Breastfeeding practices of immigrant mothers in Canada: The role of immigration status, length of residence, and ethnic minority

(*Work in Progress*)

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Abstract: Previous studies have demonstrated a strong relationship between breastfeeding practices and immigration status and length of residence. However, it remains unclear to what extent immigration status and length of residence differences can be explained by socio-economic and other factors influences. Using data from the 2005 Canadian Community Health Survey (CCHS), this study investigates whether immigration status, years of residence and visible minority status are associated with the decision to initiate and exclusive breastfeeding for the recommended duration in the context of socio-economic factors. The findings show that while the relationship between the outcome variables and immigration process is complex, some clear, broad patterns exist that may have important theoretical and policy implications. First, a longer duration of exclusive breastfeeding is significantly associated with immigrant women; having median duration of 4.6 months, compared to 3.9 months for non-immigrant women. The association persists after controlling for maternal education, household income, marital status, and risky pregnancy behaviors. Second, increased years of residence in Canada is associated with decreased likelihood of breastfeeding, with long-time residents having rates of exclusive breastfeeding as low as their Canadian-born counterparts after adjusting for the socio-economic factors. This is likely due in part to cultural and socio-economic assimilation of immigrants to the Canadian society, and suggests that the socio-economic factors partially mediate the relationship between length of residence and breastfeeding. Efforts are needed to encourage and support immigrant women to maintain their cultural tradition of breastfeeding as they become more acculturated in Canada.

Keywords: Breastfeeding, breastfeeding duration, immigration, visible minority, acculturation

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Introduction

In recent years, considerable concern and interest have been given to research on breastfeeding because of its benefits for the infant and the mother (American Academy of Pediatrics 2005; Marriott et al. 2003). Because of its numerous advantages, breastfeeding, particularly exclusive breastfeeding during the first six months of the infants life is widely recognized as the optimal feeding strategy in the public health literature (Chen and Rogan 2004; Grummer-Strawn and Mei 2004; American Academy of Pediatrics 2005). It is suggested that the health benefits of breastfeeding increase with its duration and with the exclusion of other feeding methods (Vestergaard et al. 1999). Because of such health advantages, particularly for infants, WHO (2001) recommends all infants should be exclusively breastfed from birth to 6 months of age followed by continued breastfeeding and gradual introduction of other solid or liquid foods. In Canada, the Canadian Pediatric Society supports these recommendations (Andre nd). The American Academy of Pediatricians (American Academy of Pediatrics 2005) also recommends exclusive breastfeeding during the infant's first six months of life and continued breastfeeding as other foods are introduced for at least the first 12 months of life to provide protection against illness. Beyond 12 months, breastfeeding is recommended for as long as mutually desired by the mother and child (American Academy of Pediatrics 2005).

Despite these recommendations, prevalence of exclusive breastfeeding remains low in Canada and in the United States. For instance, in Canada, 85% of mothers initiated breastfeeding their newborn babies, but only one in six mothers breastfed exclusively for the first six months of the infants' life (Andre nd.). Similarly, only 13% of infants in the U.S. are exclusively breastfed at 6 months of age and only 16% received any breastfeeding at 12 months (Li et al. 2005).

Breastfeeding rates differ markedly by immigration status (Gibson-Davis and Brooks-Gunn 2006; Kocturk and Zetterstrom 1986; Hopkinson and Gallagher 2009; Groleau et al 2006). For instance, Gibson-Davis and Brooks-Gunn (2006) found that foreign-born mothers in the United States had 85% higher in the odds of breastfeeding initiation and 66% higher in the odds of breastfeeding at 6 months than mothers born in the United States. This pattern appears to reflect the immigrants' experience in Canada as well, where immigrant mothers are more likely than their Canadian-born counterparts to breastfeed their infants (92% versus 83%) (Andre nd). Although most studies have found that immigrants are more likely than their non-immigrant counterparts to breastfeed their babies, some studies based on specific countries or immigrant groups indicate low rates of breastfeeding. For instance, a review of literature on immigrants' breastfeeding behavior by Manderson and Mathews (1981) reveals that Vietnamese mothers tend to abandon breastfeeding completely, once they settle in a western country. A study by Tuttle and Dewey (1994) also shows that only 12-15% of Vietnamese immigrant mothers in the US continue breastfeeding with their babies born in the US, despite the fact that 73-85% had breastfed their previous babies in Vietnam. A number of these studies had small sample sizes and most of them did not compare breastfeeding rates with other groups (Henderson and Brown 1987; Mathews and Manderson 1980; Rossiter et al. 1993). Other studies of Vietnamese mothers who had migrated to Australia found higher breastfeeding rates than the above studies (i.e., Reynolds et al. 1988; Nguyen et al. 2004).

Several explanations have been proposed for the variation in immigrants' breastfeeding behaviors and practices, among which acculturation is the most key factor (Gibson-Davis and Brooks-Gunn 2006; Hopkinson and Gallagher 2009: Harley et al. 2007). The argument is that breastfeeding is dominant in the country of origin, but upon immigration to the western countries, where breastfeeding rate is relatively low a change from breastfeeding to bottle-feeding occurs as a result of acculturation (Henderson and Brown 1987). That is, in order to conform to the new local norms regarding child rearing and feeding, immigrant mothers may abandon or reduce breastfeeding practices (Sharma et al. 1994; Rossiter 1992). A comparative study on breastfeeding among Turkish mothers living in Istanbul and Stockholm demonstrates that the duration of breastfeeding of Turkish immigrants living in Stockholm was significantly lower compared with a similar social and cultural background but living in Istanbul (Kocturk and Zetterstrom 1986), but quite similar to those of Swedish mothers. This change most probably is influenced by the cultural practices and the general infant feeding patterns in the new country (Kocturk and Zetterstrom 1986) supporting acculturation process. However, the study by Groleau et al (2006) based on Vietnamese immigrants in Canada argues that the decision to abandon or to bottle-feed a baby is not related to acculturation to local practices of the host country, but to conflicts between Vietnamese cultural practices and the configuration of the new social space in Canada.

Total number of years the mother has lived in the host country is another important factor that influences breastfeeding behaviors of immigrants and it can be used as a proxy measure of acculturation (Arcia et al. 2001; Harley et al. 2007). It appears that as the number of years of residence increases, the likelihood to breastfeed a child decreases (Yong and Kaufman 1988). A study on the effect of time on the duration of breastfeeding among women of Mexican descent in the US showed that the median duration of exclusive breastfeeding was 2 months for women lived in the US for 5 years or less, 1 month for women lived for 6 to 10 years, and less than one week for women lived for 11 years (Harley et al. 2007). Another study on Mexican and Hispanic immigrants' breastfeeding showed that each additional year of residence in the US decreased the odds of breastfeeding by 4% at 6 months (Gibson-Davis and Brooks-Gunn 2006). Previous studies also suggest that ethnic disparities exist in breastfeeding practices (Newton 2004). A study by Celi et al. (2005) showed that immigrants of all ethnic groups are more likely to initiate breastfeeding than their US-born counterparts. These authors also demonstrated that US-born minority groups initiated breastfeeding at similar rates as their white counterparts, and this relationship was attributed, in part, to high levels of education, income and access to health services.

The association of immigration status and duration of residence with breastfeeding practices can be mediated by the socio-economic factors, such as mother's age, marital status, education level, income, and risky pregnancy behaviors(e.g., smoking during pregnancy or breastfeeding). Mothers who are younger, particularly teen mothers are less likely than older mothers to breastfeed (Ryan et al. 2002; Mckechnie et al. 2009). Marital status was found to be associated significantly with breastfeeding initiation, with married mothers having higher breastfeeding rates (Rassin et al. 1993).A study by Williams and Pan (1994) show that Spanish-speaking women in the US who discussed breastfeeding with a physician are more likely to initiate breastfeeding during post-immigration. Immigrants from Hong Kong living in Canada who had formal education were more likely than other women to initiate and continue

breastfeeding (Agnew and Gilmore 1997). Research has shown that low-income mothers are less likely to opt for exclusive breastfeeding and more likely to introduce formula in the first month than other mothers (Jacknowitz et al. 2007; Smith et al. 2003). It is well recognized that mothers who smoke cigarettes are less likely to breastfeed their infants than mothers who do not smoke (Donath et al. 2004; Scott and Binns 1998; Horta et al. 2001). Breastfeeding could be increased if women reduce or quit smoking cigarettes (Horta et al. 2001).

Although previous researches have shown a strong association between breastfeeding and immigration status, little attention has been paid to the importance of length of residence and visible minority in evaluating breastfeeding practices and to what extent differences in these factors can be explained by other socio-economic factors. Very little is therefore known whether short-term immigrants and visible minority groups have comparable breastfeeding rates with long-term immigrants and non-visible minority groups, respectively when other socio-economic factors are taken into account. Evidence on the posited relationships is particularly important in Canada, given that children of immigrant households make up an increasing proportion of all Canadian children (Human Resources and Skills Development Canada 1998). In addition, while most studies evaluate the total duration of breastfeeding (i.e., they allow for the addition of other foods), there is little evidence on the duration of exclusive breastfeeding. It is likely that exclusive breastfeeding provides lasting benefits that increase with a longer duration of breastfeeding (Losch et al. 1995). In this study, we analyze how breastfeeding initiation and exclusive breastfeeding for at least 4 months differ by immigration status, years of residence in Canada, and visible minority status, in the context of the socio-economic and demographic factors.

Data and Method

Data for this study come from the 2005 CCHS. This survey consisted of more than 130,000 respondents of both sexes aged 12 to 80 or above, of which about 35,000 were females in the reproductive age (15-49 years). The analysis of the present study centers on about 7,240 mothers who had given their last birth in the five years prior to the survey. The primary reason for limiting our attention to these mothers is that information on breastfeeding was collected only from mothers who had given their last birth in the five years before the survey date. This study uses both bivariate and multivariate regression models to estimate the effects of the acculturation-related factors (immigration status, years of residence, and visible minority) and selected socio-economic variables on breastfeeding of women in Canada.

The two outcome variables of interest are: initiation of breastfeeding and exclusive breastfeeding for at least four months. Specifically, women were asked whether they have ever breastfed or tried to breastfeed their last birth and if they ever breastfed, they were asked whether they exclusively breastfed for at least 4 months. These responses are coded as ‘1’ for those who answered ‘yes’ and ‘2’ for those who answered ‘no’. Exclusive breastfeeding for this study is defined as the infant’s receiving breast milk only with no other liquids or solids given and is consistent with the recommendations of Labbok and Krasovec (1990). Initiation of breastfeeding is defined as the infant is ever breastfed.

The primary independent variables of interest in this study are mothers' immigration status, total number of years the mother had livid in Canada, and visible minority status. Immigration status is classified into two: immigrant mothers who were born outside Canada and non-immigrant mothers those who were born in Canada. Number of years residing in Canada is categorized as 'less than ten years' and 'ten years or more.' Mothers are also divided into visible and non-visible minority groups. Other variables of interest in this study are risky pregnancy behaviors, such as mothers' self perceived health and smoking during last pregnancy. Self perceived health is classified as excellent, very good, good, and unfair or poor. The variable type of smoker refers to mothers who smoked during last pregnancy and is categorized into three: daily/occasionally, not at all, and not applicable.

Since our primary independent variables are often correlated with a number of socio-economic factors, the later factors are included in our analysis. This makes our analysis of breastfeeding practices more complete. The socio-economic factors include mother's age at interview, marital status, education, and household income. Age is categorized into four groups: 15-24, 25-29, 30-34, and 35 or older. In order to gain larger sample, the age group 15-19 is merged with 20-24. Marital status is categorized as married/common-law, widowed/divorced/separated, and never-married. Mothers are classified into three categories according to their education level: less than secondary education, secondary and other post-secondary, and post-secondary degree. Household income is measured by four categories: less than $30,000, $30,000-49,999, $50,000-79,000, and $80,000 or more.

Results

Background Characteristics of mothers and breastfeeding

Table 1 presents the distribution of mothers, according to explanatory variables. About 14% of all mothers included in our analysis are immigrants (of whom 6% are short-term residents and 8% long-term residents) and 18% are visible minority. The median age of mothers in this study is 33 years (34 years for immigrants and 32 for non-immigrants), suggesting that immigrants are older compared with their non-immigrant counterparts. The majority of mothers (80%) are married. Close to two-thirds had post-secondary education and more than one-forth of all mothers have annual household income of $80,000 or more. The majority of mothers (70%) reported having excellent or good self perceived health and about 19% are daily/occasionally smokers. In general, a preliminary analysis (not shown here) shows that, in comparison to the Canadian-born mothers, immigrant mothers are older, are more likely to be married, have higher education level, lower household income, are less likely to engage in risky pregnancy behaviors (daily/occasionally smoking during last pregnancy and to have poor/fair health).

Figures 1 and 2 present the rates of breastfeeding initiation and exclusive breastfeeding for at least 4 months of the infant's age by some selected explanatory variables. Overall, about 85% of all mothers initiated breastfeeding, with 45% of these mothers exclusively breastfed for at least 4 months, and only 27% of mothers continued to breastfeed for 12 months of the infant's age (not shown here). A variety of reasons has been given for the low rates of exclusive breastfeeding. Insufficient breast milk (20%) was given as a primary reason for discontinuing breastfeeding early. Difficult with breastfeeding (16%), baby was ready for solid food (15%), child weaned him/her self (11%), and returning to work (10%) were also cited as reasons for

switching to foods other than breast milk. Some mothers also reported medical condition, planned to stop at this time, and other.

As can be seen from Figure 1, the proportion of initiating breastfeeding is higher among immigrants than among non-immigrants (93% vs 83%). Similarly, exclusive breastfeeding rate for at least 4 months is higher among immigrants than among non-immigrants (57% vs 43%). Visible minority and short-term immigrants are more likely to initiate and exclusively breastfeeding than non-visible minority and long-term immigrants, respectively. Older, more educated, higher household income, and married mothers are more likely to initiate and exclusively breastfeed their infant than other mothers (Figure 2).

Figures 1 & 2 about here

Pattern of duration of exclusive breastfeeding

To better understand the pattern of exclusive breastfeeding, we compare duration of exclusive breastfeeding across age groups, between immigrant and non-immigrant, and visible and non-visible minority mothers. Figures 3, 4 and 5 present the results stratified by duration of exclusive breastfeeding and these factors. Higher proportion of mothers reported longer duration of exclusive breastfeeding (Figure 3). It is evident from Figure 4 that immigrant mothers have significantly longer median duration of exclusive breastfeeding than non-immigrant mothers (4.6 vs 3.9 months) and higher exclusive breastfeeding rate at later ages of the infant, that is, 5 months or older (34% vs 25%). Mothers from visible minority groups are more likely to exclusively breastfeed at 5 months or longer durations than those mothers from the non-visible minority groups (42% vs 38%). Furthermore, the median duration of exclusive breastfeeding is 4.4 and 4.0 months for the visible and non-visible minority groups, respectively (Figure 5).

Figures 3, 4, & 5 about here

Factors associated with breastfeeding initiation and exclusive breastfeeding

Bivariate results

Initiation and exclusive breastfeeding rates according to the different explanatory variables are shown in Table 2. The first column presents results for breastfeeding initiation and the second presents results on exclusive breastfeeding for at least 4 months. The results reveal significant disparities among certain groups.

Large disparities are evident across sub-groups of mothers, although the patterns of breastfeeding are similar for the two types of breastfeeding. Immigration status is a strong predictor of both breastfeeding initiation and exclusive breastfeeding. Foreign-born mothers are about 3 times (OR=2.8, 95%CI: 2.2, 3.6) and about twice (OR=1.7, 95%CI: 1.5, 2.0) more likely to initiate breastfeeding and exclusively breastfeed, respectively than Canadian-born mothers. The findings also demonstrate that rates of breastfeeding initiation and exclusive breastfeeding significantly decrease as the number of years of residence in Canada increases. Immigrant mothers who lived in Canada for longer time (10 years or more) are 44% and 7% less likely to initiate breastfeeding and exclusively breastfeed, respectively than their

immigrant counterparts who lived in Canada for shorter time. For both breastfeeding outcomes, lifetime residents of Canada have the lowest odds ratios. There is a statistically significant association between visible minority and breastfeeding practices. Mothers from the visible minority group are more likely to initiate breastfeeding (OR=1.4, 95%CI: 1.2, 1.7) and to exclusively breastfeed (OR=1.3, 95%CI: 1.2, 1.5) their last birth than their non-visible minority counterparts.

The data also show that both initiation and exclusive breastfeeding rates vary according to the socio-economic variables. The odds of initiating breastfeeding and exclusively breastfeeding increases by 43% and 57%, respectively among women aged 15-24 years to women aged 35 or older. Considerable differences in breastfeeding are observed according to marital status, where never-married mothers have significantly lower breastfeeding odds ratios (OR=0.50, 95%CI: 0.4, 0.6) than married mothers. Obviously, level of education is found to be a strong predictor of breastfeeding. Women with higher level of education (post-secondary) are 68% and 54% more likely to initiate and exclusively breastfeed, respectively, than those with lower education levels (less than secondary or no education). Women with lower incomes (less than $30,000 or no income) are less likely to initiate breastfeeding (OR=0.38, 95%CI: 0.3, 0.5) and exclusively breastfeed (OR=0.50, 95%CI: 0.4, 0.6) than women having higher incomes ($80,000 or more). Women who perceived their health is excellent are more likely to initiate and exclusively breastfeed their last child, compared with those who perceived their health is fair or poor. Women who smoke cigarettes during last pregnancy have a lower unadjusted odds ratios (OR=0.39, 95%CI: 0.3, 0.5) of initiating breastfeeding compared to non-smokers (OR=0.93, 95%CI; 8, 1.1).

Table 2 about here

In sum, the above unadjusted relationships indicate that women's breastfeeding practices are not independent of their immigration status, length of residence, and other socio-economic characteristics. Women are more likely to initiate breastfeeding and to breastfeed exclusively if they are immigrants, short-term residents, visible minority, older, married, more educated, on a higher household income, have excellent or very good health, and non-smokers. However, since many of these variables may be correlated with one another, conclusions about independent associations cannot be drawn in the absence of multivariate analysis. In order to try to disentangle the net effect of each variable, we proceed with the estimation of multivariate models in the next section.

Multivariate results

Breastfeeding initiation and exclusive breastfeeding for at least 4 months among mothers are examined by immigration status, time of residence in Canada, and visible minority status in the context of socio-economic factors. The results are presented in Table 3. Adjusting only for visible minority (Model 1), we found significant differences in breastfeeding rates between immigrant and non-immigrant mothers with immigrant mothers are about three times as likely to initiate breastfeeding and 68% more likely to exclusively breastfeed than their non-immigrant counterparts. Consistent with the bivariate results, breastfeeding practices varied by the number of years lived in Canada, a finding confirming other previous studies (e.g., Harley et al. 2007; Kocturk and Zetterstrom (1986). Mothers who had lived their entire lives in

Canada have the lowest odds of breastfeeding initiation and exclusive breastfeeding while mothers who had lived in Canada for less than ten years have the highest odds. The trend of decreasing initiation odds ratios with increasing category of time in Canada is statistically significant, although in magnitude the odds ratios decreases after controlling for the socio-economic factors. After controlling for the socio-economic factors, the odds of exclusive breastfeeding for women who had lived in Canada for ten years or more is no more significantly different from those who had lived their entire lives. This may suggest that with longer stay in Canada, immigrant mothers seem to adopt the infant feeding practices of Canadian-born mothers, which confirms other studies (see for e.g., Goel et al. 1978). One observation is that adjustment for the socio-economic factors (Models 3 and 4) decreased the odds ratios of breastfeeding initiation and exclusive breastfeeding for immigrants, but increased the odds ratios for visible minority groups. This may suggest that the effects of immigration status, length of residence, and visible minority on breastfeeding are partly explained or mediated by the socio-economic factors.

In terms of the demographic and socio-economic factors, with the exception of age of mother for breastfeeding initiation, the multivariate results in Table 4 are consistent with our bivariate results. The pattern of relationship between breastfeeding initiation and age of mother is reversed after adjusting for the socio-economic factors, with breastfeeding initiation being significantly higher (35%) among younger (24 years or younger) than among older mothers (35 years or older). However, consistent with our bivariate results and previous studies (e.g., Harley et al. 2007) the odds of exclusive breastfeeding are significantly higher (30%) among older mothers (35 years or older) than among younger ones. This may suggest that younger mothers are more likely to initiate breastfeeding and, if they do, they are more likely to discontinue within the first three months of the infant's age. Married mothers seem to breastfeed their babies more than their never-married counterparts, although the effect on breastfeeding initiation is not statistically significant. As expected, there is strong evidence that education and household income make difference in breastfeeding. The odds of breastfeeding initiation and exclusive breastfeeding increase monotonically as the education level and household income increases.

Important variations in rates of breastfeeding initiation and exclusive breastfeeding are also found between mothers who perceived their health is excellent and those who perceived their health as fair or poor. Mothers who reported their health is excellent are 45% more likely to initiate breastfeeding and 36% to exclusively breastfeed than those who reported fair or poor health. We found that smoking cigarettes during last pregnancy is a strong predictor of both initiation and exclusive breastfeeding after controlling for other factors. Mothers who smoke cigarettes daily or occasionally during pregnancy have significantly lower adjusted odds ratios of breastfeeding initiation (0.67, p=0.000) and exclusive breastfeeding for at least 4 months (0.49, p=0.000) compared to non-smokers.

Table 3 about here

Discussion and conclusion

The findings of this study add to previous literature that immigrant women are more likely to initiate and breastfeed exclusively following migration to a new country, but after they live longer in the host country, rates of breastfeeding decline significantly.

Our results from both the bivariate and multivariate analyses show that the likelihood of the decision to initiate and exclusive breastfeeding is significantly higher among foreign-born mothers than among Canadian-born mothers. Breastfeeding is initiated by more than 90% of immigrant mothers with 57% exclusive breastfeeding at least for 4 months, compared to about 80% of Canadian-born mothers with 43% exclusive breastfeeding. Respectively, median duration of exclusive and any breastfeeding in immigrant mothers is 4.6 and 6.7 months, compared with 3.9 and 4.7 months in non-immigrant mothers. It is possible that these differences are influenced by how breastfeeding is perceived in Canada as opposed to the immigrants' country of origin. For immigrant women, breastfeeding may be the common and expected method of feeding. In contrast, women born in Canada may view breastfeeding as just one of the multiple feeding options. This is consistent with other previous studies who reported increased rates of breastfeeding among Mexican immigrants compared with US-born mothers (Romero-Gwynn and Carias 1989; Rassin et al. 1993), where increasing acculturation was said to be associated with decreasing breastfeeding rates (Celi et al 2005).

Another most important finding of this study is the relationship between length of residence in Canada and breastfeeding. The results indicate that mothers who lived in Canada for longer time (10 years or more) have significantly lower breastfeeding rates than those who lived for shorter time. The negative association between length of residence in Canada and breastfeeding practices may be due to cultural assimilation or acculturation process. The longer period immigrants lived in the host country, the more they are likely to adopt the new culture and practices. Relatively shorter time of residence in the host country can serve as a constraint to assimilation into the Canadian society. This explanation is consistent with other studies who found a negative association between residence and breastfeeding among Mexican descents in the US (Harley et al. 2007; Gibson-Davis and Brooks-Gunn 2006; Rassin et al. 1993). The fact that the odds of exclusive breastfeeding further decreases by length of residence in Canada after the socio-economic factors are controlled for supports our argument that the decline in breastfeeding is also due in part to socio-economic assimilation of immigrants into the local society. The negative relationship between length of residence and breastfeeding practices may also be viewed as a carryover of breastfeeding norms in the migrants' place of birth. Short-time arrivals are more likely to maintain the culture, reproductive norms, and other practices of their place of birth (Kahn 1994).

In addition to observing higher breastfeeding rates in immigrants and short-time residents, we found that visible minority women have higher breastfeeding initiation and exclusive breastfeeding rates than non-minority women. Visible minority mothers are significantly more likely than non-visible minority mothers to initiate and exclusively breastfeed their last child. Unfortunately, the CCHS data do not allow us to analyze mothers' breastfeeding practices by specific ethnic group or place of birth, but findings suggest that this is an important area of further research.

In this study, higher initiation and exclusive breastfeeding rates are associated with married mothers, higher maternal education, household income, excellent/very good perceived health, and non-smokers. The result of age of mother is very interesting. After adjustment for other factors, younger mothers are more likely to initiate breastfeeding than are older mothers, but less likely to exclusively breastfeed for at least 4 months of the infant's age. It may be that older mothers have accrued experience in breastfeeding previous children, achieved a higher level of practices and may be part of a supportive network in child feeding programs. While younger mothers seem to be at a disadvantage to exclusively breastfeed for longer time due to numerous influences such as partners, family, peers, culture, lack of child rearing practice and resources (Ekstrom et al. 2003; Clemmens 2003). Another interesting observation in this study is that smoking cigarettes is a strong predictor of both breastfeeding initiation and exclusive breastfeeding. This is similar to previous studies who found significantly lower rates of breastfeeding among women who smoked during pregnancy than among non-smokers (Scott and Binns 1998; Horta et al. 2001). Some studies have suggested that this is due to lower intention or motivation to breastfeed rather than a physiological effect of smoking on women's milk supply (Donath et al. 2004; Amir and Donath 2002; Haslam et al 2003). In this study, we could not investigate whether the negative relationship between smoking and breastfeeding is due to lower breastfeeding intention of smokers or not. Further research is suggested in this area.

In conclusion, the present study provides supporting evidence for the acculturation process/hypothesis which suggests that during the period immediately following immigration, breastfeeding rates are higher among immigrant mothers, but subsequently decreases as duration of stay increases. More recent immigrants may sustain their traditional practices and have higher breastfeeding prevalence than those native-born or long –term immigrants. Another possible explanation for higher rate of breastfeeding among immigrants and minority groups is the support available in communities where immigrants live. In most host countries, immigrants or minority groups tend to live in neighborhoods and have communities where they share their experiences of their country of origin and of the country of destination. Such communities may have closer ties to their homelands, where breastfeeding is the norm and may thus have strong community supports for breastfeeding. Over time, however, immigrants' breastfeeding behavior changes from the level of place of birth to the level of the native-born at the destination place because of the influence by local normative practices and the convergence of the socio-economic characteristics of immigrants with those of the hosting place (Henderson and Brown 1987).

Although our study has tried to address several important aspects of the variations of breastfeeding between immigrants and non-immigrants, short-and long-term immigrants, and visible and non-visible minority groups and the sources of those variations, there are still questions which we could not address. The effects of some important factors, including ethnicity, religion, place of birth, and availability of healthcare and family supports could not be explored due to lack of or incomplete information. In addition, the CCHS was not designed to specifically examine breastfeeding among immigrants. The survey contains a relatively small number of immigrant mothers (14%) of the total sample used which makes separate analysis for immigrants difficult and some important variables such as child's age or birth date

and mothers' age at childbirth are not available in the data set. Thus, given the importance of the above variables, further work is needed in this area. This study also suggests interventions that support immigrant mothers to maintain their cultural tradition of breastfeeding. Breastfeeding counseling with skilled professionals and reinforcement in the community where immigrants live may contribute to higher rates of breastfeeding (Hopkinson and Gallagher 2009). There is a need for programs which support and encourage breastfeeding, focusing particularly on younger, less educated, never-married, lower family income, and smoking mothers who breastfed for less than the recommended 4-6 months.

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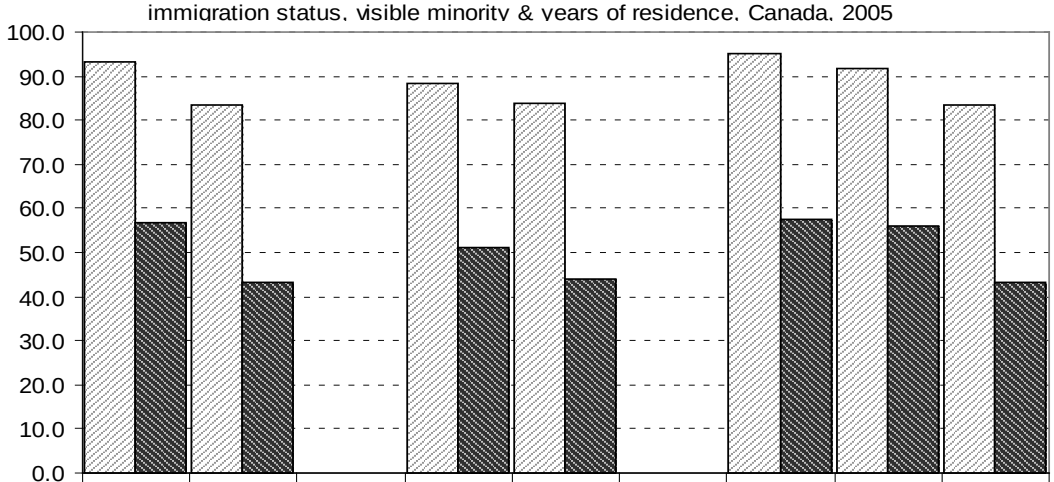
Table 1: Distribution of mothers by explanatory variables, Canada, 2005

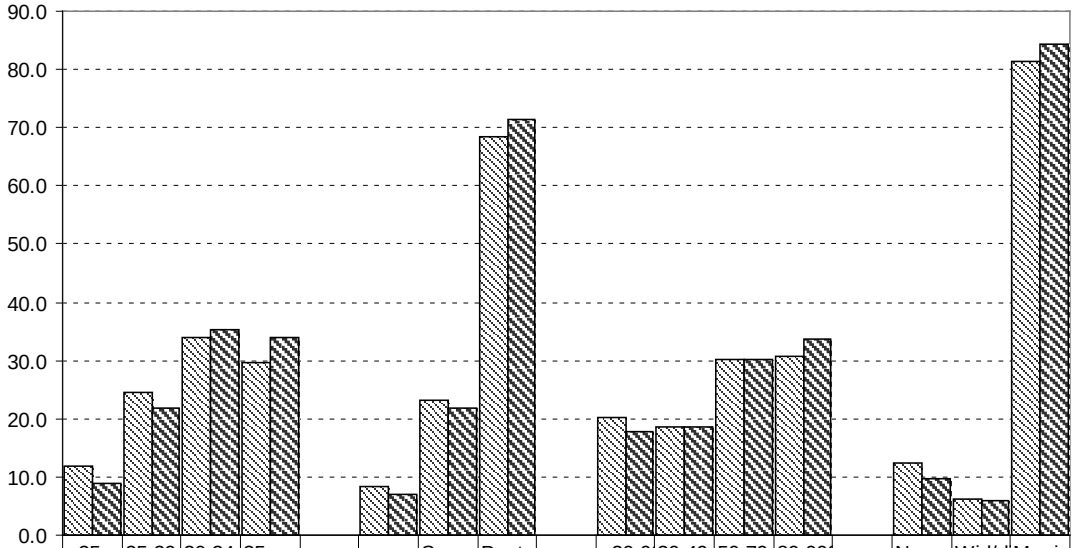
Explanatory variables	Percent in category (N=7,240)
Immigration status	
Immigrants	14.1
Non-immigrants	85.9
Years of residence in Canada	
<10	6.5
10 or more	7.6
Born in Canada	85.9
Visible minority status	
Visible	17.9
Not-visible	82.1
Age of women	
15-24	12.7
25-29	24.8
30-34	33.4
35+	29.1
Median age (years)	33
Marital status	
Married/common-law	79.5
Wid/div/separ	6.4
Never married	14.1
Maternal education	
Less than secondary	10.2
Secondary	24.7
Post secondary degree	65.2
Household income ($)	
<30,000	22.5
30-49,000	19.6
50-79,000	29.1
80,000 or higher	28.8
Self perceived health	
Excellent	27.0
Very good	42.6
Good	25.0
Fair/poor	5.4
Type of smoker during last pregnancy	
Daily/occasionally	18.6
Not at all	43.4
Not applicable	38.0
Total	100.0

Figure 1: Breastfeeding initiation & exclusive breastfeeding for at least 4 months, according to immigration status, visible minority & years of residence, Canada, 2005



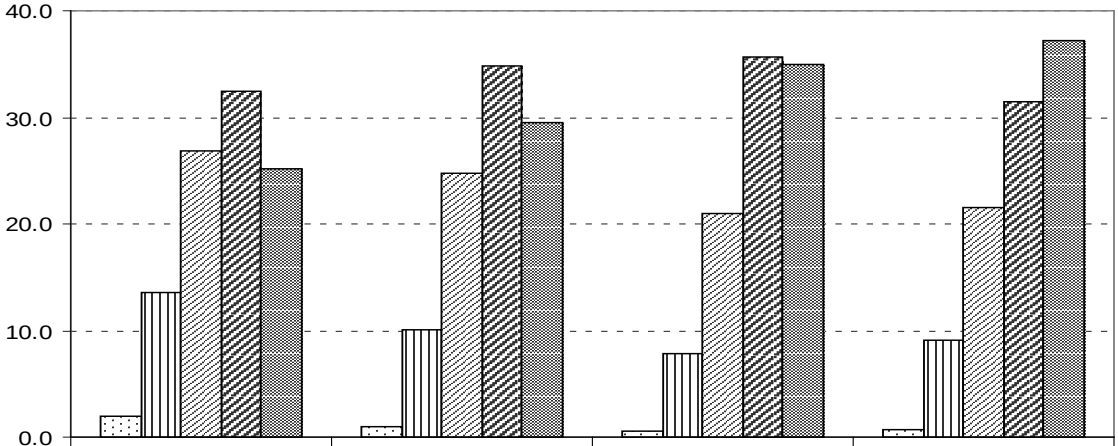
	Immigrant	Not-immig	Visible	Not visible	<10 yrs	10+ yrs	Canadian-
	Immigration status		Visible minority		Years of residence		
Bf initiation	93.2	83.3	88.3	84.0	95.1	91.6	83.3
Exclusive bf	56.7	43.1	51.1	43.8	57.6	55.9	43.1

Figure 2: Breastfeeding initiation & exclusive breastfeeding for at least 4 months, according to mothers' age, education, household income & marital status, Canada, 2005



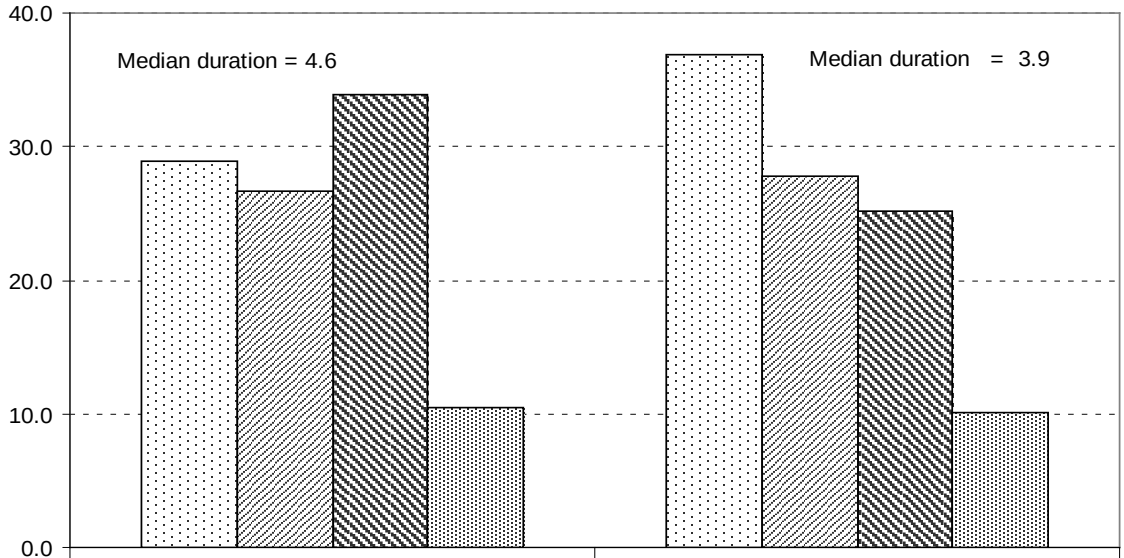
	<25	25-29	30-34	35+	<seco	Secon	Post-s	<30,0	30-49,	50-79,	80,00	Never-	Wid/d	Marrie
	Age				Eduaction			household income				Marital status		
Bf initiation	11.9	24.5	33.9	29.6	8.4	23.2	68.4	20.3	18.7	30.2	30.8	12.4	6.1	81.4
Exclusive bf	8.9	21.9	35.2	34.0	7	21.7	71.4	17.8	18.6	30.1	33.6	9.8	5.8	84.4

Figure 3: Duration of exclusive breastfeeding, according to women's age, Canada, 2005



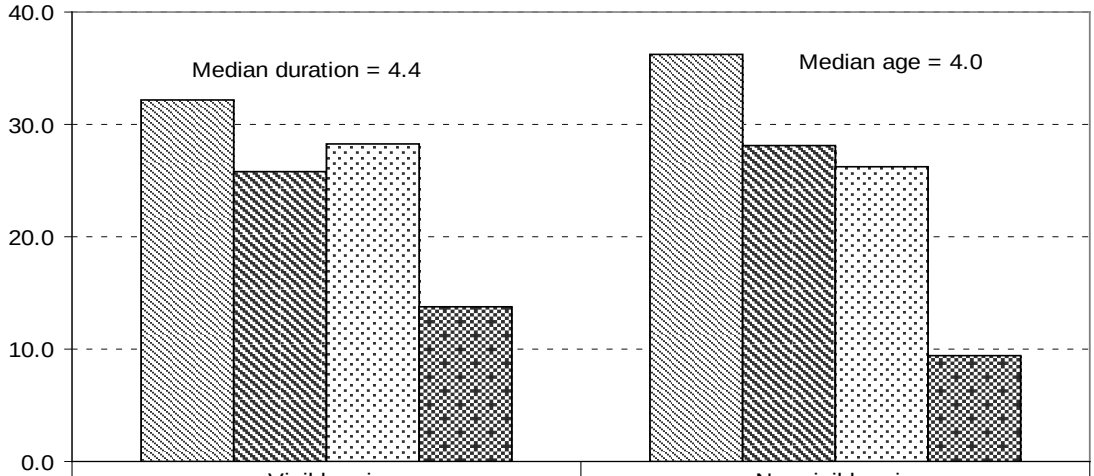
	Less than 3	3-4	5-6	7+
15-19	2.0	0.9	0.6	0.7
20-24	13.6	10.0	7.8	9.1
25-29	26.9	24.8	21.0	21.6
30-34	32.4	34.8	35.7	31.5
35+	25.1	29.5	34.9	37.1

Figure 4: Duration of exclusive breastfeeding, according to mothers' immigration status, Canada, 2005



	Immigrants	Non-immigrants
<3 months	28.9	36.9
3-4 "	26.7	27.8
5-6 "	33.9	25.2
7+ "	10.5	10.1

Figure 5: Duration of exclusive breastfeeding, according to visible minority status, Canada, 2005



	Visible min	Non-visible min
<3 months	32.2	36.3
3-4 "	25.8	28.1
5-6 "	28.2	26.3
7+ "	13.7	9.4

Table 2: Unadjusted odds ratios of initiating and exclusive breastfeeding, according to immigration status, length of residence, visible minority & other predictors, Canada, 2005

Variables	**Breastfeeding initiation**	**Exclusive breastfeeding**
	Unadjusted OR (95% CI), p	Unadjusted OR (95% CI), p
Immigration status		
Immigrants	2.77 (2.15, 3.57), p=0.000	1.73 (1.51, 1.99), p=0.000
Not-immigrants	1	1
Years of residence		
<10	3.91 (2.56, 5.97), p=0.000	1.80 (1.48, 2.18), p=0.000
10 or more	2.20 (1.61, 2.99), p=0.000	1.68 (1.40, 2.01), p=0.000
Canada	1	1
Visible minority status		
Visible	1.44 (1.20, 1.72), p=0.000	1.34 (1.19, 1.52), p=0.000
Not visible minority	1	1
Age of women		
15-24	0.57 (0.46, 0.70), p=0.000	0.43 (0.36, 0.50), p=0.000
25-29	0.70 (0.59, 0.83), p=0.000	0.60 (0.52, 0.68), p=0.000
30-34	0.90 (0.75, 1.06), p=0.202	0.82 (0.73, 0.93), p=0.000
35+	1	1
Marital status		
Married/common law	1	1
Widowed/divorced/sep	0.72 (0.56, 0.92), p=0.009	0.75 (0.62, 0.92), p=0.005
Never-married	0.50 (0.42, 0.58), p=0.000	0.50 (0.43, 0.58), p=0.000
Maternal education		
Less than secondary	0.32 (0.27, 0.39), p=0.000	0.46 (0.39, 0.55), p=0.000
Secondary	0.54 (0.47, 0.63), p=0.000	0.67 (0.60, 0.75), p=0.000
Post-secondary degree	1	1
Household income ($)		
<30,000 or no income	0.38 (0.31 ,0.46), p=0.000	0.50 (0.43, 0.57), p=0.000
30-49,000	0.49 (0.40, 0.60), p=0.000	0.67 (0.58, 0.78), p=0.000
50-79,000	0.79 (0.65, 0.96), p=0.000	0.79 (0.69, 0.90), p=0.000
80,000+	1	1
Self perceived health		
Excellent	1	1
Very good	0.85 (0.72, 1.00), p=0.053	0.77 (0.68, 0.86), p=0.000
Good	0.63 (0.53, 0.76), p=0.000	0.61 (0.54, 0.70), p=0.000
Fair/poor	0.45 (0.34, 0.59), p=0.000	0.53 (0.42, 0.66), p=0.000
Type of smoker during pregnancy		
Daily/occasionally	0.39 (0.33, 0.46), p=0.000	0.34 (0.29, 0.39), p=0.000
Not at all	0.93 (0.79, 1.08), p=0.312	0.85 (0.76, 0.94), p=0.002
Not applicable	1	1

Note: ‘OR’ stands for Odds Ratios, & ‘CI’ refers to Confidence Interval

Table 3: Adjusted logistic odds ratios of breastfeeding initiation and exclusive breastfeeding, according to immigration status , length of residence, visible minority & other predictors

	Breastfeeding initiation				Exclusive breastfeeding			
Variables	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Immigration status								
Immigrants	2.90***	-	2.80***	-	1.68***	-	1.22**	-
Not-immigrants	1	-	1	-	1	-	1	-
Years of residence								
<10	-	4.03***	-	3.05***	-	1.76***	-	1.29**
10 or more	-	2.33***	-	1.65***	-	1.62***	-	1.16
Canadian-born	-	1	-	1	-	1	-	1
Visible minority status								
Visible	0.95	0.94	1.45***	1.43***	1.04	1.04	1.35***	1.35***
Not-visible minority	1	1	1	1	1	1	1	1
Age of women								
15-24	-	-	1.36**	1.35**	-	-	0.72***	0.71***
25-29	-	-	1.08	1.07	-	-	0.72***	0.72***
30-34	-	-	0.96	0.95	-	-	0.83***	0.83***
35+	-	-	1	1	-	-	1	1
Marital status								
Married/common law	-	-	1.17	1.16	-	-	1.21**	1.20*
Widowed/divorced/sep	-	-	1.20	1.20	-	-	1.08	1.08
Never-married	-	-	1	1	-	-	1	1
Maternal education								
Less than secondary	-	-	0.43***	0.44***	-	-	0.74***	0.74***
Secondary	-	-	0.63***	0.64***	-	-	0.85**	0.85**
Post-secondary degree	-	-	1	1	-	-	1	1
Household income ($)								
<30,000 or no income	-	-	0.57***	0.56***	-	-	0.81**	0.81**
30-49,000	-	-	0.59***	0.58***	-	-	0.87**	0.87**
50-79,000	-	-	0.86	0.86	-	-	0.89*	0.89*
80,000+	-	-	1	1	-	-	1	1
Self perceived health								
Excellent	-	-	1.45**	1.45**	-	-	1.36**	1.36**
Very good	-	-	1.41**	1.41**	-	-	1.13	1.13
Good	-	-	1.21	1.20	-	-	1.01	1.01
Fair/poor	-	-	1	1	-	-	1	1
Type of smoker during last pregnancy								
Daily/occasionally	-	-	0.66***	0.67***	-	-	0.48***	0.49***
Not at all	-	-	1.14	1.14	-	-	0.95	0.95
Not applicable	-	-	1	1	-	-	1	1