

Dear Colleagues:

The Better Outcomes Registry & Network (BORN) Ontario is pleased to release this series of reports that provide an overview of the 2009–2010 fiscal year maternal-newborn outcomes for hospitals within Local Health Integration Networks (LHINs) in Ontario. There are five reports of combined LHINs corresponding to perinatal regions in Ontario. In September 2010, a companion series of seven reports for public health regions in Ontario was distributed.

We hope you find this report informative and useful for guiding policy decisions for maternal and newborn issues in your region. Please share this report and use it to guide discussions with colleagues about how to improve programs or learn from others about best practices.

Please feel free to provide BORN Ontario with any feedback about how this report could be improved or suggestions for further targeted reports to enhance understanding of particular issues.

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Preface

The Better Outcomes Registry & Network (BORN) Ontario (formerly the Ontario Perinatal Surveillance System) is pleased to present this *Perinatal Health Report* for hospitals within Local Health Integration Networks (LHINs) 5 to 9 for the Greater Toronto Area (GTA). It provides data on maternal and newborn health and outcomes of interest to maternal-newborn care providers, administrators, LHIN personnel, government and families in Ontario, for the 2009–2010 fiscal year, and with 5-year trends where possible.

The content and presentation of this report by BORN Ontario differs from previous reports by the Ontario Perinatal Surveillance System in a number of ways. For the first time, we are reporting data by combined LHIN regions for the entire province. Some data are presented for individual LHINs within the region and others focus on the region itself, particularly when numbers are small. In response to input received from hospital care providers, BORN has added a number of new figures to this report, has included definitions for all of the indicators, and has provided additional background information and data interpretation. We greatly appreciate the on-going support of our hospital and regional network colleagues for their assistance and input into the content of these reports.

Quality perinatal health care requires that hospitals work in partnership with colleagues in public health and community agencies. The continuum of care during pregnancy and birth takes women and families from home to offices, clinics, and hospitals, with return for follow-up care to these community settings after the birth. Our hope in providing these data is that they will be used by those providing care in public health, community and acute care settings to stimulate discussions and partnerships to solve common maternal and newborn care issues. We also encourage you to use these data to facilitate program management, benchmarking, quality improvement initiatives, planning, evaluation and research.

Suggestions for future reports can be directed to any member of the BORN team (see **APPENDIX A** for contact information) or to Ann Sprague, Scientific Manager of BORN Ontario (asprague@ottawahospital.on.ca).

Acknowledgements

BORN Ontario would like to acknowledge the tremendous work of the hospital personnel and regional maternal/newborn programs we consulted in developing content for this report. We particularly appreciate the guidance of the former Child Health Network (CHN) in Toronto and the former Perinatal Partnership Program of Eastern and Southeastern Ontario (PPESO) who had previously produced regional reports. As we plan for future reports, we are especially interested in hearing from Northern LHINs, smaller hospitals and other regional networks with respect to indicators that are of particular relevance to them. We appreciate the guidance provided by the Scientific Working Group of BORN Ontario and thank them for their contribution.

We also thank BORN Ontario partners who contributed data for this report – Jennifer Milburn from Newborn Screening Ontario, Tianhua Huang from the Ontario Maternal Multiple Marker Screening Program, Seetha Raja from the Ontario Midwifery Program, Vivian Holmberg on behalf of the Ontario Midwifery Program and Alex Rishia who provided data from the Ontario Ministry of Children and Youth Services. Special thanks to Brittan Fell and David King of BORN Ontario who provided help with lay-out for the report, and Karine Tawagi and Yanfang Guo who helped produce graphs.

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About the Better Outcomes Registry & Network (BORN Ontario)

BORN Ontario (formerly the Ontario Perinatal Surveillance System) was funded in January of 2009 by the Ontario Ministry of Health and Long-Term Care (MOHLTC). BORN Ontario would like to acknowledge the tremendous vision and support of the Ministry of Health and Long-Term Care in helping us to meet our goals and progress towards our mission of being an authoritative and definitive source of accurate and timely information to monitor, evaluate and plan for the best possible beginnings for life-long health.

BORN operates under the auspices of the Children's Hospital of Eastern Ontario and is recognized (as of November 2009) as a registry of personal health information under the Ontario *Personal Health Information Protection Act* (PHIPA). The focus of BORN Ontario has been to work on:

- Building capacity to enhance data quality, data output, research activities, and reporting.
- Improving data capture to include all hospitals and midwifery practices. As of November 2009, all Ontario hospitals with maternal-newborn services are contributing data.
- Developing a new database to integrate data from the five founding partners – Ontario Maternal Multiple Marker Screening Database, Fetal Alert Network, Niday Perinatal and NICU/SCN Databases, Ontario Midwifery Program Database and Newborn Screening Ontario to permit future analysis, research and reporting across multiple touch points within the maternal-newborn continuum of care.
- Developing and submitting privacy and security policies and procedures for review by the Ontario Information and Privacy Commissioner, required by PHIPA registry status.
- Communicating our mission, vision, and activities to all groups who will work with the organization as we move forward.

For those wishing to access BORN Ontario data for research or quality improvement projects, an outline of the process and guidelines can be found in **APPENDIX B**.

Executive Summary

The purpose of this report is to provide an overview of maternal-newborn indicators and trends for policy makers, hospitals, Local Health Integration Networks (LHINs) and clinicians providing maternity services. Greater Toronto Area (GTA) LHINs provide obstetrical services to more than half (52.7%) of Ontario residents who give birth in Ontario hospitals each year, thus effective and efficient delivery of obstetrical health services in the five LHINs that make up the GTA is extremely important. There are many factors that influence the demands on both general and highly specialized obstetrical and neonatal services. These include, but are not limited to, the background characteristics and health of the obstetrical population (such as maternal age and underlying medical co-morbidities), risk factors (such as multifetal gestation and previous cesarean), obstetrical practices with regard to the use of intrapartum interventions (such as labour induction and primary or repeat cesarean delivery), and prevalence of adverse newborn outcomes (such as preterm birth, growth restriction, and birth depression).

Some key findings from this report that directly relate to or strongly influence the delivery of obstetrical health services and quality care in the GTA are summarized here:

Health services utilization:

- Although the majority of women in the GTA give birth in the LHIN in which they reside, there is considerable mobility across LHIN boundaries. In particular, about 41% of women who give birth in the Toronto Central LHIN reside in another LHIN. There are a number of explanations that likely influence these care patterns, including availability of high-risk obstetrical care services, geographic proximity to a hospital in a neighbouring LHIN, capacity issues, and maternal choice.
- In 2009–2010, a total of 967 women in midwifery care gave birth at home.
- There were a total of 412 maternal inter-hospital transfers resulting in a delivery that occurred in a GTA hospital in 2009–2010, of which 73 (17.7%) were from a hospital outside of the GTA LHIN Region. Among the remaining 339 maternal transfers that occurred between GTA hospital sites, 262 (77.1%) were to a hospital with a higher level of care.

Awareness of patterns of health services utilization are essential for service planning to ensure that adequate resources are available and that the health care system supports appropriate access to services as close to home as possible.

Appropriateness:

- The proportion of live births between 24–31 weeks of gestational age that were born **outside** a Level III hospital (the optimal level of care for this gestational age) increased between 2005–2006 and 2008–2009 from 32.5% to 42.6%. However, in 2009–2010, this trend showed evidence of change with the proportion of live births between 24–31 weeks born outside a Level III hospital decreasing to 33.2%.
- Less than a quarter (21.3%) of infants born during a gestational period where survival is extremely low (<24 weeks' gestation) were born at a Level III centre (26 out of 122 live births). The reasons why these infants are not reaching tertiary care are likely complex and include a 'grey zone' in terms of survival/long-term outcome, parental wishes, and no clear clinical practice guidelines to guide care providers in a situation that can change almost daily.

Preterm infants born in hospitals equipped to deal with their complex needs have better outcomes than infants born outside these hospitals who require transport after birth, or who stay in hospitals with lower levels of neonatal care and support. Monitoring births at various levels of care is an important strategy to ensure adequate system resources and ultimately to improve patient safety and outcomes.

Population profile:

- More than one in five women (25.4%) who gave birth in 2009–2010 in the GTA were 35 years of age or older. Between 2005–2006 and 2009–2010, the proportion of women giving birth in the GTA who were ≥ 35 years of age increased slightly, from 23.6% to 25.4%.
- In 2009–2010, 24.8% of women had one or more pre-existing health conditions and 24.3% had one or more obstetrical complications during their pregnancy.
- In 2009–2010, the rate of preterm birth in the GTA LHIN Region was 8.1% and changed very little between 2005–2006 and 2009–2010. The corresponding number of babies born at <37 weeks of gestational age in 2009–2010 was 5,854.
- Rates of small for gestational age (SGA) were very stable between 2005–2006 and 2009–2010 in the GTA. In 2009–2010, 10.5% of singleton live births were SGA.
- The multiple birth rate in the GTA LHIN Region in 2009–2010 was 3.7%, corresponding to 2,739 infants. The rate of multiple birth was considerably higher in Toronto Central LHIN.

Having contemporary information on characteristics of the maternal-newborn population and monitoring trends in these characteristics is important for system planning. With the distribution of age at the time of birth continuing to shift and complications associated with increasing age in pregnancy known, system planners and funders will need to project service needs.

Intrapartum interventions:

- The rate of labour induction in the overall obstetrical population was 23.0% and in low-risk nulliparous women was 30.6% in 2009–2010. The rate of labour induction in low-risk nulliparous women increased between 2005–2006 and 2009–2010 (from 28.1% to 30.6%).
- The rate of cesarean delivery among women with a term singleton who had given birth by cesarean in a previous pregnancy has increased and in 2009–2010, it made the largest contribution to the overall rate of cesarean delivery (29.4%). Reducing primary cesarean deliveries is one of the most important strategies for reducing the total cesarean rate. Following best practice guidelines for care during labour and initiating an audit and feedback mechanism to monitor practice patterns are important strategies for hospitals and regional programs.

Increases in intrapartum interventions have important implications, since they can affect service requirements and capacity issues.

Effectiveness:

- In 2009–2010, 91.7% of women had electronic fetal monitoring (either alone or in combination with auscultation) at some time during their labour. The proportion of women who received auscultation only during labour was 6.5% in the overall obstetric population and 10.8% in low-risk women. Given that clinical practice guidelines recommend auscultation as the primary method of surveillance in low-risk women in labour, there is room for improvement. In the general population, high rates of

inductions and epidural analgesia lead care providers to use EFM. Clinical practice guidelines also support auscultation in low-risk women undergoing epidural analgesia.

- The proportion of elective repeat cesarean deliveries at term in low-risk women not in labour performed prior to 39 weeks was 63.0% (6.4% at 37 weeks and 56.6% at 38 weeks) in the GTA, higher than the other regions of the province. There is clear evidence that this practice can lead to complications in the newborn and in the absence of medical or obstetrical indication, elective repeat cesarean deliveries should be delayed until at least 39 weeks.
- Across the GTA in 2009–2010, 18.4% of women (1,079 out of 5,866 women) who were induced and had a documented indication of post-dates pregnancy were <41 weeks of gestational age at the time they gave birth. This was particularly high in Central West (27.5%), Central (26.4%) and Central East (25.0%) LHINs.
- 58.9% of term live born babies were being exclusively breastfed at the time they were discharged from hospital. A further 30.9% of term infants were being supplemented at the time of discharge (i.e., they received a combination of breast milk and formula or other supplement). Breastfeeding support and supplementation rates need further investigation. [Note that breastfeeding rates for the GTA region are based on denominators that exclude a substantial proportion of their population of term live births due to incomplete collection of breastfeeding information in some hospital sites.]
- A high proportion of women (94.7%) delivering at term were screened for Group B Streptococcus.

Best practice guidelines exist for the areas listed above and based on these findings, there are areas where improvement is needed. These examples illustrate where continuous quality improvement initiatives could be implemented. LHINs, hospitals and regional maternal-child programs can examine their data in these areas and design quality improvement programs to improve these indicators where needed.

Future direction:

With the development of the new BORN Ontario database that will be implemented in the fall of 2011, it will be soon possible to examine new variables related to maternal child health, for example, maternal pre-pregnancy body mass index, pregnancy weight gain, Bishop's Score and pregnancy outcomes for women with a positive maternal serum screen. The database has been designed to collect data by **encounter**, which is a health care interaction involving a patient and the provision of services (e.g., a lab test; a delivery; an ultrasound, a newborn screening), and will collect data from multiple encounters during pregnancy, birth and early childhood. With this system architecture, it will be possible to look at individual encounters as well as to look the full perinatal care continuum. Of course, with expansion, ensuring data quality is a high priority. The new BORN database will have improved real-time data verification processes to prevent errors and identify data discrepancies prior to saving a record.

Data provided by the BORN system will help inform health system planners, funders, policy makers, care providers, and women and families about care practices in Ontario. Feedback of data is one of the first steps to enhance awareness of what is being done well and areas for improvement in care. One feedback mechanism that is under development for the new BORN Ontario database is a standardized clinical dashboard to measure performance on key maternal newborn indicators. This innovative project will help Ontario hospitals meet the requirements set out in the newly legislated Excellent Care for All Act (2010) by helping them identify areas where they are doing well and areas where there is room for improvement. BORN Ontario looks forward to being an important partner for transforming data into information and knowledge to help Ontario mothers, children and families have the best possible beginnings to lifelong health.

Introduction

This report is based on data primarily from the 2009–2010 fiscal year; however, five-year trends are presented for some variables. The data originate chiefly from the BORN Ontario–Niday Perinatal Database, but also includes other sources of data. The report is divided into six chapters: Regional Profile; Pregnancy; Maternity Health Services; Birth; Postpartum and Newborn; and Maternal and Newborn Screening. The objectives of this report are to:

- Highlight maternal-newborn issues and trends arising from the analysis
- Present a baseline for future examination of trends

As of November 2009, all hospitals in Ontario with maternal-newborn services are contributing data to the Niday Perinatal Database within BORN. However, for this report of the 2009–2010 fiscal year, it is estimated that approximately 97% of the hospital births in the province were captured. As the new BORN Ontario database is developed throughout 2010–2011, all BORN founding partners will be contributing data and we expect to have a more robust system capable of longitudinal analysis of mothers, fetuses and newborns.

This year, for the first time, we are able to provide reports for all areas of the province. With the exception of a few figures in Chapter 1, the unit of analysis in this report is the Local Health Integration Network¹ (LHIN) region, based on the deliveries that take place in a hospital in one of the LHINs in the region (i.e., based on location of birth). For the companion series of reports on public health units, the unit of analysis is the public health region, based on maternal residence in the region, as opposed to location of birth. Both series of reports (available on the BORN website: www.bornontario.ca) differ from previous reports in several ways. Each indicator is now accompanied by its definition, including clarification of the numerator and denominator used for calculation. For graphs that provide a breakdown by individual LHIN, comparison at the regional and the provincial level is provided. Where five-year trends are reported, we have added 95% confidence levels to the estimates.

We will continue to improve reports as BORN Ontario grows and develops. Future reporting plans include adding GIS mapping for some indicators, as well as increasing the number of indicators for which we provide confidence intervals. We welcome your comments about how reports can change and improve in the future to best meet your needs. If you have specific requests for new indicators, suggestions to change existing indicators, or ideas for specialized reports, please contact a member of the BORN Ontario team (see **APPENDIX A** for contact information).

Finally, because BORN Ontario is a web-based system, we are able to add data variables to respond to emerging health issues. The most recent example is our collection of three variables on H1N1 and other influenza-like illnesses in pregnancy, treatment with antiviral medication and receipt of influenza vaccine during pregnancy. This process was implemented on November 2, 2009 for a one-year data collection period. Please visit the BORN Ontario website for more information and to view reports on the findings for this data collection initiative.

Methods

Data Sources

This report was prepared using data from several of the BORN Ontario databases, but the majority of data presented in this report originate from the BORN–Niday Perinatal Database. Information for all births (live births and stillbirths) at ≥ 20 weeks' gestational age is collected in the Niday Perinatal Database. The database does not collect information on pregnancies that end in miscarriage before 20 weeks' gestation or terminations of pregnancy for fetal anomalies at any gestational age.

The Niday Perinatal Database is a web-based system into which data on mothers and babies are directly entered either by care providers or data entry clerks, or extracted and uploaded by a hospital's electronic patient record. The Niday Perinatal Database has been operating in Eastern and Southeastern Ontario since 1997 and has undergone tremendous expansion in recent years. In 2009–2010, the principal time period reflected in this report, approximately 97% of all hospital births in Ontario were entered into the database. As of November 2009, all hospitals in the province with a maternal-newborn program are now engaged with BORN Ontario; therefore, future reports will be able to provide a complete, population-based picture of perinatal health in the province of Ontario.

BORN Ontario recently compared the number of hospital births captured in the Niday Perinatal Database with those captured in the Canadian Institute for Health Information's Discharge Abstract Database (DAD). The table below shows the number of hospital births captured by the Niday Perinatal Database, expressed as a proportion of the total number of hospital births captured in the DAD over five fiscal years. It is important to consider this expansion of data collection activities in relation to the graphs that present 5-year trends in this report, since a change in a rate over time may be due to an improvement in data capture rather than a true temporal trend.

Total number of ON hospital births	Fiscal year				
	2004–2005	2005–2006	2006–2007	2007–2008	2008–2009
BORN	113,220	120,803	125,724	136,980	139,278
DAD	137,996	139,159	141,173	144,240	142,896
% captured by BORN	82.05%	86.81%	89.06%	94.97%	97.47%

Indicators

The process for choosing indicators for the LHIN reports primarily consisted of looking at previous reports by the Child Health Network (CHN) in the Greater Toronto Area (GTA) and the Perinatal Partnership Program of Eastern and Southeastern Ontario (PPESO).^{2,3} Both of these groups had active Niday Perinatal Database subcommittees that advised them on data needs. Consultations with these groups were held in the spring and summer of 2009 to gain further insight on types of analysis. Additionally, in response to advice provided by the Scientific Working Group of BORN, national perinatal surveillance reports^{4,5} were reviewed to ensure consistency between provincial and national reporting and to enhance our ability to contribute to national data initiatives.

Data Analysis

This report presents maternal and infant data primarily for births that occurred during the fiscal year 2009–2010 (April 1, 2009–March 31, 2010); however, selected indicators are presented for a time period of five fiscal years, from April 1, 2005–March 31, 2006 to April 1, 2009–March 31, 2010. A 5-year dataset was extracted from the Niday Perinatal Database in September 2010. **Only hospital births to residents of Ontario were included in the dataset** (records in the Niday Database for home births and for births in Ontario hospitals to women from other Canadian provinces/territories or from other countries were excluded). Hospital births attended by midwives are included in these analyses. Information on home births attended by midwives was provided by the Ontario Midwifery Program and is included in this report, but presented separately (see Figure 1.7).

The majority of the information in this report is analyzed by LHIN of birth. When hospitals enter maternal-newborn data into the Niday Perinatal Database, records are automatically assigned to a LHIN based on the location of the hospital. A few figures in Chapter 1 of this report also present data based on LHIN of maternal residence. The process for assigning LHIN of maternal residence is based on the methodology developed by the Ontario Ministry of Health and Long-Term Care, whereby residential postal code information is merged to the July 2009 Postal Code Conversion File and subsequently to the LHIN Version 11 correspondence file. A manual process of assigning records to a LHIN of maternal residence is carried out, where possible, if the postal code is invalid or unknown using other data fields.

This report presents descriptive statistics, predominantly proportions. No statistical tests have been conducted on these data; therefore, differences in estimates across subgroups, or over time are not necessarily statistically significant and should be interpreted cautiously.

In order to quantify the precision of the point estimates (i.e., proportions) for indicators that are presented over a five-year period, 95% confidence intervals were calculated. The 95% confidence interval can be defined as a range that contains the true value of the point estimate 95% of the time.⁶ The width of the 95% confidence interval conveys important information about the variability of the point estimate — the narrower the confidence interval, the less variability and the greater the precision of the estimate. To a certain extent, the 95% confidence interval can provide useful information for comparing two rates. A very clear description of this application in the context of perinatal data can be found in Appendix B of the Canadian Perinatal Health Report, 2008 Edition.⁴ **Nevertheless, it is important to be mindful that the BORN–Niday Perinatal Database has been evolving rapidly in recent years, and temporal changes in some estimates over the 2005–2006 to the 2009–2010 time period may be related to changes in the**

number of hospitals that contributed birth records to the database or the completeness of data collection over this five-year period.

Every effort has been made to present data with enough detail to be meaningful, while upholding BORN's responsibility to protect the confidentiality of individual mothers, infants, care providers, and health care facilities. For this report, information is presented in aggregate form. Where aggregate information was based on five or fewer records, the information was either excluded from the report or was aggregated at a higher level.

Records that were missing information for a particular indicator were excluded from analyses of that indicator. As a result, the effective denominator size used for analysis occasionally varied across graphs. Footnotes have been added to the figures to alert the reader when more than 10% but less than 30% of records for a particular estimate were missing information. Due to validity concerns, we excluded estimates for which $\geq 30\%$ of records were missing information for that indicator. Footnotes have also been added where needed to clarify other aspects of data quality.

Data Presentation

Most of the data in this report are presented using bar graphs and line graphs. When reviewing each figure, it is important to be cognizant of the scale (i.e., the y-axis) and the denominator, as both of these parameters will vary from graph to graph depending on the indicator being presented. At the bottom of each figure, a definition of the indicator, including information on the numerator and denominator, is provided. Additionally, data tables and data labels have been used in all graphs for clarity.

Throughout the report, many of the indicators have been presented by LHIN of birth. These graphs present the estimate(s) for each LHIN, and for comparison purposes also present the LHIN region as a whole, and the overall estimate for the province of Ontario.

Data Quality

In 2009, a quality audit of the BORN–Niday Perinatal Database was completed. In this audit, information from the patient record was re-abstracted in order to assess concordance (accuracy and completeness) between the data in the database and the original maternal and infant charts. An additional component of this audit was to survey database stakeholders to learn more about site-specific data collection and entry processes, report generation capability and overall usefulness of the database. A manuscript from this project has been accepted for publication in a scientific journal.⁷ Results from the full report are available by contacting BORN Ontario.

BORN Ontario also performs ongoing data quality checks. At quarterly and annual intervals, data are downloaded and compiled into standardized data quality reports. This process requires each hospital to verify the number of births per month, address data elements with greater than 5% missing data, and respond to individual records that appear to contain logic conflicts. These ongoing activities, as well as the results of the 2009 Niday Perinatal Database data quality audit, are used to improve the system and help sites collect and enter data more efficiently. For example, more logic and verification rules that question conflicts when data are entered have been added and the number of mandatory data fields has been increased. To further enhance data quality and consistency, a data normalization exercise has been

undertaken as part of the build of the new BORN database to reduce duplication of data collection among the partners.

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CHAPTER 1 PROFILE OF GREATER TORONTO AREA LHIN REGION AND OBSTETRICAL POPULATION

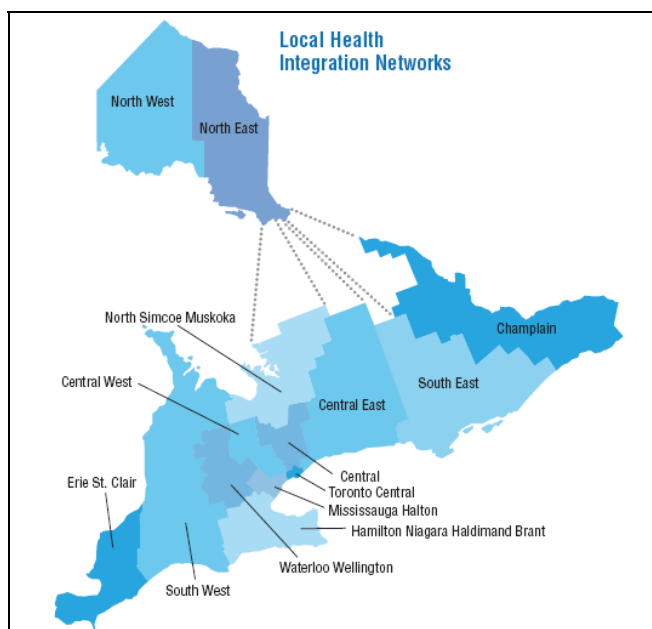
Introduction

The Greater Toronto Area (GTA) is comprised of the City of Toronto and surrounding regional municipalities of Durham, York, Peel and Halton. With over 5 million people and more than 140 languages and dialects spoken, the GTA is the largest and most diverse metropolitan area in Canada.¹ More than half of the province's births take place at a hospital in the GTA.

The GTA Local Health Integration Network (LHIN) Region includes LHINs 5 to 9. Together, these five LHINs include an estimated population of 5,803,606.

LHIN Number	LHIN Name	Population
5	Central West	739,957
6	Mississauga Halton	1,008,004
7	Toronto Central	1,090,301
8	Central	1,532,649
9	Central East	1,432,695
5–9	GTA REGION	5,803,606

Source: Statistics Canada. 2006 Community Profiles [cited 20 Apr 2010]. Available from: <http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-591/index.cfm?Lang=E>.



Source: Cancer Care Ontario: *Insight on Cancer. News and Information on Breast Cancer and Screening in Ontario*. Toronto: Canadian Cancer Society (Ontario Division), October, 2007 [cited 28 Mar 2011]. Available from: <http://www.cancercare.on.ca/common/pages/UserFile.aspx?fileId=13832>.

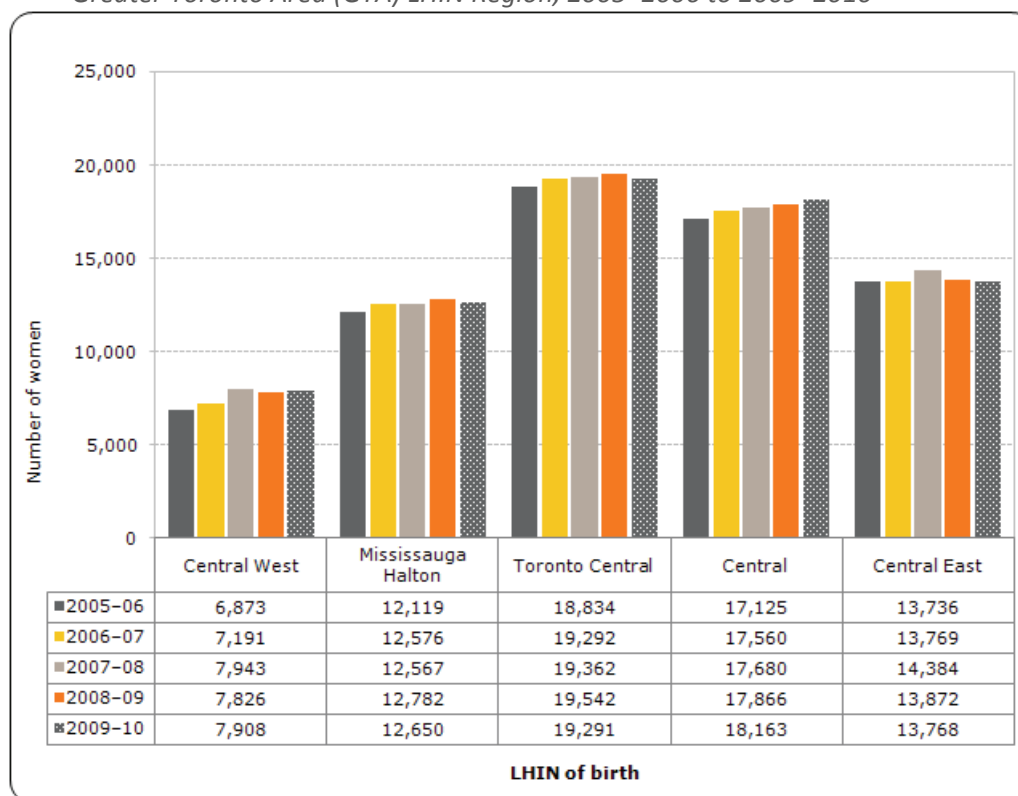
During this reporting period, the Child Health Network (CHN) was an active partner in the delivery of maternal-newborn services in the GTA. The CHN worked with hospital and community providers in the GTA and developed a shared vision to promote a sustainable and responsive maternal, newborn, and child health care system.² The CHN closed in September 2010. BORN Ontario, in partnership with the Provincial Council for Maternal Child Health (PCMCH), is committed to continuing the important work initiated by the CHN with respect to facilitating partnerships, sharing data and supporting quality improvement strategies within the GTA.

This report presents data for Ontario women who gave birth in a hospital in one of the five LHINs of the GTA region. **Readers of previous GTA reports produced by the CHN should note that this report expands the boundaries of the CHN, and therefore will differ slightly from previous GTA reports.** The total number of GTA hospital sites whose data are included in this report can be found in **APPENDIX C**. Women who resided in the GTA and gave birth at home under the care of a midwife are presented separately within this report (see Figure 1.7).

The first set of figures in this chapter portrays the distribution of births across the region. Although the majority of women in the GTA give birth in the LHIN in which they reside, there is considerable mobility across LHIN boundaries. Clinical reasons prompt some of this movement, as some women will need to travel in order to access specialized care, but the reasons why women travel to give birth cannot always be determined from the data available within the BORN–Niday Perinatal Database. Geographical proximity to a hospital in a neighbouring LHIN, access to care providers, capacity issues,³ change of residence during pregnancy and seeking care near to one’s workplace rather than one’s residence may all contribute to these patterns. Awareness of these patterns is essential for health services planning to ensure that the health care system supports appropriate continuity of care for mothers and babies when they return to their home communities, and to ensure that adequate levels of service are available as close to home as possible.



Figure 1.1 Number of women who gave birth, by LHIN of birth and fiscal year
Greater Toronto Area (GTA) LHIN Region, 2005–2006 to 2009–2010



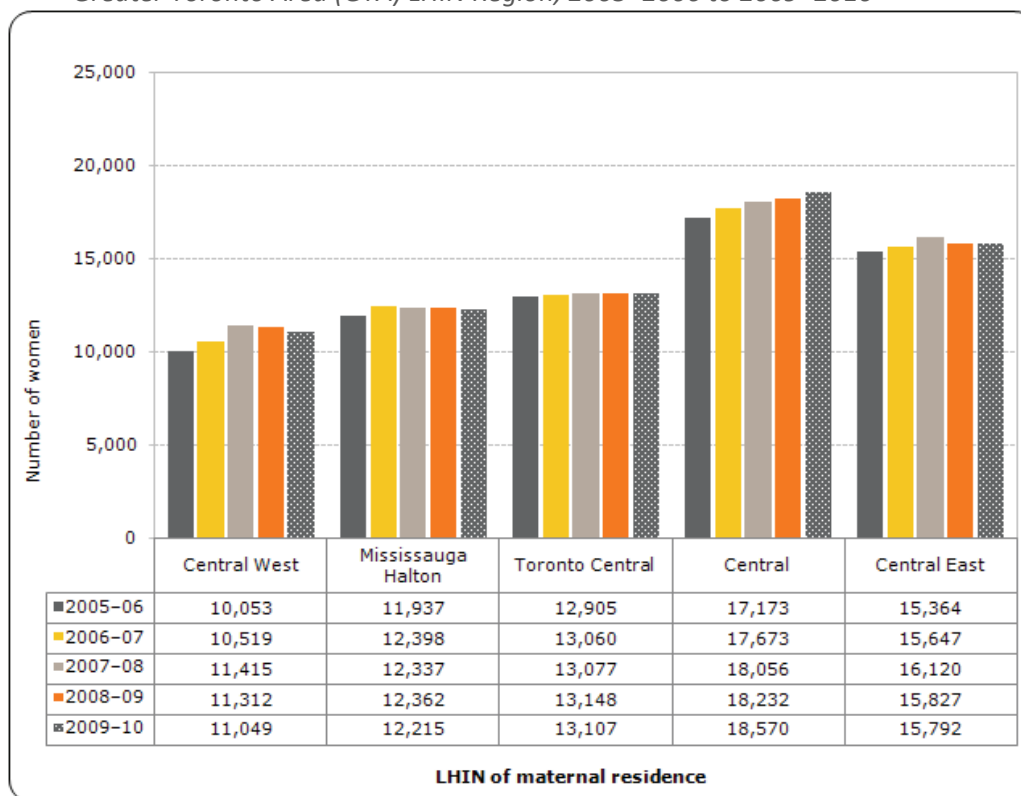
Data source BORN Ontario (Niday Perinatal Database), 2005–2006 to 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The number of women who gave birth in a hospital in one of the five LHINs in the Greater Toronto Area (GTA) in 2005–2006 to 2009–2010.

Notes: 1. The total number of women who gave birth in a GTA hospital by fiscal year was: 2005–2006: 68,688; 2006–2007: 70,388; 2007–2008: 71,936; 2008–2009: 71,887; 2009–2010: 71,780.

- The number of women who gave birth in a hospital in one of the five LHINs in the GTA in 2009–2010 was 71,780. This represents 52.7% of the total number of Ontario women who gave birth in an Ontario hospital in 2009–2010 (136,223). The GTA LHIN with the largest number of women who had a hospital birth in 2009–2010 was Toronto Central LHIN (19,291).
- Between 2005–2006 and 2009–2010, the total number of women who gave birth in a hospital in the GTA LHIN Region increased by 4.5% from 68,688 to 71,780.
- Although Central LHIN is a region of growth, some of the increase in the number of women who gave birth in a Central LHIN hospital from 2006–2007 to 2007–2008 can be attributed to the adoption of the Niday Perinatal Database by Headwater Healthcare Centre in Orangeville in 2006–2007 and by Stevenson Memorial Hospital in Alliston commencing in the spring of 2008.

Figure 1.2 Number of women who gave birth, by LHIN of maternal residence and fiscal year
Greater Toronto Area (GTA) LHIN Region, 2005–2006 to 2009–2010



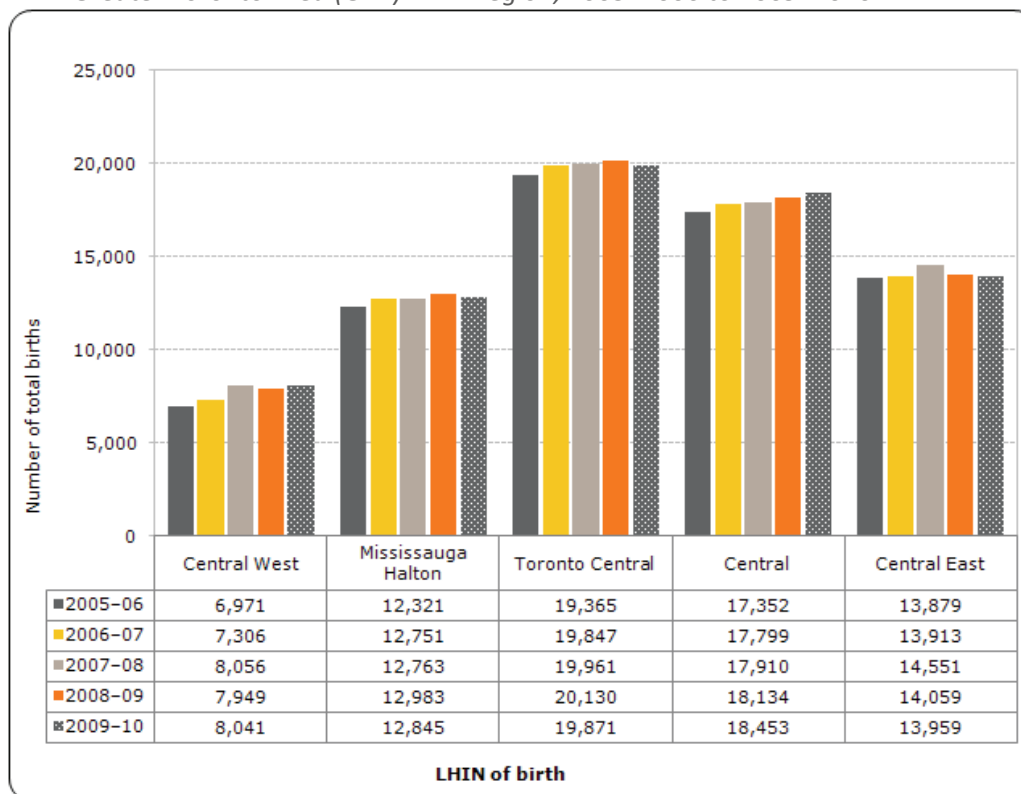
Data source BORN Ontario (Niday Perinatal Database), 2005–2006 to 2009–2010
Local Health Integration Network (LHIN) based on maternal residence

Definition of indicator The number of women residing in each LHIN in the Greater Toronto Area (GTA) who gave birth in hospital in 2005–2006 to 2009–2010.

- Notes:
1. The total number of women who resided in a GTA LHIN and gave birth in hospital by fiscal year was: 2005–2006: 67,432; 2006–2007: 69,299; 2007–2008: 71,004; 2008–2009: 70,882; 2009–2010: 70,734.
 2. A small number of women in each fiscal year who gave birth in a GTA hospital, but could not be mapped to a LHIN of maternal residence were excluded. It is possible that some of these women were GTA residents.
 3. The numbers presented in this graph may differ from previous GTA reports using the Niday Perinatal Database as a result of updates and modifications to the database or the methodology of assigning postal codes to LHIN of maternal residence.

- The number of women who resided in one of the five LHINs in the GTA and gave birth in 2009–2010 was 70,734. This represents 51.9% of the total number of Ontario women who gave birth in an Ontario hospital in 2009–2010 (136,223). The GTA LHIN with the largest number of residents who had a hospital birth in 2009–2010 was Central LHIN (18,570).
- The total number of GTA residents with a hospital birth recorded in the database increased by 4.9% from 67,432 in 2005–2006 to 70,734 in 2009–2010.

Figure 1.3 Number of total births, by LHIN of birth and fiscal year
Greater Toronto Area (GTA) LHIN Region, 2005–2006 to 2009–2010



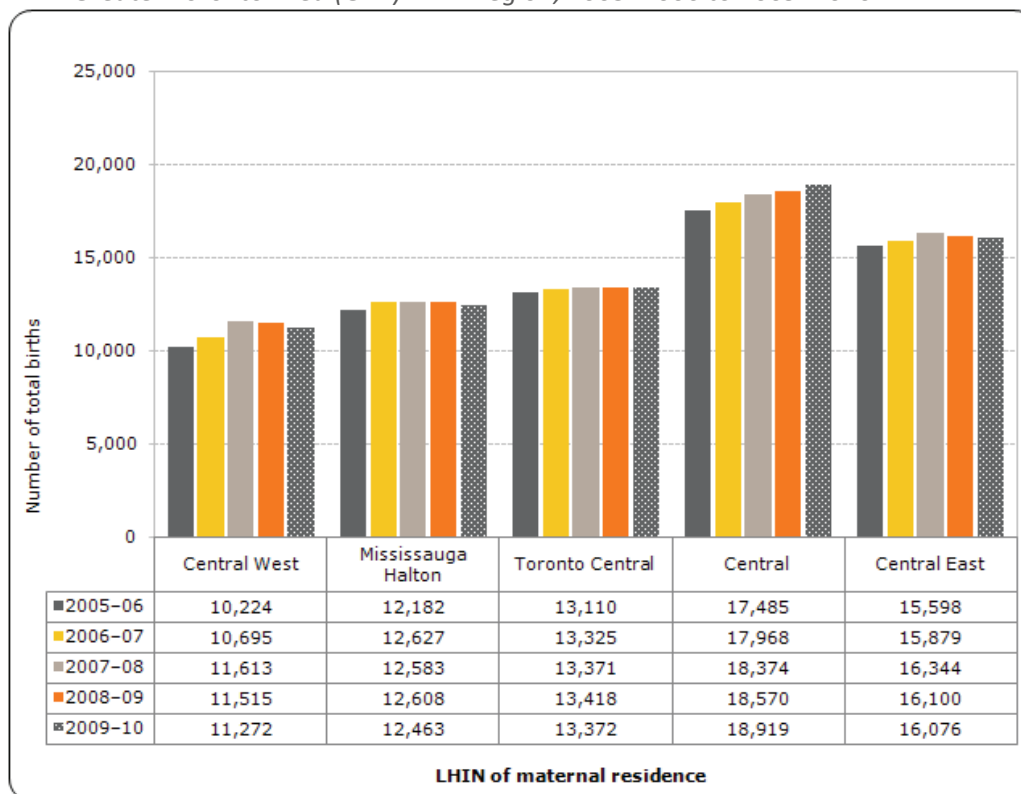
Data source BORN Ontario (Niday Perinatal Database), 2005–2006 to 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The number of total births (live births and stillbirths) to Ontario women in a hospital in one of the five LHINs in the Greater Toronto Area (GTA) in 2005–2006 to 2009–2010.

Notes: 1. The number of total births in a GTA hospital by fiscal year was: 2005–2006: 69,888; 2006–2007: 71,616; 2007–2008: 73,241; 2008–2009: 73,255; 2009–2010: 73,169.

- The number of total births (live births and stillbirths) in a hospital in one of the five LHINs in the GTA in 2009–2010 was 73,169. This represents 52.7% of the total number of hospital births in Ontario in 2009–2010 (138,775). The GTA LHIN with the largest number of hospital births in 2009–2010 was Toronto Central LHIN (19,871).
- Between 2005–2006 and 2009–2010, the number of total births in a hospital in the GTA LHIN Region increased by 4.6% from 69,888 to 73,169.
- The number of total births at each hospital site in the GTA region can be found in **APPENDIX C**.

Figure 1.4 Number of total births, by LHIN of maternal residence and fiscal year
Greater Toronto Area (GTA) LHIN Region, 2005–2006 to 2009–2010



Data source BORN Ontario (Niday Perinatal Database), 2005–2006 to 2009–2010
Local Health Integration Network (LHIN) based on maternal residence

Definition of indicator The number of total hospital births (live births and stillbirths) to residents of each LHIN in the Greater Toronto Area (GTA) in 2005–2006 to 2009–2010.

- Notes:
1. The number of total hospital births to women who resided in a GTA LHIN by fiscal year was: 2005–2006: 68,599; 2006–2007: 70,494; 2007–2008: 72,285; 2008–2009: 72,211; 2009–2010: 72,102.
 2. A small number of births in each fiscal year were excluded because they occurred in a GTA hospital, but could not be mapped to a LHIN of maternal residence. It is possible that some of these births were to GTA residents.
 3. The numbers presented in this graph may differ from previous GTA reports using the Niday Perinatal Database as a result of updates and modifications to the database or the methodology of assigning postal codes to LHIN of maternal residence.

- The number of total births to women who resided in one of the five LHINs in the GTA in 2009–2010 and gave birth in hospital was 72,102. This represents 52.0% of the number of total hospital births in Ontario in 2009–2010 (138,775). Central LHIN residents had the largest number of total hospital births (18,919) in 2009–2010 in the GTA.
- The number of total hospital births to GTA residents recorded in the database increased by 5.1% from 68,599 in 2005–2006 to 72,102 in 2009–2010.

Figure 1.5a Distribution of LHIN of maternal residence among women who had a hospital birth in the GTA, by LHIN of birth
Greater Toronto Area (GTA) LHIN Region, 2009–2010

		LHIN of birth										GTA	
		Central West		Mississauga Halton		Toronto Central		Central		Central East		n	%
		n	%	n	%	n	%	n	%	n	%		
LHIN of maternal residence	Central West	6,987	88.4	1,759	13.9	935	4.9	1,238	6.8	51	0.4	10,970	15.3
	Mississauga Halton	281	3.5	9,962	78.8	1,506	7.8	212	1.2	45	0.3	12,005	16.7
	Toronto Central	52	0.7	166	1.3	11,322	58.8	1,146	6.3	400	2.9	13,086	18.2
	Central	477	6.0	111	0.9	3,482	18.1	13,010	71.7	1,415	10.3	18,495	25.8
	Central East	11	0.1	13	0.1	1,713	8.9	2,224	12.2	11,711	85.1	15,672	21.8
	Non-GTA LHIN	100	1.3	638	5.0	304	1.6	326	1.8	145	1.1	1,513	2.1
Total number of women		7,907	100.0	12,649	100.0	19,263	100.0	18,155	100.0	13,768	100.0	71,742	100.0

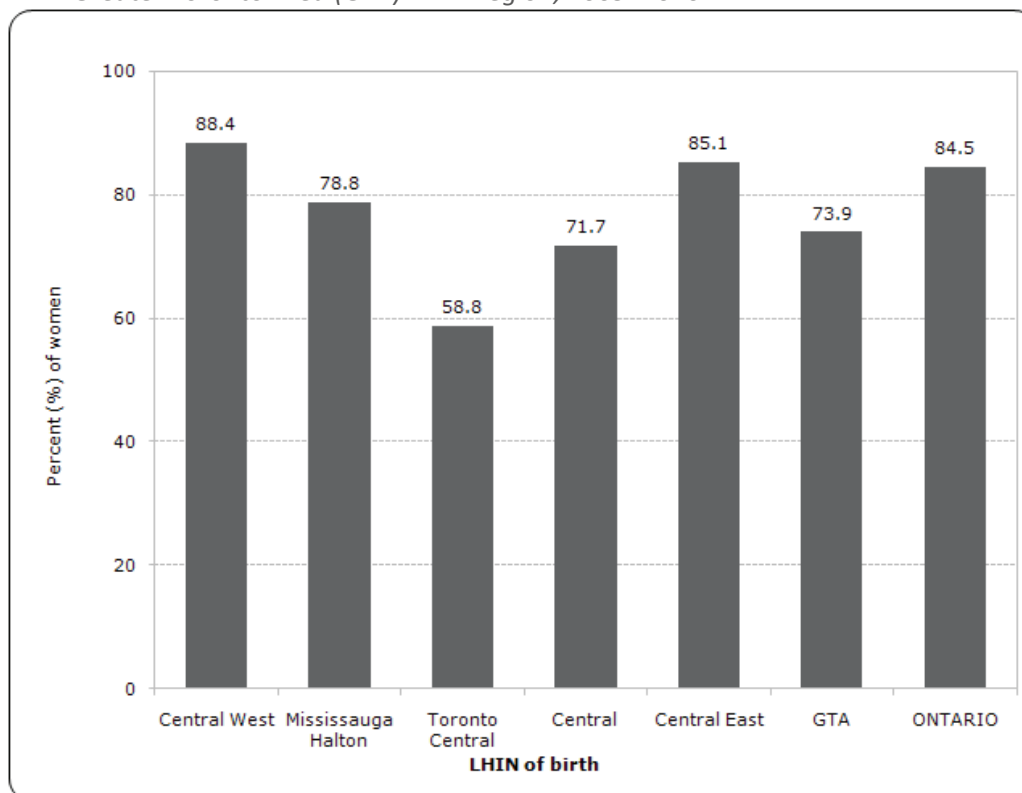
Data source BORN Ontario (Niday Perinatal Database), 2009–2010

Definition of indicator The distribution of LHIN of maternal residence, expressed as a percentage of the total number of women who gave birth in a hospital in one of the five LHINs in the Greater Toronto Area (GTA) in 2009–2010.

Notes: 1. 38 women who gave birth in a hospital in one of the five LHINs of the GTA were excluded from the figure due to incomplete address information or no fixed residential address resulting in unknown LHIN of maternal residence.

- In 2009–2010, of the women who gave birth in a hospital in the Central West LHIN, the majority (88.4%) were residents of Central West LHIN. Similarly, in Central East LHIN, 85.1% of the women who gave birth in a Central East hospital were residents of that LHIN.
- In contrast, less than two-thirds (58.8%) of the women who gave birth in a hospital in Toronto Central LHIN were residents of the LHIN.
- Mississauga Halton had the highest proportion of births to women who were residents of a LHIN outside the GTA (5.0%), the majority of whom were residents of the Hamilton Niagara Haldimand Brant LHIN (LHIN 4).

Figure 1.5b Proportion of women who had a hospital birth in their LHIN of residence, by LHIN of birth
Greater Toronto Area (GTA) LHIN Region, 2009–2010



Data source *BORN Ontario (Niday Perinatal Database), 2009–2010*

Definition of indicator *The number of women who resided in the LHIN in which they gave birth, expressed as a percentage of the total number of women who gave birth in a hospital in one of the five LHINs in the Greater Toronto Area (GTA) in 2009–2010.*

Notes: 1. *38 women who gave birth in a hospital in one of the five LHINs of the GTA were excluded from the figure due to incomplete address information or no fixed residential address resulting in unknown LHIN of maternal residence.*

- Among the women who gave birth in a hospital in the GTA LHIN Region in 2009–2010, almost three-quarters (73.9%) were residents of the LHIN in which they gave birth. Considerable variation was evident across the five LHINs of the GTA, from a low of 58.8% of women who gave birth in Toronto Central to a high of 88.4% of women who gave birth in Central West.

Figure 1.6a Distribution of LHIN of hospitals among GTA residents who had a hospital birth, by LHIN of maternal residence
Greater Toronto Area (GTA) LHIN Region, 2009–2010

		LHIN of maternal residence										GTA	
		Central West		Mississauga Halton		Toronto Central		Central		Central East		n	%
		n	%	n	%	n	%	n	%	n	%		
LHIN of birth	Central West	6,987	63.2	281	2.3	52	0.4	477	2.6	11	0.1	7,807	11.0
	Mississauga Halton	1,759	15.9	9,962	81.6	166	1.3	111	0.6	13	0.1	12,011	17.0
	Toronto Central	935	8.5	1,506	12.3	11,322	86.4	3,482	18.8	1,713	10.8	18,959	26.8
	Central	1,238	11.2	212	1.7	1,146	8.7	13,010	70.1	2,224	14.1	17,829	25.2
	Central East	51	0.5	45	0.4	400	3.1	1,415	7.6	11,711	74.2	13,623	19.3
	Non-GTA LHIN	79	0.7	210	1.7	21	0.2	75	0.4	120	0.8	504	0.7
Total number of women		11,049	100.0	12,215	100.0	13,107	100.0	18,570	100.0	15,792	100.0	70,734	100.0

Data source BORN Ontario (Niday Perinatal Database), 2009–2010

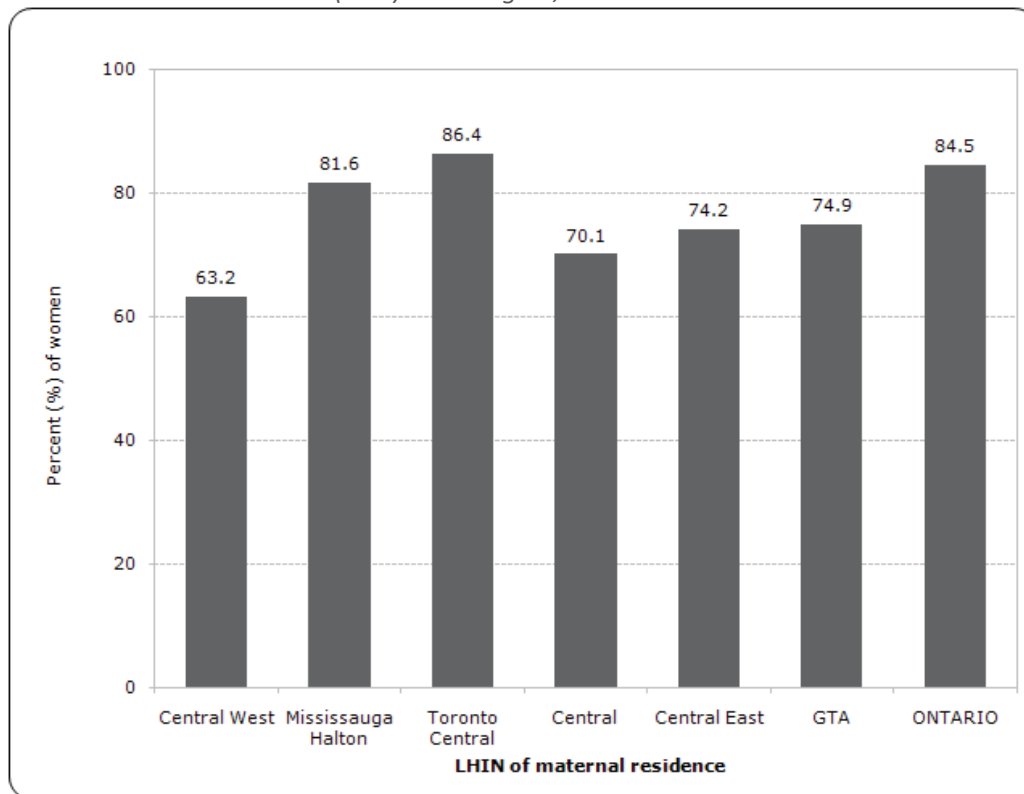
Definition of indicator The distribution of LHIN of maternal residence, expressed as a percentage of the total number of women who gave birth in a hospital in one of the five LHINs in the Greater Toronto Area (GTA) in 2009–2010.

Notes:

- 38 women who gave birth in a hospital in one of the five LHINs of the GTA were excluded from the figure due to incomplete address information or no fixed residential address resulting in unknown LHIN of maternal residence.

- Among the 70,734 women who resided in one of the five LHINs in the GTA and gave birth in 2009–2010, the proportion who delivered in a hospital in the same LHIN as they resided was highest among residents of Toronto Central (86.4%) and Mississauga Halton (81.6%) and lowest among residents of Central West (63.2%).
- Among residents of the GTA LHIN Region who gave birth in 2009–2010, Mississauga Halton had the highest proportion of residents who delivered in an Ontario hospital outside the GTA LHIN Region (1.7%). The majority of these births occurred in the Hamilton Niagara Haldimand Brant LHIN.

Figure 1.6b Proportion of women who had a hospital birth in their LHIN of residence, by LHIN of maternal residence
 Greater Toronto Area (GTA) LHIN Region, 2009–2010



Data source BORN Ontario (Niday Perinatal Database), 2009–2010

Definition of indicator The distribution of LHIN of birth (birth occurs in the LHIN in which they reside, in another LHIN in the GTA, or in another Ontario LHIN outside the GTA), expressed as a percentage of the total number of residents in one of the five LHINs in the Greater Toronto Area (GTA) who had a hospital birth in 2009–2010.

Notes: 1. 38 women who gave birth in a hospital in one of the five LHINs of the GTA were excluded from the figure due to incomplete address information or no fixed residential address resulting in unknown LHIN of maternal residence.

- Among the 70,734 women who resided in the GTA LHIN Region and gave birth in 2009–2010, about three-quarters (74.9%) delivered in a hospital in the LHIN where they resided. Variability across the five LHINs of the GTA region was evident, however, from a low of 63.2% of women who resided in Central West to a high of 86.4% of women who resided in Toronto Central.

Choice of birthplace

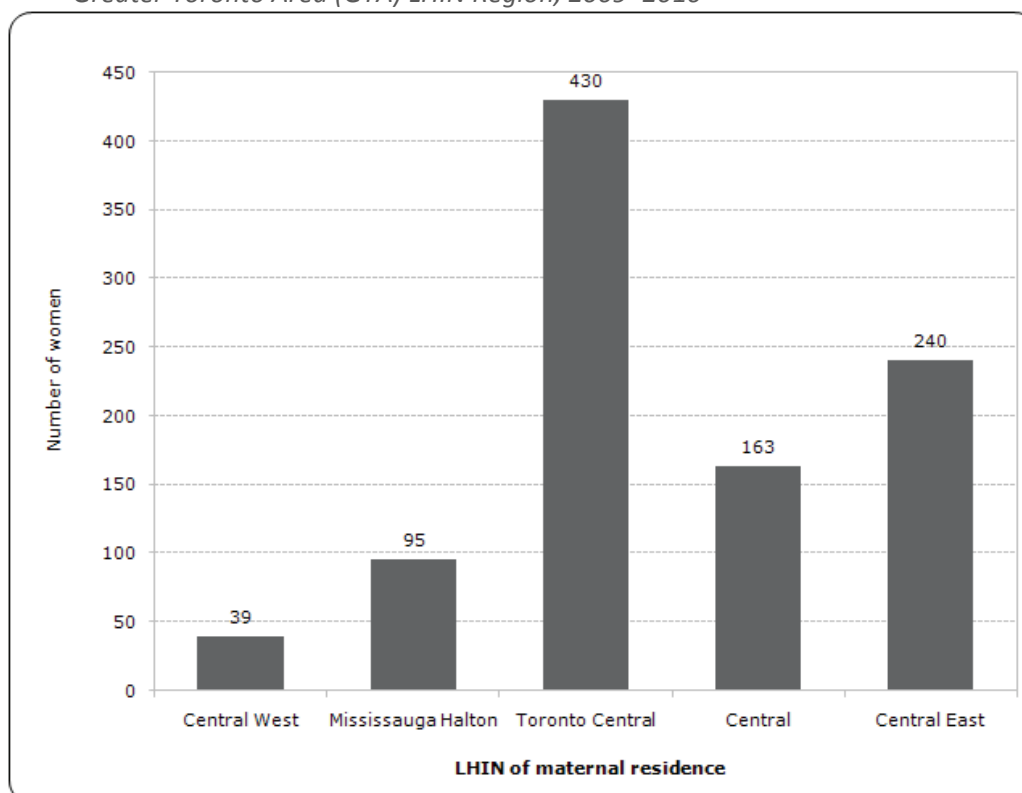
Choice of birthplace is a key component of the model of midwifery care in Ontario – midwives are expected to provide intrapartum care in both the home and the hospital setting, and to support women’s choices. Prenatally, midwives provide each woman with sufficient information in order for her to make an informed decision about where she will plan to give birth. This decision typically involves consideration of any risk factors present in the pregnancy; the distance between the woman’s home and the nearest hospital(s), and the level of obstetrical services available; research evidence regarding the benefits and risks of home and hospital birth; and the woman’s own preferences. The College of Midwives of Ontario has established standards which indicate specific circumstances in which a hospital birth should be planned (e.g., multiple birth, breech, preterm labour, and gestational age of more than 43 completed weeks).⁴ The College’s standards also identify situations in which consultation with or transfer of care to a physician is necessary, which frequently leads to a plan for a hospital birth.⁵

Two Canadian studies have demonstrated that planned home birth is associated with good maternal and neonatal outcomes when midwives are integrated into the health system with good access to emergency services.^{6,7} The integration of midwives within the health care system, good communication between all maternity care providers, and supportive relationships with the hospital teams that provide essential care when serious complications arise, all help to ensure that mothers and babies receive the best possible care.



Figure 1.7 Number of women in midwifery care that gave birth at home, by LHIN of maternal residence

Greater Toronto Area (GTA) LHIN Region, 2009–2010



Data source Ontario Midwifery Program Maternal-Newborn Health Reporting System (Ontario Ministry of Health and Long-Term Care), 2009–2010
Local Health Integration Network (LHIN) based on maternal residence

Definition of indicator The number of women residing in the Greater Toronto Area (GTA) who gave birth at home in 2009–2010 under the care of a midwife.

Notes: 1. The numbers presented are reflective of the number of babies born between April 1, 2009 and March 31, 2010.

- The number of women who gave birth at home under the care of a midwife in the GTA in 2009–2010 was 967. This represents 1.3% of the total births to **residents** of the region (967 out of 72,102 hospital births + 967 home births) and 35.7% of the total number of home births under the care of a midwife in Ontario in 2009–2010 (967 out of 2,711). Note that the Ontario total includes 34 records that could not be mapped to a LHIN of residence (either due to missing or invalid postal code information). It is possible that some of these records were for GTA residents.
- Across the five GTA LHINs, the median maternal age of women who gave birth at home under midwifery care in 2009–2010 was 32 years, 22.6% of women were pregnant for the first time (i.e., gravida=1) and 1.8% of women smoked during their pregnancy.
- The median gestational age at birth of babies born at home under midwifery care in 2009–2010 was 39 weeks across the five GTA LHINs. Median birth weight was 3,540 grams. A high proportion of babies were being exclusively breastfed at three days following birth (92.8%).

Maternal Age

Teen Pregnancy and Birth

Although the proportion of live births to teenage mothers decreased in Canada between 1995 and 2004,⁸ Canada's teenage birth rate is six times higher than that of Japan and Switzerland and more than twice that of Sweden and Finland.⁹ According to Statistics Canada, in 2007, the proportion of live births to mothers 10-19 years of age was 4.2% in Canada and 3.4% in Ontario.¹⁰

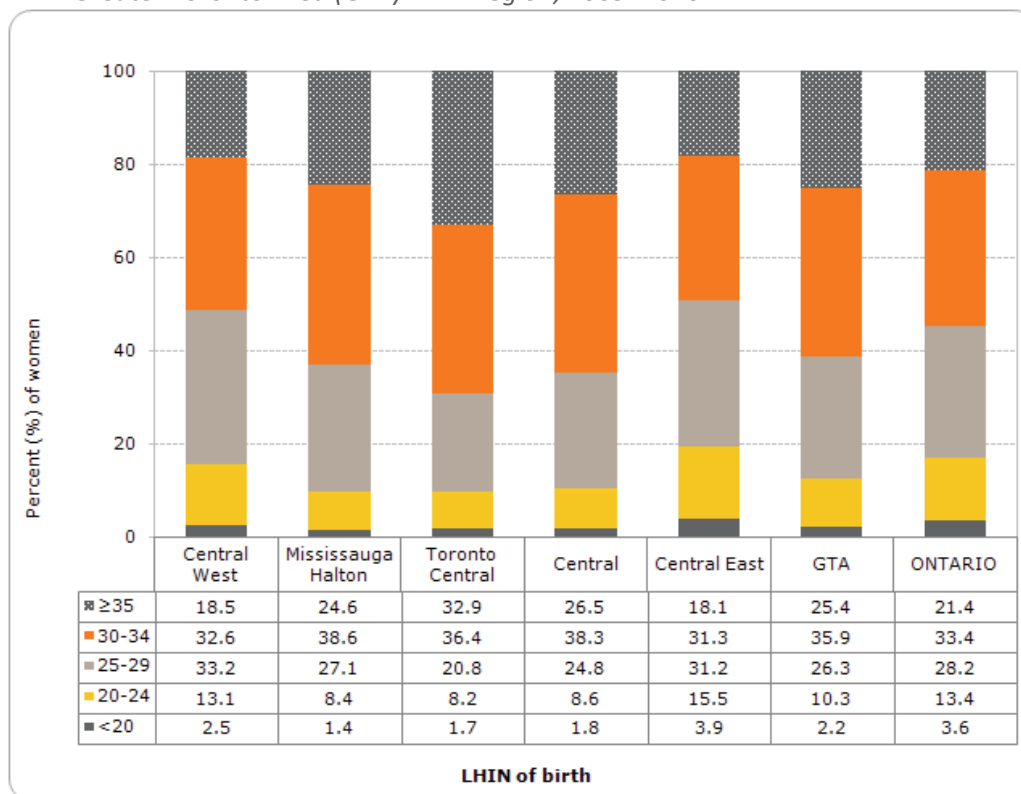
Inadequate prenatal care, physical and sexual abuse, increased likelihood of social deprivation, drug use and smoking,¹¹ poor nutrition resulting in poor maternal weight gain and anemia^{11,12} and premature termination of education^{12,13} are all factors that place teen mothers and their infants at greater risk for preterm and/or low birth weight,^{11,12} and increased perinatal mortality.^{12,14-16} Teen mothers, particularly those with limited social support, are more likely to experience postpartum depression,¹⁷ and they are less likely to breastfeed.¹⁶

Advanced Maternal Age

Increasingly, women are delaying childbearing – in Canada, the proportion of live births to older mothers (≥ 35 years of age) steadily increased between 1995 and 2004.¹⁸ In 2007, the proportion of live births to mothers 35-49 years of age was 18.0% in Canada and 21.2% in Ontario.¹⁰ This trend is important because of the association between higher maternal age and increased maternal morbidity (including gestational hypertension and diabetes), cesarean delivery, multiple gestation pregnancy and adverse pregnancy outcomes (including chromosomal abnormalities, miscarriage, low birth weight, small for gestational age, preterm birth, perinatal mortality and serious neonatal morbidity).¹⁹⁻²² Health care providers and public education campaigns should inform all women of child-bearing age of the potential risks of advanced maternal age as a means to support informed decisions about the timing of child bearing.²³

Despite the higher risk of perinatal morbidity and mortality with increased maternal age, older first-time mothers often have a higher level of education and socioeconomic status, seek prenatal care earlier and receive good quality maternity care.²⁴ Since higher socioeconomic status is associated with a lower prevalence of risk factors such as pre-pregnancy obesity and smoking during pregnancy,²⁵ older women, especially those who have no chronic conditions, generally have healthy pregnancies and healthy babies.²⁶

Figure 1.8 Distribution of maternal age, by LHIN of birth
Greater Toronto Area (GTA) LHIN Region, 2009–2010

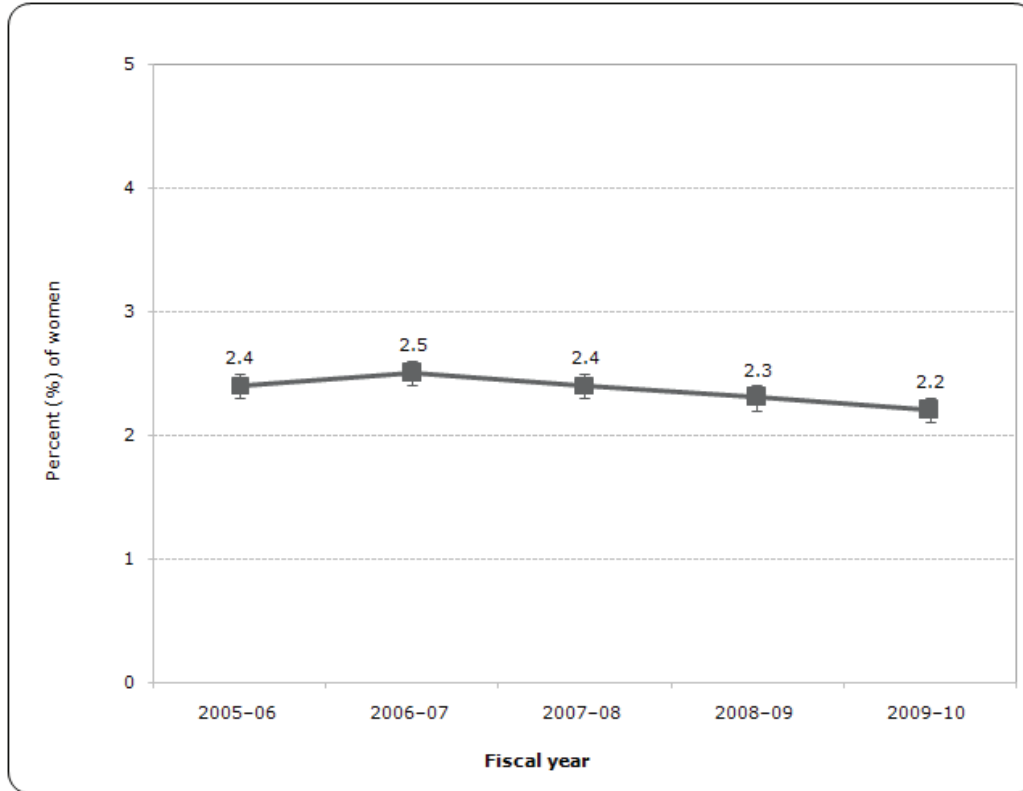


Data source *BORN Ontario (Niday Perinatal Database), 2009–2010*
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator *The distribution of categories of maternal age in years at the time of birth, expressed as a percentage of the total number of women who had a live birth or stillbirth (in a given place and time).*

- 62.2% of women who gave birth in the GTA LHIN Region in 2009–2010 were between the ages of 25 and 34 years.
- The proportion of births to teenage women (less than 20 years of age) in 2009–2010 was 2.2%. The LHIN with the highest proportion of births to teenage women in 2009–2010 was Central East (3.9%).
- The proportion of births to women 35 years of age and over in 2009–2010 in the GTA LHIN Region was 25.4%, higher than the overall background proportion of 21.4% in Ontario. The LHIN with the highest proportion of births to women 35 years of age and over in 2009–2010 was Toronto Central (32.9%). Approximately 18% of women who gave birth in Central West and Central East LHINs were ≥35 years of age.

Figure 1.9 Proportion of women who were <20 years at delivery, by fiscal year
Greater Toronto Area (GTA) LHIN Region, 2005–2006 to 2009–2010

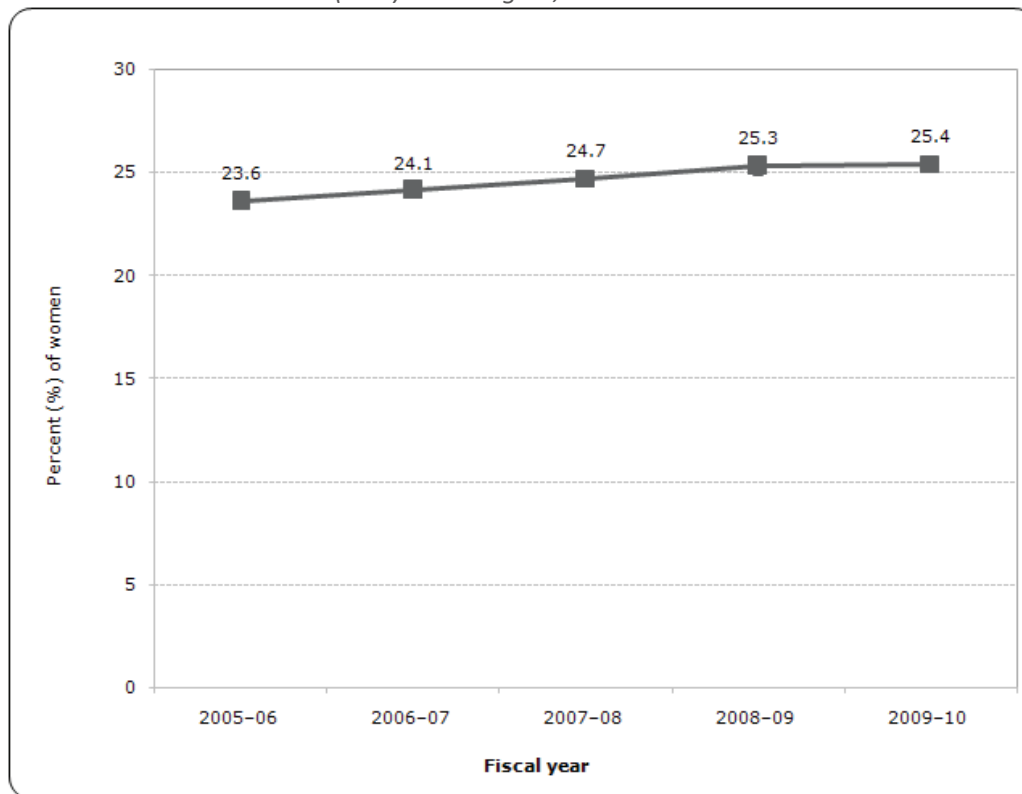


Data source BORN Ontario (Niday Perinatal Database), 2005–2006 to 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The number of women <20 years of age who gave birth, expressed as a percentage of the total number of women who had a live birth or stillbirth (in a given place and time).

- The proportion of women who gave birth in the GTA LHIN Region who were <20 years of age remained fairly constant between 2005–2006 and 2009–2010. In 2009–2010, 2.2% (95% CI: 2.1–2.3) of women who gave birth in the region were under the age of 20 years.

Figure 1.10 Proportion of women who were ≥ 35 years at delivery, by fiscal year
Greater Toronto Area (GTA) LHIN Region, 2005–2006 to 2009–2010

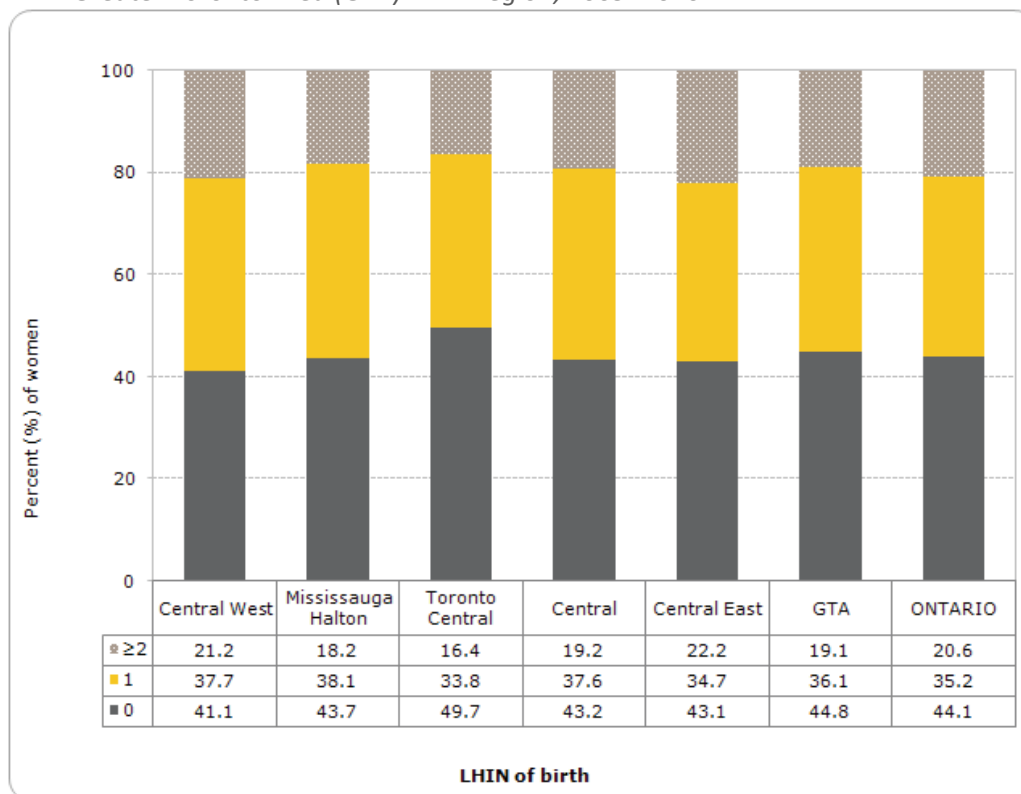


Data source BORN Ontario (Niday Perinatal Database), 2005–2006 to 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The number of women ≥ 35 years of age who gave birth, expressed as a percentage of the total number of women who had a live birth or stillbirth (in a given place and time).

- Between 2005–2006 and 2009–2010, the proportion of women giving birth in the GTA who were ≥ 35 years of age increased slightly, from 23.6% (95% CI: 23.3–23.9) in 2005–2006 to 25.4% (95% CI: 25.1–25.7) in 2009–2010.

Figure 1.11 Distribution of parity, by LHIN of birth
Greater Toronto Area (GTA) LHIN Region, 2009–2010

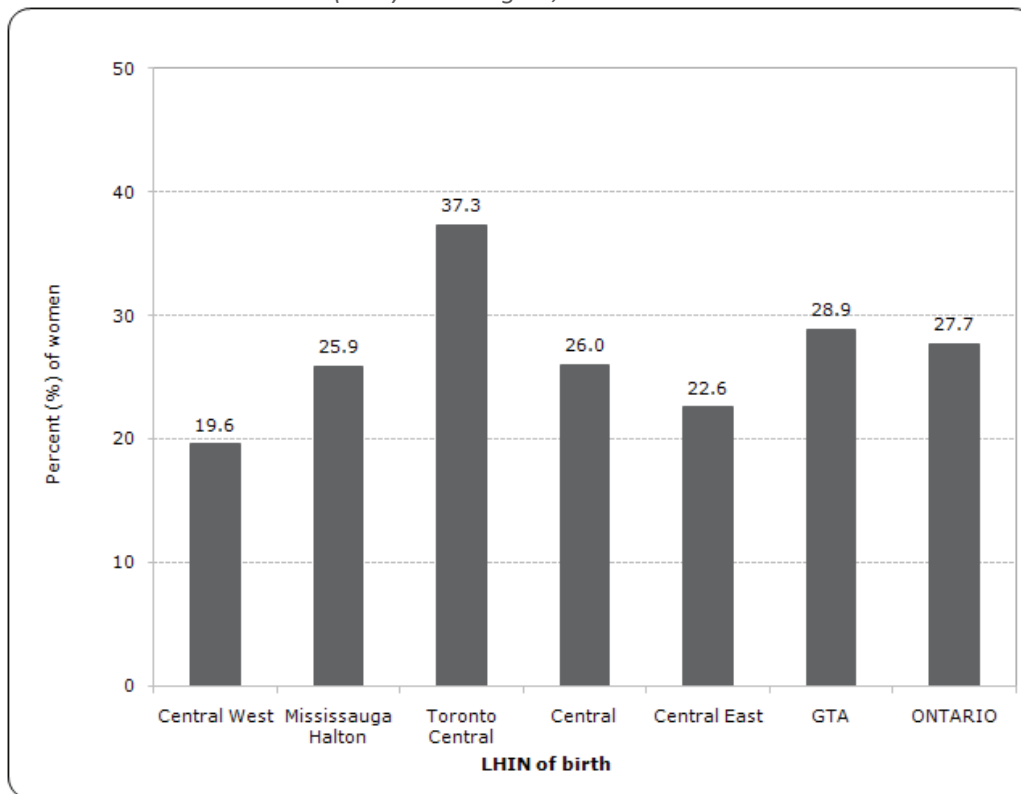


Data source BORN Ontario (Niday Perinatal Database), 2009–2010
 Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The distribution of parity, expressed as a percentage of the total number of women who had a live birth or stillbirth (in a given place and time). For this report, parity is defined as the number of previous live births or stillbirths (0, 1, ≥2), not including the current pregnancy.

- 44.8% of the women who gave birth in the GTA LHIN Region in 2009–2010 were first-time mothers (i.e., parity = 0), very similar to the background rate for the province (44.1%). The LHIN with the highest proportion of first-time mothers was Toronto Central (49.7%) and the lowest proportion of first-time mothers was in Central West LHIN (41.1%).

Figure 1.12 Proportion of women who were ≥ 35 years and nulliparous at delivery, by LHIN of birth
Greater Toronto Area (GTA) LHIN Region, 2009–2010

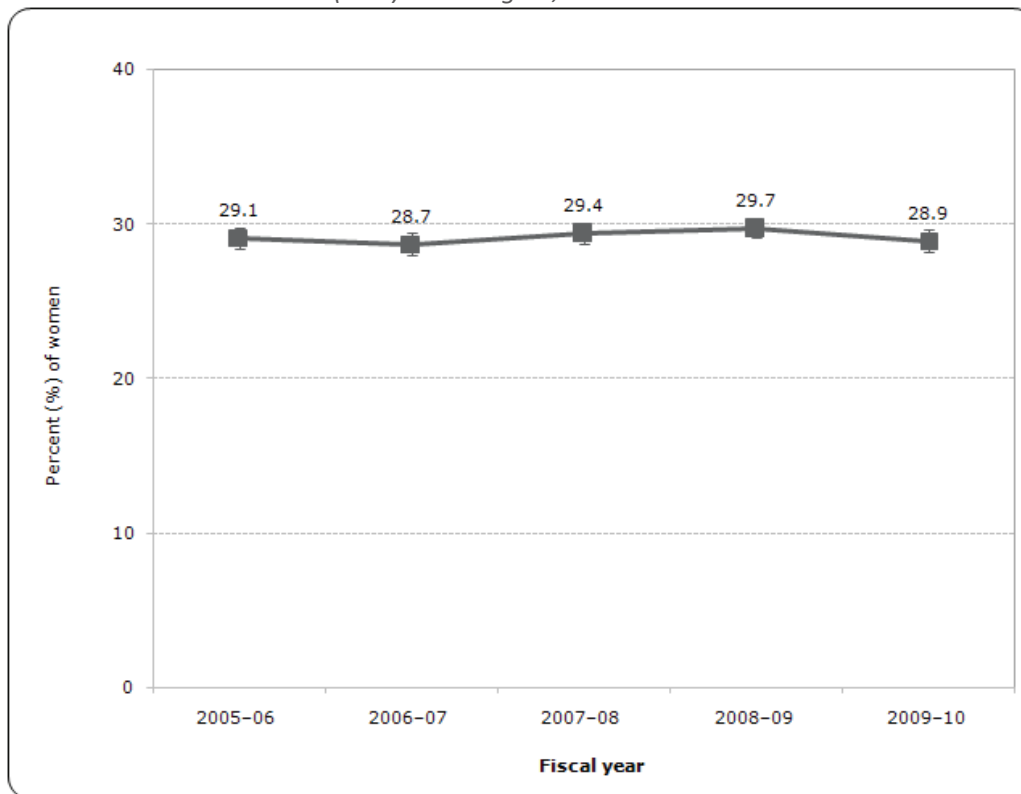


Data source BORN Ontario (Niday Perinatal Database), 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The number of deliveries to women who were nulliparous (parity=0), expressed as a percentage of the total number of women who were ≥ 35 years of age at delivery and who had a live birth or stillbirth (in a given place and time).

- The proportion of women 35 years of age or older who were nulliparous (i.e., parity = 0) at the time of delivery was 28.9% across the GTA LHIN Region. This ranged from a high of 37.3% in Toronto Central to a low of 19.6% in Central West. Across Ontario, 27.7% of women 35 years of age or older who gave birth in 2009–2010 were nulliparous.

Figure 1.13 Proportion of women who were ≥ 35 years and nulliparous at delivery, by fiscal year
Greater Toronto Area (GTA) LHIN Region, 2005–2006 to 2009–2010



Data source BORN Ontario (Niday Perinatal Database), 2005–2006 to 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The number of deliveries to women who were nulliparous (parity=0), expressed as a percentage of the total number of women who were ≥ 35 years of age at delivery and who had a live birth or stillbirth (in a given place and time).

- Between 2005–2006 and 2009–2010, the proportion of women 35 years of age or older who were nulliparous (i.e., parity = 0) at the time they gave birth in a GTA hospital remained fairly constant. In 2009–2010, 28.9% (95% CI: 28.2–29.6) of women 35 years of age or older at delivery were nulliparous.

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CHAPTER 2 PREGNANCY

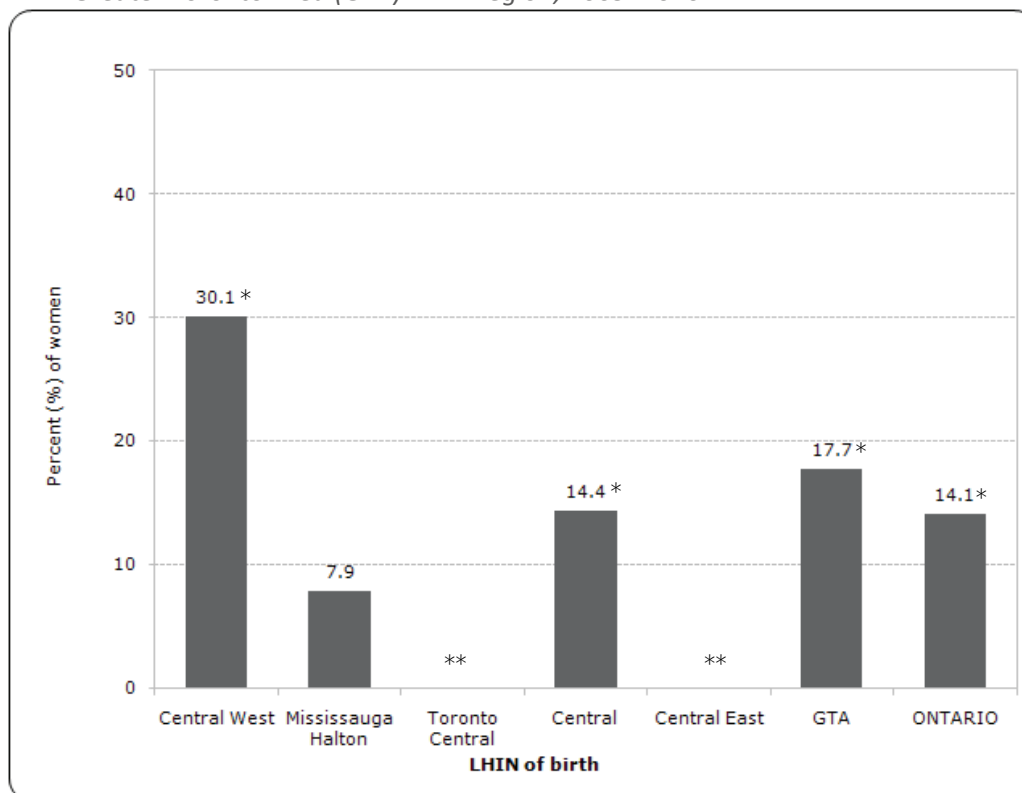
Maternal and fetal health during pregnancy are influenced by many factors that include maternal health status prior to pregnancy, health care received during pregnancy, maternal behaviours during pregnancy (such as diet, exercise and substance use), and medical conditions that arise during pregnancy. Prenatal care aims to optimize perinatal outcomes by identifying potential risks and mitigating them through the appropriate treatment of medical conditions and through the provision of education and support to encourage risk reduction.¹ Despite debate about the ideal frequency and timing of prenatal visits,² there is general agreement that it is optimal for women to begin prenatal care early in pregnancy.¹ While the vast majority of women across Canada initiate prenatal care during the first trimester, younger women (15–19 years), women with less than a high school education, and women living in a household at or below the low income cut-off are less likely to do so.³

Pre-pregnancy (i.e., non-gestational) diabetes and chronic hypertension are two pre-existing maternal medical conditions that are particularly relevant, due to their association with adverse perinatal outcomes. Diabetes prior to pregnancy is associated with a higher risk of birth defects,^{4,5} perinatal and infant mortality,⁵ as well as fetal macrosomia.⁵ Chronic hypertension is associated with both increased maternal morbidity (such as preeclampsia, gestational diabetes and placental abruption)⁶ as well as increased risk of small for gestational age at birth⁷ and perinatal mortality.⁸ Many women who have medical conditions such as these require additional evaluation and treatment during pregnancy. Information on pre-existing maternal medical conditions has been collected by the BORN–Niday Perinatal Database since 2005 and is reported in this chapter. A complete list of conditions captured in the database can be found in **APPENDIX D**.

Similarly, women who develop obstetrical complications during the course of their pregnancy also require enhanced assessment and treatment to manage the complications. Obstetrical complications during pregnancy have been captured by the database since 2005 (see **APPENDIX E** for a complete list). This consists of several of the most common obstetrical complications associated with adverse outcomes including gestational diabetes, gestational hypertensive disorders, placental conditions (placenta previa and placental abruption), preterm rupture of membranes, as well as fetal growth concerns.

In the last few years, outcomes associated with assisted human reproduction (AHR) have received considerable attention in both mainstream and obstetric literature. Ovulation induction, in vitro fertilization, intracytoplasmic sperm injection and frozen embryo transfer are increasingly used in Canada to achieve pregnancy. In 2007, the number of births (live births and stillbirths) following a pregnancy achieved by AHR was at least 4,499,⁹ which represents approximately 1.2% of the total births in Canada for that year.¹⁰ Pregnancies conceived by AHR have been shown to be more likely to be associated with numerous adverse perinatal outcomes;^{11–15} however, there remain unanswered questions with respect to distinguishing the effect of AHR from the underlying infertility itself.^{14,15} One of the most important consequences of AHR is multifetal pregnancy – in 2006, 43.1% of live births and stillbirths following AHR in Canada were twins and 2.9% were triplets or higher order.¹⁶

Figure 2.1 Proportion of women who did not attend an antenatal visit with a health care provider during the first trimester, by LHIN of birth
Greater Toronto Area (GTA) LHIN Region, 2009–2010



Data source BORN Ontario (Niday Perinatal Database), 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

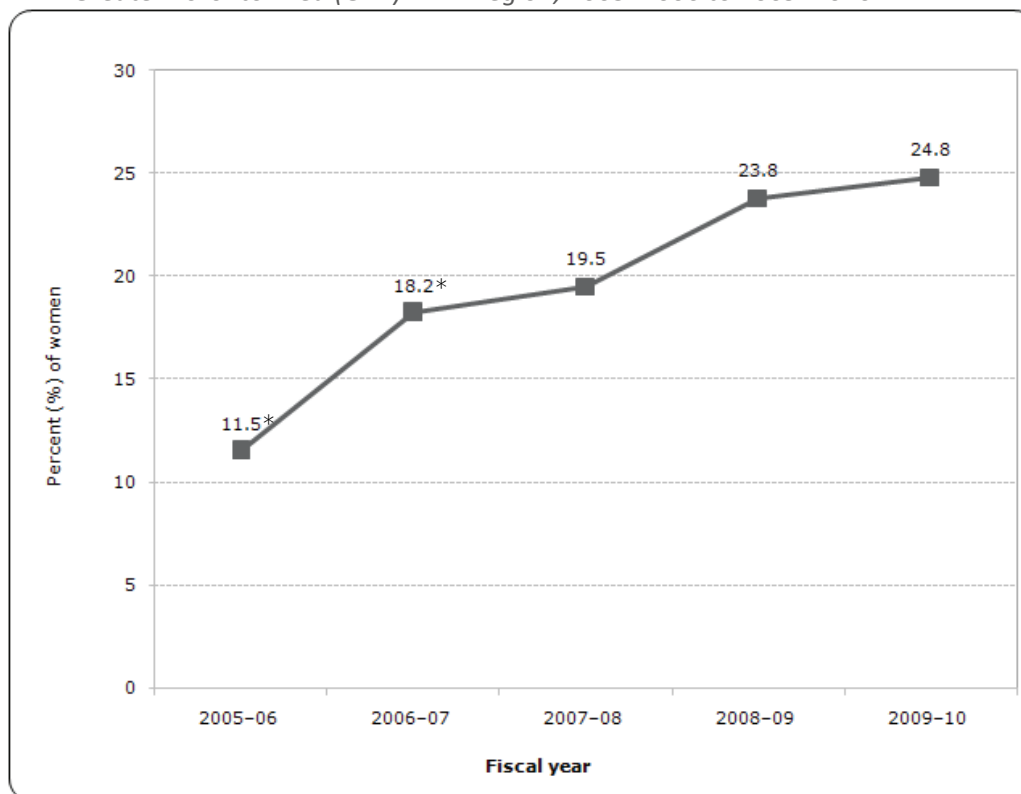
Definition of indicator The number of women who *did not* attend an antenatal visit with a health care provider during the first trimester, expressed as a percentage of the total number of women who had a live birth or stillbirth (in a given place and time).

* Between 10% and 30% of records had missing information and were excluded from the calculation of these estimates.

** Estimate not shown because more than 30% of records had missing information.

- Data for Toronto Central and Central East are not presented because more than 30% of records had missing information.
- In 2009–2010, the proportion of women who **did not** attend a first trimester prenatal care visit was 30.1% in Central West, 14.4% in Central LHIN and 7.9% in Mississauga Halton. In these LHINs, the proportion of records missing this information was 18.7%, 23.6% and 3.4%, respectively. For the province of Ontario overall, 14.1% of women **did not** attend a first trimester prenatal care visit (21.3% missing).
- These results should be interpreted with caution because of the high proportion of records with missing data. It is unclear whether the actual proportions of women who did not receive first trimester prenatal care are higher or lower than indicated here.

Figure 2.2 Proportion of women with pre-existing health conditions, by fiscal year
Greater Toronto Area (GTA) LHIN Region, 2005–2006 to 2009–2010



Data source BORN Ontario (Niday Perinatal Database), 2005–2006 to 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

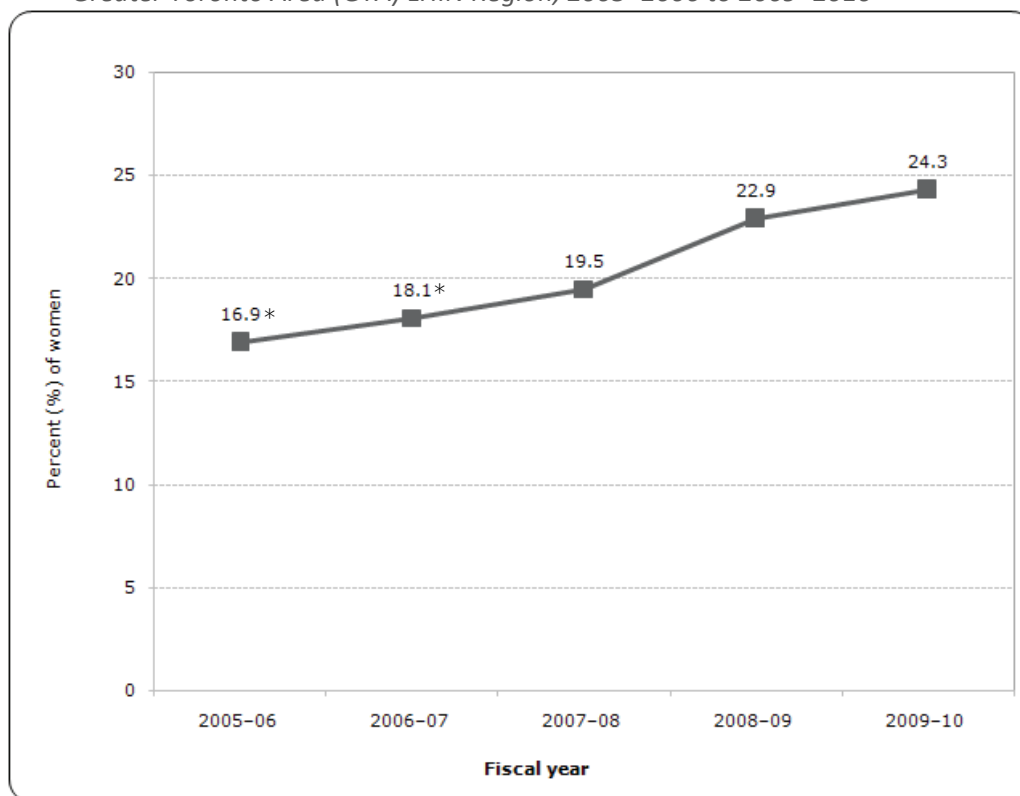
Definition of indicator The number of women with one or more pre-existing health conditions, expressed as a percentage of the total number of women who had a live birth or stillbirth (in a given place and time).

* Between 10% and 30% of records had missing information and were excluded from the calculation of these estimates.

Notes: 1. A complete list of the pre-existing maternal health condition categories collected by the database can be found in APPENDIX D.

- In 2009–2010, the most common pre-existing conditions were other (14.4%), chronic disease (e.g., asthma, hypertension, diabetes and heart disease – 8.7%) and psychiatric disorders/mental illness (3.2%).
- The proportion of women with one or more pre-existing health conditions increased from 11.5% (95% CI: 11.3–11.8) in 2005–2006 to 24.8% (95% CI: 24.5–25.2) in 2009–2010.
- In 2005–2006 and 2006–2007, the proportion of records missing this information was 19.6% and 12.7%, respectively. Comparisons across years should be interpreted with caution due to expansion of data collection activities for this variable over this five-year period. The rate for 2009–2010 is likely to reflect the most accurate estimate of the proportion of women with one or more pre-existing medical conditions since the data capture was more complete than in the earlier years.

Figure 2.3 Proportion of women with obstetrical complications during pregnancy, by fiscal year
Greater Toronto Area (GTA) LHIN Region, 2005–2006 to 2009–2010



Data source BORN Ontario (Niday Perinatal Database), 2005–2006 to 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

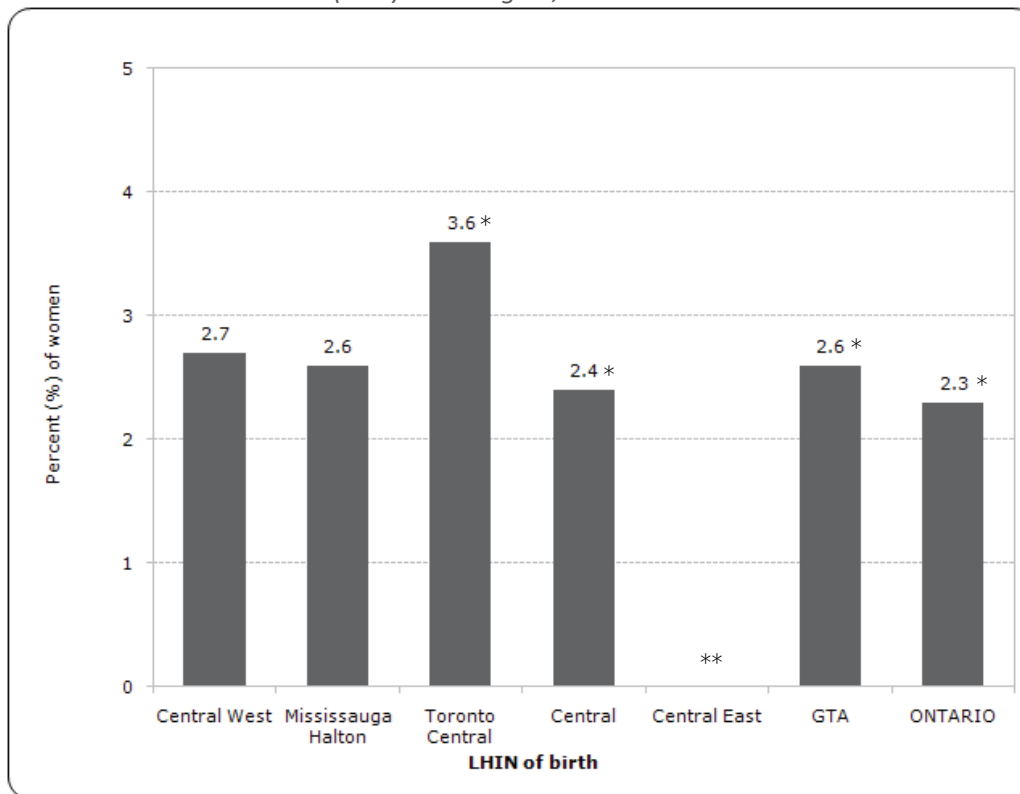
Definition of indicator The number of women with one or more obstetrical complications during pregnancy, expressed as a percentage of the total number of women who had a live birth or stillbirth (in a given place and time).

* Between 10% and 30% of records had missing information and were excluded from the calculation of these estimates.

Notes: 1. A complete list of the obstetrical complication categories collected by the database can be found in APPENDIX E.

- In 2009–2010, the most common obstetrical complications were other (6.8%), gestational diabetes (6.2%) and preterm labour (2.8%), followed by premature rupture of membranes (PROM – 2.2%) and intrauterine growth restriction (2.2%).
- The proportion of women with one or more obstetrical complications during pregnancy increased from 16.9% (95% CI: 16.6–17.2) in 2005–2006 to 24.3% (95% CI: 24.0–24.6) in 2009–2010.
- In 2005–2006 and 2006–2007, the proportion of records missing this information was 20.0% and 12.6%, respectively. Comparisons across years should be interpreted with caution due to expansion of data collection activities for this variable over this five-year period. The rate for 2009–2010 is likely to reflect the most accurate estimate of the proportion of women with one or more obstetrical complications during pregnancy since the data capture was more complete than in the earlier years.

Figure 2.4 Rate of assisted conception, by LHIN of birth
Greater Toronto Area (GTA) LHIN Region, 2009–2010



Data source BORN Ontario (Niday Perinatal Database), 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The number of women who used reproductive assistance for the current pregnancy, expressed as a percentage of the total number of women who had a live birth or stillbirth (in a given place and time).

* Between 10% and 30% of records had missing information and were excluded from the calculation of these estimates.

** Estimate not shown because more than 30% of records had missing information.

Notes:

1. At the time of data entry, only one category for this variable can be selected from the following options: intrauterine insemination, in-vitro fertilization, intracytoplasmic sperm injection, and ovulation induction (for example, clomiphine citrate, injectable gonadotropins, GnRH pump and bromocriptine). Because there are no specific instructions currently in place with respect to which code should take priority in the event that more than one type of reproductive assistance is used to achieve the pregnancy, individual categories are not reported.

- Overall, 2.6% of women who gave birth in the GTA LHIN region in 2009–2010 had used some form of reproductive assistance to achieve the current pregnancy.
- These results should be interpreted with caution because of the high proportion of records with missing data. It is unclear whether the actual proportions of women who used reproductive assistance are higher or lower than indicated here.

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CHAPTER 3 MATERNITY HEALTH SERVICE ISSUES

Level of Care

Levels of care in Ontario hospitals are designated by the Ontario Ministry of Health and Long-Term Care. These designations reflect the scope of medical services available at a particular hospital and the acuity and complexity of patients cared for at that hospital. At the time this report was prepared, four levels of care designation for maternal-newborn services existed within the GTA (see summary below).¹ A list of all GTA hospitals and their corresponding level of care can be found in **APPENDIX F**. In May 2011, recommendations regarding new maternal and newborn levels of care designation were announced by the Provincial Council for Maternal Child Health (PCMCH). These will likely phase in over the next several years and future reports will reflect these new designations.

Level of care	Description
I	Provide care for healthy mothers and infants >36 weeks' gestation
II/II+	Provide care for mothers and infants ≥32 weeks' gestation
III	Provide care for all high-risk pregnancies, including prematurity <32 weeks

The effective operation of distinct level of care designations (supported by a defined scope of services) is a fundamental component of a regionalized neonatal-perinatal care system.² Level of care designations are beneficial for several reasons:²

- They permit articulation and examination of standards that must be met for provision of specified levels of care;
- They facilitate the transfer of patients from one facility to another through common understanding of their relative capabilities and expectations;
- They help streamline planning and allocation of resources.

History in the GTA

As part of the Hospital Services Restructuring Commission (HSRC) deliberations that occurred from 1997–1999, hospitals in the GTA were reviewed with respect to their maternal-newborn and paediatric services. Final recommendations of the HSRC resulted in a number of GTA hospital closures and removal of paediatric and/or maternal-newborn services from others.

The GTA hospitals that retained paediatric and maternal-newborn services were mandated to work together under the auspices of the Child Health Network (CHN) for the Greater Toronto Area (disbanded in September 2010) to develop a coordinated regional system of care for mothers, newborns, children and youth. This hospital network included 18 acute care hospitals (across 26 hospital sites) that provided perinatal and NICU services.³ These hospitals were designated to provide a specific level of care with a clearly defined scope of services — two GTA hospitals were designated “Level III Perinatal Care”, five GTA hospitals were assigned a designation of “Advanced Level II Perinatal Care” (Level II+), while eleven others

were designated to provide “Level II Perinatal Care”. Those remaining were designated as “Level I Perinatal Care” and provided care for healthy mothers and full-term infants.³

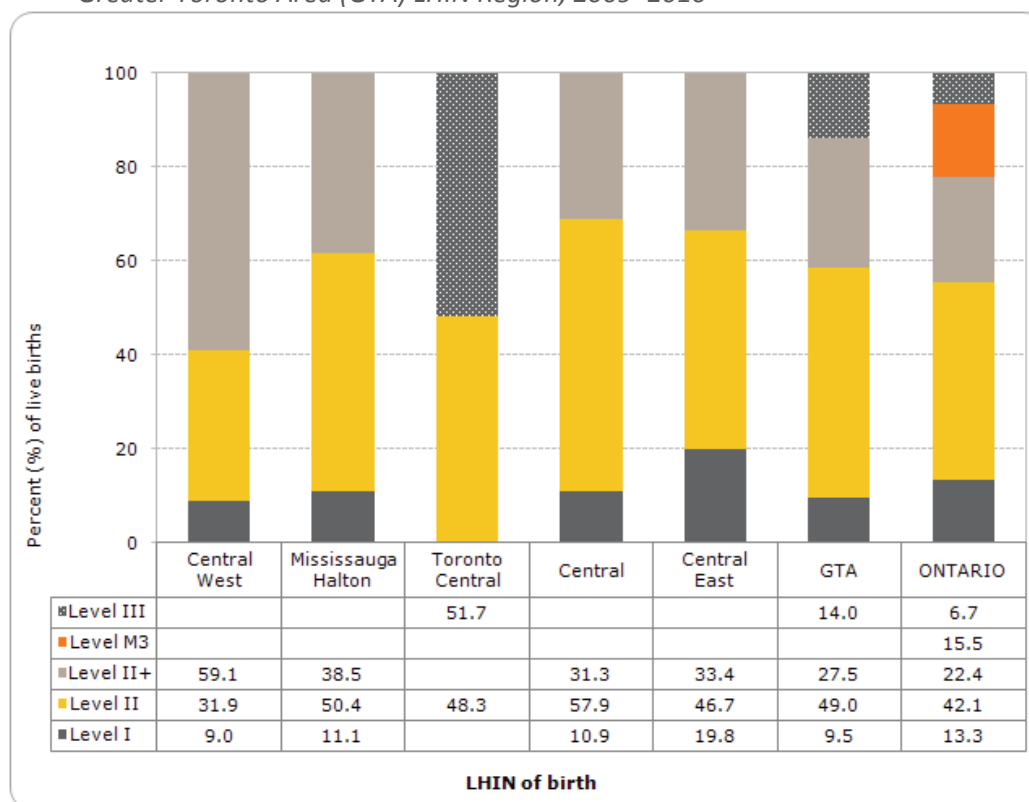
This report expands beyond the member hospitals of the former CHN to include seven additional hospital sites within the LHINs of the GTA region. This allows for LHIN reporting that is inclusive of all hospital sites providing maternity care.

Appropriate Level of Care

Research examining the outcomes of babies born at or before 32 weeks’ gestation in Canadian hospitals indicates that outcomes are better when these babies are born at a tertiary care center (i.e., a Level III hospital), even after adjusting for perinatal risk factors.⁴ Specialist care, staffing levels, the equipment that is available and the avoidance of stress caused by transport after birth have all been suggested as factors that might contribute to this difference.⁴ Subsequent research has continued to demonstrate that very-low-birth-weight babies have the best survival rates when they are born in hospitals with NICUs that provide a high level of care and have a high patient volume.⁵ While late preterm infants (born at 34–36 weeks’ gestation) have very low rates of morbidity and mortality compared with early preterm infants, they are at increased risk for a wide range of complications including respiratory distress, temperature instability, hypoglycemia, kernicterus, apnea, seizures and feeding problems when compared with infants born at term.⁶ Given the increased likelihood that late preterm babies will require NICU care, it is generally recommended that births prior to 36 weeks occur in at least a Level II hospital.



Figure 3.1 Distribution of live births at each level of care, by LHIN of birth
Greater Toronto Area (GTA) LHIN Region, 2009–2010



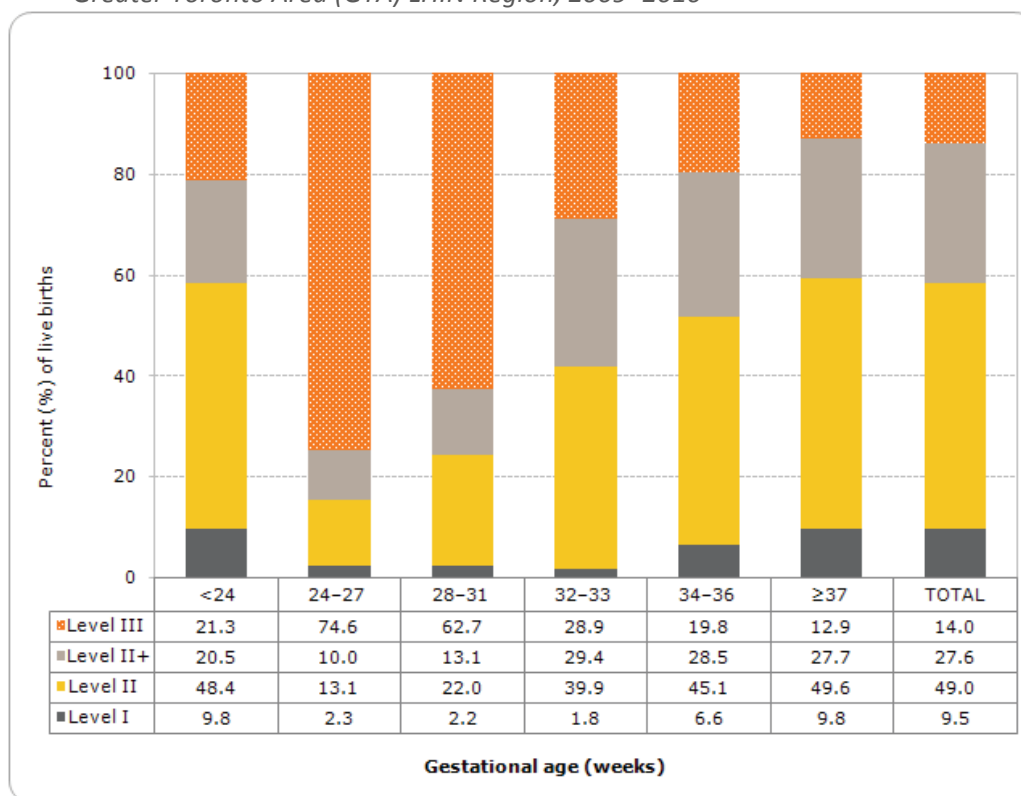
Data source BORN Ontario (Niday Perinatal Database), 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The distribution of live births at each level of care (Levels I, II, II+, modified III [M3] and Level III), expressed as a percentage of the total number of live births (in a given place and time).

- Notes:
1. A complete list of GTA hospital sites and their corresponding level of care can be found in APPENDIX F.
 2. Level M3 refers to a Modified Level III. These hospital sites provide care to infants ≥ 29 weeks' gestation.

- Across the GTA, the majority of live births took place in a Level II hospital (49.0%), followed by about a quarter (27.5%) in a Level II+ hospital, 14.0% in a Level III hospital and 9.5% in a Level I hospital.
- The highest proportion of live births in a Level I hospital occurred in Central East (19.8%).
- The scope of services for each level of care designation defines the maximum level of acuity and complexity of mothers and infants who can be cared for by that hospital. All hospitals care for mothers and infants who are healthy (low risk) as well as those who are at the maximum level of acuity and complexity according to their hospital's level of care designation.
- In Ontario, Level III hospitals are located in densely populated urban centres where critical mass supports the need for both specialized and low risk care. Unique to the GTA, each LHIN adjacent to the Toronto Central LHIN has a regional centre providing advanced Level II services (Level II+), which can provide more specialized care than Level II. These Level II+ centres decrease the demand for Level III services and offer care closer to home.

Figure 3.2 Distribution of live births at each level of care, by gestational age at birth
Greater Toronto Area (GTA) LHIN Region, 2009–2010



Data source BORN Ontario (Niday Perinatal Database), 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The distribution of live births at each level of care (Levels I, II, II+ and III), expressed as a percentage of the total number of live births (in a given place and time).

- In the GTA in 2009–2010, the proportion of live births that took place in a Level III hospital was highest among those infants born between 24–27 weeks of gestational age (74.6%) and decreased with increasing gestational age at birth to a low of 12.9% in term live births (≥37 weeks).
- From 32 weeks of gestational age onwards, the majority of live births in the GTA occurred in either a Level II+ or Level II hospital, and this proportion increased with increasing gestational age at birth.
- **Less than a quarter (21.3%) of infants born during a gestational period where survival is extremely low (<24 weeks' gestation) were born at a Level III centre (26 out of 122 live births).** Close to half of infants (48.4%) born at <24 weeks' gestation were born at a Level II hospital (59 out of 122 live births) and a further 9.8% (12 infants) were born in Level I centres. The reasons why not all live births at <24 weeks are born in a tertiary care centre are likely complex and include a 'grey zone' in terms of survival/long-term outcome, parental wishes, and no clear clinical practice guidelines to guide care providers in a situation that can change almost daily.

Figure 3.3 Distribution of live births 24–36 weeks at each level of care, by gestational age at birth and fiscal year

Greater Toronto Area (GTA) LHIN Region, 2005–2006 to 2009–2010

Fiscal year	Level of care	Gestational age		
		24-31 weeks (n=735)	32-33 weeks (n=646)	34-36 weeks (n=3,864)
2005–06	III	67.5	23.4	19.4
	II / II+	30.7	73.8	75.5
	I	1.8	2.8	5.1
2006–07	III	66.3	27.5	19.4
	II / II+	30.7	70.4	74.9
	I	3.0	2.0	5.6
2007–08	III	62.0	27.5	19.3
	II / II+	34.6	70.3	74.1
	I	3.3	2.2	6.6
2008–09	III	57.4	28.9	18.9
	II / II+	39.9	69.8	73.9
	I	2.7	1.3	7.2
2009–10	III	66.8	28.9	19.8
	II / II+	31.0	69.3	73.6
	I	2.2	1.8	6.6

Data source BORN Ontario (Niday Perinatal Database), 2005–2006 to 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The distribution of live births at each level of care (Levels I, II, II+ and III), expressed as a percentage of the total number of live births (in a given place and time).

Notes: 1. A more detailed matrix of levels of care by gestational age groups can be found in APPENDIX G.

- The proportion of live births between 24–31 weeks of gestational age that were born in a Level III hospital, which is the optimal level of care for this gestational age decreased between 2005–2006 and 2008–2009 from 67.5% (95% CI: 64.0–70.9) to 57.4% (95% CI: 53.8–61.0), and then increased by 16% in 2009–2010 to 66.8% (95% CI: 63.3–70.1).
- In recent years, concern over rising rates of live births <32 weeks born outside of Level III hospitals prompted further study of this issue in the GTA. The 16% increase in the proportion of these births in

the appropriate level of care (i.e., Level III hospital) in the 2009–2010 fiscal year is an important change in direction for this trend and should continue to be monitored.

- Among infants between 32–33 weeks of gestational age, the majority were born in a Level II or Level II+ hospital. There was a slight decrease in this proportion over time, from 73.8% (95% CI: 70.3–77.2) in 2005–2006, to 69.3% (95% CI: 65.8–72.7) in 2009–2010. At the same time, the proportion of live births born at 32–33 weeks in Level III hospitals increased slightly from 23.4% (95% CI: 20.2–26.8) in 2005–2006 to 28.9% (95% CI: 25.6–32.3) in 2009–2010.

Maternal Inter-hospital Transfers

Maternal transfers between hospitals occur for both clinical reasons and reasons related to the availability of hospital resources. Maternal transfers to a hospital that provides a higher level of care are usually driven by concerns about maternal condition or the anticipated gestational age or condition of the newborn at birth.⁷ Transfers in the opposite direction, from a hospital with a higher level of care designation to one with a lower level, include transfers back to the original hospital of care once a high risk situation has resolved as well as transfers of low-risk mothers in order to make beds available within a high-risk centre for high risk mothers.⁷ The availability of beds and human resources are often the reason for maternal transfers between hospitals with similar levels of care.⁷

Decisions to transfer involve consideration of the clinical issues, the expertise and resources available at both hospitals and travel conditions.⁸ The availability of skilled accompaniment during transfer may also influence this decision.⁷ Given the evidence of improved outcomes for preterm babies born before 30-32 weeks when their mothers are transferred to a Level III hospital prenatally,⁴ it has been suggested that in utero transfer should be a primary goal whenever the benefits of transfer outweigh the risks.⁹

Even when the clinical benefits of maternal transfer appear obvious, women may be hesitant to be transferred to what is often a larger, unfamiliar hospital. This reluctance may be due to anxiety about increased travel time, fear of invasive technology, and the potential family disruption and financial burden.¹⁰ The availability of affordable accommodation for parents anticipating a prolonged stay away from their home community may address some of these concerns.⁴ It has also been noted that care providers should be attentive to the emotional needs of women who require maternal transfer.⁹

Figure 3.4 Inter-hospital maternal transfer profile, by level of care of receiving hospital
Greater Toronto Area (GTA) LHIN Region, 2009–2010

		Level of care of 'receiving' hospital				TOTAL
		Level I	Level II	Level II+	Level III	
		%	%	%	%	%
	Level I	--	14.0	41.9	9.5	13.1
Level of care of 'sending' hospital	Level II	--	46.5	25.8	46.6	43.7
	Level II+	--	11.5	--	24.6	21.1
	Level III	--	11.5	--	1.8	4.4
	Out of region	27.8	16.6	16.1	17.6	17.7
TOTAL		100.0	100.0	100.0	100.0	100.0

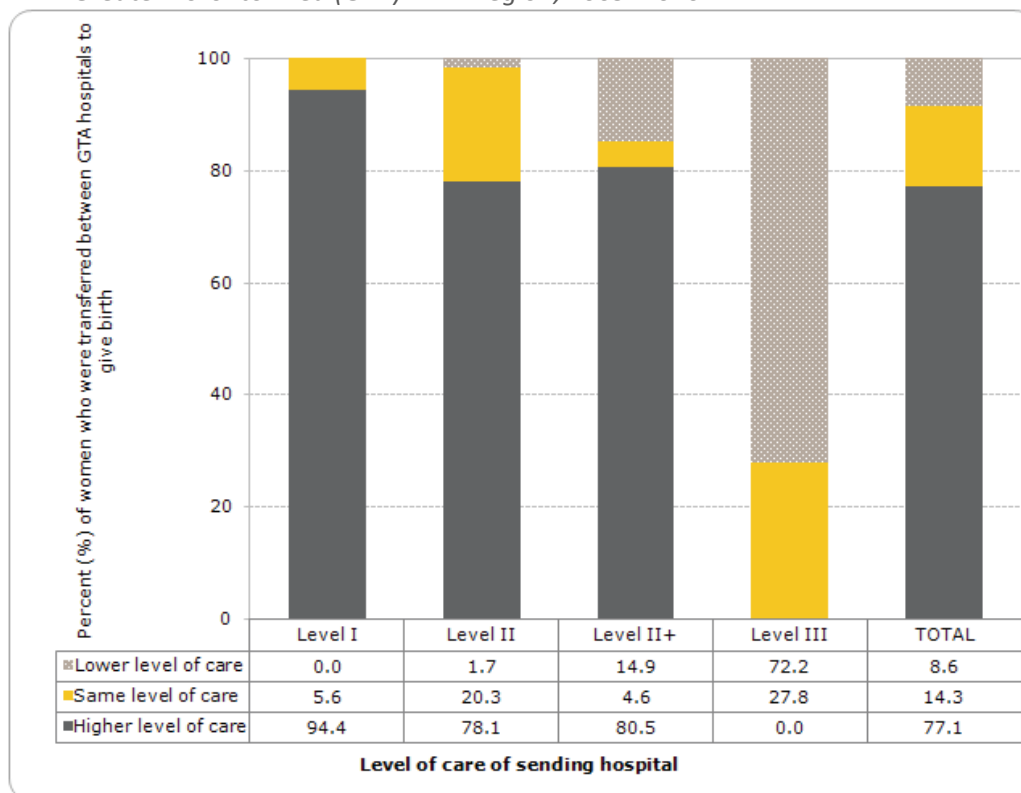
Data source BORN Ontario (Niday Perinatal Database), 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The distribution of level of care of 'sending' hospital (i.e., hospital transferred from), expressed as a percentage of the total number of maternal inter-hospital transfers resulting in a delivery in one of the five LHINs in the Greater Toronto Area (GTA) in 2009–2010.

- Notes:*
1. Hospitals with no obstetrical services (NOS) do not have a level of care assigned. Fewer than 5 women were transferred from a NOS hospital in 2009–2010. These records are excluded from this analysis.
 2. This figure only includes Ontario residents who were transferred into a GTA hospital. Residents from other Canadian provinces/territories or from other countries are excluded.
 3. Planned home births are excluded from this figure.
 4. Out-of-region maternal transfers do not have a level of care assigned as this information is not consistently available in the database.
 5. Estimates based on a cell size of <5 have been suppressed.

- There were a total of **412 maternal inter-hospital** transfers resulting in a delivery that occurred in a GTA hospital in 2009–2010, of which 73 (17.7%) were from a hospital outside of the GTA LHIN Region. The remaining 339 maternal transfers (82.3%) were between GTA hospital sites.
- Among the 284 maternal transfers that were received by a Level III GTA hospital for delivery in 2009–2010, the majority were transferred from a Level II (46.6%) or Level II+ (24.6%) GTA hospital. About 9% (9.5%) were transferred from a Level I GTA hospital and 17.6% were transferred from a hospital outside the GTA.
- Among the 73 maternal transfers from a hospital outside the GTA LHIN Region into a GTA hospital, 50 (68.5%) were transferred into a Level III GTA hospital for delivery (percentage not shown in figure above).

Figure 3.5 Proportion of maternal inter-hospital transfers to a higher, equivalent or lower level of care, by level of care of sending hospital
Greater Toronto Area (GTA) LHIN Region, 2009–2010



Data source BORN Ontario (Niday Perinatal Database), 2009–2010
Local Health Integration Network (LHIN) based on hospital of birth

Definition of indicator The number of maternal inter-hospital transfers to a higher, equivalent or lower level of care, expressed as a percentage of the total number of women who were transferred to another hospital to give birth (in a given place and time).

- Notes:
- Hospitals with no obstetrical services (NOS) do not have a level of care assigned. Fewer than 5 women were transferred from a NOS hospital in 2009–2010. These records are excluded from this analysis.
 - Women who were transferred from a hospital from outside the GTA LHIN region are excluded since the information on level of care for the transferring hospital is not consistently available in the database.
 - Planned home births are excluded from this figure.

- Among the 339 maternal inter-hospital transfers between GTA hospital sites, 262 (77.1%) were transferred to a hospital with a higher level of care, 48 (14.3%) to a hospital with the same level of care and 29 (8.6%) were transferred to a hospital with a lower level of care designation.
- Of the 18 women who were transferred from a Level III hospital to give birth, the majority were transferred to a hospital with a lower level of care designation to give birth 13 (72.2%).

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