

Sociodemographic and Prenatal Predictors of Breastfeeding Initiation and Exclusive Breastfeeding in Hospitals in Nova Scotia

by

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Acknowledgement and Endorsement

The internship work presented in this report aims to determine the sociodemographic and prenatal predictors of breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia. The driving force and guiding vision behind the project has been provided by Becky Attenborough, the Manager of the Reproductive Care Program of Nova Scotia and Co-Chair of the Provincial Breastfeeding Steering Committee, who also first proposed the idea to initiate the study of association between sociodemographic factors and breastfeeding. I would like to extend my most heartfelt thanks to Ms. Attenborough for giving me the opportunity to join a well-established team and work together with members of the Provincial Breastfeeding Steering Committee on the study of breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia. I would also like to thank the perinatal nurse consultants at the Reproductive Care Program of Nova Scotia, for their substantial input to the project and for providing ample guidance, supports and feedback through the duration of my internship that enabled production of this final report.

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- Reproductive Care Program of Nova Scotia (RCPNS)
- Provincial Breastfeeding Steering Committee (PBSC), through the RCPNS

This report has been written by me and has not received any previous academic credit at this or any other institution.

Xinxin (Emily) Wang

Executive Summary

This report describes the work performed during a 13-week internship in the Reproductive Care Program of Nova Scotia (RCPNS) by Master of Health Informatics (MHI) candidate Xinxin (Emily) Wang in summer 2014. The RCPNS was established as a provincial program by the Nova Scotia Department of Health and Wellness in 1973. The RCPNS collaborates with other members of the Provincial Breastfeeding Steering Committee (PBSC) to provide leadership for the protection, promotion and support of breastfeeding in Nova Scotia. As part of understanding barriers to implementation of the Provincial Breastfeeding Policy, the intern was assigned a research project for *Determining Sociodemographic and Prenatal Predictors of Breastfeeding Initiation and Exclusive Breastfeeding in Hospitals in Nova Scotia*, which will be used to inform further research of breastfeeding outcomes in Nova Scotia, development of provincial indicators at RCPNS, and potential areas of focus as the Provincial Breastfeeding Policy is implemented.

The World Health Organization (WHO) recommends breastfeeding as the means of providing young infants with the nutrients needed for healthy growth and development. Breast milk is also recommended by WHO as the perfect food for the newborn, and the feeding should be initiated within the first hour after birth (WHO, 2002). In 2010, the national average rate of breastfeeding initiation in Canada was 87.3%. However for the same year, the rate in the Atlantic Provinces was 74.8% (Health Canada, 2010) and the rate in Nova Scotia was 80.4% (RCP, 2014a). The Nova Scotia Department of Health and Wellness, RCPNS and the PBSC are working together to provide women with the information and support needed to initiate and continue exclusive breastfeeding. Therefore, a study of predictors of breastfeeding outcomes in the Nova Scotian population is essential to delivering important information to healthcare providers and decision makers.

There were three phases within this project: define the gaps in previous literature, design a study based on existing data in the Nova Scotia Atlee Perinatal Database managed by RCPNS, and provide a comprehensive data analysis to inform ongoing and future breastfeeding initiatives. The internship was successfully completed with positive feedback from the supervisor and colleagues at RCPNS. The intern applied Health Informatics skills, especially the knowledge gained from *Health Information Flow and Use, Research Methods, and Statistics for Health Information*. The intern achieved the overall objective of the project. An analysis determined that sociodemographic factors such as neighbourhood income level, marital status, and maternal age can significantly impact both breastfeeding initiation and exclusive breastfeeding at hospital discharge. The strong prenatal predictors that influence breastfeeding initiation and exclusivity include intention to breastfeed, pre-pregnancy Body Mass Index (BMI), gestational weight gain (GWG) and parity.

The findings of this internship project have provided important information to RCPNS that will support introduction of a breastfeeding indicator for the province. The information will be shared with the PBSC and may influence identification of key areas of focus as the newly revised Provincial Breastfeeding Policy is implemented.

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1. Introduction

The Master of Health Informatics (MHI) program at Dalhousie University offers students the opportunity to gain valuable health informatics work experience by pursuing an internship in a healthcare setting. This report describes the internship work performed by the MHI candidate, Xinxin Emily Wang, over a 13-week period between May and August of 2014. The internship took place in the Reproductive Care Program of Nova Scotia (RCPNS) under the supervision of Ms. Rebecca Attenborough. The goal of the internship project was to study data from the Nova Scotia Atlee Perinatal Database (NSAPD) and determine the sociodemographic and prenatal predictors of breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia. It is anticipated that findings from this project will enable further research on the factors that influence breastfeeding initiation and exclusivity and inform initiatives by the Provincial Breastfeeding Steering Committee (PBSC) to better support and promote breastfeeding in hospitals and in the community.

1.1 Background

Breastfeeding is the recommended practice for the promotion of infant health, as breast milk confers immunity, is nutritionally balanced, easily digested, and promotes healthy growth (Stevens et al., 2012). Breastfeeding is associated with lower rates of disease not only in newborns (e.g. Sudden Infant Death Syndrome, respiratory, gastrointestinal and ear infections) and children (e.g. allergies, asthma and obesity), but also in mothers (e.g. breast cancer, ovarian cancer, osteoporosis and heart disease) (Arendas et al., 2008). A UK study showed that if 75% of babies were breastfed at hospital discharge, there would be annual savings around £6.7 million due to the fewer babies being hospitalized with respiratory illness and fewer physician consultations (Renfrew et al., 2012). Breastfeeding also has benefits for employers and the community. By supporting a woman to return to work and continue to provide her child with breast milk, the mother tends to be more satisfied with the balance of her life, resulting in increased job satisfaction and greater productivity (Frittenburg, 2012). Breastfeeding is environmentally friendly and has no waste that results from milk preparation so it benefits all members of the community as well (Frittenburg, 2012).

The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) recommend early initiation of breastfeeding within one hour of birth and exclusive breastfeeding for the first 6 months of life (WHO, 2014). Early initiation of breastfeeding, within one hour of birth, protects the newborn from acquiring infections and reduces newborn mortality (WHO, 2014). The risk of mortality due to diarrhea and other infections can increase in infants who are either partially breastfed or not breastfed at all. About 800,000 children's lives could be saved every year among children under 5 years of age, if all children 0-23 months were optimally breastfed (WHO, 2014).

In 2009-2010, 87.3% of Canadian mothers initiated breastfeeding. Canada's breastfeeding initiation rate was higher than that of the United States (77%), but lower than the rate in Norway (95%) and Australia (92%) (Health Canada, 2010). The breastfeeding initiation rate in the Atlantic Provinces was 74.8%, which was significantly lower than the national average (Health Canada, 2010). In Nova Scotia, the breastfeeding initiation rate was 78.7% between 2009 and 2010 (RCP, 2014a). Low breastfeeding rates incur billions in medical costs worldwide (WHO, 2014). For each 1000 infants never breastfed, there is excess of 2033 office visits, greater than 200 days of hospitalization and greater than 600 prescriptions compared to infants breastfed exclusively for at least three months (BCC, 2002). This excess use of healthcare services attributable to inadequate breastfeeding costs between \$331 and \$475 per infant never breastfed (Ball & Wright, 1999).

Taking action to encourage breastfeeding would likely be cost-effective. There have been major efforts to improve the quality of care for mothers and babies by each level of the Canadian government (federal, provincial and territorial). Several stakeholder groups, such as the Breastfeeding Committee for Canada (BCC), La Leche League Canada (LLLC) and Society of Obstetricians and Gynecologists of Canada (SOGC) have also promoted breastfeeding in Canada since 1978 (BCC, 2002). However, as indicated by numerous studies, support for women generally and specifically for vulnerable groups, is needed to raise the breastfeeding rates (Littman et al., 1994; Scott et al., 1997; Freed et al., 1993; Jordan et al., 1993). Therefore, the primary goal of this project is to investigate the predictors of breastfeeding. This will assist in identifying potential barriers and determinants of breastfeeding initiation and exclusive breastfeeding in hospitals. Being informed of the barriers and determinants will assist in finding solutions to provide quality care for breastfeeding mothers and children during both the prenatal and postnatal periods (BCC, 2002).

1.2 Objectives

The overall objective of this internship project was to determine the sociodemographic and prenatal predictors of breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia by studying variables in the NSAPD administered by the RCPNS. The RCPNS could then use the results of this study to inform the initial and ongoing development of provincial breastfeeding indicators. The intent is that the PBSC will use the findings from this project to identify important areas of focus to facilitate implementation of Provincial Breastfeeding Policy. The policy intent to promote, support, and protect breastfeeding through initiatives with the District Health Authorities (DHAs), the IWK Health Centre, family resource centres and other community organizations. This project also complemented work underway at the WHO and national level for implementing the Baby-friendly Hospital Initiative (BFHI).

1.3 Contributions

The intern¹ collaborated with a team of perinatal clinicians, statisticians at the RCPNS and the PBSC members at the RCPNS to plan the project topic that would most benefit their current and

¹ "Intern" and "investigator" are used interchangeably in this report to refer to Xinxin (Emily) Wang.

future priorities and activities. At the beginning of the internship, the intern conducted a systematic literature review to identify the gaps in knowledge related to the determinants of breastfeeding initiation and exclusive breastfeeding in developed countries and a critical analysis of the determinants in the previous literature. A meeting of the RCPNS was held to present and discuss the findings from the literature review. The presentation slides are included in [Appendix B](#). This resulted in a project to study the sociodemographic and prenatal predictors of breastfeeding outcomes in hospitals based on the Nova Scotian population. The intern then generated a research proposal to address the identified problem using an approach based upon the knowledge gained from the Health Informatics courses in the MHI program.

Using the approach described above, the primary objective of determining the sociodemographic and prenatal predictors of breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia was met. Specific examples of potential initiatives that may be informed by these findings include:

- The establishment of breastfeeding social marketing strategies aimed at vulnerable or marginalized populations who have difficulty initiating breastfeeding and continuing to exclusively breastfeed.
- Monitoring progress towards achievement of the Baby-Friendly Initiative (BFI)² in hospitals and community health services across the province.
- Development of one or more breastfeeding indicators for the province
- Identification of important areas of focus that need attention as the newly revised Provincial Breastfeeding Policy is implemented.

² The Baby-Friendly Initiative (BFI) was launched in Canada in 1998 and since then has been implemented by the provinces and territories (BCC, 2014).

2. Organizations

2.1 Reproductive Care Program of Nova Scotia

The Reproductive Care Program of Nova Scotia (RCPNS) was established by the Nova Scotia Department of Health and Wellness (DHW) in 1973. It is now one of nine provincial programs³. The vision of the RCPNS is “Optimal health for women, babies and families” (RCP, 2014b). The primary objective of the program is “to work directly with health care facilities and hospital and community-based health professionals to promote excellence in the provision of reproductive care” (RCP, 2014b). The mission of the RCPNS is “to promote and advocate for excellence in reproductive/perinatal and newborn health as well as evidence informed practice... ” (RCP, 2014b). The RCPNS has taken a leadership role in perinatal care by facilitating the interpretation and implementation of national standards of practice at local and provincial levels and by facilitating the use of health information to improve outcomes for women and newborns (RCP, 2014b). The RCPNS’s core activities include medical-nursing peer review, perinatal surveys, perinatal mortality and morbidity rounds, development of indicators of perinatal health and care among Nova Scotia residents, maternal newborn orientation learning modules for perinatal care providers, and continuing education and workshops for care providers in the province. The intern’s study results from this project are beneficial to the development and implementation of provincial breastfeeding indicators.

2.1.1 Nova Scotia Atlee Perinatal Database

The Nova Scotia Atlee Perinatal Database (NSAPD) is a population-based database that contains detailed province-wide clinical and demographic information from 1988 onwards and the RCPNS is the custodian (PERU, 2012). There are two primary data sources for the NSAPD. Data are abstracted on-site in Nova Scotia health care facilities by health information professionals and submitted to the RCPNS. An extract from the Canadian Institute for Health Information (CIHI) submission is also sent to the RCPNS for the cases that meet the NSAPD inclusion criteria. The health information professionals enter data using online perinatal forms and data are transferred to the NSAPD in a timely fashion. The population in the NSAPD includes all reported liveborn infants and stillbirths at a gestational age of at least 20 weeks or having a birth weight of at least 500 grams, and the mothers of these infants. The NSAPD includes perinatal events for all Nova Scotia residents in health care facilities and home births have been included in the NSAPD since the introduction of regulated midwifery in 2009 (PERU, 2012). The intern’s project is based on data from the NSAPD.

³ Nine Provincial Programs: Cancer Care Nova Scotia, Cardiovascular health Nova Scotia, Diabetes Care Program of Nova Scotia, Nova Scotia Organ and Tissue Donation Program, Nova Scotia Breast Screening program, Nova Scotia Hearing and Speech Centres, Nova Scotia Provincial Blood Coordinating Program, Nova Scotia Renal Program, and Reproductive Care Program/Rh Program of Nova Scotia. Source: http://novascotia.ca/dhw/provincial_programs.asp

2.2 Provincial Breastfeeding Steering Committee

The PBSC provides leadership for the implementation of the Provincial Breastfeeding Policy and serves as a forum to ensure integration of breastfeeding across the continuum of care. The committee is co-chaired by representatives from the DHW and the RCPNS. The membership includes a manager from each DHA and the IWK Health Centre, as well as federal partners (Public Health Agency of Canada, First Nations and Inuit Health, and Health Canada) and maternal-child health program coordinators from two First Nations Communities. Currently, there are four working groups within the PBSC: Baby-Friendly Initiative Implementation (BFI), Education and Standards, Monitoring and Evaluation and Capacity Building. Although the Terms of Reference and the structure for the PBSC are under review, implementation of the BFI remains a key strategy to improve the health of Nova Scotians. The outcomes of this internship project will inform many aspects of the Provincial Breastfeeding Policy implementation, particularly the Baby-Friendly Initiative Implementation within the province.

3. Internship Work

3.1 Job Description

The intern will be required to work with the clinical group at RCP to perform a research project on breastfeeding by using the NSAPD. The outcomes of the research project must be related to the work of the Provincial Breastfeeding Steering Committee. The intern will contribute to the full range of activities involved in the analysis and reporting. These activities include: idea generation, literature review, developing analytical plans, conducting comprehensive statistical analyses, reviewing and interpreting complex data and information, and sharing findings.

3.2 Responsibilities

The intern will

- participate in project planning with all stakeholders of this research project
- complete any data access forms necessary
- prepare and perform a literature review based on the desires of clinicians and researchers
- assist in idea generation, drafting the research proposal and analytical plan
- design, develop and implement the project including the selection of appropriate statistical methods and analysis of data
- analyze data, interpret results, collaborate with others to prepare recommendations, prepare the scientific report and communicate with and report the findings to clinicians, policy and decision-makers and other key stakeholders.

3.3 Achievements

The deliverables for this internship project are three fold and includes: a literature review, a research proposal, and a comprehensive data analysis report of sociodemographic and prenatal predictors of breastfeeding initiation and exclusive breastfeeding. As part of the project, the intern presented the findings of the systematic review and gave a presentation of the literature review in weeks one to three of the internship ([Section 5.1](#)). During weeks four to six, the intern drafted the research proposal and data analysis plan ([Section 5.2](#)). A comprehensive analysis of the data was performed using SAS during weeks seven to eleven ([Section 5.3](#)). The data analysis report was delivered to the supervisor and colleagues in RCPNS in week twelve and an informal presentation was given to them on August 1st, 2014, which was one week ahead of the required deadline.

4. Relevance of the Internship Project to Health Informatics

A wide range of concepts from the Master of Health Informatics program were relevant during the internship at RCPNS. These concepts included:

- Understanding the purposes, type, dimensions and quality framework of health indicators.
- Understanding the research terminology for clinical use.
- Understanding how to review, critically appraise and synthesize research literature to develop a literature review.
- Understanding how to design research questions based on the critical analysis of existing research.
- Understanding qualitative and quantitative research designs and their advantages and disadvantages.
- Understanding how to design an analysis plan that fits the research questions and data being collected.
- Understanding the sampling strategies for different research methodologies.
- Understanding ethical principles in research design.
- Understanding a wide range of statistical analyses principles that underlie health research design, data analysis and interpretation of results.
- Understanding how to form a formal hypothesis, model the hypothesis and interpret the results.

The courses described in the following sections were most beneficial to the work performed during the internship project. Participation in the MHI program helped the intern gain a good conceptual knowledge of health, its broad determinants and the measurement of health status. The intern also gained insight into both the Nova Scotia and Canadian health systems. The project also significantly improved writing skills and the verbal and interpersonal communication skills of the intern.

4.1 HINF 6101 - Health Information Flow and Use

Several concepts garnered from *Health Information Flow and Use* were applied during the internship. These concepts include the purposes of collecting, storing and accessing health information; describing the data used to measure the health of Canadians; searching scientific literature to identify the best evidence; and the information on health indicators. During the internship, the intern reviewed the Breastfeeding Committee for Canada Integrated Ten Steps and WHO Code Practice Outcome Indicators for Hospitals and Community Health Services. The intern reviewed the health indicators by following Statistics Canada's indicator quality framework (as taught in HINF6101) and explored the following questions: How was the indicator defined? Where does the data come from? How were data collected? How will the information be used? The intern's project will inform the implementation of a provincial breastfeeding indicator selected through a provincial consultation project and in partnership with members of the RCPNS

Provincial Steering Committee. The specific indicator is – Babies who receive breast milk exclusively during the birth admission/time period, among those whose mothers intended to breastfeed. This complements work underway by clinicians and policymakers in Nova Scotia to support and promote the WHO’s Baby-friendly Hospital Initiative – Hospital Level Implementation. The predictors determined in this study also identify potential areas of focus that will help with the implementation of the Provincial Breastfeeding Policy⁴ and the development and implementation of a provincial breastfeeding surveillance system.

4.2 HINF 6020 – Research Methods

This course provided the fundamentals of research design and presented the criteria for health services research, various research designs, the strengths and weakness of study designs, the research process, the steps of developing research questions, the format and rules of a literature review, research methods for different research purposes, the structure of a study proposal and data analysis plan and the importance of research ethics. All the above concepts were applied during the internship. The literature review was used to identify gaps in the previous studies of predictors of breastfeeding initiation and exclusive breastfeeding. It assisted the intern to ascertain a research problem related to these gaps and design research questions to bridge the gaps. The proposal included the summary of the literature review, hypotheses of the study, proposed research methodology, data analysis plan and ethical considerations. In the data analysis, the intern used retrospective cohorts to examine the association between predictors and outcomes of breastfeeding. The intern understands thoroughly the principles of research ethics such as openness, confidentiality, social responsibility, and non-discrimination and applied these to the project.

4.3 HINF 6030 – Statistics for Health Informatics

This course provided very useful knowledge to the intern on statistical methodology for health services research and SAS software skills. During the internship, the intern applied the information from this course to explore and analyze the data. The statistical concepts used during the internship included preliminary analysis of data, hypothesis testing on continuous and categorical data, sample size calculations, independence tests, and complex analysis (such as multivariable linear regression). The course knowledge helped the intern to explore and summarize the statistical model and interpret the results of complex data analyses.

⁴ The Provincial Breastfeeding Policy was developed and implemented in 2005 and now is under revision. The evaluation of the implementation of provincial breastfeeding policy was completed in 2011. (PBSC, 2014).

5. The study of sociodemographic and prenatal predictors of breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia

Breastfeeding is the recommended practice for the promotion of infant health, as breast milk is the ideal natural food for infants. Breastfeeding is associated with lower rates of disease not only in newborn and children but also mothers (Arendas et al., 2008; Ip et al., 2009). However, the breastfeeding rates in Nova Scotia are significantly lower than the national average (DHW, 2012). While 78% of women initiate breastfeeding, only about half of mothers are exclusively breastfeeding at hospital discharge, with rates varying from 36 to 64 per cent across the province (DHW, 2012). The Nova Scotia Provincial Breastfeeding Policy outlines comprehensive action to protect, promote, and support breastfeeding in the province. The scope of this internship project was to determine the sociodemographic and prenatal predictors of breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia. There were three deliverables of this project: a literature review, study proposal and a comprehensive data analysis.

5.1 Review of the Literature

The primary aim of this systematic review was to identify what is known about the determinants of breastfeeding initiation and exclusive breastfeeding in developed countries in the existing literature. Key questions to inform the literature review were:

- What is known about the determinants of breastfeeding initiation and exclusivity generally and for specific populations of women?
- What interventions have been implemented to address factors associated with breastfeeding initiation and exclusivity?
- What breastfeeding outcomes related to initiation and exclusivity have been identified?

This review included studies published after 2000 focusing on the determinants of breastfeeding initiation and exclusivity, the sample of women targeted, the content of the intervention, the breastfeeding outcomes, and the duration of exclusive breastfeeding in hospitals.

5.1.1 Methods

5.1.1.1 Information Sources

Peer-reviewed articles were acquired from a search of six databases: PubMed, CINAHL, Cochrane Library, BioMed Central, Web of Science, and PsycINFO. The search for eligible articles using the combination of the following terms: “determinants” (all fields), “exclusive” (all fields) and “breast feeding” (MeSH Terms) or “exclusive breastfeeding” (all fields), and “initiation” (all fields). No limitation of publication date was used in the search; however, the earliest eligible article was published in 2001.

5.1.1.2 Inclusion and Exclusion Criteria

A search of publications was conducted for studies published in English. Articles were excluded if they were not human studies, not focused on initiation, or referred specifically to developing or low-income countries. Other exclusion criteria were articles not aimed at breastfeeding initiation or exclusive breastfeeding, those specific to breastfeeding in a human immunodeficiency virus-positive status, or those specific to adolescent mothers because the literature review in this study was about the general population instead of a particular group of people. Titles and abstracts of identified citations were screened based on the inclusion and exclusion criteria described earlier. Potentially eligible articles were then reviewed in full text. Information extracted from the articles and presented in Table 1 includes: (1) study purpose; (2) sample size; (3) outcome; (4) determinants of the initiation of breastfeeding identified in the article; (5) definition of exclusive breastfeeding in the article.

5.1.2 Results

A total of 75 articles were identified based on the searches conducted in the medical databases. Initially, articles were screened based on the title and abstract and 12 articles were excluded as they were not published in English or were not a human study. The remaining 63 articles were reviewed in full text, and 54 additional articles were excluded based on the fact that exclusive breastfeeding was not described; the studies were conducted in developing or low-income countries and may not be comparable due to the different healthcare systems; or the articles were written in a language different than English. At the end, nine articles complied with the eligibility criteria and were included in this study (Figure 1).

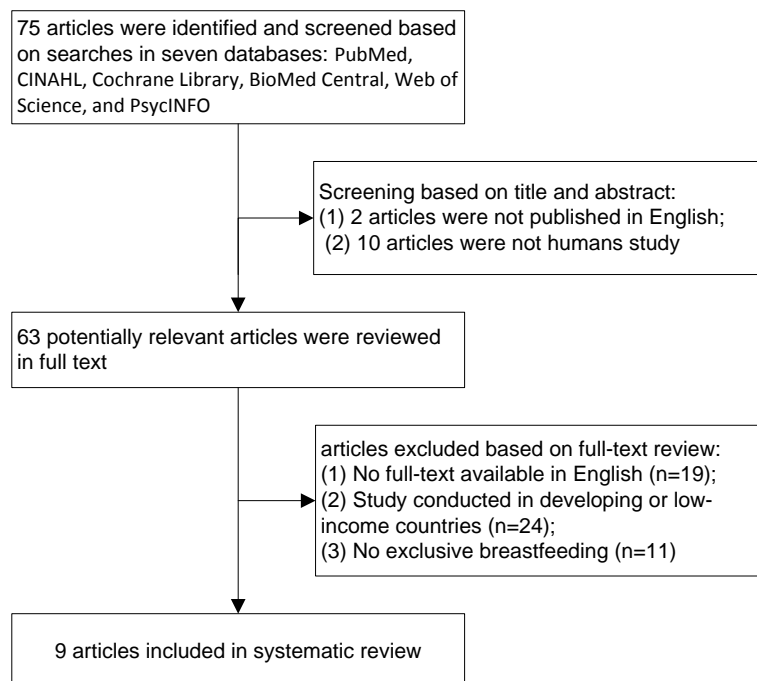


Figure 1: Systematic Review Flow Diagram

Table 1 Literature Review Summary

Author (Year)	Study Purpose	Study Design	Sample	Outcomes	Determinants of Breastfeeding Outcomes
Gisbers et al. (2006)	To identify psychosocial behavioral determinants of the intended duration and actual initiation of breastfeeding in families with a predisposition to asthma.	A cluster randomized trial (analyses were based at the individual level because this study was an almost one-to-one match.	89 women were less than 7 months pregnant and at least one first-degree relative had asthma that had been diagnosed by a doctor in southeastern Netherlands.	The attitudinal beliefs appeared to be significantly associated with the intended duration to breastfeed. The level of breastfeeding knowledge was the strongest independent predictor amount the external determinants. A positive intention to breastfeeding is significantly associated with actual behavior.	<ul style="list-style-type: none"> - Attitude to breastfeeding - Knowledge of breastfeeding - Intention to breastfeeding
Scott et al. (2001)	To identify determinants of the initiation and duration of breastfeeding amongst Australian women.	A prospective cohort study	556 women in Perth, Western Australia between September 1992 and April 1993 and 503 women from the Darling Downs area, Queensland, Australia between November 1995 and July 1996.	Breastfeeding initiation was most strongly associated with perceived paternal support of breastfeeding. Duration of breastfeeding was most strongly associated with the length of time a mother intended to breastfeed. Maternal education positively associate to duration but not initiation. No difference between urban and rural.	<ul style="list-style-type: none"> - Education - Maternal education - Experience of breastfeeding
Scott et al. (2006)	To compare determinants of breastfeeding at discharge from hospital in 2002/2003 with those reported for 1992/1993.	A prospective cohort study	870 women eligible to participate were contacted and 587 completed baseline questionnaires (67%)	Same as previous study, a woman who perceived her husband to prefer breastfeeding was significantly more likely to leave hospital breastfeeding and to be exclusively breastfeeding. The strongest predictor in both studies for a woman to not be exclusively breastfeeding in hospitals was having an infant who had been admitted to the special care nursery after delivery.	<ul style="list-style-type: none"> - Maternal and Paternal feeding attitudes - Delivery method - Cesarean deliveries - Pre-pregnancy BMI
Li et al. (2004)	To identify determinants of the initiation and duration of breastfeeding by Chinese Australian mothers	Cross-sectional survey	506 Mandarin-speaking women in Perth, Western Australia	Mother's level of education and father's preference for breastfeeding was positively associated with the initiation of breastfeeding. 88.5% of women who had given birth in Australia initiate breastfeeding at hospital discharge. At 6 months, only 6.4% of the mothers were still fully breastfeeding. Mother's age no association with breastfeeding initiation or duration in Australia.	<ul style="list-style-type: none"> -Doctor's support - Education

Author (Year)	Study Purpose	Study Design	Sample	Outcomes	Determinants of Breastfeeding Outcomes
Kohlhuber et al. (2007)	To assess the current state of breastfeeding prevalence, duration and behaviour in Bavaria in a prospective study to provide a basis for developing targeted breastfeeding promotion measures.	Prospective cohort study planned as a survey	144 birth clinics in Bavaria. Of the 8805 mothers who delivered in April 2005, some 3840 completed a questionnaire in the baseline survey (43.6%). The average age of participating mothers was 31.7 (range 18-46) years.	Almost 90% of mothers started to breastfeed. Two months after birth 70% still breastfed (44.7% exclusive breastfeeding). No significant associations were observed for mother's age, country of birth, family status, smoking, and birth mode, paternal grandmother's attitude towards breastfeeding or hospital size.	- Education - Attitude to breastfeeding
Tarrant and Keaney (2008)	To review secular and current breastfeeding practices in Ireland as well as providing an overview of the documented determinants and influences of mothers' infant feeding decisions in Ireland.	Cross-sectional prospective study	561 pregnant women attending a Dublin hospital	42.5% of the Irish-national mothers initiated exclusive breastfeeding, while only 24% were still offering any breast milk to their infant at 6 weeks in 2004. Study had shown that higher breastfeeding rate in the east, west, and mid-west regions and lower rates in the south-east and north-west of Ireland. Intention to breastfeed has been suggested as a stronger predictor of both initiation and duration.	- Socio-economic status - Age - Smoking status - Education attainment level - Intention to breastfeed
Theofilogi annakou et al. (2006)	To determine the prevalence, examine the influence of hospital practices and investigate potential determinants of breastfeeding in Athens	A prospective study presents the results of an epidemiological survey conducted from September 2003 to February 2004 in Athens, Greece.	312 mothers were at certain maternity hospitals in Athens.	Only 10% of the participants reported that they exclusively breastfed their infant in the maternity clinical during the first 2 days, though 85% breastfed exclusively on the last day of their stay in the maternity clinic. 55% of the mother breastfed and 35% breastfed exclusively for 40 days in certain maternity hospitals in Athens.	- BMI - caesarean section - Family support - Intention
Singh et al. (2003)	To examine the extent to which breastfeeding initiation and duration varied by immigrant status overall and in conjunction with race/ethnicity and socioeconomic status after controlling for other relevant social and behavioral covariates.	Cross-sectional data	33121 children aged 0 to 5 years from 2003 National Survey of Children's Health	Immigrant women in each racial/ethnic group had higher breastfeeding initiation and longer duration rates than native women. Asian women had the highest breastfeeding initiation rates (89%) and black women had the lowest rates 51%. Breastfeeding rates varied substantially from a low 55% for the poor native children with native parents to a high of 94% for the affluent US	- Income - Ethnicity

Author (Year)	Study Purpose	Study Design	Sample	Outcomes	Determinants of Breastfeeding Outcomes
Kools et al. (2005)	To evaluate the behavioral determinants of the initiation of breastfeeding at birth.	A prospective cohort study	373 pregnant women in five child health care centers. The mean age of the participants was 31 years, ranging from 18 to 42 years in Netherlands.	72% of the women had the intention of breastfeed and 73% actually started with breastfeeding (exclusive breastfeeding, feeding of expressed maternal milk, or breastfeeding with complementary liquids or with complementary formula feeding.	- Attitude - Social influence - Self-efficacy (ASE)

5.1.2.1 Maternal experience and exposure to breastfeeding

5.1.2.1.1 *Intention to initiate breastfeeding*

Intention to initiate breastfeeding has been found to be associated with choosing exclusive breastfeeding or formula feeding. In four studies, investigators found that attitudes were significantly related to feeding intentions and behaviour (Gisbers et al., 2006; Kools et al., 2005; Mehta et al., 2011; Scott et al., 2006). The decision to initiate exclusive breastfeeding is guided not only by women's own underlying attitudes, skills, abilities and beliefs, but also by perceptions of what other people think. Determinants of breastfeeding intention included the social influence of significant others, positive social norms, knowledge of breastfeeding, positive attitude toward breastfeeding, and low social pressure toward formula feeding (Goksen, 2002). Positive previous experience with breastfeeding also predicted the intention (Kools et al., 2005). Kools and colleagues (2005) defined the best predictors of intention to initiate breastfeeding as attitudes, social influences, and self-efficacy (Kools et al., 2005).

5.1.2.1.2 *Family Support*

In the breastfeeding initiation rates study from Germany, Kohlhuber et al. (2008) found that the partner's attitude towards breastfeeding is the main influencing factor. If the infant's father had a negative attitude, the mother had a 22 times higher risk of not intending to breastfeed from the beginning of pregnancy (Kohlhuber et al., 2008). Tarrant and Keaney (2008) in a cross-sectional prospective study demonstrated that breastfeeding exposure, such as having friends or family with previous breastfeeding experience and having breast-fed previous children, have also been reported as important determinants of exclusive breastfeeding initiation (Tarrant & Kearney, 2008). Scott and colleagues identified that a woman's support from her partner is an important determinant of initiation of breastfeeding (Scott et al., 2006).

5.1.2.2 Sociodemographic Predictors of Breastfeeding

5.1.2.2.1 *Household Income*

Empirical evidence has found that the household income is also a critical correlate of exclusive breastfeeding initiation, with studies showing that women in families with a higher income are more likely to breastfeed, with a correspondingly low rate of breastfeeding initiation among low-

income women (Taveras et al., 2003). Although higher household income level has been strongly linked to higher breastfeeding initiation rates, they do not fully account for the observed racial/ethnic differences in breastfeeding. In Li and colleagues' (2004) survey study, they focus on Australian Chinese as the sample of targeted women. The results of their study showed that for Chinese women who delivered a baby in Australia, the household income is positively correlated with the exclusive breastfeeding initiation rate. However, in women who delivered a baby in their home country, high-income women tended to believe that formula feeding was a sign of their wealth (Li et al., 2004). Obviously, the determinants of breastfeeding are very different due to the different culture, socioeconomic and healthcare system in developing countries. This is the reason that the investigator did not include any studies from developing countries. Singh and colleagues (2003) examined the immigration status in conjunction with race/ethnicity and income levels. They found that breastfeeding rates varied substantially from a low of 55% for poor native children with native parents, to a high of 94% for the affluent US-born children with both parents being immigrants (Singh et al., 2003).

5.1.2.2 Education Level

Two studies from Australia compared the factors associated with exclusive breastfeeding initiation between 1992/1993 and 2002/2003. The study of 1992/1993 shows that significantly more mothers with higher education initiated exclusive breastfeeding than ones with lower education (Scott et al., 2006). In the Kohlhuber et al. (2008) study, participants who didn't finish high school had a higher risk of not breastfeeding than women with high school graduate and beyond.

5.1.2.3 Prenatal Predictors of Breastfeeding

5.1.2.3.1 Pre-pregnancy Body Mass Index

Four studies reported that mothers who began pregnancy overweight or obese had a significantly higher risk of not initiating breastfeeding compared with underweight or normal weight women (Mehta et al., 2003; Scott et al., 2006; Kohlhuber et al., 2008; Tarrant et al., 2008). Obese mothers were also more likely to report difficulties with breastfeeding while in the hospital (Mok et al., 2008).

5.1.2.3.2 Gestational Weight Gain

A study based on a New York population (Hilson et al., 2005) identified excessive Gestational Weight Gain (GWG) as a high risk factor for breastfeeding initiation failure. The combined effects of pre-pregnancy BMI and GWG on initiation of breastfeeding had higher odds of unsuccessful initiation. Women who exceeded the recommendations for GWG also had a higher risk of early discontinuation of exclusive breastfeeding (Hilson et al., 2005).

5.1.2.3.3 Smoking

Smoking during pregnancy has been found to be a predictor of decreased exclusive breastfeeding initiation rate in a literature review of breastfeeding initiation and duration between 1990 and 2000

(Dennis, 2002). However, there was a conflicting study regarding harms to breastfeeding with smoking that did not find interactions between maternal smoking and the initiation of breastfeeding (Theofilogiannakou et al., 2006).

5.1.2.4 Intra-partum Predictors of Breastfeeding

The intra-partum period is the time during labour and birth of the baby (Colledge, 2011). The mode of delivery can be either vaginal or by caesarean section (C-Section). The way in which a woman delivers her baby can impact breastfeeding outcomes. Four studies showed that C-sections reduced the incidence of exclusive breastfeeding initiation but did not affect duration of breastfeeding (Scott et al., 2001; Scott et al., 2006; Li et al., 2004; Tarrant & Keaney, 2008). One study indicated that labour analgesia had a negative impact on the initiation of breastfeeding; however, it did not affect breastfeeding duration (Theofilogiannakou et al., 2006).

5.1.2.5 Post-partum Predictors of Breastfeeding

The postpartum period is the time after the baby is born (Colledge, 2011). Previous studies reviewed by Dennis (2002) identified timing of initiation of breastfeeding, rooming-in and supplementary feedings as predictors of breastfeeding initiation. Another study also found that supplementation in the hospital decreased the duration of breastfeeding (Sheehan et al., 2006).

5.1.3 Discussion

The aim of this systematic review was to identify the determinants of exclusive breastfeeding initiation. There were five groups of determinants: maternal experience and exposure to breastfeeding, socio-demographic, and prenatal, intra-partum and post-partum characteristics. Maternal experience and exposure to breastfeeding include mother's experience of being breastfed as an infant, relatives and friends with breastfeeding experience; having breastfed previous children; receiving prenatal or postnatal breastfeeding education; and a number of environmental factors that influence a mother's decision to breastfeed or not. Socio-economic and demographic characteristics (age, race/ethnicity, education, attitude towards breastfeeding, knowledge of breastfeeding, household composition and total family income) are associated with both the initiation and exclusivity of breastfeeding. Prenatal factors (maternal pre-pregnancy BMI, gestational weight gain and smoking), intra-partum factors (non-spontaneous delivery methods) and post-partum factors (early introduction of other liquids and foods for medical reasons) are possible predictors of breastfeeding found in the literature and in keeping with research in Nova Scotia as well (Brown et al., 2013).

Of the nine studies included in this systematic review, four provided recommendations for interventions on increasing breastfeeding initiation and exclusivity. The successful interventions tended to be support-based programs providing additional home-based and telephone support by lactation experts (Li et al., 2004; Singh et al., 2003; Mehta et al., 2011; Scott et al., 2006). One suggested intervention was education-based: providing additional face-to-face postnatal breastfeeding education before discharge from hospital (Mehta et al., 2011).

5.2 Proposal

5.2.1 Research Questions

Although many types of predictors have been identified in the previous studies that impact breastfeeding initiation and exclusive breastfeeding, many of these variables have not been studied in a Canadian context to determine their combined effect on breastfeeding initiation and exclusive breastfeeding. By investigating the previously identified predictors, this study will aim to provide a comprehensive picture of the predictors that are impacting initiation of breastfeeding in a Canadian population. The research questions derived from the literature review are as follows:

1. Are there sociodemographic and prenatal factors that may be predictors of breastfeeding initiation in Nova Scotia?
2. Are there sociodemographic and prenatal factors that may be predictors of exclusive breastfeeding in hospitals in Nova Scotia?

5.2.2 Objectives

The main objective of this study is to determine the sociodemographic and prenatal predictors of breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia. The specific objectives of this study are:

- (1) To identify sociodemographic and prenatal predictors of breastfeeding initiation in Nova Scotia;
- (2) To identify sociodemographic and prenatal predictors of exclusive breastfeeding in hospitals in Nova Scotia;
- (3) To quantify the relationship between socio-demographic and prenatal factors and breastfeeding initiation in Nova Scotia;
- (4) To quantify the relationship between socio-demographic and prenatal factors and exclusive breastfeeding in hospitals in Nova Scotia.

5.2.3 Study Design

A retrospective cohort study was conducted on a population of Nova Scotia mothers who delivered a baby between April 1, 2006 and March 31, 2013. The data source for this study was an extract of the NSAPD. The NSAPD is a provincial, population-based, clinically-oriented database that collects information on maternal characteristics, maternal medical conditions, obstetric procedures, and pregnancy outcomes on all pregnancies and births in the province of Nova Scotia (RCP, 2014a).

5.2.4 Inclusion and exclusion criteria

The sample population for this study included Nova Scotia mothers who delivered infants with birth weight ≥ 500 grams or gestational age ≥ 20 weeks, alive at discharge from birth admission and alive at time of discharge from any neonatal admission if mother and baby had never been discharged home. That is, if mother and baby were transferred from one healthcare facility or hospital to another one without being discharged home, they are included in this study. In addition,

women were excluded from the study if they were missing any information regarding breastfeeding, pre-pregnancy BMI, GWG, marital status, maternal age, parity, or quintiles of neighbourhood income per single person equivalent (QAIPPE). The QAIPPE is derived from the average household income variable included in the census profile files (Statistics Canada, 2011). The methodological implications of the absence of data will be explored in the analysis.

5.2.5 Sampling and Data Selection

For the proposed study, the population can be predetermined as the number of live births from 2006/04/01 to 2013/03/31. As this study is a retrospective cohort study, the investigator accessed a historical dataset to determine breastfeeding initiation and exclusivity. Thus, the number of cases in this study was limited by the number of records collected during that time period. The sample size of this study is the number of live births who were recorded into NSAPD with sufficient information related to the study variables.

The independent variables in this study were breastfeeding variable (intention to breastfeed), sociodemographic variables (marital status at delivery, maternal age, and QAIPPE), and prenatal variables (parity, gestational age at delivery, pre-pregnancy BMI, and GWG). The two dependent variables were breastfeeding initiation and exclusive breastfeeding in hospitals. Each dependent variable is related to one research question: “Are there sociodemographic and prenatal factors that may be predictors of breastfeeding initiation in Nova Scotia?” and “Are there sociodemographic and prenatal factors that may be predictors of exclusive breastfeeding in hospitals in Nova Scotia?”

5.2.6 Data Analysis Plan

Both dependent variables are binominal variables. For breastfeeding initiation, the cases of no breastfeeding initiation were categorized as “no breastfeeding initiation” and the cases of either exclusive breastfeeding or breast milk and formula mixed feeding were categorized as “breastfeeding initiation”. For exclusive breastfeeding, the cases of exclusive breastfeeding were categorized as “exclusive breastfeeding” and the cases of mixed feeding were categorized as “no exclusive breastfeeding”. Multivariable logistic regression was used to determine predictors of breastfeeding initiation and exclusive breastfeeding at hospital discharge. Independent t-tests were conducted for independent variables that are continuous. Chi-square was used for independent variables that are categorical. Each variable has to have a significant relationship with breastfeeding initiation ($p \leq 0.05$) in the univariate analyses to identify predictors for the outcome variable. The data analysis was conducted using SAS 9.3. This software is available for use in the RCPNS.

5.2.7 Ethics

Data access approval is required from the Data Access Committee Reproductive Care Program of Nova Scotia. This research was conducted using de-identified patient data from the NSAPD for all pregnancies in Nova Scotia collected from 2006/04/01 to 2012/03/31. This study is for the internal purposes of assessment and improvement of breastfeeding outcome. Therefore, it does not fall

within the scope of Research Ethics Boards (REBs) (Tri-council Policy Statement, 1998), since “Quality assurance studies, performance reviews or testing within normal educational requirements should also not be subject to REB review” (Tri-council Policy Statement, 1998).

5.3 Statistical Analysis

5.3.1 Data Pre-processing

5.3.1.1 Data Cleaning

To handle missing data, the investigator applied two methods:

- (1) Fixing missing categorical variables by filling in with global constants;
- (2) Fixing missing continuous numerical variables by filling in with calculated values.

There were 3322 records missing marital status. The global constant “unknown” was filled into these rows. There was 30% of pre-pregnancy BMI missing. The missing BMI values were calculated by the pre-pregnancy weight and height based on international BMI calculation formula (weight (kg)/height (cm²)). The missing values of weight and height were filled with the mean of all samples belonging to the same attribute.

5.3.1.2 Data Reduction

Parity is a variable to record how many live births mothers already had before the current pregnancy. Parity was a continuous integer variable. In this study, the investigator consulted other colleagues and we decided to focus on the difference of breastfeeding outcomes between the first delivery and not first delivery. Therefore, the values of parity were separated into two groups: first delivery (if parity=0) and not first delivery (if parity>0).

5.3.2 Exploratory Analysis

Of the 52,974 women who delivered baby between April 1, 2009 and March 31, 2010, in hospitals in Nova Scotia, there were 11,471 women missing one or more pieces of information on feeding at discharge. Baseline descriptive characteristics of the 41,503 women that constituted the study population are presented in Table 2, of whom 31,700 (76.4%) initiated breastfeeding and 19,568 (51.3%) exclusively breastfed their infants at discharge while 9,803 (23.6%) did not.

Baseline characteristics of the women who initiated breastfeeding were similar on all characteristics of the exclusive breastfeeding group: intention to breastfeeding, smoking status, maternal age, marital status, pre-pregnancy BMI, and QAIPPE. The majority of predictors included in the analyses were chosen based on either theoretical reasoning based on the literature review or clinical advice from expert nurses. Figure 2 shows the breastfeeding outcomes in each income level.

Table 2 Descriptive Variables by Breastfeeding Status in hospitals in Nova Scotia

Socio-Demographic Factors	Sample Size	No Breastfeeding Initiation	Breastfeeding Initiation	Exclusive Breastfeeding	Non Exclusive Breastfeeding
	n (%)	n (%)	n (%)	n (%)	n (%)
All Women	41503	9803 (23.62)	31700 (76.38)	19568 (51.25)	9979 (26.14)
Intention	41503	9803 (23.62)	31700 (76.38)	21051 (50.72)	10649 (25.66)
No	7598 (18.31)	6643 (16.01)	955 (2.30)	469 (1.13)	486 (1.17)
Yes	32447 (78.18)	2405 (5.79)	30042 (72.39)	20223 (48.73)	9819 (23.66)
Unsure	1458 (3.51)	755 (1.82)	703 (1.69)	359 (0.86)	344 (0.83)
QAIPPE (Income Level)	41503	9803 (23.62)	31700 (76.38)	21051 (50.72)	10649 (25.66)
1	8802 (21.21)	2873 (6.92)	5929 (14.29)	3800 (9.16)	2129 (5.13)
2	8256 (19.89)	2041 (4.92)	6215 (14.97)	4121 (9.93)	2094 (5.05)
3	8382 (20.20)	1888 (4.55)	6494 (15.65)	4376 (10.54)	2118 (5.10)
4	7675 (18.49)	1539 (3.71)	6136 (14.78)	4135 (9.96)	2001 (4.82)
5	8388 (20.21)	1462 (3.52)	6926 (16.69)	4619 (11.13)	2307 (5.56)
Pre-pregnancy BMI	41503	7190 (22.50)	24764 (77.5)	16351 (51.17)	8413 (26.33)
Underweight	1436 (4.49)	400 (1.25)	1036 (3.24)	662 (2.07)	374 (1.17)
Normal	25135 (48.78)	7846 (9.61)	17289 (39.17)	11165 (27.47)	6124 (11.69)
Overweight	7721 (24.16)	1647 (5.15)	6074 (19.01)	3989 (12.48)	2085 (6.53)
Obese	7211 (22.57)	2072 (6.48)	5139 (16.08)	2922 (9.14)	2217 (6.94)
(Missing = 9549)					
Gestational Weight Gain in BMI Group	31822	7153 (22.48)	24669 (77.52)	16291 (51.19)	8378 (26.33)
Below 12.5kg in Underweight	327 (1.03)	90 (0.28)	237 (0.74)	144 (0.45)	90 (0.28)
Between 12.5-18kg in Underweight	465 (1.46)	127 (0.40)	338 (1.06)	234 (0.74)	104 (0.33)
Above 18kg in Underweight	512 (1.61)	146 (0.46)	366 (1.15)	224 (0.70)	142 (0.45)
Below 11.5kg in Normal	4245 (13.34)	987 (3.10)	3258 (10.24)	2312 (7.27)	946 (2.97)
Between 11.5-16kg in Normal	4653 (14.62)	838 (2.63)	3815 (11.99)	2853 (8.97)	962 (3.02)
Above 16kg in Normal	6688 (21.2)	1246 (3.92)	5442 (17.10)	3613 (11.35)	1829 (5.75)
Below 7kg in Overweight	1294 (4.07)	354 (1.11)	940 (2.95)	608 (1.91)	332 (1.04)
Between 7-11.5kg in Overweight	1441 (4.53)	330 (1.04)	1111 (3.49)	729 (2.29)	382 (1.20)
Above 11.5kg in Overweight	4986 (15.67)	963 (3.03)	4023 (12.64)	2652 (8.33)	1371 (4.31)
Below 5kg in Obese	1937 (6.09)	615 (1.93)	1322 (4.15)	786 (2.47)	536 (1.68)
Between 5-9kg in Obese	1093 (3.43)	326 (1.02)	767 (2.41)	442 (1.39)	325 (1.02)
Above 9kg in Obese	4181 (13.14)	1131 (3.55)	3050 (9.58)	1694 (5.32)	1356 (4.26)
(Missing = 9681)					
Parity	41503	9803 (23.62)	31700 (76.38)	21051 (50.72)	10649 (25.66)
First Pregnancy	19109 (46.04)	3577 (8.62)	15532 (37.42)	9399 (22.765)	6133 (14.78)
Non-first Pregnancy	22394 (53.96)	6226 (15.00)	16168 (38.96)	11652 (28.08)	4516 (10.88)
Smoking at admission	40997	9682 (23.62)	31700(76.38)	20822 (50.79)	10493 (25.59)
No smoking	33439 (81.56)	6120 (14.93)	27319 (66.64)	17217 (45.70)	8444 (22.41)
Smoking	7558 (18.44)	3562 (8.69)	3996 (9.75)	2122 (5.63)	1379 (3.66)
(Missing = 506)					
Maternal Age	41503	9803 (23.62)	31700 (76.38)	21051 (50.72)	10649 (25.66)
<20	2438 (5.87)	1078 (2.60)	1360 (3.28)	801 (1.93)	559 (1.35)
20-24	7928 (19.10)	2691 (6.48)	5237 (12.62)	3385 (8.16)	1852 (4.46)
25-29	12270 (29.56)	2848 (6.86)	9422 (22.70)	6368 (15.34)	3054 (7.36)
30-34	12384 (29.84)	2138 (5.15)	10246 (24.69)	7011 (16.89)	3235 (7.79)
35+	6483 (15.62)	1048 (2.53)	5435 (13.10)	3486 (8.40)	1949 (4.70)
Marital Status	41503	9803 (23.62)	31700 (76.38)	21051 (50.72)	10649 (25.66)
Single	10975 (28.74)	4095 (9.87)	6880 (16.58)	4222 (11.17)	2658 (6.96)
Married / Common-Law	26973 (70.65)	4470 (10.77)	22503 (54.22)	15258 (36.76)	7245 (17.46)
Other	233 (0.61)	69 (0.17)	164 (0.40)	88 (0.21)	76 (0.18)
Unknown	3322	1169 (2.82)	2153 (5.19)	1483 (3.57)	670 (20.17)

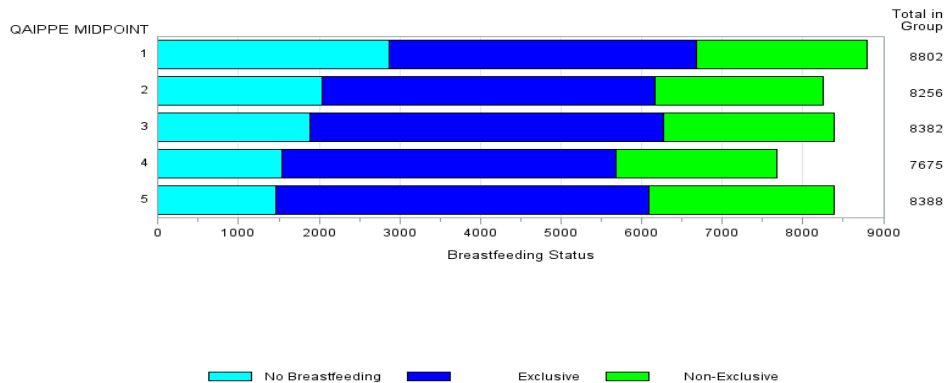


Figure 2 Impact of Income Level on Breastfeeding Initiation and Exclusive Breastfeeding

5.3.3 Complex Analysis

The univariate statistical analyses were applied to identify unadjusted predictors. The Chi-Square analyses were used for all nominal variables. Three continuous variables were converted to nominal variables before data analyses. Parity was converted to a binominal variable with two values: ‘first delivery’ and ‘not first delivery’. Based on the WHO recommendations, pre-pregnancy BMI was put into four categories: underweight (less than 18.5 kg/m²), normal (18.5 to 25 kg/m²), overweight (25 to 30 kg/m²), and obese (greater than 30 kg/m²). Gestational weight gain was categorized based on both GWG recommendations from Health Canada and using the BMI scale. Under the current Health Canada recommendations, it suggests that women who were underweight before pregnancy should gain 12.5-18 kg, women with a normal BMI should gain 11.5-16 kg, women who were overweight should gain 7-11.5 kg, and finally, all women who were obese are advised to gain 5-9 kg during pregnancy (Institute of Medicine, 2009). To find the impact of GWG in each BMI group on breastfeeding status, GWG was categorized into 12 groups: real GWG lower than the GWG recommendations, between the GWG recommendations, and above the GWG recommendations. The results of Chi-Square revealed that eight variables were significant for both breastfeeding initiation and exclusive breastfeeding (Table 3). These variables were chosen as potential predictors included in the multivariable logistic regression to identify the independent predictors of mother’s breastfeeding choices at hospital discharge. All analyses were conducted using SAS 9.3.

Table 3: Chi-Square of Categorical Variables

Variable Name	Breastfeeding Initiation		Exclusive Breastfeeding	
	Chi-Square	p-value	Chi-Square	p-value
Intention	22514.3	<.0001	213.36	<.0001
QAIPPE	640.43	<.0001	19.96	0.0005
Pre-Pregnancy BMI	260.25	<.0001	289.35	<.0001
Gestational Weight Gain	359.38	<.0001	374.42	<.0001
Parity	471.53	<.0001	474.09	<.0001
Smoking at admission	2839.82	<.0001	73.56	<.0001
Maternal Age	1519.69	<.0001	78.88	<.0001
Marital Status	2134.24	<.0001	115.91	<.0001

The multivariable logistic regression with backward elimination analysis is an efficient algorithm that starts with all candidate variables and tests the deletion of each variable using a criterion. Using this approach, insignificant variables are eliminated from the model and the process is repeated until the model cannot be improved further (SAS, 2009). The Receiver Operating Characteristic (ROC) curves are presented in Figure 3. Figure 3 (a) represents the accuracy of the test depending on how well the test separated the group being tested into those who initiated breastfeeding and those who did not initiate breastfeeding. The area under the ROC curve is 0.9113, which means the regression model for the initiation of breastfeeding is 91.1% accurate at separating breastfeeding initiation groups. Figure 3 (b) represents the accuracy of the test

depending on how well the test separated the group being tested into those who exclusively breastfed and those who did not exclusively breastfeed. The area under the ROC is 0.6247, which means the regression model of exclusive breastfeeding in hospital is 62.5% accurate at separating exclusive breastfeeding groups.

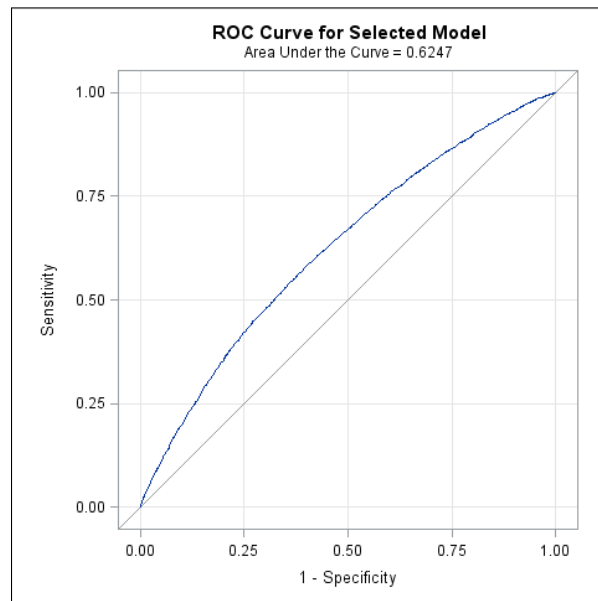
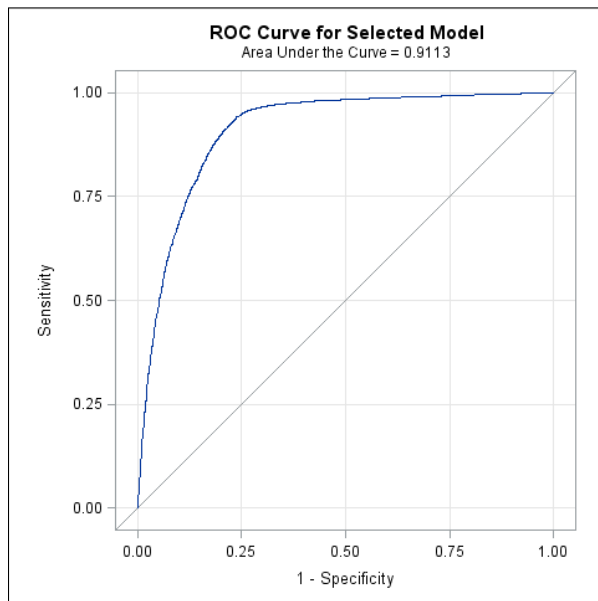


Figure 3 (a) Model of Initiation Breastfeeding

Figure 3 (b) Model of Exclusive Breastfeeding

More complex analyses were completed for breastfeeding initiation and exclusive breastfeeding in hospitals to determine the predictors of mothers' breastfeeding choices in hospitals. To determine the predictors of breastfeeding initiation and of early cessation of exclusive breastfeeding at hospital discharge, multivariable logistic regression was used. The logistic regression analyses confirmed that potential predictors were significant for both breastfeeding initiation and exclusive breastfeeding in hospitals ($p\text{-value} \leq 0.05$). These predictors are: intention to breastfeed, neighbourhood income quintile based on post code and surrounding area, pre-pregnancy BMI, GWG, parity, smoking at the time of hospital admission, maternal age, and marital status. The results of the logistic regression analyses for both breastfeeding initiation and exclusive breastfeeding are presented in Table 4.

Table 4 Factors associated with breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia

Socio-Demographic Factors	Breastfeeding Initiation			Exclusive Breastfeeding		
	Odds Ratio	95% Confidence Interval	Adjusted p-value (*<0.05)	Odds Ratio	95% Confidence Interval	Adjusted p-value (*<0.05)
Intention	Reference (Ref.)	Ref.	Ref.	Ref.	Ref.	Ref.
No	74.63	67.78 - 82.17	<.0001*	24.15	21.49 - 27.13	<.0001*
Yes	6.49	5.59 - 7.54	<.0001*	5.58	4.66 - 6.67	<.0001*
Unsure						
QAIPPE (Income Level)			<.0001*			0.0016*
1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
2	1.30	1.15 - 1.46	<.0001*	1.16	1.07 - 1.26	0.0002*
3	1.25	1.10 - 1.41	0.0004*	1.16	1.07 - 1.25	0.0004*
4	1.28	1.13 - 1.45	0.0001*	1.11	1.03 - 1.21	0.0098*
5	1.37	1.21 - 1.55	<.0001*	1.11	1.02 - 1.20	0.0114*
Pre-Pregnancy BMI			<.0001*			<.0001*
Underweight (BMI <18.5)	2.16	1.49 - 3.13	<.0001*	2.06	1.60 - 2.65	<.0001*
Normal (18.5 ≤BMI<25)	1.98	1.58 - 2.49	<.0001*	2.44	2.10 - 2.84	<.0001*
Overweight (25<BMI<30)	1.70	1.29 - 2.22	0.0001*	1.55	1.30 - 1.85	<.0001*
Obese (BMI ≥30)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Gestational Weight Gain in BMI Group			0.0061*			<.0001*
Below 12.5kg in Underweight	1.05	0.64 - 1.74	0.8361	0.73	0.53 - 1.02	0.0633
Between 12.5-18kg in Underweight	-	-	-	-	-	-
Above 18kg in Underweight	0.92	0.59 - 1.42	0.7077	0.78	0.58 - 1.04	0.0946
Below 11.5kg in Normal	0.84	0.72 - 0.98	0.0292*	0.81	0.73 - 0.89	<.0001*
Between 11.5-16kg in Normal	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Above 16kg in Normal	1.07	0.92 - 1.23	0.3962	0.76	0.69 - 0.82	<.0001*
Below 7kg in Overweight	0.90	0.69 - 1.18	0.4444	0.96	0.81 - 1.14	0.6462
Between 7-11.5kg in Overweight	-	-	-	-	-	-
Above 11.5kg in Overweight	1.04	0.834 - 1.28	0.7507	1.08	0.94 - 1.23	0.2859
Below 5kg in Obese	0.93	0.73 - 1.18	0.5336	1.05	0.89 - 1.24	0.5756
Between 5-9kg in Obese	-	-	-	-	-	-
Above 9kg in Obese	1.19	0.96 - 1.49	0.1128	1.03	0.88 - 1.20	0.7169
PARA			<.0001*			<.0001*
First Pregnancy	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Non-first Pregnancy	0.57	0.52 - 0.62	<.0001*	1.48	1.40 - 1.56	<.0001*
Smoking at admission			<.0001*			<.0001*
No smoking	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Smoking	0.47	0.43 - 0.52	<.0001*	0.61	0.57 - 0.66	<.0001*
Maternal Age			<.0001*			<.0001*
<20	0.48	0.40 - 0.57	<.0001*	0.76	0.67 - 0.86	<.0001*
20-24	0.74	0.66 - 0.83	<.0001*	0.95	0.88 - 1.03	0.2373
25-29	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
30-34	1.28	1.15 - 1.43	<.0001*	0.94	0.88 - 1.00	0.0481*
35+	1.45	1.26 - 1.67	<.0001*	0.77	0.71 - 0.83	<.0001*
Marital Status			<.0001*			<.0001*
Single	0.64	0.58 - 0.71	<.0001*	0.79	0.74 - 0.84	<.0001*
Married / Common-Law	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Other	0.91	0.64 - 0.85	0.7377	0.63	0.44 - 0.89	0.0088*
Unknown	0.74	0.64 - 0.85	<.0001*	0.97	0.87 - 1.07	0.5085

5.3.4 Discussion

This study is a retrospective cohort study looking at breastfeeding outcomes in Nova Scotia from 2006-2013. By reviewing the relevant literature and analyzing the dataset of local residents, the investigator found that the sociodemographic factors, such as neighbourhood income level, maternal age and marital status have significant impact on breastfeeding outcomes. The prenatal factors, such as pre-pregnancy BMI, GWG, parity and intention to breastfeeding are also strong predictors of breastfeeding outcomes.

5.3.4.1 Sociodemographic Predictors of Breastfeeding Outcomes

5.3.4.1.1 Household Income

QAIPPE is a measure of neighbourhood socioeconomic status that divides the population into five income groups (from the lowest income to the highest income, Q1 to Q5) so that there is approximately 20% of the population in each group (MacEwan and Saulnier, 2010). The 2008 average household income quintiles of Nova Scotia are presented in Table 5. Nova Scotian women who had the highest income, were more likely to initiate breastfeeding than women in other income levels (OR=1.37, 95% CI=1.21-1.55). Meanwhile, women who had the lowest income were least likely to be exclusively breastfeeding their newborn at hospital discharge. The finding of income level from this study for exclusive breastfeeding is consistent with the results of the study by Brown et al. (2013) that the lower neighbourhood income is a predictor of a lower exclusive breastfeeding rate. Furthermore, most Canadian studies corroborate this association between poorer breastfeeding outcomes with a lower income (Simard et al., 2005; Clifford et al., 2006, Semenic et al., 2008; Kehler et al., 2009). By showing that income level is a predictor for breastfeeding initiation and exclusivity, providers, policy makers and health care leaders in the province will become more aware of how income impacts breastfeeding success and consider local and provincial strategies to provide more support to those mothers who have financial challenges.

Table 5 Average household income, by adjusted after tax income quintiles, Nova Scotia, 2008

	Total Income	After Tax Income	Total Income Tax
Lowest	\$21,534	\$20,759	\$775
Second	\$42,782	\$39,318	\$3,464
Third	\$60,114	\$52,961	\$7,152
Fourth	\$84,004	\$70,321	\$13,683
Fifth	\$148,956	\$114,489	\$34,468

5.3.4.1.2 Maternal Age

Based on the results of this study, as maternal age increased, breastfeeding initiation also increased. Maternal age also impacted exclusivity of breastfeeding, with women at 20 - 34 years of age at delivery having a higher incidence of exclusive breastfeeding than those younger than 20 years old or older than 35 years old at hospital discharge. Most young mothers have no breastfeeding experience. Therefore, they may need more support from clinical professionals for successful breastfeeding initiation. The investigator's suggestion is that BFI healthcare service centres can provide support of breastfeeding not only from clinical breastfeeding professionals, but also from peer support groups of mothers who had breastfeeding experience and would like to share their experience with new young mothers. For example, The South Shore's Collaborative Breastfeeding Network is a successful prenatal pilot project to reduce barriers in accessing consistent information of breastfeeding in Nova Scotia. The members of the network includes anyone who plays a role in supporting women who are breastfeeding, even volunteers from parent and peer support groups (RCP, 2014c).

5.3.4.1.3 Marital Status

Marital status of mothers has a major influence on breastfeeding initiation and exclusive breastfeeding. Single mothers were less likely to initiate breastfeeding or be exclusively breastfeeding than married or common-law mothers (OR=0.64, 95%CI=0.58-0.71; OR=0.79, 95%CI=0.74-0.84) at hospital discharge. To improve breastfeeding rates of single mothers, the obstetric family physicians, health service centres, prenatal clinics and all other funded healthcare organizations should promote mother-to-mother breastfeeding support groups, for example the La Leche League Canada (LLLC), which is a national organization, encourages, promotes and provides mother-to-mother breastfeeding support and educational opportunities (LLLC, 2014). This organization has trained volunteer leaders who provide experienced mother-to-mother breastfeeding support through a variety of innovative programs and services. It is free to mothers who are trying to breastfeed or breastfeeding their babies. The investigator attended the local LLLC event during the internship and realized that it is a very strong support group for mothers to exchange information and breastfeeding experiences in a casual and supportive atmosphere. At LLLC's events, mothers can not only bring their friends and family but also get support from each other. It is important to influence the knowledge and attitude of women's support circle.

5.3.4.2 Prenatal Predictors of Breastfeeding Outcomes

5.3.4.2.1 Intention to breastfeeding

As identified in the literature review, intention to initiate breastfeeding has been found to be associated with choosing exclusive breastfeeding or formula feeding (Kools, 2005; Kohlhuber, 2008). Determinants of breastfeeding intention included social influence of mothers' partners, positive social norms, knowledge of breastfeeding, and support from family or friends with previous breastfeeding experience (Kools, 2005). Based on the analysis of population data of Nova Scotia, women who had intention to breastfeed, were significantly more likely to initiate breastfeeding (OR=74.63, 95% CI=67.78-82.17, $p<.0001$) and significantly more likely to exclusively breastfeed (OR=24.15, 95% CI=21.49-27.13, $p<.0001$) their newborn at hospital discharge. Social media has become to a popular tool for the public to access helpful information and communicate with each other more conveniently. Tools such as Twitter, Facebook, Pinterest, Blogs and websites can be used to promote breastfeeding policy and provide information about the benefits of breastfeeding province wide. Some pilot projects have been implemented successfully in Nova Scotia. An example is the Breastfeeding Community of Practice Facebook page (<https://www.facebook.com/Breastfeeding.CoP/info>), which is a partnership with IWK Health Centre, Capital Health, community-based health services and mothers who have breastfed. On their page, they share the tips of breastfeeding for first-time mothers, update information about breastfeeding events and provide a peer-to-peer network to develop expertise and problem solve. Another example is the hotline service for supporting breastfeeding in Yarmouth, Nova Scotia. The Yarmouth Friendly Feeding Line (YFFL) is a peer support network for breastfeeding mothers, so mothers receive telephone support from other mothers who have breastfed (Comeau, 2007).

5.3.4.2.2 *Pre-pregnancy BMI*

Pre-pregnancy BMI was chosen as a variable for this study because it had been used in relation to breastfeeding outcomes in the previous literature. Compared to the obese group, the normal weight group were twice as likely to initiate breastfeeding (OR=1.98, 95% CI=1.58-2.49) and exclusively breastfeed (OR=2.44, 95% CI=2.10-2.84) at hospital discharge. These findings are supported by three studies exploring the impacts of obesity on breastfeeding initiation and success, (Mehta, 2003; Scott, 2006; Kohlhuber, 2008) which found that women experiencing obesity had a significantly higher risk of not initiating breastfeeding compared with women with a normal weight. The study by Mok et al. (2008) also reported that mothers with obesity were more likely to report difficulties with breastfeeding while in the hospital.

5.3.4.2.3 *Gestational Weight Gain*

Similarly, the results of the multivariable logistic regression show that weight gain during pregnancy can be significantly associated with breastfeeding initiation and exclusive breastfeeding. Hilson et al. (2005) identified excessive GWG as a high risk factor for breastfeeding initiation failure. In this study, compared to women who had normal pre-pregnancy BMI and gained weight within the recommended range for normal BMI, women who either gained above (OR=0.76, 95% CI=0.69-0.82) or below (OR=0.81, 95% CI=0.73-0.89) the recommended weight were less likely to be exclusively breastfeeding their newborn at hospital discharge. This information is important as it will inform how we counsel women in pregnancy about gestational weight gain and breastfeeding (Hilson et al., 2005). In 2013, the Canadian Obesity Network (CON) convened a working group of nurses, midwives, primary care physicians, obstetricians, researchers and policy makers to adapt the 5As of Obesity Management for pregnancy. The 5As are the 5 key principles of healthy pregnancy weight gain: (1) Ask for permission to discuss weight; (2) Assess potential “root causes” of guideline-discordant weight gain; (3) Advise on pregnancy weight gain risk and management options; (4) Agree on a realistic SMART plan to achieve health behaviour outcomes; and (5) Assist women in identifying barriers and facilitators, educate, refer and arrange follow-up (CON, 2014). The findings related to GWG in this study can provide provincial healthcare providers reliable Nova Scotia evidence on how GWG impacts breastfeeding initiation. Based on the analysis and supporting literature, collaborative efforts are required between healthcare facilities, community-based care providers and women to support and implement initiatives aimed at achieving healthy weight gain in pregnancy and therefore, improving breastfeeding outcomes.

5.3.4.2.4 *Parity*

As demonstrated by the analysis in this study, women who were mothers for the first time were more likely to initiate breastfeeding; however, women who had a previous child were more likely to be exclusively breastfeeding their latest newborn in hospitals (OR=1.48, 95% CI=1.40-1.56). Scott et al. (2006) also found that primiparous women were more likely to initiate breastfeeding than multiparous women. Parity is a strong predictor found in this study. Women who had breastfeeding failure in their first pregnancy were not likely to initiate breastfeeding in the later pregnancies. Many mothers got frustrated from the first failed breastfeeding experience so they

believed that they are unable to breastfeed their second newborn (Uhl, 2009). However, the previous breastfeeding failure does not mean a future inability to breastfeed (Uhl, 2009). Therefore, the support of breastfeeding cannot only focus on the population of new mothers but also needs to consider mothers who had negative breastfeeding experiences but want to breastfeed the second baby.

5.3.4.2.5 *Smoking*

Smoking at the time of admission is another variable negatively associated with breastfeeding initiation and exclusive breastfeeding at hospital discharge. The results of multivariable logistic regression show that women who smoke at the time of admission to hospital, were significantly less likely to initiate breastfeeding (OR=0.47, 95%CI=0.43-0.52, $p<.0001$) or be exclusively breastfeeding (OR=0.61, 95%CI=0.57-0.66, $p<.0001$) at hospital discharge. These findings are supported by the literature. Three studies (Dennis, 2002; Theofiliogiannakou, 2006; Hilson, 2005) found that smoking during pregnancy was inversely related to breastfeeding initiation and exclusive breastfeeding. The significantly lower breastfeeding rates in both breastfeeding initiation and exclusive breastfeeding in this study show evidence that strategies aimed at smoking reduction or cessation before or during pregnancy will enhance the likelihood that a woman chooses to breastfeed her newborn. Currently in Nova Scotia, there are smoking cessation programs available for the public; however, few are directed specifically at women of childbearing age or pregnant women. There is a smoking cessation program for pregnant women offered in-hospital at the IWK Health Centre and there are accepted pharmacological and non-pharmacological approaches to smoking reduction and cessation in pregnancy (IWK, 2006; DHW, 2011). Smoking cessation is one of the key perinatal indicators selected in the consultation process by RCPNS.

5.3.5 **Limitations**

Limitations for this study stem from the degree of missing variables in the dataset and timeline limitations. Absence of information is often attributed to limited documentation by clinicians but may also be related to coding error. There is no information on exclusive breastfeeding duration in the NSAPD as the data is captured from the hospital birth admission. Although efforts are underway to create the infrastructure for capturing breastfeeding duration data, the current data source for breastfeeding duration for Nova Scotia is not available for this project. However, the information of exclusive breastfeeding in hospitals is available from the NSAPD.

Another important piece of information missing is maternal immigration status. Based on the 2009-2010 Canadian Community Health Survey results, immigrant women in Canada are more likely to initiate breastfeeding than those who were born in Canada (Health Canada, 2010). Ethnicity was determined to be a significant predictor of exclusive breastfeeding initiation in the literature review. However, ethnicity information was not well captured in the NSAPD for the time period selected for this study. Hence, this study may have limited generalizability to larger Canadian urban areas with a high proportion of visible minorities. The visible minority rate was 5.2 per cent of the

province's population, which is a fraction of the 19.1 per cent visible minority rate across Canada in 2011 (Stats Canada, 2011).

In addition, this study focused on sociodemographic and prenatal factors of breastfeeding initiation and exclusive breastfeeding. However, intra-partum factors can also be important for predicting breastfeeding outcomes (Colledge, 2011).

6. Conclusion

Maternal and infant benefits of breastfeeding have continuously been shown in the literature (WHO, 2002). This internship project confirmed that sociodemographic and prenatal factors are strong predictors of breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia. The investigator found that increased maternal age, being partnered and higher income positively influenced breastfeeding outcomes. Smoking and increased pre-pregnancy BMI have negative relationships with breastfeeding outcomes. Weight gained during pregnancy can significantly impact on breastfeeding outcomes for both those women with normal BMI and too high or too low GWG resulting in a reduction in the initiation of breastfeeding and exclusive breastfeeding at hospital discharge. Future studies should address the healthcare and social barriers that impact on breastfeeding initiation and exclusive breastfeeding to inform potential policy and practice strategies.

Being a candidate health informatician, my goal is to help transform healthcare by providing essential information to clinicians, scientists and policymakers when and where they need it. The role of the health informatician is to bring clinical practice and IT together, improve patient care, make the value of health information more visible, reduce the burden of unnecessary costs in healthcare, and improve communication among members of interdisciplinary teams. In this internship, the intern has applied the knowledge gained from academic health informatics training: health indicators, statistics for health information, and research methods, to achieve the primary goal of studying NSAPD data and determining the sociodemographic and prenatal predictors of breastfeeding initiation and exclusive breastfeeding in hospitals in Nova Scotia. Contributions of the project to wider breastfeeding initiatives are evident and positive feedback was received from the project supervisor and colleagues.

7. Recommendations

Health Informatician as a new role in health care system in Canada, has a social commitment to deliver information of health promotion and illness prevention on both an individual and a population perspective. As a candidate health informatician, the intern will continue working with RCPNS on improvement of breastfeeding outcomes in Nova Scotia after the internship. As previously mentioned in the discussion of statistical analysis results, there are many examples of promotion and support for breastfeeding for first-time mothers. However, the support for mothers who had poor experience of breastfeeding in the first pregnancy is very weak. To overcome an unsuccessful breastfeeding experience at the first pregnancy, eHealth tools could be applied to provide more efficient and convenient support to those mothers. These tools could prevent a repeat of breastfeeding failure in their later pregnancies. For example, the HealthLink811 is a good telehealth tool to provide breastfeeding consulting by clinical professionals. The online community of practice also could be used to recruit mothers who had experience of breastfeeding to provide mother-to-mother support. Mobile applications are another option to consider and could be used to provide e-learning breastfeeding teaching modules and videos to mothers.

As RCPNS is in the process of developing and disseminating a provincial indicator on breastfeeding, it is recommended that RCPNS share the information from this project with stakeholders to increase the understanding of, and support for this indicator, and for the importance of targeted strategies to promote breastfeeding in the province.

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Appendix A – List of Abbreviations Used

BCC	Breastfeeding Committee for Canada
BFHI	Baby-friendly Hospital Initiative
BFI	Baby-Friendly Initiative
BMI	Body Mass Index
CIHI	Canadian Institute of Health Information
CON	Canadian Obesity Network
DHAs	District Health Authorities
DHW	Department of Health and Wellness
GWG	Gestational Weight Gain
LLLC	La Leche League Canada
NSAPD	Nova Scotia Atlee Perinatal Database
PBSC	Provincial Breastfeeding Steering Committee
QAIPPE	Income per single person equivalent
RCPNS	Reproductive Care Program of Nova Scotia
ROC	Receiver Operating Characteristic
SOGC	The Society of Obstetricians and Gynaecologists of Canada
UNICEF	The United Nations Children’s Fund
WHO	World Health Organization
YFFL	Yarmouth Friendly Feeding Line

Appendix B – Presentation of Literature Review

Determinants of Exclusive Breastfeeding Initiation in Developed Countries: Systematic Review



Emily Wang
May 30, 2014

Reproductive Care Program of Nova Scotia

Agenda

- Introduction
- Literature Review
- Results
- Discussion
- Conclusion

Introduction

- What is exclusive breastfeeding?
 - Exclusive breastfeeding means that the infant receives only breast milk. No other liquids or solids are given – not even water – with the exception of oral rehydration solution, or drops/syrups of vitamins, minerals or medicines.



Why exclusive breastfeeding is so important?

- Benefits for infants
- Benefits for mothers
- Benefits to employers
- Benefits to community

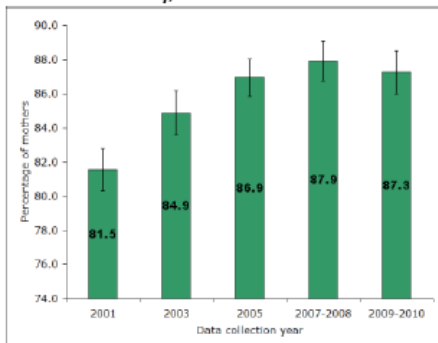
Breastfeeding
Mother's milk is the BEST food for newborns and young babies

- It provides all the necessary nutrients
- It's safe and requires no preparation
- It contains antibodies

Breastfeeding is also good for MOTHERS

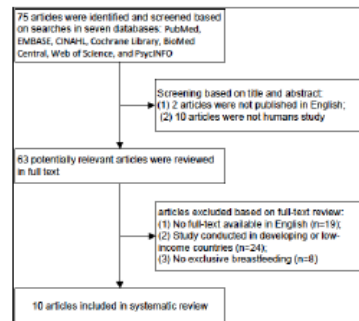
- It helps with weight loss after childbirth
- It reduces the risk of type 2 diabetes and breast and ovarian cancer
- It lowers the risk of anemia

Percentage of mother who breastfed or tried to breastfeed their last baby, Canada 2001 to 2009-2010



Source: Health Canada

Literature Review



Determinants of Exclusive Breastfeeding Initiation

- Maternal experience and exposure to breastfeeding
 - Intention to initiate breastfeeding
 - Support
- Family socio-demographic determinants
 - Household income
 - Education level
- Biomedical determinants

7

Five circles of support



8

Discussion

- Interventions should focus on overcoming the barriers of exclusive breastfeeding, such as family support, education, pre-pregnancy weight control.
- To better understand the relationship between different groups of determinants of exclusive breastfeeding initiation.

9

Conclusion

- Promote breastfeeding friendly in public
- Facilitate new/previous breastfeeding failed mothers
- Investigate the further barriers of exclusive breastfeeding initiation and deliver the efficacy of intervention to overcome the barriers.

10

Thank You and Question



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