

## ORIGINAL ARTICLE

# Inequitable health service use in a Canadian paediatric population: A cross-sectional study of individual- and contextual-level factors

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## Abstract

**Background:** Health service use may be influenced by multilevel predisposing, enabling, and need factors but is equitable when driven by need. The study's objectives were as follows: (a) to investigate residential context's effect on child health service use and (b) to examine inequity of child health service use by testing for effect measure modification of need factors.

**Methods:** The sample of 1,451 children was from a prenatal cohort recruited from London, Ontario, between 2002 and 2004, with follow-up until children were toddler/preschooler-aged. Individual-level data were linked by residential address to neighbourhood contextual-level data sourced from Statistics Canada. Multilevel logistic regression modelled factors associated with child health service use. Interaction terms were included in the model to test for effect measure modification of need factors by predisposing and enabling factors.

**Results:** Contextual-level factors were not associated with child health service use. Maternal parity and nativity to Canada modified the effect of the need factor, paediatric health condition, on health service use. Health condition's effect was lowest in children of Canadian-born mothers with one child only ( $OR = 1.58, p = .04$ ) and highest in children of Canadian-born mothers with three or more children ( $OR = 3.52, p < .01$ ). Further, its effect was higher in children of Canadian-born mothers compared to children of mothers who migrated to Canada; however, odds ratios were not statistically significant for the latter.

**Conclusions:** Results may inform future investigation of the potential inequity of health service use for subgroups of children whose mothers are of lower parity and not Canadian-born. An understanding of these inequities may inform future healthcare policy and care for paediatric populations.

## KEYWORDS

Canada, equity, health service use, maternal, neighbourhood, paediatric

## 1 | INTRODUCTION

Early childhood is an important period for children to utilize health services, which may foster optimal health and development (Starfield & Simpson, 1993). Understanding the factors that drive children's use of health services may inform healthcare planning to ensure that children receive appropriate medical care. Further, understanding why

certain subgroups of children have inequitable health service use is helpful to reduce disparities and ultimately improve paediatric health and development. Health service use in populations with universal health care systems may be speculated as equitable; however, this is not always reported (Health Council of Canada, 2014; Sin, Svenson, Cowie, & Man, 2003). For example, economic barriers were stated by 2% to 7% of Canadians who reported not seeing a doctor for known medical problems (Health Council of Canada, 2014). The investigation of health service use and equity may benefit from a multilevel approach, because healthcare planning that considers contextual

*Dr. Holtz conducted the research and wrote the manuscript while completing her doctoral degree at Western University.*

characteristics at the neighbourhood level may result in place-based action (Denny & Davidson, 2012). However, the consideration of contextual characteristics is sparse in health services research (Sibley & Weiner, 2011), notably in paediatric populations.

Andersen's behavioural model conceptualizes factors of health service use into three components: (a) predisposing factors, including socio-demographic characteristics; (b) enabling factors, which facilitate the use of health services; and (c) need factors, often represented by measures of health status (Andersen, 1995). Further, these factors may be measured at individual and contextual levels resulting in a multilevel conceptual framework of health service use (Andersen, 2008). Andersen's behavioural model may be applied to assess equity of health service use, with the notion that equity exists when use is driven predominantly by need (Andersen, 2008). A novel method to analytically assess inequity may be to test for effect measure modification of factors reflective of need (Holtz, Gilliland, Thind, Wilk, & Campbell, 2014). This approach proposes that unequal effects of the same need factor on health service use across subgroups of predisposing or enabling factors (i.e., significant effect measure modification) are indicative of inequity.

The aim of this study was to investigate health service use and inequity in a population of children residing in London-Middlesex, Ontario, Canada. Analyses were exploratory but based on the multilevel framework of Andersen's behavioural model and tested three hypotheses: (a) Child health service use varies across the neighbourhoods in which children reside; (b) contextual characteristics conceptualized within the framework of Andersen's behavioural model are associated with child health service use; and (c) the effects of need factors on child health service use vary depending on subgroups of predisposing and enabling factors. Figure 1 illustrates the conceptual framework that guided the exploratory analyses and depicts how multilevel factors may affect health service use.

## 2 | METHODS

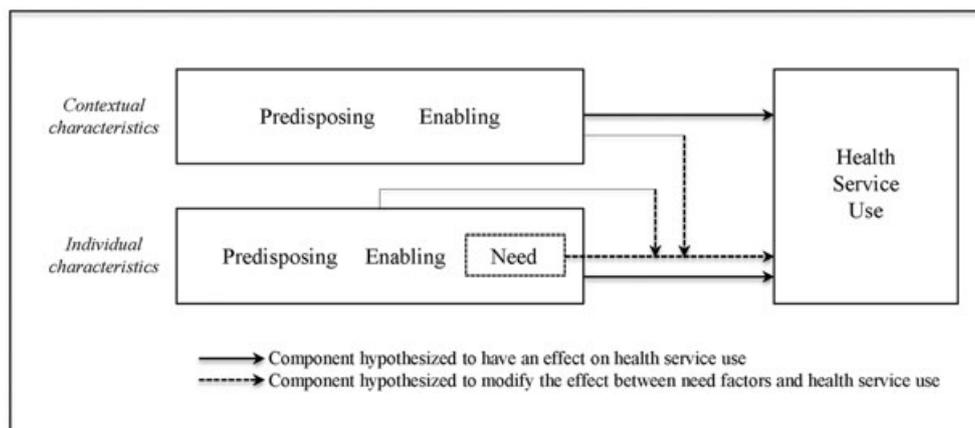
This cross-sectional study used a sample of children of mothers who participated in a larger cohort study, approved by the research ethics board at the University of Western Ontario, London, Canada. The cohort study recruited pregnant women from seven of 10 ultrasound

### Key Messages

- A novel method to analytically assess inequity in health service use was explored.
- The effect of children's health condition on health service use depended on maternal parity and nativity to Canada.
- Child health service use did not vary by the neighbourhood in which children resided.
- Healthcare policy could benefit from further investigation of the observed inequities.

clinics in the city of London, Ontario, Canada, from 2002 to 2004. The inclusion criteria at recruitment were as follows: residence in the London-Middlesex region of Ontario, singleton pregnancy, maternal age of at least 16 years, gestational age 11.5–20.5 weeks, no known foetal abnormalities, and adequate knowledge of English. Mothers were interviewed at prenatal ( $N = 2,357$ ), perinatal ( $N = 2,357$ ), and toddler/preschooler stages ( $N = 1,607$ ). Individual-level data (i.e., child and maternal characteristics) from the cohort completing the toddler/preschooler stage were linked by residential address to a second dataset sourced from Statistics Canada (2006) that included contextual characteristics of the neighbourhoods in which children resided. After dataset linkage and removal of participants no longer living in the London-Middlesex region, the final study sample included 1,451 children, residing in 471 neighbourhoods.

Individual-level maternal and child characteristics were collected during the toddler/preschooler stage survey, with the exception of maternal health condition, nativity, and education, which were captured prenatally, and child birth data at the perinatal stage. The contextual characteristics of the neighbourhoods in which children resided were measured at the dissemination area level, the smallest geographical unit provided by Statistics Canada. These individual- and contextual-level characteristics, grouped by predisposing, enabling and need factors, are presented in Table 1.



**FIGURE 1** Conceptual framework of contextual- and individual-level predisposing, enabling, and need factors and their effects on health service use

**TABLE 1** Descriptive statistics of individual and contextual characteristics of children living in London-Middlesex, Ontario, organized by predisposing, enabling, and need factors

		Categorical characteristic: Frequency (%)	Continuous characteristic: M (SD)
<b>Individual characteristics</b>			
Predisposing	Maternal age in years	33.8 (4.8)	
	Child age in months	34.1 (5.6)	
	Child sex		
	Female	725/1,448 (50.1%)	
	Male	723/1,448 (49.9%)	
	Maternal nativity		
	Born in Canada	1,265/1,449 (87.3%)	
	Not born in Canada	184/1,449 (12.7%)	
	Maternal education		
	High school or less	331/1,448 (22.9%)	
	College or trade	489/1,448 (33.8%)	
	University or more	628/1,448 (43.4%)	
	Survey season		
	Winter	549/1,451 (37.8%)	
Spring	404/1,451 (27.8%)		
Summer	193/1,451 (13.3%)		
Fall	305/1,451 (21.0%)		
Enabling	Household income		
	Low (<\$40,000)	168/1,335 (12.6%)	
	Middle (\$40,000–79,999)	468/1,335 (35.1%)	
	High (\$80,000+)	699/1,335 (52.4%)	
	Maternal employment status		
	Full time	647/1,446 (44.7%)	
	Part time	279/1,446 (19.3%)	
	Not working	520/1,446 (36.0%)	
	Maternal marital status		
	Married or common-law	1,317/1,449 (90.9%)	
	Single or equivalent	132/1,449 (9.1%)	
	Maternal parity		
	1 child	406/1,449 (28.0%)	
	2 children	763/1,449 (52.7%)	
3 or more children	280/1,449 (19.3%)		
Maternal access to a vehicle			
Yes	1,335/1,451 (92.0%)		
No	116/1,451 (8.0%)		
Mother has a regular care provider			
Yes	1,384/1,451 (95.4%)		
No	67/1,451 (4.6%)		
Child has a regular care provider			
Yes	1,432/1,451 (98.7%)		
No	19/1,451 (1.3%)		

(Continues)

**TABLE 1** (Continued)

		Categorical characteristic: Frequency (%)	Continuous characteristic: M (SD)
Need	Maternal depression score (CES-D)	8.8 (8.0)	
	Maternal anxiety score (STAI)	19.2 (5.3)	
	Child gestational age in weeks	39.0 (1.7)	
	Child size for gestational age		
	Small	91/1,444 (6.3%)	
	Appropriate	1172/1,444 (81.2%)	
	Large	181/1,444 (12.5%)	
	Child born with anomaly		
	Yes	67/1,451 (4.6%)	
	No	1,384/1,451 (95.4%)	
	Child has development/behaviour concern		
	Yes	203/1,451 (14.0%)	
	No	1,248/1,451 (86.0%)	
	Child has physical health condition		
Yes	906/1,451 (62.4%)		
No	545/1,451 (37.6%)		
Mother has health condition			
Yes	662/1,451 (45.6%)		
No	789/1,451 (54.4%)		
<b>Neighbourhood contextual characteristics</b>			
Predisposing	% immigrants	19.8 (8.2)	
	% visible minority	11.6 (9.9)	
	% without high school education	16.6 (7.5)	
Enabling	% unemployed	5.7 (3.9)	
	% single parenthood	14.7 (10.4)	
	Mean # children per household	1.2 (0.25)	
Mean income			
<20th percentile	285/1,444 (19.7%)		
20–80th percentile	869/1,444 (60.2%)		
>80th percentile	290/1,444 (20.1%)		
Residence			
Urban	1,306/1,452 (89.9%)		
Rural	146/1,452 (10.1%)		

Note. CES-D = Center for Epidemiologic Studies Depression Scale; SD = standard deviation; STAI = State-Trait Anxiety Inventory.

Factors reflective of need at the individual level included broad measures of health, such as the presence of a health condition, and more specific measures such as size for gestational age. Maternal health condition was a composite variable of health conditions, reported by mothers prenatally or recorded on perinatal medical records that could be reflective of underlying chronic conditions requiring ongoing health service use. Maternal depression and anxiety

were measured with the Centre for Epidemiological Studies Depression Scale and State-Trait Anxiety Inventory, respectively. Data from children's perinatal medical records were abstracted to measure the presence of a birth anomaly, gestational age in weeks, and size for gestational age using standardized percentiles (Kramer et al., 2001). Child developmental/behavioural concern was derived from maternal responses to the Ages and Stages Questionnaire and Functional Status II-(R) and included concerns of speech development, eating and sleeping behaviour. Finally, a dichotomous measure of child's physical health condition was derived from maternal responses to the Ages and Stages Questionnaire, Functional Status II-(R), including issues such as infections, allergies, asthma, and from maternal responses to Liberatos measure of unmet need that includes a series of symptoms possibly requiring medical attention.

For the present study, health services were defined as first-contact services that respond to community needs (Canadian Health Services Research Foundation, 2003; Health Canada, 2012). These services may include prevention and treatment of common diseases and injuries, healthy child development, and basic emergency services (Health Canada, 2012), and may be provided in Canada by regular care providers (e.g., family physicians and some paediatricians), walk-in clinics, and emergency departments. During the toddler/preschooler stage interview, children's health service use over the past 2 months was captured by maternal recall and dichotomized as use versus no use.

Analyses were performed using the statistical software package SAS®9.2 (SAS, Windows build 9.2, SAS Institute Inc., Cary, NC, USA). Descriptive analyses were performed on individual and contextual characteristics. Univariable associations of health service use with independent variables were performed using logistic regression, where associations with  $p < .20$  were considered in multivariable analyses. The multivariable logistic model was estimated using the GLIMMIX procedure, allowing for estimation of a random intercept to test the variance in health service use across neighbourhoods. Further, a conservative level of significance ( $p < .20$ ) was applied during model building. Individual characteristics were added as fixed effects to the random intercept model. Contextual characteristics were added to the model if significant variance in health service use existed across neighbourhoods after accounting for individual characteristics. The final stage of model building tested for effect measure modification by including interactions of need factors with predisposing and enabling factors. To achieve a final parsimonious model, variables whose odds ratios were not significant ( $p \geq .05$ ) were removed from the model one at a time.

### 3 | RESULTS

In the 2 months prior to survey administration, 48.9% of children had used a health service. Although more than half of these children used a health service only once (median number of health service visits = 1.0), 28.5% used a combination of regular care provider, walk-in clinic, and/or emergency department services. The most frequent type of health service used was children's regular care provider (77.3%). Descriptive statistics of the factors conceptualized to influence health service use are presented in Table 1. Factors that were significant in univariable analyses with health service use ( $p < .20$ ), and considered in the multivariable model, are presented in Table 2. These included four

**TABLE 2** Univariable associations of predisposing, enabling, and need factors with child health service use

Variable	OR [95% CI]
Individual characteristics	
Predisposing	
Maternal age	0.98 [0.96, 1.00] <sup>a</sup>
Child age	0.97 [0.95, 0.99] <sup>a</sup>
Child sex (ref = female)	1.16 [0.95, 1.43] <sup>b</sup>
Survey season (ref = winter)	
Spring	0.83 [0.64, 1.07] <sup>b</sup>
Summer	0.73 [0.53, 1.02] <sup>b</sup>
Fall	0.82 [0.62, 1.08] <sup>b</sup>
Enabling	
Household income (ref = high)	
Low	1.50 [1.07, 2.09] <sup>a</sup>
Middle	1.16 [0.92, 1.46]
Maternal employment (ref = full time)	
Part time	0.73 [0.55, 0.97] <sup>a</sup>
Not working	0.81 [0.64, 1.02] <sup>b</sup>
Maternal parity (ref = 1 child)	
2 children	0.75 [0.59, 0.95] <sup>a</sup>
3 or more children	0.57 [0.42, 0.78] <sup>a</sup>
Need	
Maternal anxiety (STAI)	1.02 [1.00, 1.04] <sup>a</sup>
Child has physical condition	2.38 [1.91, 2.97] <sup>a</sup>
Contextual characteristics	
Enabling	
Neighbourhood mean income (ref = >80th percentile)	
<20th percentile	1.38 [0.99, 1.91] <sup>b</sup>
20th–80th percentile	1.28 [0.98, 1.67] <sup>b</sup>
Neighbourhood % lone parenthood	1.01 [1.00, 1.02] <sup>b</sup>

<sup>a</sup> $p < .05$ .

<sup>b</sup> $p < .20$ .

individual-level predisposing factors, three individual-level enabling factors, two contextual-level enabling factors, maternal anxiety, and child physical health condition.

Results from the multivariable model building process are shown in Table 3. After controlling for individual characteristics, there was no significant variance of health service use across neighbourhoods ( $p = .29$ ). Hence, contextual characteristics were not included in the multivariable model and the model was re-estimated with a fixed intercept using the logistic procedure. The final model revealed that the odds of children's health service use increased with younger child age, low household income, and maternal full-time employment. Further, the effect of child health condition was dependent on both maternal parity and nativity to Canada.

The main effects of child health condition, maternal parity, and maternal nativity to Canada in subgroups of their effect measure modifiers are shown in Table 4. A dose-response relationship existed for the effect of child health condition in subgroups of maternal parity but only reached statistical significance for children whose mothers were Canadian-born. That is, the odds of health service use increased as maternal parity increased. In these children, the effect of child

**TABLE 3** Variables associated with child health service use through multivariable logistic modelling stages

Variable	OR [95% CI] <sup>c</sup>	OR [95% CI] <sup>c</sup>	OR [95% CI] <sup>d</sup>
Individual characteristics			
Predisposing			
Child age	0.97 [0.95, 0.99] <sup>a</sup>	0.97 [0.95, 0.989] <sup>a</sup>	0.97 [0.95, 0.99] <sup>a</sup>
Child sex ( <i>ref = female</i> )			
Male	1.16 [0.93, 1.44] <sup>b</sup>	—	—
Season ( <i>ref = winter</i> )			
Spring	0.87 [0.67, 1.14]	—	—
Summer	0.82 [0.58, 1.16]	—	—
Fall	0.76 [0.57, 1.03] <sup>b</sup>	—	—
Maternal nativity ( <i>ref = not born in Canada</i> )			
Born in Canada	—	0.62 [0.39, 1.00] <sup>a,e</sup>	0.63 [0.39, 1.00] <sup>b,e</sup>
Enabling			
Household income ( <i>ref = high</i> )			
Low	1.61 [1.13, 2.31] <sup>a</sup>	1.61 [1.13, 2.31] <sup>a</sup>	1.60 [1.12, 2.29] <sup>a</sup>
Middle	1.23 [0.97, 1.56] <sup>b</sup>	1.21 [0.95, 1.54] <sup>b</sup>	1.20 [0.95, 1.53] <sup>b</sup>
Maternal employment ( <i>ref = full time</i> )			
Part time	0.71 [0.52, 0.96] <sup>a</sup>	0.69 [0.51, 0.93] <sup>a</sup>	0.69 [0.51, 0.94] <sup>a</sup>
Not working	0.83 [0.65, 1.07] <sup>b</sup>	0.83 [0.65, 1.07] <sup>b</sup>	0.84 [0.65, 1.07] <sup>b</sup>
Maternal parity ( <i>ref = 1 child</i> )			
2 children	0.89 [0.69, 1.16]	0.58 [0.38, 0.90] <sup>a,e</sup>	0.58 [0.38, 0.90] <sup>a,e</sup>
3 or more children	0.67 [0.48, 0.92] <sup>a</sup>	0.37 [0.21, 0.65] <sup>a,e</sup>	0.38 [0.22, 0.66] <sup>a,e</sup>
Need			
Child has physical health condition	2.27 [1.81, 2.85] <sup>a</sup>	0.73 [0.36, 1.48] <sup>e</sup>	0.74 [0.37, 1.48] <sup>e</sup>
Interactions			
Child health condition and maternal parity			
Condition*2 children	—	1.87 [1.10, 3.17] <sup>a</sup>	1.86 [1.10, 3.13] <sup>a</sup>
Condition*3 or more children	—	2.36 [1.19, 4.67] <sup>a</sup>	2.32 [1.18, 4.56] <sup>a</sup>
Child health condition and maternal nativity			
Condition*born in Canada	—	2.15 [1.13, 4.09] <sup>a</sup>	2.14 [1.13, 4.04] <sup>a</sup>

<sup>a</sup>*p* < .05.<sup>b</sup>*p* < .20.<sup>c</sup>Model estimated with a random intercept using the GLIMMIX procedure.<sup>d</sup>Model estimated with a fixed intercept using the logistic procedure.<sup>e</sup>Variable included in interaction term. Main effect odds ratios do not maintain their usual interpretation, as they are dependent on their effect measure modifier.

health condition increased the odds of health service use by 1.58 95% CI [1.02, 2.44] for the subgroup of children whose mothers had one child only, further increased the odds by 2.86 95% CI [2.08, 3.95] for the subgroup of children whose mothers had two children, and increased the odds by 3.53 95% CI [2.08, 5.99] for the subgroup of children whose mothers had three or more children. The main effect of maternal parity on child health service use revealed reduced odds as parity increased but only for children without a health condition.

## 4 | DISCUSSION

There was no evidence to support neighbourhood variation of health service use in this paediatric population, suggesting that contextual characteristics of the neighbourhoods in which children reside are not influential in their health care utilization. Although similar null

findings have been reported (Ryan, Stewart, Campbell, Koval, & Thind, 2011), several studies have found certain contextual characteristics to be associated with child health service use (Gresenz, Rogowski, & Escarce, 2006; Guttman, Shipman, Lam, Goodman, & Stukel, 2010; Roos & Walld, 2007; Shipman, Lan, Chang, & Goodman, 2011; Sin et al., 2003; Woodward et al., 1988). For example, children residing in urban contexts (Woodward et al., 1988), and areas with higher physician supply (Gresenz et al., 2006; Guttman et al., 2010), have experienced increased service use. As well, inequity in primary care geographic access has been observed (Shipman et al., 2011). Neighbourhood mean income has also been associated with child health service use, but variations in its effect have been observed (Guttman et al., 2010; Roos & Walld, 2007; Sin et al., 2003). Children residing in neighbourhoods with lower mean income have experienced reduced regular care provider use (Guttman et al., 2010), but increased general practitioner use (Roos & Walld, 2007), and emergency

**TABLE 4** Variables' main effects on child health service use in subgroups of effect measure modifiers.

Main effect	Effect measure modifier subgroup	OR [95% CI]
Child health condition	Mother born in Canada and parity 1 child	1.58 [1.02, 2.44]*
Child health condition	Mother born in Canada and parity 2 children	2.86 [2.08, 3.95]*
Child health condition	Mother born in Canada and parity 3 or more children	3.53 [2.08, 5.99]*
Child health condition	Mother not born in Canada and parity 1 child	0.74 [0.37, 1.48]
Child health condition	Mother not born in Canada and parity 2 children	1.34 [0.72, 2.48]
Child health condition	Mother not born in Canada and parity 3 or more children	1.65 [0.77, 3.51]
Maternal parity ( <i>ref</i> = 1 child)		
2 children	No health condition	0.58 [0.38, 0.90]*
3 or more children	No health condition	0.38 [0.22, 0.66]*
Maternal parity ( <i>ref</i> = 1 child)		
2 children	Has health condition	1.08 [0.79, 1.48]
3 or more children	Has health condition	0.88 [0.59, 1.31]
Mother born in Canada	No health condition	0.63 [0.31, 1.00]
Mother born in Canada	Has health condition	1.34 [0.87, 2.07]

\* $p < .05$ .

department use (Sin et al., 2003). In the present study, children residing in lower mean income neighbourhoods had a tendency to experience increased health service use on the basis of univariable analyses, but this variable was not included in multivariable analyses because of the lack of variation in health service use across neighbourhoods.

There may be several reasons why no variation in health service use was found across neighbourhoods. First, the study population was limited to one region of Ontario, and perhaps neighbourhoods were homogenous in this area. Neighbourhoods were defined by dissemination area resulting in small geographic areas, which have been shown to lead to stronger contextual effect estimates (Boyle & Willms, 1999; Roos & Walld, 2007; Sampson, Morenoff, & Gannon-Rowley, 2002). However, doing so resulted in several hundred artificial neighbourhoods with few children residing in each, which may inflate standard errors perhaps masking significant findings (Theall et al., 2011). Further, previous literature has found contextual characteristics to be associated with specific types of health services (e.g., regular care provider and emergency department) as opposed to health services as a composite measure.

Inequitable health service use was evident from significant interaction terms of child health condition with both maternal nativity to Canada and parity. In subgroups of maternal parity, the magnitude of health condition's effect increased as maternal parity increased. Further, the effect of health condition was greater in magnitude in children of Canadian-born mothers compared to children of mothers who had migrated to Canada, although the latter effect did not reach statistical significance. These results suggest that children with a health condition whose mothers were of lower parity and not Canadian-born had experienced inequitable health service use, because their odds of service use were lower in magnitude compared to children with a health condition whose mothers were of higher parity and Canadian-born. Although it is possible that some children with a health condition used a health service outside of, and not within, the 2-month recall period, there is no reason to believe that these children are more likely to belong to the subgroups of maternal parity and nativity with reduced the odds of health service use. Hence, there is minimal

concern that the interpretation of inequity is biased by the 2-month recall period.

Maternal parity was conceptualized as an enabling factor in that mothers of lower parity would have fewer barriers in using health services for their child. Speculatively, they may not have to secure childcare for other children and have more time to focus on their child's health. Hence, it was surprising that lower parity reduced the effect of health condition, resulting in potential inequity. Perhaps the finding is a consequence of health condition severity and/or acuity in children of mothers with higher parity, because poorer health has been observed in larger sized families (Weitzman, Gortmaker, & Sobol, 1990). The finding that inequity for children of mothers not born in Canada was consistent with reports of increased difficulties accessing first-contact health services for immigrants compared to Canadian-born (Sanmartin & Ross, 2006).

The consideration of effect measure modification in health services research may prove beneficial in enhancing the understanding of factors that drive health service use. The presence of significant interaction terms affects the way in which its covariates are interpreted and how they may be investigated in future studies. Factors may not be associated with the outcome but may act as effect measure modifiers, altering study findings in important ways. For example, the main effect of maternal nativity was not significant; however, it was found to significantly modify the association between child health condition and health service use. Likewise, prior to testing for effect measure modification, the effect of three children or more reduced the odds of health service use. However, after testing for effect measure modification, the effect of two children or more reduced the odds of health service use but only in children without a health condition. In testing the study's second objective, effect measure modification showed potential as an analytic method to assess inequity of health service use, because the effect of children's need for health care varied depending on maternal characteristics.

A potential limitation of this study is the inclusion of regular care providers, walk-in clinics, and emergency departments into one definition of health service use. Different service types exist to provide

different types of care. For instance, regular care providers such as family physicians ought to provide preventative care (Health Canada, 2012), and urgent sick/injury care should be provided at emergency departments but this is not always the case. For example, 62% of Canadians have reported difficulties accessing regular care providers outside of traditional business hours, resulting in the use of emergency departments for non-urgent reasons (Health Council of Canada, 2014). Other examples include receiving preventative care such as vaccinations at both regular care provider offices and walk-in clinics and receiving sick care for an ear infection from any health service. These examples illustrate the complexities involved in health services research. Given this challenge, three types of services were amalgamated into one measure of health services that provide patients with a first-contact with the healthcare system. This method recognizes that one type of care is not restricted to one type of service and focuses on children's abilities to utilize any type of health service for any type of care.

## 5 | CONCLUSION

This study improves the understanding of child health service use, in particular, how maternal characteristics may influence the effect of children's need for health services. Subgroups of children who were potentially disadvantaged in their use of health services were identified, warranting further investigation. Analytic methods of this study may be adopted in future health services research to identify important nuances that may arise in subpopulations of the population of interest. Replication of the methods used in this study is warranted to gather concrete evidence that may inform Canadian healthcare policy with regards to the multilevel factors affecting child health service use and inequity.

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