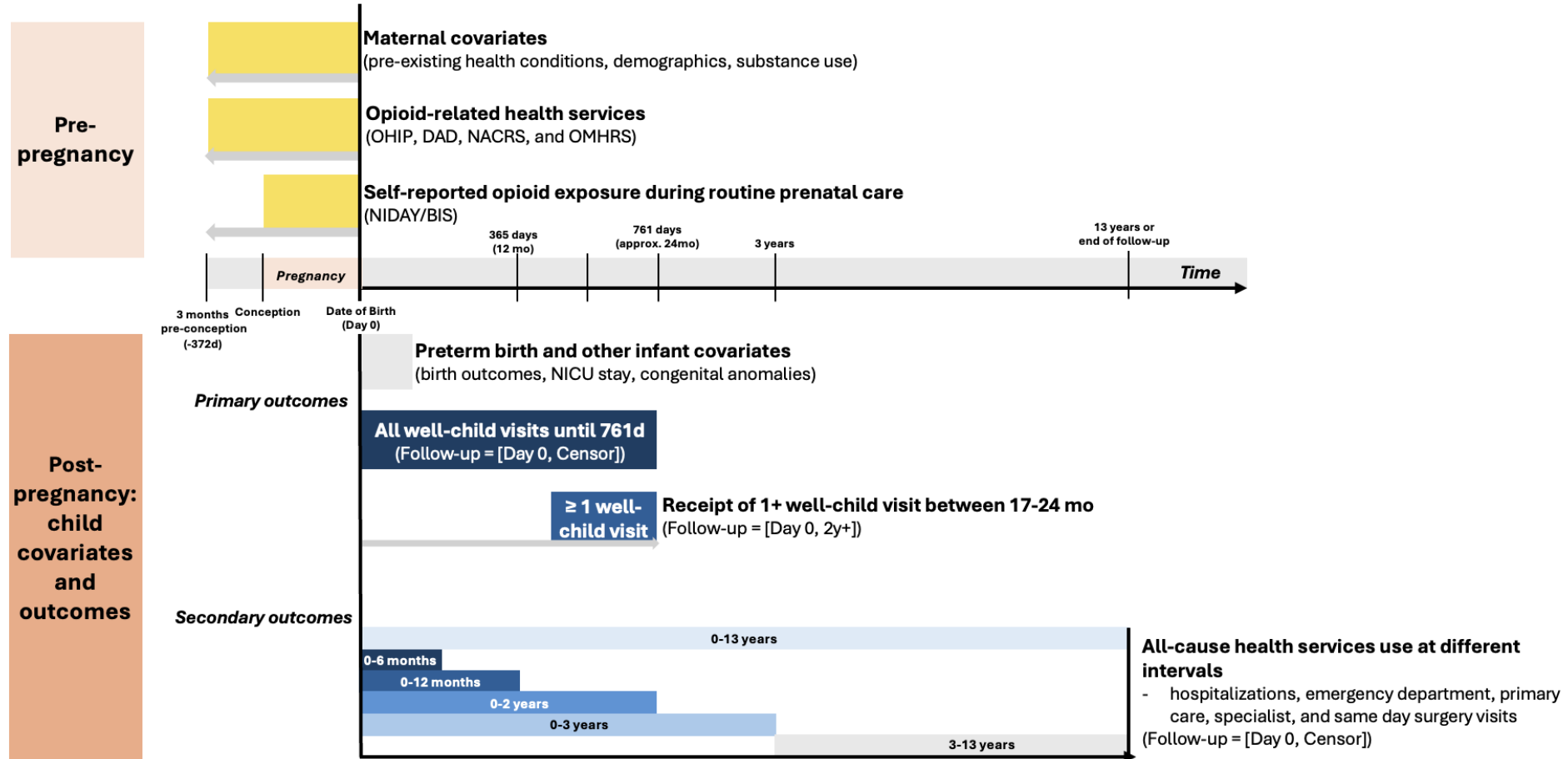


Appendix 1. Exposure, covariates, and outcome ascertainment timeline



Appendix 2. List of health administrative databases used in the study

Discharge Abstract Database (DAD)

The DAD, managed by the Canadian Institute for Health Information (CIHI), contains patient-level data on all hospital admissions from acute, rehab, chronic and day surgery institutions with administrative, clinical and demographic information (1). Prenatal opioid exposure, maternal substance-related disorder and psychiatric conditions were ascertained from the mother's DAD encounters. Infant DAD encounters were used to ascertain infant covariates (neonatal intensive care unit admission and length of stay in the first 30 days of life, and diagnosis of any major congenital anomalies in the first 90 days of life) and inpatient visits.

Census Area Profiles (CENSUS)

The Census Area Profiles (CENSUS) 2016 for Ontario provides a statistical portrait of Ontario and its residents by their demographic, social and economic characteristics, including age, family structure, households, language, income, immigration and ethnocultural diversity, First Nations and education as measured in the 2016 Census of Population (2). The CENSUS was used to determine the income level of mothers based on residence at the time of birth.

National Ambulatory Care Reporting System (NACRS)

The NACRS, managed by the CIHI, captures patient-level data on visits to a hospital or community-based ambulatory care with demographic, administrative, financial and clinical information (3, 4). Information on maternal opioid-related health services in an emergency department during pregnancy and infant emergency department visits was ascertained from this database. NACRS was also used to determine hospital visits (including hospital-based clinics or

emergency department visits) or community-based ambulatory care that did not require overnight admission.

Narcotics Monitoring System (NMS)

The NMS, collects information on dispensed prescriptions for controlled substances that are being monitored, including opioids, regardless of the funding source of the prescription (5). This database was used to ascertain the additional definition of exposure using prescription records in a sub-group of mother-infant dyads whose lookback period began on or after July 1, 2012 in the sensitivity analysis (**Supplementary Appendix 8**).

Ontario Diabetes Dataset (ODD)

The Ontario Diabetes Dataset (ODD) is an ICES-derived cumulative database containing all Ontario individuals diagnosed with non-gestational diabetes (6). Maternal pre-existing diabetes diagnosis was identified from this database.

Ontario Health Insurance Plan (OHIP) Claims database

The OHIP claims database contains health service billing information submitted by healthcare providers for service reimbursement purposes (7). Prenatal opioid exposure was ascertained from the mother's OHIP encounters. Well-child and outpatient visits were ascertained from the infant's OHIP encounters.

Ontario Hypertension (HYPER) dataset

The Ontario Hypertension dataset is an ICES-derived cumulative database containing all Ontario individuals with hypertension (8). The database was established using the information from OHIP, DAD, SDS, NACRS and RPDB and the algorithm to identify patients to build the database has been validated previously (9). Maternal pre-existing hypertension was identified using this database.

Ontario Marginalization Index (ON-Marg)

The Ontario Marginalization Index (ON-Marg) is a data tool developed by Public Health Ontario to estimate marginalization in Ontario using Census-based measures (10, 11). The dataset is available at ICES at the geographic level of census dissemination areas. ON-Marg uses census data for Ontario and is based on algorithms adapted from the Canadian Marginalization Index (12). It has four dimensions that estimate marginalization: households and dwellings, material resources, age and labour force, and racialized and newcomer populations. Households and dwellings reflects housing conditions and instability prevalence and is associated with neighbourhood quality and support. Material resources is closely associated with poverty and corresponds to the concentration of residents who cannot access basic material requirements. This dimension can approximate education, family type, income, employment, social assistance, and housing quality. The age and labour force measure indicates an area-level concentration of unemployed residents without income. Racialized and newcomer populations refers to the high area-level prevalence of recent immigrants who arrived in the past five years and/or self-identified visible minorities who may experience structural racism or discrimination. The scores for each dimension were divided into quintile scales, where quintile one reflects low levels of marginalization and quintile five represents high levels of marginalization. The ONMARG was used to ascertain neighbourhood-level marginalization and estimate the socioeconomic status of mother-infant pairs.

Ontario Mental Health Reporting System (OMHRS)

The OMHRS collects data on patients occupying adult-designated mental health beds in an inpatient setting, including general, provincial psychiatric and specialty psychiatric

institutions (13). Prenatal opioid exposure and maternal covariates (substance-related disorders, psychiatric conditions) were ascertained from the mother's OMHRS encounters.

Postal Code Conversion File (PCCF)

The Postal Code Conversion File (PCCF) links the postal code by Canada Post Corporation with the corresponding standard geographic areas of Statistics Canada, a standard geographic identifier in census data (14). The PCCF was used to link postal codes from the RPDB to census geographic identifiers to acquire neighbourhood income quintiles from the CENSUS.

Registered Persons Database (RPDB)

The Registered Persons Database (RPDB) contains basic demographic and vital status information for all persons eligible for insured health services in Ontario or anyone who has ever received an Ontario health card number (15). We used the RPDB to determine vital status and any change in the eligibility for Ontario health care coverage for infants and mothers with continuous OHIP eligibility during the pre-conception period.

Same-Day Surgery (SDS) database

The SDS database, managed by CIHI, captures information on day surgery from institutions in Ontario (16). Counts of same-day surgeries that infants received during the follow-up period were ascertained from the infants' SDS encounters.

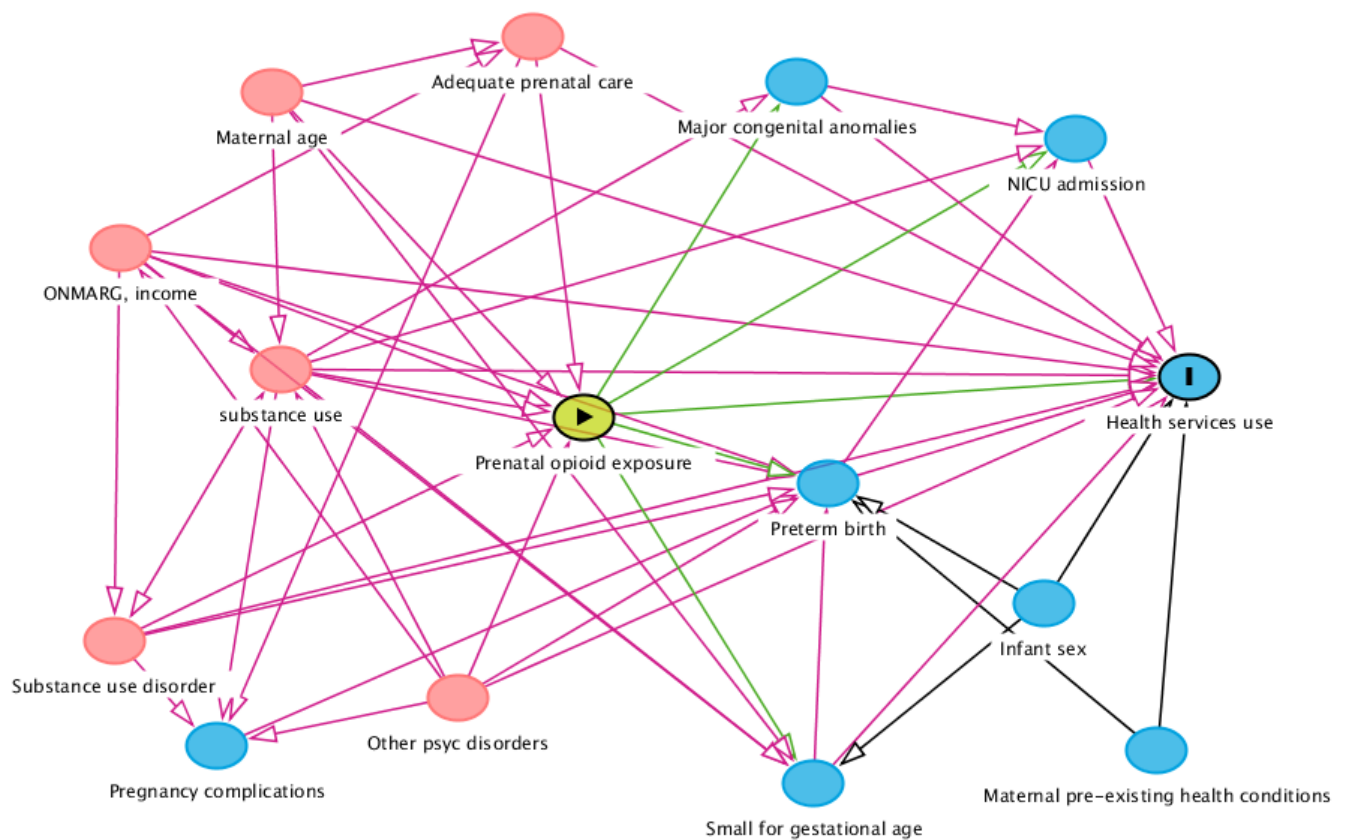
Appendix 3. Exposure and outcome definitions

Exposure: Prenatal opioid exposure	Definition	Data source
Maternal opioid use during pregnancy collected during routine prenatal care.	Exposure to drugs and substances and exposure to medication. Includes opioids, narcotics, and agonist maintenance therapy.	NIDAY/BIS
Outpatient opioid agonist maintenance program during pregnancy.	OHIP billing codes: K682, K683, K684	OHIP
Inpatient opioid-related health services during pregnancy.	ICD-10-CA codes: F111, F112, F119, T400, T401, T402, T403, T404, T406, Y450, Z79891	DAD OMHRS
Opioid-related health services in an emergency department during pregnancy.	DSM-IV codes: 30550, 30400	NACRS

Outcomes	Definition	Data source	Follow-up requirements / inclusion criteria
<i>Primary outcomes: Preventive health services utilization</i>			
Well-child visits			
1. Any well baby visits until 24 months of age (count variable)	Frequency of any check-ups, assessment, or periodic health visits in outpatient setting. OHIP billing codes: A268, A002, A003, A007, A261, K017, K267 OHIP diagnosis codes: 916, 917	OHIP	Entire cohort (no follow-up requirement)
2. Completion of well-child visits between 17-24 months of life (generic and/or enhanced)	Having 1 or more any check-ups, assessment, or periodic health visits in outpatient setting between 515-761 days of life. OHIP billing codes: A268, A002, A003, A007, A261, K017, K267 OHIP diagnosis codes: 916, 917	OHIP	Continuous OHIP eligibility from birth until 761 days of life

	3. Completion of enhanced well-child visit between 17-24 months of life	Having 1 or more 18-month enhanced well-child visit between 515-761 days of life OHIP billing codes A002 or A268	OHIP	Continuous OHIP eligibility from birth until 761 days of life AND born on/after May 1, 2008
<i>Secondary outcomes: All-cause health service utilization</i>				
	Primary care visits	Any OHIP encounters billed by a family physician (SPEC = 00 or 05) or a pediatrician (physician specialty code 26) with at least one of the following billing codes (OHIP variable: FEECODE) for primary care: A001, A002, A003, A004 A007, A261 A888, A901, G462 G538 G539, G590, G591, G592, G840, G841, G842, G843, G844, G845, G846, G847, G848, K002, K005, K007, K013, K017, K033, K130, K267, K268, K269	OHIP	Entire cohort (no follow-up requirement); 3-12 years old: follow-up for 3 continuous years or longer
	Specialist visits	Any OHIP encounters billed by specialists (SPEC ne 00 or 05) without primary care visits billed by pediatrician.	OHIP	
	Well-child visits	See above	OHIP	
	Hospitalizations	Number of DAD encounters.	DAD	
	ED visits	Number of NACRS encounters.	NACRS	
	Same day surgery visits	Number of SDS encounters.	SDS	

Appendix 4. Directed acyclic graph



The exposure, prenatal opioid use, is denoted by the green oval with an arrow, while the outcome of interest, health services use, is depicted by a blue oval with a line. The remaining blue circles represent ancestors of the outcome, and the red circles are represent variables associated with both the exposure and outcome (confounders). Green arrows indicate the direction of causal paths, while red arrows represent biasing paths. Covariates on the causal pathway, also known as mediators, were not controlled for in our analyses. The confounding variables selected for the regression models are listed in **Appendix 5**.

Appendix 5. Complete list of potential covariates and confounding variables

Covariates	Definition / Data source	Included as confounding variable	Included in multiple imputation
Maternal demographic information			
Mother's age at the time of birth	NIDAY/BIS, RPDB	yes	yes
Neighbourhood marginalization index	ONMARG	yes	yes
Neighbourhood income quintile	CENSUS, PCCF	yes	yes
Maternal health conditions			
History of hypertension	HYPER		yes
History of diabetes	ODD		yes
Substance-related disorders	DAD: ICD-10-CA = F55, F10, F11, F12, F13, F14, F15, F16, F17, F18, F19 OHIP: DXCODE = 303, 304 (nonspecific drug addiction), 291, 977 OMHRS: DSM4 = 2910, 2911, 2912, 29181, 29189, 2919, 2920, 29281, 29282, 29283, 29289, 2929, 30300, 30390, 30410, 30420, 30430, 30440, 30450, 30460, 30480, 30490, 30500, 30510, 30520, 30530, 30540, 30560, 30570, 30590	yes	yes
Mood affective / anxiety disorders	DAD: ICD-10-CA = F30, F31, F32, F33, F34, F38, F39, F530, F40, F41, F42, F43, F488, F489; F930, F931, F932 OHIP: DXCODE = 296, 311, 300, 309 OMHRS: DSM4 = 29284, 29383, 290, 2962, 2963, 2964, 2965, 2966, 2967, 29680, 29689, 29690, 3004, 30113, 30000, 30001, 30002, 30021, 30022, 30023, 30029, 3003, 3083, 30921, 20981	yes	yes
Personality and behaviour disorders	DAD: ICD-10-CA = F60, F61, F62, F68, F69, F21 OHIP: Dxcode = 301, 306, 307 OMHRS: DSM4 = 3010, 30120, 30122, 3014, 30150, 3016, 3017, 30181, 30182, 30183, 3019	yes	yes

Schizophrenia, delusional and psychotic disorders	DAD: ICD-10-CA = F200, F201, F202, F203, F205, F208, F209, F22, F23, F24, F25, F28, F29, F531 OHIP: Dxcode = 295, 297, 298 OMHRS: DSM4 = 2913, 2915, 29211, 29212, 29381, 29382, 29510, 29520, 29530, 29540, 29560, 29570, 29590, 2971, 2973, 2988, 2989	yes	yes
Hepatitis B	NIDAY/BIS		yes
HIV	NIDAY/BIS		yes
Pregnancy-related information			
Premature rupture of membranes	NIDAY/BIS. Includes Prelabour rupture of membranes (PROM) and Preterm prelabour rupture of membranes		yes
Gestational diabetes	NIDAY/BIS		yes
Gestational hypertension	NIDAY/BIS. Includes pre-eclampsia, gestational hypertension, eclampsia		yes
Placental complications	NIDAY/BIS. Includes placenta previa, placental abruption, Placental accrete, Placental increta, Placental perceta		yes
Parity	NIDAY/BIS		
Mode of delivery	NIDAY/BIS		
Tobacco	NIDAY/BIS	yes	yes
Cocaine	NIDAY/BIS	yes	yes
Hallucinogen	NIDAY/BIS	yes	yes
Cannabis	NIDAY/BIS	yes	yes
Other substance use	NIDAY/BIS	yes	yes
Multiple births	NIDAY/BIS		

Adequacy of prenatal care	NIDAY/BIS, OHIP. Adequacy of prenatal care was determined using the Revised-Graduated Prenatal Care Utilization Index and categorized into 6 groups (Intensive, adequate, intermediate, inadequate, No care, and Missing). The index was calculated using the gestational age (from NIDAY/BIS), the trimester of the initial prenatal care, and the total number of prenatal care visits. Prenatal care visits were captured by any OHIP encounters with the FEECODE A920, A921, A005, A006, A665, Q606, Q607, P002, P003, P004, P005 with SPEC = 00 (GP) or 20 (obgyn). Visits were defined by one record per person per type of doctor per day. The trimester of the initial prenatal care was determined by subtracting LMP from the service date of the first appearance of the prenatal visit encounter (1-91: 1st trimester, 92-189: 2nd trimester, and 190 or more: 3rd trimester) The total number of prenatal care visits was determined by counting the number of any OHIP encounters with the FEECODE above before the date of birth	yes	yes
Infant characteristics			
Sex	NIDAY/BIS		
Birth weight	NIDAY/BIS		
Gestational age	NIDAY/BIS		
Small for gestational age (SGA)	NIDAY/BIS. SGA was calculated based on a Canadian standard reference, developed by Kramer et al. (2001) (17). If below the 10th percentile of the sex and gestational age-specific birth weight distribution, the infant was considered as small for gestational age.		yes
Preterm birth	NIDAY/BIS		yes
Length of birth hospitalization	DAD		yes

NICU admission in the first 30 days of life	DAD		yes
Length of NICU stay in the first 30 days of life	DAD		
APGAR score at 5 min after birth	NIDAY/BIS		yes
Major congenital anomalies diagnosed in the first 90 days of life	DAD: ICD-10-CA = Q00-Q99 excluding Q10, Q162, Q17-Q182, Q184-Q189, Q250, Q270, Q381, Q515, Q516, Q520-Q527, Q53, Q664-Q666, Q69, Q70, Q81-Q84, Q950-Q952, Q954, Q955, Q959		yes

Appendix 6. Coarsened Exact Matching

A set of potential confounders can be coarsened into adequately comparable groups, and exposed subjects can be 1:k matched to unexposed subjects within covariate categories (18). Exposed and unexposed children were matched within each strata of unique combinations of covariate categories. We matched maternal age, instability quintile, deprivation quintile, income quintile, maternal substance-related disorder, cannabis use, tobacco use, mood affective disorder, and R-GINDEX for adequacy of prenatal care. Categories of the R-GINDEX were collapsed to prevent any strata of small sample size for efficient matching. Other confounding variables were included using the previously defined categories. Since the number of exposed and unexposed subjects may differ, a weight to equalize the number of exposed and unexposed subjects in each stratum was assigned (19). A weight was defined as 1 for exposed subjects. For the unexposed group, a normalized weight ($\frac{\text{All matched unexposed in the sample}}{\text{All matched exposed in the sample}} \times \frac{\text{matched exposed in stratum}}{\text{matched unexposed in stratum}}$) was assigned to balance and match the covariate distribution of the exposed subjects (19).

Ten imputed datasets were used for the CEM analyses and to account for missing data in covariates. Across the ten datasets, an average of 10,515 exposed children were matched to 693,945 unexposed children. After matching and applying weight, SMD of baseline characteristics were below 0.1, indicating that exposure groups are more balanced and comparable. We show the covariate distribution for the exposed and unexposed samples after CEM with and without applying the CEM weights, for the first imputed dataset (**Appendix Table 6-1**). All CEM analyses incorporated the CEM weights.

Appendix Table 6.1. Weighted and unweighted baseline characteristics of the study population after coarsened exact matching (imputation 1)

	Unweighted			Weighted		
Matched baseline characteristics	Exposed (n=10,515)	Unexposed (n=693,945)	SMD	Exposed (n=10,515)	Unexposed (n=693,945)	SMD
Maternal age	27.83	30.34	0.504	27.83	27.83	0.001
Instability quintile						
1 (lowest)	7.31%	21.56%	0.414	7.31%	7.31%	0.000
2	11.30%	18.61%	0.206	11.30%	11.30%	0.000
3	14.80%	16.46%	0.046	14.80%	14.80%	0.000
4	25.19%	19.25%	0.143	25.19%	25.19%	0.000
5 (highest)	41.39%	24.12%	0.374	41.39%	41.39%	0.000
Deprivation quintile						
1 (lowest)	8.28%	20.71%	0.359	8.28%	8.28%	0.000
2	9.87%	17.66%	0.228	9.87%	9.87%	0.000
3	12.04%	15.25%	0.094	12.04%	12.04%	0.000
4	18.63%	16.65%	0.052	18.63%	18.63%	0.000
5 (highest)	51.18%	29.72%	0.448	51.18%	51.18%	0.000
Income quintile						
1 (lowest)	49.62%	27.91%	0.457	49.62%	49.62%	0.000
2	18.64%	17.08%	0.041	18.64%	18.64%	0.000
3	12.81%	17.14%	0.121	12.81%	12.81%	0.000
4	10.89%	21.22%	0.284	10.89%	10.89%	0.000
5 (highest)	7.34%	16.61%	0.288	7.34%	7.34%	0.000
Missing	0.69%	0.04%	0.108	0.69%	0.69%	0.000
Substance-related disorder	54.86%	1.21%	1.489	54.86%	54.86%	0.000
Mood affective disorder	26.29%	8.68%	0.476	26.29%	26.29%	0.000
Cannabis use	12.05%	0.57%	0.486	12.05%	12.05%	0.000
Tobacco use	59.22%	7.52%	1.311	59.22%	59.22%	0.000
Prenatal care index						
Adequate + intensive	18.69%	26.35%	0.184	18.69%	18.69%	0.000
Intermediate	41.47%	56.30%	0.300	41.47%	41.47%	0.000
Inadequate + no care	39.84%	17.35%	0.514	39.84%	39.84%	0.000

CEM-adjusted associations were attenuated and approached the null, compared to the main analyses. We assessed the magnitude of association attenuated by CEM

$(\frac{RR(CEM) - RR(original)}{RR(original)})$. Incidence rate of well-child visits until 24 months was attenuated by 11.1%,

and risk ratio of completing any well-child visit near 18 months of age was attenuated by 6.0%.

Associations between specialist visits and prenatal opioid exposure between 0 to 2 years were attenuated in magnitude by 23.1 to 24.6% through CEM and remained statistically significant.

Appendix Table 6.2. Weighted adjusted association between health services utilization and prenatal opioid exposure until the age of 24 months.

	CEM	Main analysis	Attenuation in association through CEM (%)
Outcomes	Adjusted incidence rate ratio (95% CI)		
All well-child visits until 24 months of age	0.84 (0.84, 0.84)	0.82 (0.81, 0.83)	11.1%
	Adjusted risk ratio (95% CI)		
Completion of 1+ well-child visit between 17-24 months of life	0.95 (0.95, 0.96)	0.89 (0.88, 0.90)	6.0%
	Adjusted incidence rate ratio (95% CI)		
Specialist visits 0-6m	1.71 (1.68, 1.74)	1.93 (1.86, 2.00)	24.0%
Specialist visits 0-1y	1.60 (1.57, 1.63)	1.78 (1.72, 1.85)	23.1%
Specialist visits 0-2y	1.46 (1.44, 1.49)	1.61 (1.55, 1.67)	24.6%

Appendix 7. The mean length of stay for hospitalizations

Age intervals	Exposed mean (standard deviation)	Unexposed mean (standard deviation)
0 - 6 months ¹	11.7 (16.1)	4.5 (9.5)
0 - 1 year ¹	12.0 (17.3)	4.6 (10.0)
0 - 2 years ¹	12.4 (18.4)	4.8 (10.7)
0 - 3 years ¹	12.6 (19.0)	4.9 (11.2)
3 – 13 years ²	5.8 (6.0)	5.8 (17.4)
0 – 13 years ¹	13.0 (20.4)	5.2 (12.9)

¹Sample included all eligible individuals. Unexposed (n) = 1,330,363, Exposed (n) = 13,290.

²Sample was restricted to eligible individuals with ≥ 761 days of follow-up. Exposed (n) = 1,196,156, Unexposed (n) = 11,209.

Appendix 8. Baseline characteristics of children identified as exposed using different exposure definitions among children born between July 2012 – March 2018 (n=583,332).

Original exposure definition				Alternative exposure definitions				Combined exposure definitions	
	Original [(n (%))]	BIS only [(n (%))]	Maternal healthcare encounters [(n (%))]	NMS [(n (%))]	Opioid replace ment therapy (ORT) [(n (%))]	Opioid analgesics +11days [(n (%))]	NAS [(n (%))]	All sources combined [(n (%))]	Original + ORT + NAS [(n (%))]
Sample size	7,806 (1.3%)	6,580 (1.1%)	4,682 (0.8%)	39,737 (6.8%)	3,809 (0.7%)	6,642 (1.1%)	4,510 (0.8%)	45,670 (7.8%)	9,056 (1.6%)
Mother's age at the time of birth									
Mean (SD)	28.51 (5.29)	28.55 (5.28)	28.01 (4.92)	30.38 (5.49)	28.16 (4.76)	31.36 (5.31)	28.00 (5.42)	30.02 (5.55)	28.37 (5.46)
Median (Q1-Q3)	28 (25-32)	28 (25-32)	28 (24-31)	31 (27- 34)	28 (25- 31)	31 (28-35)	28 (24-32)	30 (26-34)	28 (24-32)
Households and Dwellings									
1 (lowest)	559 (7.2%)	480 (7.3%)	222 (4.7%)	6,988 (17.6%)	181 (4.8%)	981 (14.8%)	246 (5.5%)	7,341 (16.1%)	665 (7.3%)
2	926 (11.9%)	788 (12.0%)	448 (9.6%)	6,909 (17.4%)	372 (9.8%)	1,099 (16.5%)	463 (10.3%)	7,548 (16.5%)	1,089 (12.0%)
3	1,203 (15.4%)	1,025 (15.6%)	620 (13.2%)	7,380 (18.6%)	513 (13.5%)	1,261 (19.0%)	615 (13.6%)	8,173 (17.9%)	1,387 (15.3%)
4	1,863 (23.9%)	1,563 (23.8%)	1,130 (24.1%)	8,565 (21.6%)	981 (25.8%)	1,518 (22.9%)	1,122 (24.9%)	9,951 (21.8%)	2,159 (23.8%)
5 (highest)	2,230 (28.6%)	1,868 (28.4%)	1,478 (31.6%)	9,527 (24.0%)	1,288 (33.8%)	1,695 (25.5%)	1,540 (34.1%)	11,318 (24.8%)	2,671 (29.5%)
Missing	1,025 (13.1%)	856 (13.0%)	784 (16.7%)	368 (0.9%)	474 (12.4%)	88 (1.3%)	524 (11.6%)	1,339 (2.9%)	1,085 (12.0%)
Material Resources									

1 (lowest)	707 (9.1%)	599 (9.1%)	284 (6.1%)		7,042 (17.7%)	221 (5.8%)	925 (13.9%)	303 (6.7%)		7,470 (16.4%)	813 (9.0%)
2	856 (11.0%)	727 (11.0%)	387 (8.3%)		7,179 (18.1%)	318 (8.3%)	1,037 (15.6%)	406 (9.0%)		7,750 (17.0%)	1,009 (11.1%)
3	979 (12.5%)	831 (12.6%)	490 (10.5%)		7,192 (18.1%)	415 (10.9%)	1,142 (17.2%)	516 (11.4%)		7,848 (17.2%)	1,143 (12.6%)
4	1,406 (18.0%)	1,184 (18.0%)	823 (17.6%)		7,458 (18.8%)	699 (18.4%)	1,347 (20.3%)	838 (18.6%)		8,484 (18.6%)	1,648 (18.2%)
5 (highest)	2,833 (36.3%)	2,383 (36.2%)	1,914 (40.9%)		10,498 (26.4%)	1,682 (44.2%)	2,103 (31.7%)	1,923 (42.6%)		12,779 (28.0%)	3,358 (37.1%)
Missing	1,025 (13.1%)	856 (13.0%)	784 (16.7%)		368 (0.9%)	474 (12.4%)	88 (1.3%)	524 (11.6%)		1,339 (2.9%)	1,085 (12.0%)
Age and Labour Force											
1 (lowest)	1,310 (16.8%)	1,103 (16.8%)	620 (13.2%)		12,156 (30.6%)	504 (13.2%)	1,839 (27.7%)	684 (15.2%)		13,062 (28.6%)	1,582 (17.5%)
2	1,324 (17.0%)	1,118 (17.0%)	765 (16.3%)		8,235 (20.7%)	656 (17.2%)	1,367 (20.6%)	787 (17.5%)		9,206 (20.2%)	1,564 (17.3%)
3	1,420 (18.2%)	1,199 (18.2%)	866 (18.5%)		6,907 (17.4%)	743 (19.5%)	1,162 (17.5%)	854 (18.9%)		7,978 (17.5%)	1,661 (18.3%)
4	1,336 (17.1%)	1,122 (17.1%)	800 (17.1%)		6,263 (15.8%)	691 (18.1%)	1,056 (15.9%)	772 (17.1%)		7,247 (15.9%)	1,539 (17.0%)
5 (highest)	1,391 (17.8%)	1,182 (18.0%)	847 (18.1%)		5,808 (14.6%)	741 (19.5%)	1,130 (17.0%)	889 (19.7%)		6,838 (15.0%)	1,625 (17.9%)
Missing	1,025 (13.1%)	856 (13.0%)	784 (16.7%)		368 (0.9%)	474 (12.4%)	88 (1.3%)	524 (11.6%)		1,339 (2.9%)	1,085 (12.0%)
Racialized and Newcomer Populations											
1 (lowest)	1,576 (20.2%)	1,339 (20.3%)	928 (19.8%)		6,209 (15.6%)	767 (20.1%)	1,135 (17.1%)	912 (20.2%)		7,384 (16.2%)	1,810 (20.0%)
2	1,677 (21.5%)	1,439 (21.9%)	993 (21.2%)		7,005 (17.6%)	873 (22.9%)	1,228 (18.5%)	968 (21.5%)		8,230 (18.0%)	1,924 (21.2%)

3	1,447 (18.5%)	1,246 (18.9%)	812 (17.3%)	7,311 (18.4%)	698 (18.3%)	1,240 (18.7%)	804 (17.8%)	8,327 (18.2%)	1,686 (18.6%)
4	1,240 (15.9%)	1,023 (15.5%)	711 (15.2%)	8,349 (21.0%)	611 (16.0%)	1,331 (20.0%)	729 (16.2%)	9,234 (20.2%)	1,458 (16.1%)
5 (highest)	841 (10.8%)	677 (10.3%)	454 (9.7%)	10,495 (26.4%)	386 (10.1%)	1,620 (24.4%)	573 (12.7%)	11,156 (24.4%)	1,093 (12.1%)
Missing	1,025 (13.1%)	856 (13.0%)	784 (16.7%)	368 (0.9%)	474 (12.4%)	88 (1.3%)	524 (11.6%)	1,339 (2.9%)	1,085 (12.0%)
Neighbourhood Income Quintile									
1 (lowest)	3,381 (43.3%)	2,839 (43.1%)	2,368 (50.6%)	10,022 (25.2%)	1,878 (49.3%)	1,972 (29.7%)	2,213 (49.1%)	12,895 (28.2%)	3,906 (43.1%)
2	1,540 (19.7%)	1,304 (19.8%)	872 (18.6%)	8,303 (20.9%)	755 (19.8%)	1,453 (21.9%)	924 (20.5%)	9,396 (20.6%)	1,834 (20.3%)
3	1,168 (15.0%)	993 (15.1%)	591 (12.6%)	7,997 (20.1%)	504 (13.2%)	1,295 (19.5%)	564 (12.5%)	8,787 (19.2%)	1,342 (14.8%)
4	953 (12.2%)	804 (12.2%)	462 (9.9%)	7,689 (19.3%)	365 (9.6%)	1,115 (16.8%)	445 (9.9%)	8,338 (18.3%)	1,097 (12.1%)
5 (highest)	694 (8.9%)	585 (8.9%)	341 (7.3%)	5,644 (14.2%)	270 (7.1%)	791 (11.9%)	320 (7.1%)	6,109 (13.4%)	796 (8.8%)
Missing	70 (0.9%)	55 (0.8%)	48 (1.0%)	82 (0.2%)	37 (1.0%)	16 (0.2%)	44 (1.0%)	145 (0.3%)	81 (0.9%)
Substance-related disorder	5,063 (64.9%)	3,961 (60.2%)	4,528 (96.7%)	2,309 (5.8%)	3,745 (98.3%)	880 (13.2%)	3,334 (73.9%)	6,525 (14.3%)	5,447 (60.1%)
Mood affective / anxiety disorder	2,202 (28.2%)	1,809 (27.5%)	1,318 (28.2%)	9,450 (23.8%)	1,057 (27.8%)	2,342 (35.3%)	1,472 (32.6%)	11,027 (24.1%)	2,721 (30.0%)
Personality and behaviour disorders	322 (4.1%)	262 (4.0%)	192 (4.1%)	1,339 (3.4%)	140 (3.7%)	407 (6.1%)	204 (4.5%)	1,557 (3.4%)	395 (4.4%)
Schizophrenia, delusional, and psychotic disorders	121 (1.6%)	87 (1.3%)	88 (1.9%)	169 (0.4%)	49 (1.3%)	54 (0.8%)	102 (2.3%)	270 (0.6%)	162 (1.8%)
Tobacco Yes	4,722 (60.5%)	3,993 (60.7%)	3,501 (74.8%)	7,094 (17.9%)	2,934 (77.0%)	1,863 (28.0%)	3,216 (71.3%)	11,089 (24.3%)	5,437 (60.0%)

Cocaine	593 (7.6%)	531 (8.1%)	433 (9.2%)	192 (0.5%)	353 (9.3%)	63 (0.9%)	523 (11.6%)	802 (1.8%)	731 (8.1%)
Yes	271 (3.5%)	125 (1.9%)	247 (5.3%)	2,002 (5.0%)	201 (5.3%)	360 (5.4%)	263 (5.8%)	2,270 (5.0%)	374 (4.1%)
Missing	42 (0.5%)	36 (0.5%)	27 (0.6%)	14 (0.0%)	17 (0.4%)	*	40 (0.9%)	63 (0.1%)	57 (0.6%)
Hallucinogen	271 (3.5%)	125 (1.9%)	247 (5.3%)	2,002 (5.0%)	201 (5.3%)	360-364	263 (5.8%)	2,270 (5.0%)	374 (4.1%)
Yes	1,134 (14.5%)	1,005 (15.3%)	726 (15.5%)	1,142 (2.9%)	592 (15.5%)	336 (5.1%)	1,038 (23.0%)	2,321 (5.1%)	1,563 (17.3%)
Missing	271 (3.5%)	125 (1.9%)	247 (5.3%)	2,002 (5.0%)	201 (5.3%)	360 (5.4%)	263 (5.8%)	2,270 (5.0%)	374 (4.1%)
Cannabis	1,331 (17.1%)	1,120 (17.0%)	777 (16.6%)	4,309 (10.8%)	644 (16.9%)	980 (14.8%)	887 (19.7%)	5,360 (11.7%)	1,619 (17.9%)
Yes									
Missing									
Preterm birth									
Gestational age in weeks									
Mean (SD)	38.04 (2.37)	38.05 (2.33)	38.08 (2.38)	38.48 (2.04)	38.09 (2.40)	38.17 (2.17)	37.90 (2.46)	38.42 (2.10)	37.98 (2.41)
Median (Q1-Q3)	39 (37-40)	38 (37-40)	39 (37-40)	39 (38-40)	39 (37-40)	39 (37-40)	38 (37-39)	39 (38-40)	38 (37-40)
Birthweight (g)									
Mean (SD)	3127.83 (653.15)	3130.74 (646.84)	3091.28 (643.56)	3294.10 (616.90)	3074.62 (636.28)	3211.65 (621.44)	3022.23 (645.20)	3268.22 (626.93)	3102.30 (657.56)
Median (Q1-Q3)	3160 (2760-3540)	3160 (2760-3540)	3125 (2730-3498)	3330 (2966-3670)	3100 (2705-3470)	3250 (2870-3602)	3050 (2630-3430)	3300 (2930-3658)	3135 (2730-3524)
Small for gestational age	1,185 (15.2%)	993 (15.1%)	805 (17.2%)	4,000 (10.1%)	688 (18.1%)	790 (11.9%)	894 (19.8%)	4,997 (10.9%)	1,452 (16.0%)
Length of birth hospitalization (days)									
Mean (SD)	7.97 (11.82)	8.15 (11.83)	9.89 (12.15)	2.99 (6.94)	10.90 (12.67)	3.78 (8.59)	10.87 (12.06)	3.70 (7.94)	7.74 (11.49)
Median (Q1-Q3)	4 (2-9)	4 (2-10)	5 (3-14)	2 (1-2)	5 (3-16)	2 (1-3)	6 (3-15)	2 (1-3)	4 (2-9)

NICU admission during neonatal period	3,403 (43.6%)	2,896 (44.0%)	2,408 (51.4%)		7,209 (18.1%)	2,144 (56.3%)	1,658 (25.0%)	3,177 (70.4%)		10,146 (22.2%)	4,258 (47.0%)
Length of neonatal period NICU stays (hours)											
Mean (SD)	161.78 (360.00)	161.15 (354.65)	199.78 (376.50)		52.92 (245.36)	221.72 (386.52)	77.30 (280.39)	248.71 (392.44)		69.13 (269.56)	165.37 (363.80)
Median (Q1-Q3)	0 (0-173)	0 (0-175)	7 (0-271)		0 (0-0)	60 (0-328)	0 (0-0)	115 (0-349)		0 (0-0)	0 (0-176)

*Small cell (<6)

References

1. Discharge Abstract Database (DAD) [Available from: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=DAD>].
2. Ontario Census Area Profiles [Available from: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=CENSUS>].
3. National Ambulatory Care Reporting System (NACRS) [Available from: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=NACRS>].
4. Canadian Institute for Health Information. National Ambulatory Care Reporting System (NACRS) metadata [Available from: <https://www.cihi.ca/en/national-ambulatory-care-reporting-system-nacrs-metadata>].
5. Narcotics Monitoring System (NMS) [Available from: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=NMS>].
6. Ontario Diabetes dataset (ODD) [Available from: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=ODD>].
7. Ontario Health Insurance Plan (OHIP) Claims database [Available from: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=OHIP>].
8. Ontario Hypertension (HYPER) dataset [Available from: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=HYPER>].
9. Quan H, Khan N, Hemmelgarn BR, Tu K, Chen G, Campbell N, et al. Validation of a case definition to define hypertension using administrative data. *Hypertension*. 2009;54(6):1423-8.
10. Ontario Marginalization Index (ONMARG) dataset [Available from: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=ONMARG>].
11. Public Health Ontario. Ontario Marginalization Index (ON-Marg) 2023 [Available from: <https://www.publichealthontario.ca/en/Data-and-Analysis/Health-Equity/Ontario-Marginalization-Index>].
12. Matheson FI, Dunn JR, Smith KL, Moineddin R, Glazier RH. Development of the Canadian Marginalization Index: a new tool for the study of inequality. *Can J Public Health*. 2012;103(8 Suppl 2):S12-6.
13. Ontario Mental Health Health Reporting System (OMHRS) [Available from: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=OMHRS>].
14. Postal Code OM Conversion File (PCCF) [Available from: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=PCCF>].

15. Registered Persons Database (RPDB) dataset [Available from:
<https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=RPDB>.
16. Same Day Surgery (SDS) database [Available from:
<https://datadictionary.ices.on.ca/Applications/DataDictionary/Library.aspx?Library=SDS>.
17. Kramer MS, Platt RW, Wen SW, Joseph KS, Allen A, Abrahamowicz M, et al. A new and improved population-based Canadian reference for birth weight for gestational age. *Pediatrics*. 2001;108(2):E35.
18. Iacus SM, Gary K, and Porro G. Multivariate Matching Methods That Are Monotonic Imbalance Bounding. *J Am Stat Assoc*. 2011;106(493):345-61.
19. King G. An Explanation for CEM Weights [Available from:
https://docs.google.com/document/d/1xQwyLt_6EXdNpA685LjmhjO20y5pZDZYwe2qeNoI5dE/edit?tab=t.0.