for education and economic development (Aboriginal Children in Care Working Group, 2015). These factors are some of the root causes of family dysfunction, placing families in conditions of risk for child maltreatment, and they are the primary reasons so many Indigenous children are taken into care (Trocme et al., 2005; Trocmé et al., 2006).

Addressing the social determinants of health is essential for promoting the health and well-being of Indigenous families (Aboriginal Children in Care Working Group, 2015). Federal and provincial governments have been slow to respond to the Truth and Reconciliation Commission of Canada's Calls to Action (Truth and Reconciliation Commission of Canada, 2015), particularly Call #1, which calls on federal, provincial, territorial, and Aboriginal governments to commit to reducing the number of Aboriginal children in care. Given that the number of Indigenous children in care is still increasing, there is a critical need for culturally appropriate and community-based strategies that build on the strengths of Indigenous peoples and provide adequate resources to ensure their children are adequately cared for.

It must also be acknowledged that despite the grim statistics on the proportion of Indigenous children in care, the majority of First Nation children and youth in Manitoba are resilient, report being healthy, have a sense of balance in their lives, have someone who shows them love and affection, receive positive family support, and retain connections to their language, culture and traditions (Assembly of Manitoba Chiefs, 2012). These positive factors, coupled with traditional teachings to guide people in living a balanced life, are what many traditional Elders claim are keys to healing and well-being for Indigenous people (Pratt & Bone, 2014). Additional strategies, such as prevention and early intervention programs that aim to keep families intact, may also be highly effective at mitigating factors that contribute to family dysfunction and children being taken into care (Aboriginal Children in Care Working Group, 2015). Home visiting is one such intervention, as it aims to promote children's well-being while reducing or eliminating the need for child welfare involvement.

The literature on the efficacy of home visiting in reducing child maltreatment is somewhat inconsistent across programs. Some reviews reporting fewer hospitalizations for injuries (Olds et al., 1997; Olds et al., 2014), lower rates of children being taken into care (Barlow et al., 2007; Duggan et al., 2004), and lower mortality rates (Olds et al., 2014; Kitzman et al., 1997), while others report no evidence of effectiveness (Avellar & Supplee, 2013; Sweet & Appelbaum, 2004). However, the

provincial Families First Home Visiting (FFHV) program in Manitoba[2] has been shown to be associated with several positive outcomes in the general population, including higher rates of childhood vaccination (Isaac et al., 2015), fewer instances of hospitalizations for child maltreatment-related injuries (Chartier et al., 2017), and lower rates of children being taken into care of child protection services (Chartier et al., 2017). Another study, one of the very few involving American Indian families previously involved in the child welfare system, also found that families who received home visiting services had lower rates of recidivism into the system compared to control families in their study (Chaffin et al., 2012). This last study differs from the previously-cited home visiting studies in that all families included in the analysis had previous child welfare involvement rather than being at-risk for child maltreatment.

While program records show that many families enrolled in FFHV are First Nation, evidence on whether FFHV is effective at decreasing child maltreatment among First Nation families is lacking. This is an important knowledge gap to address, because the unique contextual and cultural factors influencing the experiences of First Nation people may impact how a home visiting program is received and how its effects may manifest in this population. Given that child maltreatment is challenging to examine directly, we undertook this study to determine whether FFHV is associated with lower rates of maltreatment-related indicators (being taken into care of child protection services, hospitalizations for maltreatment-related injuries, and witnessing or being a victim of a crime) among Manitoba First Nation families.

2. Methods

2.1. Study setting and design

In 2015, a partnership was formed between planners in the Maternal Child Health program at the First Nations Health and Social Secretariat of Manitoba[3] and researchers at the University of Manitoba to address the paucity of home visiting program evidence among First Nation families. It has been recognized, not only in Canada but also internationally, that involving local Indigenous research and program staff is crucial for conducting research involving Indigenous data and ensuring the acceptability of the results (Kemp et al., 2018). The study design was approved by the Health Research Ethics Board at the University of Manitoba, the Health Information Privacy Committee of the Manitoba Government, and the First Nations Health Information Research Governance Committee.[4]

In this retrospective cohort study, we examined indicators of child maltreatment in Manitoba First Nation families with children born 2003–2009 who faced multiple parenting challenges (e.g., poverty, single parenthood, or relationship distress). Information on FFHV participants came from the individual-level administrative data held in the Manitoba Population Research Data Repository at the Manitoba Centre for Health Policy. To conduct the analyses, we linked de-identified home visiting program data to administrative data from the health, social and justice systems, and examined differences between families who participated in FFHV and those who were eligible for FFHV but did not participate.

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[2] Families First Home Visiting operates across Manitoba and is available to Indigenous families living off-reserve, but is not offered in First Nation communities.

[3] The First Nations Health and Social Secretariat is a health policy, advocacy and research organization formed in 2013 by a resolution of the Manitoba Chiefs in Assembly.

[4] The First Nations Health Information Research Governance Committee is an ethical body that reviews research involving First Nation people in Manitoba.

2.2. The Families First Home Visiting program

FFHV is a strength-based, family-centered home visiting program funded by Healthy Child Manitoba[5] and built on the premise that parents with strong attachments to their children are at lower risk for child abuse and neglect. All Manitoba parents with newborns are screened and assessed for FFHV eligibility by public health nurses (PHNs) in the post-partum period. Families who are eligible (eligibility described in detail in the following section) are offered enrollment in FFHV. The program is overseen by PHNs who ensure that families receive clinical expertise and support as required, and provide two hours per week of reflective supervision to the home visitors. The para-professional home visitors have a high school education and either some postsecondary education in health, education or child development, or personal experience with parenting under difficult circumstances. Home visitors are trained in the Growing Great Kids curriculum (Growing Great Kids Inc., 2015); a curriculum used by Healthy Families America, which includes child development, parenting and health information, and parental and child activities.

Under PHN supervision, the home visitors conduct home visits, working to develop a trusting relationship with families enrolled in FFHV. They focus on strengthening parent-child relationships, supporting healthy child development and connecting families with health and social services (Healthy Child Manitoba, 2010). Depending on the family's needs, the frequency of the visits may vary from once a week to once a month, and the visits may last between one to two hours each. Families may participate in FFHV for up to three years; the average time that they spend in the program is about 18 months.

2.3. Study cohort

The study cohort comprised all Manitoba First Nation families with children born 2003–2009 who met the eligibility criteria for FFHV, as shown in Fig. 1. Eligibility for FFHV is determined by a two-stage process where: (i) PHNs conduct a universal newborn screen in the post-partum period to collect information on demographic, biological and social factors, and (ii) families identified as facing 3+ parenting challenges on the newborn screen (for example, being a single parent family, the mother having a mental illness, or the mother being socially isolated) are then assessed using the 10-item Parent Survey based on the Kempe Family Stress Checklist (Korfmacher, 2000). Families with a score of 25+ on the Parent Survey are offered enrollment in FFHV. In our cohort, 2140 families were missing Parent Survey score data, so we imputed these scores from the information-rich data in the universal newborn screen, as previously described (Chartier et al., 2017). Imputing the Parent Survey scores allowed us to retain families in the study cohort whom we would otherwise have had to exclude due to missing data, potentially introducing selection bias. The final study cohort included 4010 First Nation families. Among these, 1681 families were enrolled in FFHV (exposed group), and 2329 families met the eligibility criteria but did not enroll in FFHV (comparison group).

2.4. Data sources and variables

The population-based administrative data for the study were derived from the PATHS Data Resource at the Manitoba Centre for Health Policy, a collection of individual-level data on over 99% of all children born 1984–2014 in Manitoba (Nickel et al., 2014). All records in the Repository, including those in the PATHS Data Resource, are stripped of names and addresses, but can be linked together across files and over time by use of a scrambled numeric identifier. The Repository data have been used extensively in population health research and their validity

has been well established (Roos et al., 2004; Roos et al., 2005; Jutte et al., 2011). The FFHV program data were used to identify families screened for eligibility and to determine program enrollment. These program data provided comprehensive information on the parenting challenges faced by families. To determine and verify First Nation identity among Manitoba residents, we cross-referenced the program data with three additional datasets (the Indigenous & Northern Affairs Canada registry, data from a prenatal benefit program in Manitoba, and income assistance data). Other datasets we used in this study are listed in Table A1.

The study variables are listed in Table 1. Measuring child maltreatment directly is challenging, given that caregivers rarely disclose these actions on surveys, much less to authorities. Much of what we learn about child maltreatment generally comes from official child welfare records or retrospective accounts of childhood experiences (Fallon et al., 2013). For these reasons, the outcome variables "taken into care of child protection services" and "hospitalization for maltreatment-related injuries" were selected as proxies for child maltreatment. Children may be removed from their family homes and taken into care of child protection services when maltreatment is alleged or substantiated. Thus, we defined the outcome "taken into care of child protection services" as children being taken into care for at least one day between birth and their first birthday, and between birth and their second birthday. We defined "hospitalization for maltreatment-related injuries" using ICD codes in hospital records, including codes for maltreatment syndrome (abuse or neglect), assault, undetermined cause, and codes describing adverse social circumstances concerning children's welfare (social environment, family support, and lifestyle) – see Table A2 for the full list of codes (Gilbert et al., 2012). We used records from Manitoba Justice to identify children up to age 3 who were involved in prosecutions as a witness to or a victim of a crime. Children involved with the justice system as victims or witnesses of a crime are at high risk of maltreatment. Witnessing inter-partner violence is, in fact, itself considered child maltreatment (Fallon et al., 2013).

2.5. Data analyses

2.5.1. Applying inverse probability of treatment weights

The measured and unmeasured challenges experienced by families enrolled in FFHV may to some degree differ from the challenges experienced by families in the comparison group. The differences between groups has the potential to bias estimates of the association between FFHV enrollment and child maltreatment outcomes. We have attempted to mitigate this bias by calculating propensity scores using variables that might influence the study cohort's likelihood of enrolling in FFHV and their outcomes (Table 1). We then used the propensity scores to create inverse probability of treatment weights (IPTWs), which were applied to the study groups to balance potentially confounding characteristics between them.

Using logistic regression, we calculated three sets of propensity scores for each family to determine the likelihood of FFHV enrollment; propensity scores were based on family challenges such as substance use, mental illness, and relationship distress between parenting partners. The three sets of propensity scores were used to calculate the average treatment effect (ATE; the average program effect on outcomes across the entire eligible population), the average treatment effect on the treated (ATT; the average effect among all families whose characteristics are weighted to resemble those who actually received FFHV), and the average treatment effect on the untreated (ATU; the potential average program effect among all families whose characteristics are weighted to resemble those who were eligible for FFHV but did not receive it) (Rosenbaum, 2010). Each of these three measures (the ATE, the ATT and the ATU) addresses a different (but complementary) research question. The ATE tells us whether *families who* were enrolled in the program had better outcomes than *families who* were not enrolled in the program. The ATT tells us whether the program was associated with

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[5] Healthy Child Manitoba is the Government of Manitoba's long-term, cross-departmental strategy for putting children and families first.
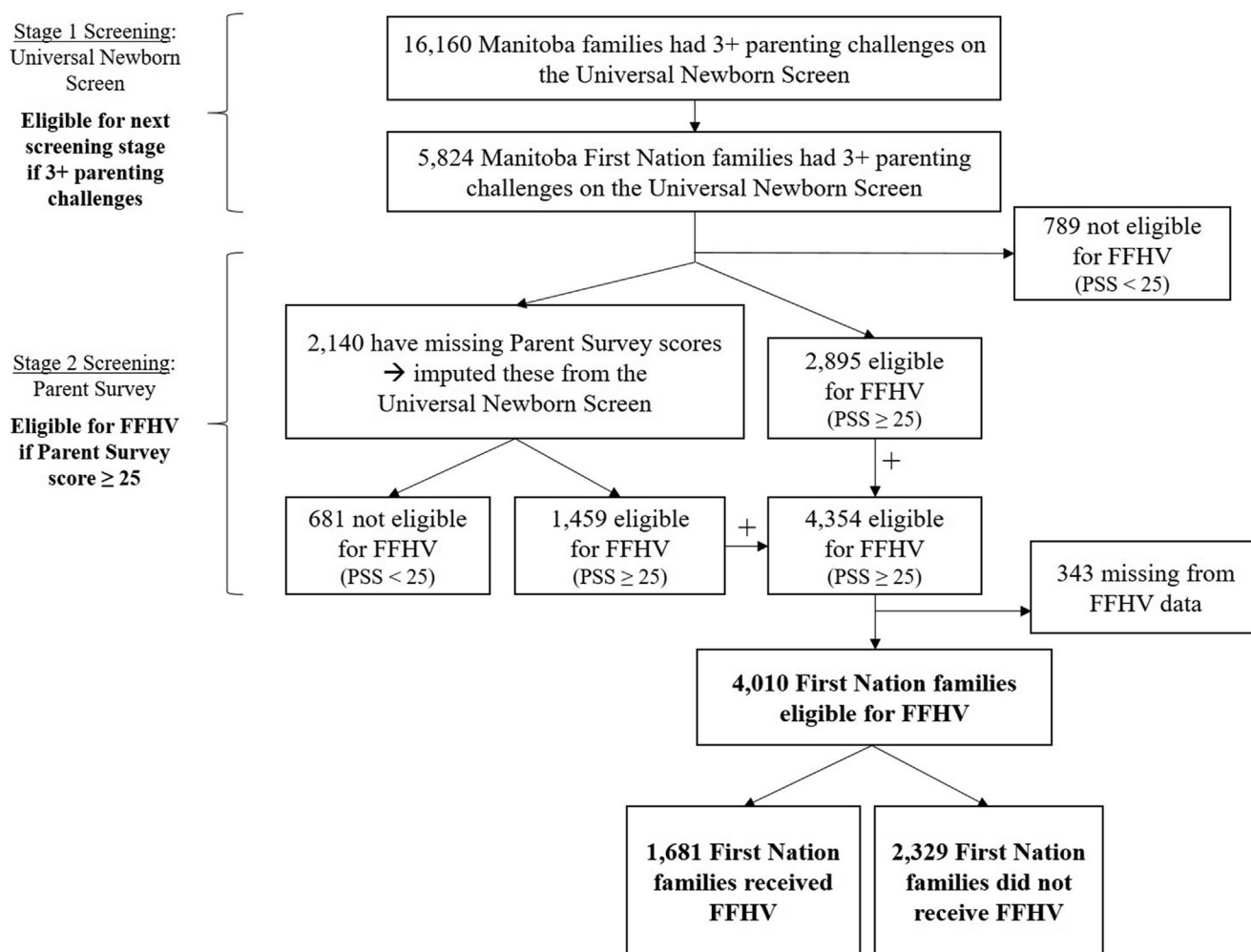
Fig. 1. The flowchart identifies Manitoba First Nation families with children born 2003–2009 who were eligible for the Families First Home Visiting program. PSS: Parent Survey Scores; FFHV: Families First Home Visiting.

better outcomes *among families who were enrolled*. And the ATU tells us whether the program would have improved outcomes *among families who were eligible but not enrolled*.

2.5.2. Statistical analyses

We ran separate statistical models to estimate adjusted risk differences and adjusted risk ratios for each outcome and obtain 95% confidence intervals (Wacholder, 1986) and applied generalized linear modelling using an *a priori* significance level of $p < 0.05$ to test for associations between FFHV program enrollment and the outcomes. Multiple regression and propensity score methods rest on the assumption that adjusting or weighting accounts for measured and unmeasured confounding. While we cannot directly test whether the IPTWs controlled for all unmeasured confounding, we calculated γ sensitivity values for each statistically significant result to assess how sensitive the results were to unmeasured confounders (Rosenbaum, 2010). This tells us how strong any unmeasured confounder would have to be to nullify our statistically significant results. All analyses were performed using SAS® version 9.4 (SAS Institute, 2011).

3. Results

Table 2 presents a list of challenges experienced by families who were eligible for FFHV, and shows how applying IPTWs resulted in these characteristics becoming more balanced between families who did and did not receive FFHV. Before weighting, the two groups were

notably different from each other in several of the challenges. For example, the percent of mothers who smoked during their pregnancies was higher among those who did not receive FFHV, while the percent of mothers who reported being socially isolated was higher than those who did receive the program. In an effort to make the study groups as comparable as possible, we applied IPTWs to more evenly balance these challenges. After applying the IPTWs, the standardized differences between study groups for the measured challenges were all less than 10%, indicating that the study groups were more balanced.

The association between FFHV enrollment and child maltreatment outcomes is shown in Table 3. Families enrolled in FFHV were significantly less likely to have a child taken into care in their first year of life (adjusted Risk Ratio [aRR] for the ATE estimate 0.687, 95% CI 0.576–0.819) and in their first two years of life (aRR for the ATE estimate 0.763, 95% CI 0.611–0.881) than non-FFHV families. We saw this significant association not only for the ATE estimate, but also when families' challenges were weighted so that they were similar to those enrolled in FFHV (Average Effect on the Treated, ATT) and when they were weighted so that they were similar to those not enrolled in FFHV (Average Effect on the Untreated, ATU). As well, children from families enrolled in FFHV were significantly less likely to be admitted to hospital for maltreatment-related injuries before the age of three than children from non-FFHV families (aRR for the ATE estimate 0.429, 95% CI 0.187–0.983). Families enrolled in FFHV were also significantly less likely to have a child who either witnessed a crime or was the victim of a crime than families who were not enrolled. Collectively, these

Table 1
Study variables.

Main outcome variables	Description
Taken into care of child protection services	Child was taken into care of child protection services for at least one day between birth and first birthday, or between birth and second birthday
Hospitalized for maltreatment-related injuries	Child was hospitalized for injury due to maltreatment in first three years of life, as recorded by ICD diagnosis and procedure codes
Witnessed a crime	Child was recorded in justice system data as a witness to a crime in their first three years of life
Victim of a crime	Child was recorded in justice system data as a victim of a crime in their first three years of life
Potential confounding variables accounted for in statistical models	
Variables from the Families First Universal Newborn Screen	
No prenatal care before 6 months	Mother did not attend prenatal care physician visits before 6 months gestation
Screened for FFHV eligibility during the prenatal period	Mother was screened prenatally for eligibility for FFHV
Smoking during pregnancy	Mother smoked during pregnancy
Substance use during pregnancy	Mother used alcohol and/or drugs during pregnancy
Maternal substance use	Mother currently using alcohol and/or drugs
Social isolation	Mother lacked social support and/or experienced social isolation related to culture, language or geography
Maternal low education	Mother's highest level of education completed was less than grade 12
Single parent family	Parent or guardian not currently in common-law relationship or married
Social assistance	Family on social assistance/income support or having significant financial difficulties
Relationship distress	Parent reports relationship distress
Maternal schizophrenia	Mother diagnosed with schizophrenia or bipolar affective disorder
Maternal depression and/or anxiety	Mother diagnosed with depression (including postpartum) and/or anxiety disorder
Antisocial father	Father exhibits antisocial behaviour
Antisocial mother	Mother exhibits antisocial behaviour
Mentally disabled	Mother has a mental disability
Family history of disability	Family history of a disability not detectable at birth that could affect development (e.g., deafness, mentally disabled/challenged)
Child abuse	Mother has a history of child abuse or neglect
Variables from the Families First Home Visiting data	
Parent Survey scores	Cumulative score of items on parent survey; a score of 25 or higher indicates that the family may be living in conditions of risk
Other variables	
Mother's age at first birth	Calculated from the population registry database using mother's date of birth and date of first birth
Socioeconomic Factor Index 2 (SEFI-2)	An index based on Canadian census data that reflects non-medical social determinants of health

findings suggest that FFHV enrollment was associated with lower child maltreatment and with lower criminal activity in First Nation families. In particular, the finding that the ATU estimate was significant for children being taken into care indicates that FFHV could potentially have had benefits for difficult-to-reach families had they been enrolled in the home visiting program.

The γ sensitivity values provide a measure of the robustness of the association, or a measure of how strong an unmeasured confounder would have to be to nullify the statistically significant results (Table 3). A γ sensitivity value of 0.15 indicates that a result is moderately robust to unmeasured confounders, with larger γ values indicating greater robustness. In other words, after adjusting for confounding variables in the propensity score, there would need to be unmeasured confounding that would both perfectly predict enrollment in the FFHV and account

Table 2
Challenges experienced by families eligible for FFHV, before and after weighting.

	Before weighting		After weighting		Difference between groups	
	Received FFHV	No FFHV	Received FFHV	No FFHV	Before weighting	After weighting
No prenatal care before 6 months (%)	9.62	14.54	12.87	12.45	4.92	0.42
Screened for FFHV eligibility during the prenatal period (%)	16.11	7.48	11.22	11.20	8.63	0.02
Substance use during pregnancy (%)	44.79	45.76	44.63	45.05	0.97	0.42
Maternal substance use (%)	5.30	3.73	4.44	4.17	1.57	0.27
Smoking during pregnancy (%)	58.85	63.36	61.76	61.22	4.51	0.54
Social isolation (%)	13.95	7.45	10.29	10.31	6.50	0.02
Maternal low education (%)	67.62	65.58	67.17	66.69	2.04	0.48
Single parent family (%)	50.60	56.81	55.00	54.23	6.21	0.77
Social assistance (%)	82.55	85.77	84.52	84.43	3.22	0.09
Relationship distress (%)	25.39	17.88	21.51	21.52	7.51	0.01
Family violence (%)	12.09	10.28	11.16	10.96	1.81	0.20
Maternal schizophrenia (%)	1.13	0.92	0.97	0.99	0.21	0.02
Maternal depression/anxiety (%)	31.22	26.48	28.92	28.36	4.74	0.56
Antisocial (father) (%)	6.45	5.25	6.17	5.93	1.20	0.24
Antisocial (mother) (%)	2.68	2.63	2.59	2.67	0.05	0.08
Mentally disabled (%)	2.08	0.86	1.32	1.25	1.22	0.07
Family history of disability (%)	4.39	3.71	3.97	3.89	0.68	0.08
Maternal history of child abuse (%)	31.11	21.36	25.30	25.22	9.75	0.08
Parent survey score (mean)	39.25	37.76	38.26	38.29	1.49	0.03
Mother's age at first birth (mean)	19.35	19.07	19.25	19.22	0.28	0.03
Socioeconomic Factor Index 2 (mean)	0.87	1.12	1.02	1.02	0.25	0.00

FFHV: Families First Home Visiting.

Table 3

Association between First Nation families' enrollment in home visiting and child maltreatment-related outcomes.

	Predicted probability		Adjusted risk difference	95% CI	Adjusted risk ratio	95% CI	γ Sensitivity value
	FFHV	No FFHV					
Child taken into care of Child Protection Services[†] in first year of life							
Unweighted	0.094	0.148	−0.054*	−0.075, −0.033	0.634*	0.527, 0.762	0.27
Average Treatment Effect	0.098	0.142	−0.045*	−0.065, −0.024	0.687*	0.576, 0.819	0.20
Average Effect on the Treated	0.094	0.134	−0.040*	−0.060, −0.020	0.701*	0.583, 0.843	0.17
Average Effect on the Untreated	0.100	0.148	−0.048*	−0.069, −0.026	0.678*	0.566, 0.811	0.21
Child taken into care of Child Protection Services[†] in first two years of life							
Unweighted	0.145	0.200	−0.055*	−0.079, −0.030	0.725*	0.626, 0.840	0.17
Average Treatment Effect	0.147	0.192	−0.046*	−0.070, −0.021	0.763*	0.611, 0.881	0.13
Average Effect on the Treated	0.145	0.182	−0.037*	−0.061, −0.013	0.798*	0.687, 0.927	0.08
Average Effect on the Untreated	0.148	0.200	−0.052*	−0.077, −0.027	0.740*	0.638, 0.858	−0.15
Child hospitalized for maltreatment-related injuries in first three years of life							
Unweighted	0.005	0.010	−0.005	−0.010, 0.001	0.514	0.222, 1.185	–
Average Treatment Effect	0.004	0.010	−0.006*	−0.012, 0.000	0.429*	0.187, 0.983	0.02
Average Effect on the Treated	0.005	0.011	−0.006*	−0.012, 0.000	0.449	0.197, 1.023	–
Average Effect on the Untreated	0.004	0.010	−0.006*	−0.011, 0.000	0.412	0.167, 1.018	–
Child witnessed or was a victim of a crime							
Unweighted	0.019	0.030	−0.011*	−0.021, −0.001	0.639*	0.417, 0.981	0.02
Average Treatment Effect	0.017	0.030	−0.012*	−0.022, −0.002	0.591*	0.385, 0.907	0.10
Average Effect on the Treated	0.019	0.029	−0.010*	−0.020, 0.000	0.654	0.426, 1.006	–
Average Effect on the Untreated	0.016	0.030	−0.014*	−0.023, −0.004	0.546*	0.346, 0.863	−0.15

The risk difference is the predicted probability for FFHV families minus the predicted probability for non-FFHV families; the risk ratio is the predicted probability for FFHV families divided by the predicted probability for non-FFHV families. Adjusted for family challenges in Table 2. *Statistically significant at p < 0.05. [†]Child taken into care of child protection services for at least one day. FFHV: Families First Home Visiting; CI: confidence interval.

for 15% or more of the relationship between FFHV and the outcome. It is highly unlikely that such confounding exists, given that we have controlled for many of the factors that are criteria for admission into the program. Our findings suggest that the association between FFHV enrollment and a child being taken into care before the age of one is robust, while our other findings, while still significant, may be more sensitive to unmeasured confounders.

4. Discussion

This study demonstrates that the Families First Home Visiting (FFHV) program is associated with lower rates of children from Manitoba First Nation families being taken into care of child welfare and lower rates of hospitalizations for maltreatment-related injuries. Children from families enrolled in the home visiting program were also less likely to be involved in the justice system as witnesses to or victims of crimes. The significant differences we observed in these indicators of child maltreatment speak to the influence of the program in bolstering parenting skills, reducing parental stress, and/or otherwise supporting parents in creating a safe, nurturing home environment for their children.

This study is among the first to examine the effectiveness of home visiting on child maltreatment among First Nation families in Canada. Despite the high proportions of First Nation and other Indigenous children in care, there is very little Canadian research (indeed, very little research in any jurisdiction) describing interventions that promote and strengthen family relationships through the postpartum period, thereby reducing negative outcomes among Indigenous people. Although a few promising studies exist in the international literature, there is a distinct paucity of studies looking specifically at the association between home visiting programs and child maltreatment among Indigenous families. The international literature includes an American study that found that Family Spirit, a paraprofessional home visiting intervention, was associated with higher parenting knowledge, parental self-efficacy and home safety, and lower rates of child internalizing and externalizing behaviours (Barlow et al., 2013). Kemp et al. (2018), similarly recognizing the dearth of evidence in Australia and internationally, describe a protocol for a study of the effectiveness of

sustained nurse home visiting for improving outcomes among Australian Aboriginal infants (Kemp et al., 2018). As well, Novins, Meyer, and Beltangady (Novins et al., 2018) acknowledge the potential for improving child outcomes for American Indians and Alaska Native communities through home visiting and partnerships with Indigenous communities (Novins et al., 2018). These studies demonstrate promising results for Indigenous-focused home visiting programs, but the small number of published studies reminds us that much work remains to be done.

The Truth and Reconciliation Commission of Canada describes the child welfare system as a continuation of the residential school system, as Indigenous children continue to be removed from their families, resulting in further loss of their connections to their language and culture, and acknowledges the potential for Aboriginal communities and families to provide more appropriate solutions to family healing (Truth and Reconciliation Commission of Canada, 2015). This is evidenced by Call to Action #5, to develop culturally appropriate parenting programs for Indigenous families, so that they can promote the well-being of their children and prevent them from being taken into care (Truth and Reconciliation Commission of Canada, 2015).

While it is challenging to draw direct comparisons between our study and the limited literature, our findings are consistent with other studies that found the FFHV program to be associated with lower rates of child apprehensions and hospitalization for maltreatment-related injuries (Chartier et al., 2017). A Healthy Child Manitoba evaluation found that FFHV was associated with higher positive parenting and lower hostile parenting scores, as well as with higher social support and neighbourhood cohesion, factors that are in turn associated with reduced risks of child maltreatment (Healthy Child Manitoba, 2010). Similarly, home visiting was associated with improved parenting knowledge and skills among American Indigenous families, factors that can strengthen family functioning (Barlow et al., 2013). Home visiting was also found to be as effective in decreasing recidivism into the child welfare system among American Indian families as among Caucasian families (Chaffin et al., 2012).

We acknowledge that child maltreatment can be difficult to measure, since only the more extreme cases come to the attention of child protection agencies and appear in the official databases. Most cases of

Table A1
Administrative datasets used in this study.

Dataset name	Description
Manitoba Health Insurance Registry	Demographic information on Manitoba residents registered for universal healthcare
Canada Census	Small area-level data from the Canada Census, used to create the Socioeconomic Factor Index 2 (SEFI 2), an index of socio-economic disadvantage*
Families First Home Visiting Data	The dataset includes (i) information on biological, social and demographic factors of Manitoba families, including parents' ethnic identity, history of alcohol and drug use, mental health disorders, and education, which is used to asses families eligibility for the Families First Home Visiting program; and (ii) administrative data capturing enrollment of families in the program
Indigenous & Northern Affairs Canada Registry	An official record of persons registered as status Indians under the Indian Act
Healthy Baby Prenatal Benefit	The Healthy Baby Prenatal Benefit program provides monthly income supplements to low-income women in their 2nd and 3rd trimesters. The dataset includes information on income, education, marital status, ethnic identity, benefit eligibility, and benefits received
Employment Income Assistance/Social Allowances Management Information Network	Demographic information, including ethnicity, from Manitoba residents who receive financial assistance
Child and Family Services	Information concerning children in care of Child Protection Services and families receiving voluntary protection and support services from Child Protection Services
Medical Claims Data	Claims for physician services during visits
Hospital Discharge Abstracts	Demographic and clinical information (e.g., gender, postal code, diagnoses and ICD codes) from hospitalization
Prosecution Information and Scheduling Management (PRISM)	Data from the Manitoba justice system identifying individuals who are involved with the justice system (i.e., have been charged with a crime, have witnessed a crime, or were victims of a crime)

*Chateau D, Metge C, Prior H, Soodeen RA. 2012. Learning from the census: The Socio-economic Factor Index (SEFI) and health outcomes in Manitoba. Can J Public Health 103(8 Suppl 2): S23-7

child maltreatment therefore remain unreported (Sinha et al., 2011). Thus, the outcomes in this study really only measure the 'tip of the iceberg' in terms of the problems that may occur. Retrospective surveys suggest that up to 32% of children experience child maltreatment; however, child protection agency records show that only 5% of children are reported to have endured maltreatment (Afifi et al., 2014). Therefore, if FFHV has a significant influence on the more extreme outcomes that are captured in the administrative data, it could be presumed that the program could also be decreasing incidents of reported and unreported child maltreatment among families experiencing multiple parenting challenges.

We noted that a large proportion of First Nation families in Manitoba were eligible for but not enrolled in FFHV, and that this proportion was relatively larger than what was previously found in the general Manitoba population of families experiencing a multitude of challenges. Our findings suggest that difficult-to-reach First Nation families could have benefited from the intervention, and that greater efforts to increase enrollment among First Nation families are warranted. Using the adjusted risk difference for the ATU for 'child taken into care of child protection services in first year of life', we can estimate the impact of FFHV on child welfare outcomes for these families as follows: for every 20.83 families enrolled in FFHV, one child would be prevented from entering the care of child protection services (1/ 0.048 = 20.83). At the same time, others have written about the challenges in enrolling and retaining families in programs (Durlak & DuPre, 2008; Daro et al., 2003; O'Brien et al., 2012). Family factors (mistrust of service providers, addiction issues, no telephone) and public health system factors (limited home visiting spaces, high workloads, lack of experience with at-risk families) are some of the challenges of engaging families in FFHV identified by program staff (Ross, 2014). Program planners for Indigenous families should work in partnership with Indigenous leaders and communities, ensuring that home visiting programs are culturally safe and employ Indigenous service providers whenever possible.

4.1. Strengths and limitations

The data used in this study are administrative records from the population-based Manitoba Population Research Repository. These linked records from the FFHV program, Manitoba hospitals, the child protection system and justice system enabled us in examining child maltreatment-related indicators and permitted follow-up of normally difficult-to-reach families. Given the stigma and secrecy surrounding child maltreatment, these data provided an opportunity to examine a number of important outcomes. We were limited by the possibility of unmeasured confounding, which could bias the study findings. The use of IPTW and γ sensitivity values addresses this limitation to some extent; our testing indicated that the study groups were balanced and the γ sensitivity values strengthen our confidence in the comparisons that are drawn between them.

5. Conclusions

The study showed that First Nation families enrolled in FFHV had lower rates of maltreatment-related indicators compared to families eligible for but not enrolled in the program. Greater efforts to engage eligible First Nation families in FFHV are warranted, given that they would result in fewer children taken into care and fewer families being torn apart. In the era of Truth and Reconciliation, governments should pay close attention to Call to Action #1 and provide "adequate resources to enable Aboriginal communities and child-welfare organizations to keep Aboriginal families together where it is safe to do so, and to keep children in culturally appropriate environments, regardless of where they reside" (Truth and Reconciliation Commission of Canada, 2015). To this, we add a call to government and other relevant sectors to make available culturally appropriate services, which include FFHV and similar supports, to *all* First Nation families, whether or not they reside in First Nation communities.

CRediT authorship contribution statement

Mariette Chartier: Conceptualization, Methodology, Investigation, Writing - original draft, Funding acquisition. **Jennifer E Enns:** Conceptualization, Methodology, Investigation, Writing - original draft,

Table A2
Definitions of child maltreatment indicators.

Indicator	Definition	Data source
Child was taken into care of child protection services	Child was taken into care of child protection services for at least one day	Child and Family Services (Manitoba Families)
Child was hospitalized for a maltreatment-related injury	• *Maltreatment-syndrome*: ICD-9 codes 995.5, E967, E994.2 or E994.3; and ICD-10 codes T74, Y06, Y07, or T73 • *Assault*: ICD-9 codes E960 – E966, E968, E969; and ICD-10 codes X85 – Y09 • *Undetermined cause*: ICD-9 codes E980 – E989, V68.2, V70.4, V71.4, V71.5, V71.6, V71.81; and ICD-10 codes Y10 – Y34, Z04.0, Z04.5, Z04.8 • *Adverse social circumstances*: ICD-9 codes V15.4, V15.5, V61; and ICD-10 codes Z60 – Z63, Z72, Z74, Z76.1, Z76.2, Z81, Z86.5, Z91.6, Z91.8	Hospital Discharge Abstracts (Winnipeg Regional Health Authority)
Marker conditions in infants (< 1 y)	• *Fracture and head injuries*: ICD-9 codes 800 – 830, 848, 850 – 854, 870 – 874, 910, 918, 920, 921, 925, 950, 951 and 995.55; and ICD-10 codes S00 – S09, S12, S22, S32, S42, S52, S62, S72, S82, S92, T02, T10, T12 • *Long-bone fractures*: ICD-9 codes 812, 820, 821; and ICD-10 codes S42.2, S42.3, S42.4, S42.7, S42.8, S72 Hospitalizations were excluded if they occurred outside of Manitoba or were coded as an assault by spouse or partner (Y060, Y070), maltreatment by spouse or partner (E967.3), or visit to the Manitoba Adolescent Treatment Centre (0020). An admission to hospital within one day of the previous separation was counted as one hospitalization	
Child was a witness to a crime	Child was recorded as a witness to a crime	Prosecution Scheduling and Information Management (Manitoba Justice)
Child was a victim of a crime	Child was recorded as a victim of a crime	Prosecution Scheduling and Information Management (Manitoba Justice)

Declaration of Competing Interest

The authors declare that they have no conflicts of interest relevant to this study.

Appendix A

See Tables A1 and A2.

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