Maternal and Neonatal Outcomes of Women With Cystic Fibrosis in Canada

Methodology Notes

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Identifying information

Project name	Maternal and Neonatal Outcomes of Women With Cystic Fibrosis in Canada
Project description	To explore the maternal and neonatal outcomes of women with cystic fibrosis (CF) and their health care service use before CF transmembrane conductance regulator (CFTR) modulators became widely available This analysis, conducted by the Canadian Institute for Health Information (CIHI), includes 9 parts: 1. Building the maternal and neonatal cohorts 2. Identifying maternal demographics, outcomes and health care resource use 3. Identifying neonatal demographics, outcomes and health care resource use 4. Exploring all-cause readmissions of patients from maternal cohorts 5. Exploring maternal deaths using linked CVSD/DAD data 6. Exploring distance between women's home and hospital for baby delivery 7. Exploring pharmaceutical utilization — All drug claims 8. Exploring pharmaceutical utilization and expenditure — Public drug claims 9. Describing jurisdictional formulary coverage Note: These methodology notes were developed for work contributing to the National Strategy for Drugs for Rare Diseases.
Project time frame	May 2023 to July 2023
General inquiries	drugs@cihi.ca

Project analysis 1: Maternal and neonatal cohorts

Objective of analysis	To build the maternal and neonatal cohorts of mothers with CF and the general maternal and neonatal population (comparison group)
Data sources	Discharge Abstract Database (DAD), CIHI
Data time frame	Fiscal years 2006–2007 to 2020–2021
Geographic coverage	All provinces (excluding Quebec) and territories
Cohort description	1. Mothers with CF and baby delivery: Women diagnosed with CF who gave birth in hospital between 2006–2007 and 2020–2021 2. Babies born to mothers with CF: Babies born to women identified in cohort 1 3. General Canadian maternal cohort: All women who gave birth in 2019–2020 4. General Canadian neonatal cohort: All babies born in 2019–2020
Inclusions	1. Cohort 1: Mothers with CF and baby delivery — Hospital record with a diagnosis of CF (ICD-10-CA code E84) and baby delivery between 2006–2007 and 2020–2021 2. Cohort 3: General Canadian maternal cohort — Hospital record with a baby delivery in 2019–2020 Baby deliveries were identified by the following ICD-10-CA codes in any position in the diagnosis fields: O10, O11, O12, O13, O14, O15, O16, O21, O22, O23, O24, O25, O26, O27, O28, O29, O30, O31, O32, O33, O34, O35, O36, O37, O40, O41, O42, O43, O44, O45, O46, O48, O60, O61, O62, O63, O64, O65, O66, O67, O68, O69, O70, O71, O72, O73, O74, O75, O85, O86, O87, O88, O89, O90, O91, O92, O95, O98 or O99 ending in 1 or 2, **or** Z37 3. Cohort 2: Babies born to mothers with CF i. Newborns born to women identified in cohort 1 (refer to linkage information) ii. Newborns delivered in hospital (records with admission category N and ICD-10-CA code Z380, Z383 or Z386 in any position in the diagnosis fields) 4. Cohort 4: General Canadian neonatal cohort — Newborns delivered in hospital in 2019–2020 (records with admission category N and ICD-10-CA code Z380, Z383 or Z386 in any position in the diagnosis fields)
Exclusions	1. Patients living in Quebec or who have a Quebec health card number 2. Cohorts 1 and 3: Hospital stays that resulted in abortions or stillbirths (admission category S) (i.e., no live baby delivery) Abortions were identified by the following CCI procedure codes and ICD-10-CA diagnosis code: CCI code 5.CA.20, 5.CA.24, 5.CA.88, 5.CA.89 or 5.CA.93 coded in any position that was not abandoned or done out of hospital; **or** ICD-10-CA code O04 in any position 3. Cohorts 2 and 4: Newborns born outside of hospital, per diagnosis fields in newborn record Newborns born outside of the hospital were identified by the following ICD-10-CA diagnosis codes: Z38.1, Z38.2, Z38.4, Z38.5, Z38.7 or Z38.8
Linkage	Babies born to mothers with CF were identified by matching the mother's chart number with the maternal/newborn chart number.

Project analysis 2: Maternal demographics, outcomes and health care resource use

Objective of analysis	To identify hospital resource use, deliveries and complications of pregnancy and labour, comparing mothers with CF with the general Canadian maternal population
Cohort description	Cohorts 1 and 3 (see analysis 1)
Calculation description	Refer to Appendix B for the list of comorbidities, complications and interventions with their corresponding ICD-10-CA and/or CCI codes. **Maternal profile** 1. Deliveries i. The number of deliveries 2. Age of patients (numeric) i. The age distribution (10th, 25th, 50th, 75th and 90th percentiles) of the cohort, calculated as the number of days from birth until hospitalization for delivery 3. Urban versus rural/remote i. The number and percentage of patients in urban or rural/remote residence categories Patients were assigned to urban or rural/remote communities based on the postal codes of place of residence using the Postal Code Conversion File+ (PCCF+) version 7E. Patients with unknown postal codes were excluded. 4. Neighbourhood income quintile i. The number and percentage of patients in each neighbourhood income quintile Patients were assigned to a neighbourhood income quintile based on the postal codes of place of residence using the PCCF+ version 7E. Cases with unknown neighbourhood income quintile were excluded. 5. The number and percentage of patients with a previous live birth 6. The number and percentage of patients with a previous therapeutic abortion 7. The number and percentage of patients with a previous spontaneous abortion

Calculation description (continued)	**Outcomes** 8. Lung transplants: The number and percentage of patients admitted for a lung transplant procedure within 5 years of delivery 9. Comorbidities: The number and percentage of patients who used assisted reproductive technology (ART), had pre-existing diabetes and/or had pre-existing hypertension, per the diagnosis fields on the delivery record 10. Pregnancy complications: The number and percentage of patients who had gestational diabetes, gestational hypertension, pre-eclampsia and/or eclampsia, per the diagnosis fields on the delivery record 11. Labour complications: The number and percentage of patients who had placenta previa, abruption placenta, premature rupture of membranes and/or hemorrhage, per the diagnosis fields on the delivery record 12. Labour interventions: The number and percentage of patients who had an induction of labour, epidural anesthesia, operative vaginal delivery and/or Caesarean section, per the intervention fields on the delivery record 13. Maternal deaths: The number and percentage of patients who died during the delivery hospitalization, per the discharge disposition field on the delivery record **Resource use during the delivery episode** 14. The length of stay distribution (10th, 25th, 50th, 75th and 90th percentiles) Calculated as the total number of days from the admission date to the discharge date in acute care, excluding the number of alternate level of care (ALC) days. 15. The number and percentage of patients with an intensive care unit (ICU) admission ICU admission was defined by admission to a special care unit (SCU). An SCU is an inpatient unit that is specifically designed, staffed and equipped for the observation and treatment of patients who cannot be cared for in a general acute care unit. SCUs include ICUs and step-down units. 16. The number and percentage of patients admitted to community or teaching hospitals based on CIHI's peer group methodology Teaching hospital definition: Hospitals are designated as teaching if they had confirmed teaching status from the provincial ministry or were identified as teaching in the provincial ministry's submission to CIHI's Canadian MIS Database. Community hospital definition: Non-teaching hospitals are allocated to the community hospital peer group, which encompasses 3 types — large, medium and small. This analysis grouped all non-teaching hospitals into community regardless of size. 17. The number and percentage of patients admitted to a hospital with a CF clinic, as identified from Cystic Fibrosis Canada and CIHI's databases For this project, it is assumed that CF clinics were open for all years in the time frame of analysis. 18. The top 10 interventions administered to patients

Project analysis 3: Neonatal demographics, outcomes and health care resource use

Objective of analysis	To identify hospital resource use and complications/conditions of neonates born to moms with CF, compared with general Canadian neonates
Cohort description	Cohorts 2 and 4 (see analysis 1)
Calculation description	Refer to Appendix B for the list of neonatal outcomes with their corresponding ICD-10-CA and/or CCI codes, as well as the diagnosis codes used to identify singletons/twins/triplets. **Patient profile as indicated on birth record** 1. The number and percentage of female and male babies 2. The number and percentage of newborns who were preterm birth (gestational age <37 weeks) and term birth (gestational age 37+ weeks) 3. The number and percentage of newborns with low birth weight (birth weight <2,500 grams) and normal birth weight (birth weight 2,500+ grams) 4. The number and percentage of singleton newborns and newborns who were part of multiples (i.e., twins or triplets), per the diagnosis fields in the newborn record **Outcomes** 5. The number and percentage of newborns who were small/large for gestational age To identify newborns who were small/large for gestational age, we used charts of standard Canadian birth weights for gestational age by gender.[1] Newborns below the 10th percentile were considered small and those above the 90th percentile were considered large for gestational age. 6. The number and percentage of newborns who had fetal asphyxia, jaundice, birth defects and/or necrotizing enterocolitis, per the diagnosis fields in the newborn record **Resource use** 7. The length of stay distribution (10th, 25th, 50th, 75th and 90th percentiles) Calculated as the total number of days from the admission date to the discharge date in acute care, excluding the number of ALC days 8. The number and percentage of babies with an ICU admission, per the SCU fields 9. The number and percentage of newborns admitted to community or teaching hospitals, based on CIHI's peer group methodology Teaching hospital definition: Hospitals are designated as teaching if they had confirmed teaching status from the provincial ministry or were identified as teaching in the provincial ministry's submission to CIHI's Canadian MIS Database. Community hospital definition: Non-teaching hospitals are allocated to the community hospital peer group, which encompasses 3 types — large, medium and small. This analysis grouped all non-teaching hospitals into community regardless of size. 10. The number and percentage of newborns admitted to a hospital with a CF clinic, as identified from Cystic Fibrosis Canada and CIHI's databases For this project, it is assumed that CF clinics were open for all years in the time frame of analysis. 11. The top 5 interventions administered to newborns

Project analysis 4: All-cause readmissions of patients from maternal cohorts

Objective of analysis	To identify the number of patients in the CF and general Canadian maternal cohorts who were readmitted to acute care within 30 days and 1 year of baby delivery
Cohort description	Cohorts 1 and 3 (see analysis 1)
Calculation description	1. The number and percentage of patients readmitted within 30 days of delivery discharge We identified patients who were readmitted to the hospital within 30 days after baby delivery using their health card number and health card jurisdiction. The discharge date on the baby delivery record was used as the index date and the admission date in the later record was used to calculate the days between visits. Flags were created for records that were within 30 days of baby delivery. 2. The number and percentage of patients readmitted within 1 year of delivery discharge We identified patients who were readmitted to the hospital within 365 days after baby delivery using their health card number and health card jurisdiction. The discharge date on the baby delivery record was used as the index date and the admission date in the later record was used to calculate the days between visits. Flags were created for records that were within 365 days of baby delivery. 3. The top 5 most responsible diagnoses (MRDx) for readmissions The MRDx is defined as the 1 diagnosis or condition that is most responsible for the patient's stay in a facility. If there is more than one such diagnosis, the 1 diagnosis most responsible for the greatest portion of the length of stay or greatest use of resources is selected (see DAD metadata for details).

Project analysis 5: Maternal deaths using linked CVSD/DAD data

Objective of analysis	To identify mothers with CF who had a baby and died 1 year post–delivery episode
Data sources	Canadian Vital Statistics Deaths Database (CVSD) data, Statistics Canada, linked to the Discharge Abstract Database (DAD), CIHI
Data time frame	Fiscal years 2006–2007 to 2020–2021
Geographic coverage	All provinces (excluding Quebec) and territories (excluding the Yukon)
Inclusions	1. Cohort 1: Patients with a baby delivery record and a diagnosis of CF on their record between 2006–2007 and 2020–2021 (ICD-10-CA code E84 was used to identify patients with CF) 2. Cohort 3: Patients with a baby delivery record in 2019–2020 Baby deliveries were identified by the following ICD-10-CA codes: O10, O11, O12, O13, O14, O15, O16, O21, O22, O23, O24, O25, O26, O27, O28, O29, O30, O31, O32, O33, O34, O35, O36, O37, O40, O41, O42, O43, O44, O45, O46, O48, O60, O61, O62, O63, O64, O65, O66, O67, O68, O69, O70, O71, O72, O73, O74, O75, O85, O86, O87, O88, O89, O90, O91, O92, O95, O98 or O99 ending in 1 or 2, **or** Z37 in any position
Exclusions	1. Patients living in Quebec or who have a Quebec health card number 2. Patients who had abortions Abortions were identified by the following CCI procedure codes and ICD-10-CA diagnosis code: CCI code 5.CA.20, 5.CA.24, 5.CA.88, 5.CA.89 or 5.CA.93 coded in any position that was not abandoned or done out of hospital; **or** ICD-10-CA code O04 coded in any position
Linkage	The linkage between the CVSD and the DAD was conducted at Statistics Canada using the Social Data Linkage Environment (SDLE), a highly secure linkage environment facilitating the creation of linked population data files for social analysis. The DAD was linked deterministically; records that were missing information in any of the linking variables were excluded, as accurate linkage was not possible.
Calculation description	1. The number and percentage of patients who died in hospital, private home, other health care facility or other specified locality i. Hospital: Licensed to operate as a hospital under provincial, territorial or federal government legislation ii. Other health care facility: Nursing homes, other long-term care facilities, nursing stations, other short-term care facilities and other health care facilities not licensed to operate as hospitals by provincial, territorial or federal governments (e.g., free-standing birthing centres) iii. Other specified locality

Project analysis 6: Distance between women's home and hospital for baby delivery

Objective of analysis	To calculate the distance that patients in the CF and general Canadian maternal cohorts travel for their delivery (the distance between patient's home and the delivery hospital)
Cohort description	Cohorts 1 and 3 (see analysis 1) **Note:** A random subset of 20% (278,473) of the general Canadian maternal cohort was used as the reference population.
Linkage	Postal codes from cohorts 1 and 3 were used to derive longitudes and latitudes of the patient residence and the hospital (treatment facility) where the baby was delivered.
Calculation description	1. The number of patients who had to travel less than 20 km, 20 to 49 km, 50 to 99 km and 100 km or more to get to the hospital i. To calculate an estimated distance from patient residence to treatment facility, Geographic Information System (GIS) was used. Esri's ArcGIS Pro desktop platform, in conjunction with the Network Analyst extension, was used with Statistics Canada's 2018 National Road Network (geospatial data layer). ii. Patient residence locations were approximated based on their postal code, with latitude and longitude coordinates derived using Statistics Canada's PCCF+, version 8A. Treatment facility locations were also derived using their postal codes and PCCF+, version 8A. iii. With all patient and facility locations mapped in the GIS, Network Analyst was used to calculate the shortest route between each patient's location and the facility that they went to for their health services. The GIS determines the shortest travel time (in minutes) based on road distances and the speed limits of the road segments for the various route options. Distance travelled is also calculated and is simply a function of the length of the road segments that comprise the shortest route. iv. Patient locations that were more than 5 km from the road network were excluded from the analysis. In addition, for some patients, complete road routes could not be established and so no results were obtained. This occurs when a patient lives on an island and must take a ferry or airplane to the mainland, or when a patient lives in a remote location and no continuous road route exists from their residence to the facility where they were treated. In such cases, complete travel by road is impossible and alternative travel methods must have also been used (e.g., airplane).

Project analysis 7: Pharmaceutical utilization — All drug claims

Objective of analysis	To describe the use of CF drugs based on all drug claims
Data sources	National Prescription Drug Utilization Information System (NPDUIS), CIHI
Data time frame	Fiscal years 2012–2013 to 2021–2022
Geographic coverage	Manitoba, Saskatchewan and British Columbia (provinces from which both private and public drug claim data is submitted to NPDUIS)
Cohort description	Women age 15 to 50 with a drug claim for a CF drug in a given fiscal year
Inclusions	1. Women age 15 to 50 2. At least one claim for a CF drug submitted to public drug programs for payment or for processing for documentation under a drug information system (DIS) Cystic fibrosis drug products were identified by their drug identification numbers (DINs) assigned by Health Canada and by the following World Health Organization (WHO) ATC codes in NPDUIS: R07AX02: Ivacaftor R07AX30: Ivacaftor and lumacaftor R07AX31: Ivacaftor and tezacaftor R07AX32: Ivacaftor, tezacaftor and elexacaftor
Calculation description	1. The number of claimants by chemical, province and fiscal year The number of people who had at least one claim that was processed for documentation under a DIS 2. The number of claims by chemical, province and fiscal year The total number of claims that were submitted to public drug programs for payment or that were processed for documentation under a DIS for the requested drugs

Project analysis 8: Pharmaceutical utilization and expenditure — Public drug claims

Objective of analysis	To describe the use of CF drugs based on public drug claims
Data sources	National Prescription Drug Utilization Information System (NPDUIS), CIHI
Data time frame	Fiscal years 2012–2013 to 2021–2022
Geographic coverage	Newfoundland and Labrador, New Brunswick, Manitoba, Saskatchewan, British Columbia and the Yukon **Note:** Other provinces may have a CF program but don't submit data to CIHI.
Cohort description	Women age 15 to 50 with a public drug claim for a CF drug in a given fiscal year
Inclusions	1. Women age 15 to 50 2. At least one claim for a CF drug where at least part of the claim was accepted by the public plan/program, either toward a deductible (if applicable) or for payment Cystic fibrosis drug products were identified by their DINs assigned by Health Canada and by the following WHO ATC codes in NPDUIS: R07AX02: Ivacaftor R07AX30: Ivacaftor and lumacaftor R07AX31: Ivacaftor and tezacaftor R07AX32: Ivacaftor, tezacaftor and elexacaftor
Calculation description	1. The number of active beneficiaries by chemical, province/territory and fiscal year The number of people for whom the public plan/program has accepted at least part of at least one claim either toward a deductible or for reimbursement 2. The number of accepted claims by chemical, province/territory and fiscal year The total number of claims that were submitted to public drug programs for payment or that were processed for documentation under a DIS for the requested drugs 3. Costs associated with CF drugs by chemical, province/territory and fiscal year i. Total cost accepted: The total dollar amount of a prescription accepted by the plan/program as eligible for payment, as it relates to quantity accepted. This amount includes the drug cost as well as the associated professional fee and markup, if applicable. ii. Program paid amount: The amount from the total prescription cost accepted that is paid by the plan/program. This amount includes the drug cost as well as the associated professional fee and markup, if applicable. iii. Percentage of the cost paid by the public drug plan: The program paid amount divided by the total cost accepted

Project analysis 9: Jurisdictional formulary coverage

Objective of analysis	To describe the formulary data at the drug identification number (DIN)/pseudo-DIN (PDIN) level for the requested drugs
Data sources	National Prescription Drug Utilization Information System (NPDUIS), CIHI
Data time frame	Fiscal years 2012–2013 to 2021–2022
Geographic coverage	Newfoundland and Labrador, New Brunswick, Manitoba, Saskatchewan, British Columbia and the Yukon
Cohort description	Not applicable
Inclusions	Not applicable
Calculation description	Coverage start and end dates by DIN/PDIN, jurisdiction, plan/program and benefit status
Methodology notes	A drug product is determined to be listed in a jurisdiction if it has been reported to NPDUIS as being eligible in any provincial/territorial drug program, with or without benefit criteria. The formulary information provided also includes products that may have been covered as an exception to the formulary listing. A product covered as an exception to the formulary listing is included in this analysis if at least one claim for the drug was accepted by a public drug plan/program at some point between April 1, 2012, and March 31, 2022. • Plan/program: The drug benefit plan/program to which the formulary information applies, or to which the claim was submitted for payment • DIN: A drug identification number as assigned by Health Canada to uniquely identify drug products sold in a dosage form in Canada. A DIN is specific to a manufacturer, product name, active ingredient(s), strength(s) of active ingredient(s) and pharmaceutical form. • PDIN: A pseudo-drug identification number as assigned by a drug program when a benefit has not been assigned a DIN by Health Canada. This is typically to identify non-drug benefits (e.g., diabetes supplies) and is sometimes used to differentiate benefits based on package size or covered indication (e.g., methadone for substance use disorder versus pain management). • PDIN flag: A flag that indicates whether a drug is listed as a PDIN. If the PDIN flag is Y, the value received is a PDIN. If the PDIN flag is N, the value received is a DIN. • CIHI uniform description: Based on the brand name assigned by Health Canada combined with the CIHI standardized strength/dosage and CIHI pharmaceutical form. For PDINs, the data element will contain all the attributes that define the PDIN as submitted by the corresponding jurisdiction.

Methodology notes (continued)	• Benefit status: A code that specifies the benefit status of a DIN in the plan/program. The codes are as follows: – B (benefit) — Drugs that are regular benefits, where no patient-specific justification to receive reimbursement is required – L (limited) — Drugs that are listed in the plan/program and are limited benefits through regular (automated) adjudication processes against a set of plan-/program-specific criteria (coded by either the prescriber or the pharmacy/service provider) – R (restricted) — Drugs that are listed in the plan/program and are restricted benefits through a formal request for coverage to be completed by the prescriber for patient-specific review, against a plan-/program-specific set of published criteria • Coverage start date: The date on which a given combination of coverage attributes became effective in the plan/program for a DIN/PDIN. • Coverage end date: The date on which a DIN/PDIN was no longer subject to a given combination of coverage attributes in a plan/program. A blank field denotes that coverage remains effective as of the start date.

Quality statement

Exceptions and limitations	**DAD** Due to different reporting methods, only single babies can be identified in Newfoundland and Labrador and Prince Edward Island (i.e., if a patient had multiple babies [twins or triplets], all babies share a single chart number and cannot be uniquely identified). The DAD does not capture care or deaths outside of acute care facilities. **CVSD data linked to the DAD** Deaths occurring in the Yukon are not included in the CVSD linked data sets available to CIHI due to restrictions on sharing. Release of linked CVSD/DAD data: Note the following in accordance with CIHI's and Statistics Canada's privacy policies for tables where data from the CVSD is linked to data from the DAD: 1. Counts • Counts based on 0 people are releasable. • Counts based on 1, 2, 3 and 4 people are not releasable. The table is redesigned to collapse categories. • Counts based on 5+ people are releasable but must be rounded to base 5 using either random rounding or controlled rounding. • The minimum count requirement must be based on the number of people and not on the number of visits to the hospital/health care facility. For example, a person (as identified by the person identifier) with multiple transactions contributes 1 person toward the minimum count. • Any estimate must include contributors from at least 2 institutions.

Exceptions and limitations (continued)	2. Statistics: Means, percentages and ratios • These statistics are releasable if they involve at least 5 people. To contribute, a person must add a non-0 quantity to the total. • Use unrounded counts for calculating means. The magnitude variable (numerator) must pass dominance rules as defined by Statistics Canada's Research Data Centre census guidelines. This prevents calculating proportions as the mean of an indicator value. For proportions and ratios, rounded counts (random or controlled rounding to base 5) of both the numerator and denominator should be used. **NPDUIS** Due to the design of public drug programs in Canada (i.e., seniors and low-income families/individuals are the only populations covered in all jurisdictions), we have limited data on claims made by non-seniors. As a result, NPDUIS is not a population-based system (except for Manitoba, Saskatchewan and British Columbia). There may also be differences in population characteristics (such as age and health status) between seniors with and without public coverage. In provinces where a lower proportion of seniors have claims accepted by the public plan (e.g., Newfoundland and Labrador, Nova Scotia, New Brunswick), drug utilization patterns among those with public coverage are more likely to be affected by these differences and, therefore, may be less reflective of utilization patterns among all seniors in the province. Claims for drugs dispensed in hospitals as well as for those funded through cancer agencies are not submitted to NPDUIS. NPDUIS does not include information regarding • Prescriptions that were written but never dispensed; • Prescriptions that were dispensed but for which the associated drug costs were not submitted to, or not accepted by, the public drug programs; or • Diagnoses or conditions for which prescriptions were written.

Appendices

Appendix A: Codes used to build the cohorts

Intervention/diagnosis	ICD-10-CA and CCI codes
CF	ICD-10-CA: E84 coded in any position
Baby delivery	ICD-10-CA: O10, O11, O12, O13, O14, O15, O16, O21, O22, O23, O24, O25, O26, O27, O28, O29, O30, O31, O32, O33, O34, O35, O36, O37, O40, O41, O42, O43, O44, O45, O46, O48, O60, O61, O62, O63, O64, O65, O66, O67, O68, O69, O70, O71, O72, O73, O74, O75, O85, O86, O87, O88, O89, O90, O91, O92, O95, O98 or O99 ending in 1 or 2, **or** Z37 coded in any position
Abortions (excluded)	CCI: 5.CA.20, 5.CA.24, 5.CA.88, 5.CA.89 or 5.CA.93 coded in any position that was not abandoned or done out of hospital ICD-10-CA: O04 coded in any position
Baby delivery in hospital	ICD-10-CA: Z380, Z383 or Z386 coded in any position
Baby born outside of hospital (excluded)	ICD-10-CA: Z38.1, Z38.2, Z38.4, Z38.5, Z38.7 or Z38.8 coded in any position

Appendix B: Codes used to identify maternal and neonatal outcomes

Table B1: Maternal outcomes

Outcome	ICD-10-CA and CCI codes
Lung transplant	CCI: 1.GT.85, 1.GR.85 or 1.HY.85 coded in any position ICD-9-CM: 33.50, 33.51, 33.52 and 33.6 (2000–2001 to 2005–2006 only)
ART use	ICD-10-CA: Z37 or Z38 coded in any position with 1 in the sixth digit
Pre-existing hypertension	ICD-10-CA: O10 or O11 coded in any position
Gestational hypertension	ICD-10-CA: O13 coded in any position
Pre-existing diabetes	ICD-10-CA: O24.5, O24.6 or O24.7 coded in any position
Gestational diabetes	ICD-10-CA: O24.8 coded in any position
Placenta previa	ICD-10-CA: O44 coded in any position
Abruptio placenta	ICD-10-CA: O45 coded in any position
Premature rupture of membranes	ICD-10-CA: O42 coded in any position
Hemorrhage	ICD-10-CA: O72, O67, O902, O4300 or O46 coded in any position
Induction of labour	CCI: 5.AC.30 coded in any position

Outcome	ICD-10-CA and CCI codes
Epidural anesthesia	CCI: 5.LD.20.HA-P1 coded in any position **or** anesthetic technique code is 3
Operative vaginal delivery	CCI: 5.MD.53 to 5.MD.55 coded in any position
Caesarean section	CCI: 5.MD.60 that was not abandoned

Table B2: Neonatal outcomes

Outcome	ICD-10-CA and CCI codes
Multiple babies	ICD-10-CA: Z38.3 (twins) or Z38.6 (triplets) coded in any position
Asphyxia	ICD-10-CA: P20 or P21.9 coded in any position
Any birth defects	ICD-10-CA: Q00 to Q99 coded in any position
Neonatal jaundice	ICD-10-CA: P58 or P59 coded in any position
Necrotizing enterocolitis	ICD-10-CA: P77 coded in any position

Note

ICD-10-CA code P21.9 *Newborn asphyxia, unspecified* was used in this analysis but was disabled in v2015. After 2015, unspecified newborn asphyxia was moved to P96.6; however, this category includes conditions other than asphyxia. Caution should be used when trending.

Appendix C: Classification systems used in analyses

ATC: Anatomical Therapeutic Chemical.

CCI: Canadian Classification of Health Interventions.

ICD-9-CM: International Classification of Diseases, Ninth Revision, Clinical Modification.

ICD-10-CA: International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Canada.

Reference

1. Kramer MS, et al. A new and improved population-based Canadian reference for birth weight for gestational age. *Pediatrics*. 2001.

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