Research

Racial inequities in severe maternal morbidity among Black and White people in Canada: a population-based cohort study, 2012 to 2023

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Abstract

Background: Internationally, rates of severe maternal morbidity (SMM) are consistently higher among Black people than White people; however, in Canada, such disparities remain poorly understood. We sought to assess racial inequities in SMM among Black and White people in Canada.

Methods: We conducted a population-based cohort study of in-hospital live births in Canada (excluding Quebec) from 2012 to 2023 using a Statistics Canada data set linking hospitalization and Census data. We included people who self-identified their race as Black or White. We defined SMM as a composite of diagnoses and procedures associated with high case fatality and prolonged hospitalization. We assessed frequencies of SMM overall and by SMM type, province or territory, year, and household income. We used logistic regression to estimate the association between race (as a social construct) and SMM, adjusted for maternal sociodemographic and clinical characteristics. All analyses used person-based weights for national representativeness.

Results: We included 108 365 in-hospital deliveries to Black people and 1 385 810 in-hospital deliveries to White people that occurred between 2012 and 2023. Overall, SMM occurred in 47.8 and 27.7 per 1000 live births among Black and White people, respectively. The most common SMM type in both groups was severe preeclampsia (Black: 11.1, White: 6.7 per 1000 births). Rates of SMM were stable across years but varied by province or territory, with the largest disparity by race in New Brunswick (odds ratio [OR] 2.28, 95% confidence interval [CI] 1.46 to 5.43). Additionally, rates of SMM declined with increasing income among White people but increased with increasing income among Black people. After multivariable adjustment, Black people remained at higher risk of SMM (adjusted OR 1.66, 95% CI 1.53 to 1.80).

Interpretation: In Canada, Black people have a higher risk of SMM than White people after adjustment for sociodemographic and clinical factors. Equity-driven policies and care models centring Black communities are urgently needed.

Major disparities in maternal health between Black and White people have been documented in Europe, Australia, and the United States.[1–4] The extent of these disparities in Canada is unclear, given differences in history, immigration patterns, health care systems, and limited race-disaggregated health data.[5–8]

Traditionally, mortality has been a primary indicator of maternal health, but its rarity limits its usefulness for surveillance. Severe maternal morbidity (SMM) has therefore emerged as a complementary indicator — capturing life-threatening complications of pregnancy leading to severe illness, prolonged hospitalization, or death — to inform quality improvement and prevention strategies.[9,10] Studies from high-income countries consistently show higher rates of SMM among Black people than White people.[3,4,11–15]

The Canadian Network for Health Equity Using Advanced Data Linkage (CanHEAL) is a partnership of obstetric providers, researchers, and the Black Reproductive Health Working Group.[16] Using a novel, population-based data linkage, we sought to assess differences in SMM between Black and White people in Canada.

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Methods

Study design and data sources

We conducted a population-based retrospective cohort study of in-hospital live births in Canada (excluding Quebec) between the fiscal years of 2012/13 and 2022/23 (hereafter, 2012 to 2023). We used records from the Mother-Centric Data Linkages created by Statistics Canada. Within this data linkage, we identified births from the Canadian Vital Statistics Birth Database, a national registry of births to Canadian residents and nonresidents. These records were linked to the Discharge Abstract Database (demographic, clinical, and administrative information on hospitalizations), the National Ambulatory Care Reporting System (demographic, clinical, and administrative information on emergency department visits), the 2021 long-form Canadian Census (demographic, social, and economic characteristics of the population), the T1 Family File (annual tax returns filed with the Canada Revenue Agency), and the Longitudinal Immigration Database (administrative data on immigrants and nonpermanent residents) (Appendix 1, Table S1, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.252020/tab-related-content).[17]

Study population

We included people who self-identified their race as Black or White on the 2021 long-form Census and who conceived on or after Apr. 1, 2012, with a 6-week postpartum follow-up period ending before or on Mar. 31, 2023. We excluded people residing in or giving birth in Quebec because hospital and emergency department data from this province were not available in the linked data set. Date of conception was estimated using the child's birth date and gestational age at delivery. All residents of Canada were mandated to complete the Census, with 1 in 4 households randomly selected to complete the long-form questionnaire. Accordingly, the study population comprised approximately 25% of births to Black and White people, weighted to be nationally representative.

Exposure

Race is a social construct that affects health by shaping how people are perceived and treated in social and health systems.[18–20] In this analysis, self-identified race served as a proxy for the structural and institutional processes through which racism influenced maternal health.[18–21]

Respondents could select from 12 population group categories listed on the 2021 long-form Census.[22] Given consistent evidence of disparities in maternal morbidity for Black populations in high-income settings,[1–4] we restricted our analysis to people who self-identified their race as Black or White only, with White people serving as the reference group. We excluded people who reported mixed Black race because we were unable to determine how they were perceived within this conceptualization of race.

Outcome

We defined SMM using a composite of diagnoses and procedures developed by the Canadian Perinatal Surveillance System:[9] severe preeclampsia, eclampsia, or hemolysis, elevated liver enzymes, and low platelets (HELLP) syndrome; cerebrovascular accidents; severe hemorrhage; severe uterine rupture; cardiac conditions; sepsis; obstetric embolism, shock, or disseminated intravascular coagulation; acute renal failure; hysterectomy; surgical complications; maternal intensive care unit (ICU) admission; and assisted ventilation, plus an "other" category for conditions not otherwise classified (e.g., sickle cell crisis, acute abdomen). Diagnoses were coded using the Canadian version of the *International Classification of Diseases and Related Health Problems, 10th Revision* and interventions using the Canadian Classification of Health Interventions (Appendix 1, Table S2). We identified SMM events between conception and 6 weeks postpartum, categorized as antepartum (conception to delivery admission), intrapartum (delivery admission to discharge), and postpartum (delivery discharge to 6 wk postpartum). We classified an individual as a case if they experienced at least 1 SMM event during the period at risk.

Covariates

We selected covariates a priori based on the literature, by consultation with community partners and clinical experts, and through constructing conceptual diagrams.[3,4,12,13] As race was conceptualized as a proxy for exposure to structural and institutional racism, covariates were considered in relation to this framework, including experience of assault as a marker of social vulnerability (Appendix 1, Figure S1).[21] Covariates were maternal age, immigration category (economic, family, refugee or protected person, and other, such as humanitarian or extended-family sponsorship),[23] marital status, after-tax household income quintile, experience of assault within 2 years before delivery, province or territory of residence, birth year, parity, multifetal gestation, diabetes (pre-existing or gestational), pre-existing hypertension, previous cesarean birth, and use of assisted reproductive technology (Appendix 1, Table S3).

Statistical analysis

We calculated crude rates of SMM among Black and White people between 2012 and 2023 using person-based weights assigned by Statistics Canada to derive nationally representative estimates.[24] We compared baseline characteristics using standardized differences, with values greater than 0.10 indicating a meaningful imbalance.[25] We determined rates of SMM by SMM type, year, province or territory, and period (i.e., antepartum, intrapartum, postpartum). We estimated crude and adjusted associations between race and SMM using weighted logistic regression with clustering at the maternal level to account for multiple pregnancies to the same individual. In crude analyses, we estimated the overall association between race and SMM, whereas in adjusted analyses, we included sociodemographic and clinical covariates to assess the extent to which the association was explained by measured sociodemographic and clinical factors. We assessed temporal trends using weighted logistic regression with clustering at the maternal level. We combined the territories to address small cell counts, and we rounded all reported counts to the nearest 5 in accordance with Statistics Canada's privacy policies.[26] We explored variations in the SMM rate among Black

and White people by immigration category and income. We conducted a complete-case analysis, given low missingness (< 1%). Since intrapartum characteristics were relevant only to intrapartum and postpartum SMM, a secondary model included labour and delivery characteristics (e.g., induction, mode of birth; Appendix 1, Table S3) and excluded people who had an antepartum SMM only.

We conducted several sensitivity analyses. To assess the potential variation in the association between race and SMM, we examined interactions between race and income, immigration status and category, and mode of delivery. Additional sensitivity analyses excluded people with sickle cell disease, HIV, and preeclampsia-related conditions. We also repeated analyses including people who self-identified as mixed Black race. Finally, we compared differences between Black and White people before and after 2020/21, when the COVID-19 pandemic coincided with heightened public awareness of anti-Black racism.

We conducted statistical analyses in SAS version 9.4 (SAS Institute). We applied person-based survey weights in all descriptive and regression analyses using the WEIGHT statement in each SAS procedure (e.g., PROC SURVEYLOGISTIC) to generate population-representative estimates and account for the sampling design.

Ethics approval

The Hamilton Integrated Research Ethics Board provided ethics approval (no. 16305).

Results

We identified 2 355 035 weighted in-hospital live births in Canada (excluding Quebec) with a 2021 long-form Census record (Figure 1). Of these births, 108 805 (4.6%) were to Black people and 1 388 090 (58.9%) were to White people. After restricting the cohort to people with complete covariate information, 1 494 175 remained in the study cohort. Black people were more likely to be immigrants, aged 35 years or older, without a partner, in the 2 lowest income quintiles, and parous (Table 1). They were more likely to have had a cesarean delivery previously and for the index birth, as well as to have induction of labour, augmentation of labour, and episiotomy.

Overall, the SMM rate per 1000 births was 47.8 among Black people and 27.7 among White people. Rates were consistently higher among Black people across SMM types (Appendix 1, Table S4). Among Black and White people, the most common SMM types per 1000 births were severe preeclampsia (Black: 11.1, White: 6.7; Figure 2 and Appendix 1, Table S4), severe hemorrhage (Black: 9.1, White: 6.7), and sepsis (Black: 6.6, White: 5.2).

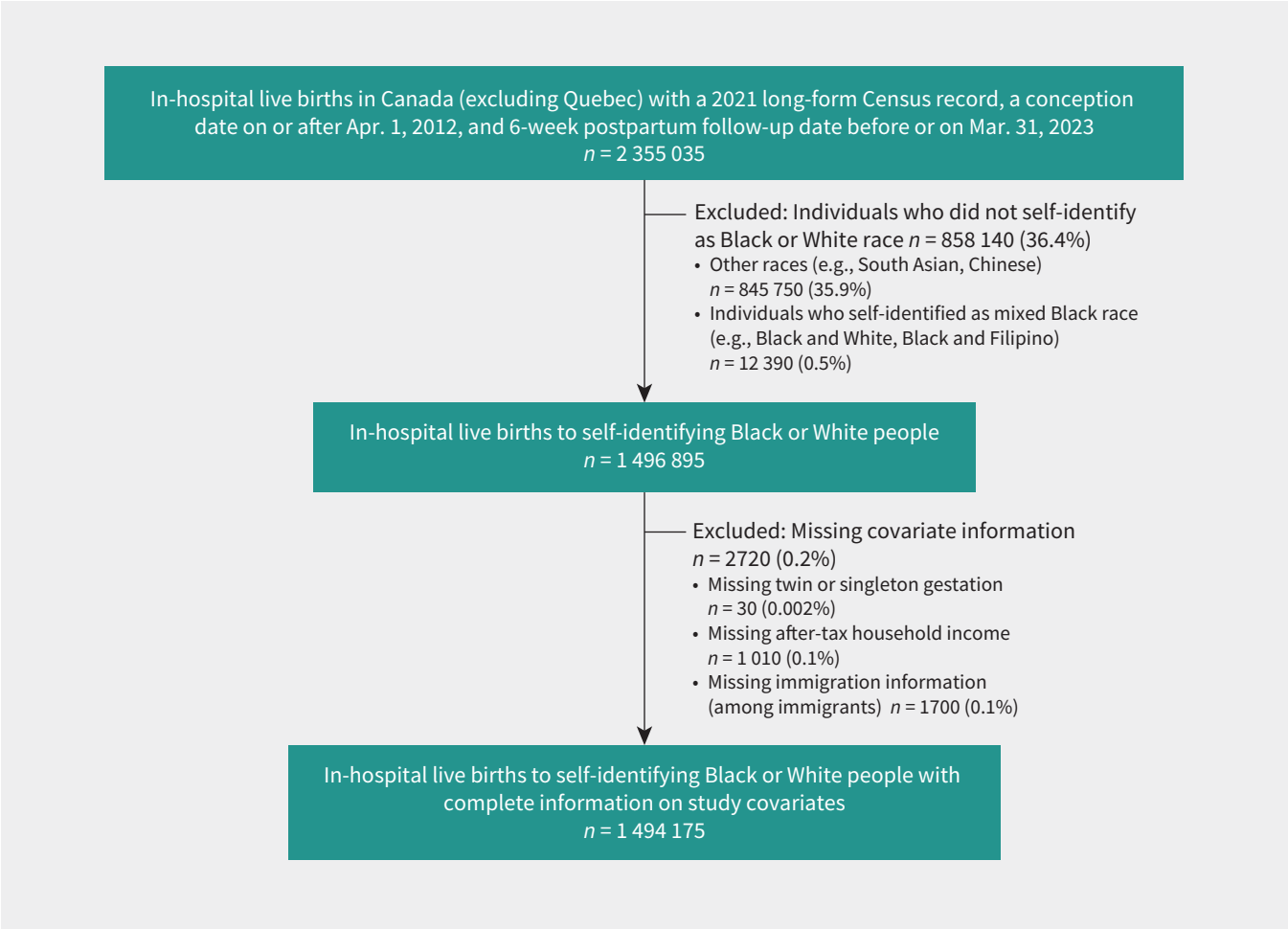

Figure 1: Derivation of study cohort. See Related Content tab for accessible version.

Table 1 (part 1 of 3): Demographic and clinical characteristics by self-reported maternal race, Canada (excluding Quebec), 2012 to 2023

Characteristic	No. (%) of people		Standardized difference
	Black *n* = 108 365	White *n* = 1 385 810	
Maternal demographic and psychosocial characteristics			
Age, yr			
≤ 19	1345 (1.2)	21 265 (1.5)	0.03
20–24	9985 (9.2)	139 230 (10.0)	0.03
25–34	64 370 (59.4)	925 265 (66.8)	0.15
35–39	25 110 (23.2)	252 990 (18.3)	0.12
≥ 40	7555 (7.0)	47 060 (3.4)	0.16
Fiscal year of birth*			
2012/13	2260 (2.1)	36 860 (2.7)	0.04
2013/14	8985 (8.3)	148 910 (10.7)	0.08
2014/15	8970 (8.3)	146 045 (10.5)	0.08
2015/16	10 210 (9.4)	151 170 (10.9)	0.05
2016/17	10 720 (9.9)	144 560 (10.4)	0.02
2017/18	11 205 (10.3)	140 640 (10.1)	0.01
2018/19	11 685 (10.8)	134 815 (9.7)	0.03
2019/20	11 440 (10.6)	131 360 (9.5)	0.04
2020/21	12 150 (11.2)	124 165 (9.0)	0.07
2021/22	11 035 (10.2)	127 770 (9.2)	0.03
2022/23	9705 (9.0)	99 515 (7.2)	0.07
Immigrant category			
Economic	16 915 (15.6)	53 925 (3.9)	0.40
Family	32 425 (29.9)	39 600 (2.9)	0.79
Refugee	27 435 (25.3)	12 100 (0.9)	0.78
Other	1645 (1.5)	830 (0.1)	0.17
Nonpermanent resident	5910 (5.5)	6680 (0.5)	0.30
Nonimmigrant	24 035 (22.2)	1 272 675 (91.8)	1.98
Duration in Canada among immigrants, yr			
0–4	37 935 (45.0)	37 315 (33.0)	0.25
5–9	20 045 (23.8)	22 405 (19.8)	0.10
10–14	10 710 (12.7)	13 505 (11.9)	0.02
≥ 15	15 640 (18.5)	39 910 (35.3)	0.38
Marital status at time of delivery			
Single	30 600 (28.2)	267 950 (19.3)	0.21
Married	70 170 (64.8)	938 385 (67.7)	0.06
Widowed	90 (0.1)	530 (< 0.1)	0.02
Divorced	725 (0.7)	9670 (0.7)	0.00
Separated	110 (0.1)	3950 (0.3)	0.04
Unknown	6670 (6.2)	165 325 (11.9)	0.20

Table 1 (part 2 of 3): Demographic and clinical characteristics by self-reported maternal race, Canada (excluding Quebec), 2012 to 2023

Characteristic	No. (%) of people		Standardized difference
	Black *n* = 108 365	White *n* = 1 385 810	
Partner gender and status†			
Same gender	190 (0.2)	4725 (0.3)	0.03
Opposite gender	73 210 (67.6)	1 192 865 (86.1)	0.45
No partner, woman	30 640 (28.3)	156 750 (11.3)	0.44
No partner, man	430 (0.4)	3045 (0.2)	0.03
Missing	3895 (3.6)	28 425 (2.1)	0.09
After-tax household income			
Q1 (lowest)	30 695 (28.3)	174 175 (12.6)	0.40
Q2	33 715 (31.1)	213 865 (15.4)	0.38
Q3	22 475 (20.7)	287 230 (20.7)	0.00
Q4	13 765 (12.7)	347 935 (25.1)	0.32
Q5 (highest)	7715 (7.1)	362 605 (26.2)	0.53
Experience of assault (≤ 2 yr before delivery)	220 (0.2)	4260 (0.3)	0.02
Province of residence			
Alberta	26 685 (24.6)	252 750 (18.2)	0.16
British Columbia	4295 (4.0)	197 265 (14.2)	0.36
Manitoba	5705 (5.3)	65 735 (4.7)	0.02
New Brunswick	645 (0.6)	39 415 (2.8)	0.17
Newfoundland and Labrador	345 (0.3)	29 045 (2.1)	0.16
Nova Scotia	1635 (1.5)	55 250 (4.0)	0.15
Ontario	65 840 (60.8)	663 930 (47.9)	0.26
Prince Edward Island	65 (0.1)	10 175 (0.7)	0.11
Saskatchewan	2975 (2.7)	69 510 (5.0)	0.12
Territories	175 (0.2)	2735 (0.2)	0.01
Clinical characteristics			
Diabetes			
Type I	165 (0.2)	5155 (0.4)	0.04
Type II	885 (0.8)	3725 (0.3)	0.07
Type unknown	65 (0.1)	820 (0.1)	0.00
Gestational	9500 (8.8)	88 020 (6.4)	0.09
None	97 750 (90.2)	1 288 090 (92.9)	0.10
Preexisting hypertension	1785 (1.6)	11 915 (0.9)	0.07
Parity			
Nulliparous	35 505 (32.8)	604 170 (43.6)	0.22
Parous	72 860 (67.2)	781 640 (56.4)	0.22
Previous cesarean delivery‡	22 910 (31.4)	199 390 (25.5)	0.13

Table 1 (part 3 of 3): Demographic and clinical characteristics by self-reported maternal race, Canada (excluding Quebec), 2012 to 2023

Characteristic	No. (%) of people		Standardized difference
	Black *n* = 108 365	White *n* = 1 385 810	
Assisted reproductive technology	2170 (2.0)	46 645 (3.4)	0.08
Multifetal gestation			
Singleton	106 445 (98.2)	1 360 975 (98.2)	0.00
Multiple	1920 (1.8)	24 835 (1.8)	0.00
Obstetric-related factors			
Induction of labour	31 690 (29.2)	431 415 (31.1)	0.04
Augmentation of labour	38 950 (35.9)	502 125 (36.2)	0.01
Epidural	47 285 (43.6)	686 960 (49.6)	0.12
Episiotomy	6795 (6.3)	108 005 (7.8)	0.06
Prolonged second stage of labour	2360 (2.2)	65 015 (4.7)	0.14
Mode of birth			
SVD	61 920 (57.1)	844 975 (61.0)	0.08
Vacuum	5375 (5.0)	85 255 (6.2)	0.05
Forceps	1530 (1.4)	33 845(2.4)	0.08
Sequential	305 (0.3)	5105 (0.4)	0.02
Cesarean delivery	38 525 (35.6)	407 490 (29.4)	0.13
Unknown	710 (0.7)	9140 (0.7)	0.00
Fetal characteristics			
Gestational age, wk			
≤ 21	125 (0.1)	270 (< 0.1)	0.04
22–27	870 (0.8)	3690 (0.3)	0.07
28–32	1370 (1.3)	11 680 (0.8)	0.04
33–36	5895 (5.4)	78 165 (5.6)	0.01
≥ 37	100 105 (92.4)	1 292 005 (93.2)	0.03
Fetal presentation			
Cephalic	103 485 (95.5)	1 311 285 (94.6)	0.04
Breech	4065 (3.8)	68 490 (4.9)	0.06
Transverse	815 (0.8)	6035 (0.4)	0.04

Note: SVD = spontaneous vaginal delivery.
*The fiscal year of 2012/13 is restricted to individuals who conceived Apr 1, 2012, or later and the fiscal year of 2022/23 is restricted to individuals with a complete 6-week postpartum follow-period (ending Mar 31, 2023, or earlier).
†Partner gender and status as reported on the 2021 long-form Census. The Census collects gender and marital status information for each person in a census family and uses these values to derive the gender of an individual's partner, if one existed. For those with no partner, the gender of the pregnant person is presented.
‡Percentages calculated among parous people.

Between 2012 and 2023, the rate of SMM remained stable among both Black and White people (Appendix 1, Table S5), although we observed regional variations in race-specific rates (Table 2). Disparities in rates of SMM by race were largest in New Brunswick (odds ratio [OR] 2.28, 95% confidence interval [CI] 1.46 to 5.43), and lowest in Nova Scotia (OR 1.34, 95% CI 0.76 to 2.35); however, these differences by province were not significant ($p_{interaction}$ = 0.6; Table 2).

The distribution of SMM events by period of occurrence was similar among Black and White people. In Black people, 16.2% of SMM events occurred during the antepartum period, 57.0% during the intrapartum period, and 26.8% during the postpartum period; for White people, these proportions were 15.7%, 57.1%, and 27.1%, respectively. The distribution of SMM types by period and race are shown in Figure 3; Black people had higher rates of several SMM types compared with White people.

After adjustment, Black people had 1.66-fold higher odds (95% CI 1.53 to 1.80) of experiencing SMM from conception to 6 weeks postpartum than White people (Table 3). The secondary analysis restricted to SMM events at or following delivery yielded similar relative estimates (adjusted OR 1.66, 95% CI 1.52 to 1.81; Table 3).

When analyzed by immigrant status or category, Black people had consistently higher rates of SMM than their White counterparts, with the largest difference in rates among immigrants in the economic and other or non-permanent resident categories (Figure 4). The association between race and SMM varied by immigrant status or category ($p_{interaction}$ < 0.0001), with Black people experiencing an approximately 3-fold higher risk within each immigrant category and a 1.6-fold higher risk among nonimmigrants (Appendix 1, Table S6).

Rates of SMM decreased with increasing income among White people but increased by income quintile among Black people (Figure 5). Consistent with this pattern, the association between race and SMM varied by income ($p_{interaction}$ = 0.0001), with the Black–White disparity increasing by income quintile (e.g., Q1: adjusted OR 1.05, 95% CI 0.88 to 1.26, Q5: adjusted OR 1.62, 95% CI 1.28 to 2.07; Appendix 1, Table S6).

Additional sensitivity analyses showed that the disparity between Black and White people also varied by mode of delivery ($p_{interaction}$ < 0.0001), with larger disparities among those with a cesarean delivery (adjusted OR 1.90, 95% CI 1.72 to 2.10) than among those with a spontaneous vaginal delivery (adjusted OR 1.33, 95% CI 1.16 to 1.53; Appendix 1, Table S7). Results were consistent in sensitivity analyses excluding sickle cell disease, HIV, and preeclampsia-related conditions (Appendix 1, Tables S8 to S10). People of mixed Black race had a comparable risk to White people (Appendix 1, Table S11). We did not observe a difference in the disparity between Black and White people in analyses comparing the 2012/13 to 2020/21 period with the 2021/22 to 2022/23 period (Appendix 1, Table S12).

Discussion

Using nationally representative data on Black and White people in Canada, we found rates of SMM to be consistently higher among Black people. These disparities persisted after adjustment for sociodemographic and clinical characteristics, indicating that measured factors did not account for the observed inequities.

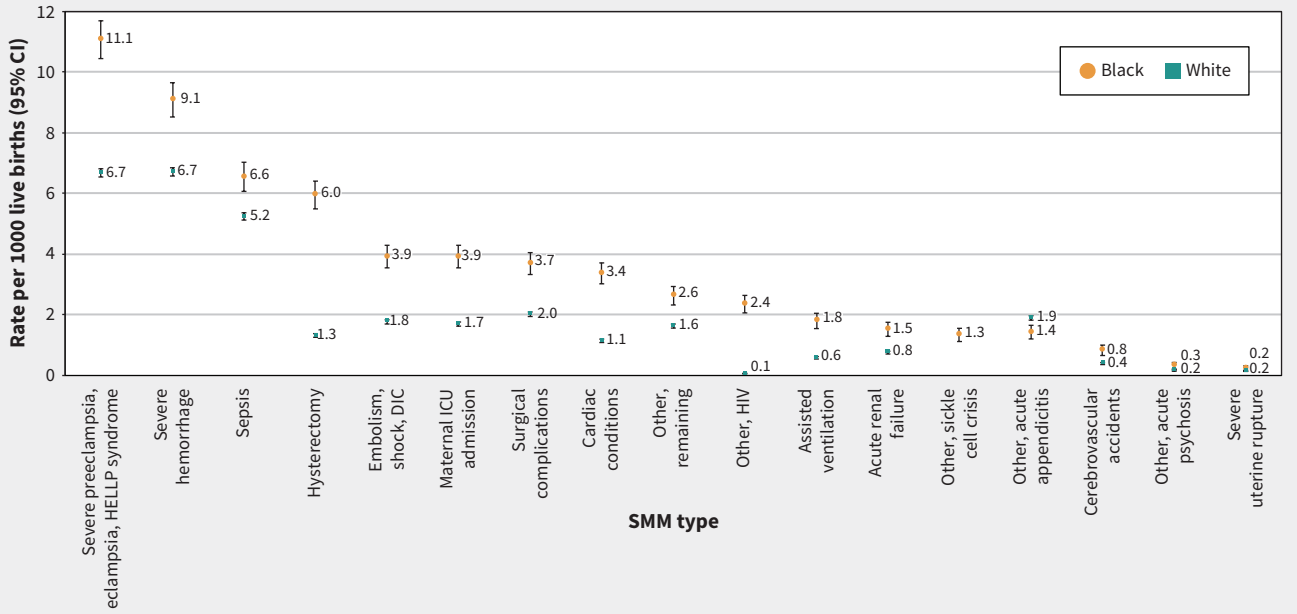

Figure 2: Rate of severe maternal morbidity (SMM) types per 1000 live births from conception to 6 weeks postpartum among Black and White people, Canada (excluding Quebec), 2012 to 2023. Data points are not shown for SMM types where cell counts were below reporting thresholds. "Other, remaining" SMM includes conditions such as status asthmaticus, hepatic failure, and adult respiratory distress syndrome. Note: CI = confidence interval; DIC = disseminated intravascular coagulation; HELLP = hemolysis, elevated liver enzymes, and low platelets; ICU = intensive care unit.

Table 2: Severe maternal morbidity by province of residence in Canada (excluding Quebec) among Black and White people, 2012 to 2023*

	Black people *n* = 108 365			White people *n* = 1 385 810				
Province or territory	No. of weighted cases	No. of weighted births	Rate per 1000 births	No. of weighted cases	No. of weighted births	Rate per 1000 births	OR (95% CI) Black v. White individuals	*p* value
Alberta	1470	26 685	55.1	8365	252 750	33.1	1.71 (1.51–1.93)	0.6
British Columbia	145	4295	33.8	4525	197 265	22.9	1.51 (1.06–2.15)	
Manitoba	230	5705	40.3	1455	65 735	22.1	1.86 (1.38–2.51)	
New Brunswick	45	645	69.8	1075	39 415	27.3	2.83 (1.48–5.44)	
Newfoundland and Labrador	†	345	†	675	29 045	23.2	†	
Nova Scotia	55	1635	33.6	1430	55 250	25.9	1.34 (0.76–2.34)	
Ontario	3065	65 840	46.6	18 755	663 930	28.2	1.68 (1.55–1.83)	
Prince Edward Island	†	65	†	300	10 175	29.5	†	
Saskatchewan	140	2975	47.1	1745	69 510	25.1	1.92 (1.33–2.79)	
Northwest Territories, Nunavut, and Yukon	†	175	†	90	2735	32.9	†	

Note: CI = confidence interval, OR = odds ratio.
*Model included terms for race, province of residence, and interaction of race by province. The *p* value reflects differences across provinces (the interaction term of race by province), estimated using the joint Wald test.
†Cannot report because of small cell counts.

Population-based evidence on race-based inequities in maternal health in Canada is limited. A recent scoping review identified only 6 epidemiologic studies comparing pregnancy outcomes among Black and White people in Canada, 4 of which were restricted to people who accessed prenatal screening in Ontario.[27] These studies reported higher risks of adverse pregnancy outcomes among Black people, including preterm birth,[28] congenital heart disease,[29] miscarriage,[30] preeclampsia,[31,32] gestational diabetes,[32] and inadequate gestational weight gain.[33]

Our study extends this literature in several important ways. We provide national estimates of Black–White inequities in SMM, a composite outcome capturing life-threatening complications of pregnancy, whereas prior Canadian studies have largely focused on individual perinatal outcomes within single provinces.[27] Leveraging 11 years of national data from the Mother-Centric Data Linkages enabled us to study racial disparities in relatively uncommon but severe maternal complications with sufficient precision to support meaningful inference. We assessed the incidence and distribution of SMM beyond the intrapartum period by including antepartum and postpartum events, providing an important foundation for understanding their scope and pattern. This approach allowed for the recognition that maternal health care is not solely an obstetric domain but rather a multidisciplinary area requiring expertise from primary care, emergency medicine, internal medicine, and other subspeciality services.[34] By linking health administrative and Census data and incorporating self-reported measures of race, we were able to examine inequities at a national level while also assessing variation by individual-level socioeconomic measures, rather than the neighbourhood-level proxies used in previous studies.[29,32,33] Finally, our findings demonstrate that inequities in SMM between Black and White people persisted across regions and sociodemographic strata, including across income and immigration categories, providing a more granular characterization of disparities than has been previously described in Canada.[35,36]

Our findings align with international studies documenting Black–White inequities in maternal morbidity and mortality in many high-income countries.[3,4,11–13,15,37] We observed that Black people had 60% higher odds of SMM, consistent with these findings. The persistence of such inequities across countries with different degrees of publicly funded health coverage suggests that access to care alone is insufficient to eliminate disparities in maternal health. Within Canada, although race-specific rates of SMM varied across provinces, we found no evidence that the relative disparity between Black and White people differed significantly by province. This suggests that racial inequities are not confined to a particular health care system or jurisdiction and may instead reflect broader structural factors operating across Canada.

We found that inequities in SMM were not explained by measured sociodemographic factors, such as income and immigration status. The risk of SMM increased with income among Black people, in contrast to the expected decrease, as observed among White people. Although the reasons for this finding are uncertain, similar patterns have been reported in studies of SMM and pregnancy-related mortality in the US.[38,39] One possible explanation is that

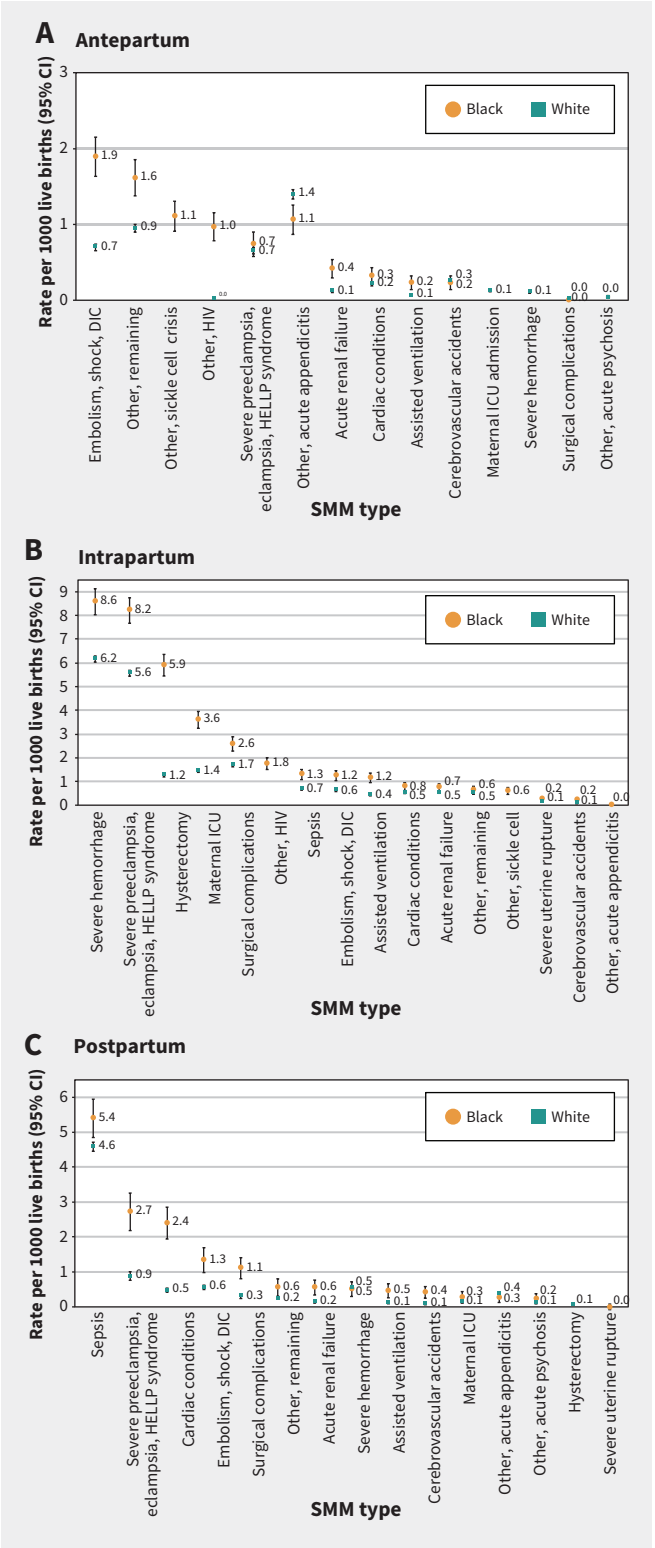

Figure 3: Rates of severe maternal morbidity (SMM) types within the (A) antepartum, (B) intrapartum, and (C) postpartum (delivery discharge to 6 weeks postpartum) periods among Black and White people, Canada (excluding Quebec), 2012 to 2023. Data points are not shown for SMM types where cell counts were below reporting thresholds. "Other, remaining" SMM includes conditions such as status asthmaticus, hepatic failure, and adult respiratory distress syndrome. Note: CI = confidence interval; DIC = disseminated intravascular coagulation; HELLP = hemolysis, elevated liver enzymes, and low platelets; ICU = intensive care unit.

Table 3 (part 1 of 3): Crude and adjusted odds of severe maternal morbidity (SMM) among Black people compared with White people, Canada (excluding Quebec), 2012 to 2023

	Model 1: SMM from conception to 6 weeks postpartum*			Model 2: SMM from labour and delivery to 6 weeks postpartum†		
Variable	Rate per 1000 births	Crude OR (95% CI)	Adjusted OR (95% CI)	Rate per 1000 births	Crude OR (95% CI)	Adjusted OR (95% CI)
Maternal race						
Black	47.8	1.76 (1.65–1.88)	1.66 (1.53–1.80)	42.2	1.80 (1.68–1.93)	1.66 (1.52–1.81)
White	27.7	Ref.	Ref.	23.9	Ref.	Ref.
Age, yr						
≤ 19	38.3	1.42 (1.23–1.65)	1.16 (0.99–1.36)	29.8	1.28 (1.08–1.51)	1.29 (1.08–1.53)
20–24	30.5	1.12 (1.05–1.20)	1.03 (0.96–1.11)	24.2	1.03 (0.96–1.11)	1.06 (0.97–1.15)
25–34	27.3	Ref.	Ref.	23.4	Ref.	Ref.
35–39	31.2	1.15 (1.09–1.21)	1.11 (1.06–1.18)	28.4	1.22 (1.15–1.29)	1.10 (1.04–1.16)
≥ 40	46.1	1.73 (1.58–1.88)	1.42 (1.30–1.56)	42.2	1.83 (1.67–2.01)	1.29 (1.17–1.42)
Fiscal year of birth						
2012/13	32.0	Ref.	Ref.	28.8	Ref.	Ref.
2013/14	30.0	0.94 (0.82–1.07)	0.94 (0.82–1.08)	25.8	0.89 (0.78–1.03)	0.91 (0.79–1.04)
2014/15	26.9	0.84 (0.73–0.96)	0.85 (0.74–0.97)	22.7	0.78 (0.68–0.90)	0.80 (0.69–0.92)
2015/16	29.7	0.93 (0.81–1.06)	0.94 (0.82–1.07)	25.3	0.87 (0.76–1.01)	0.87 (0.76–1.01)
2016/17	28.4	0.89 (0.78–1.01)	0.89 (0.78–1.02)	24.5	0.85 (0.74–0.98)	0.85 (0.74–0.98)
2017/18	28.0	0.87 (0.76–1.00)	0.88 (0.77–1.00)	23.8	0.83 (0.72–0.95)	0.81 (0.70–0.93)
2018/19	32.9	1.03 (0.90–1.18)	1.02 (0.90–1.17)	28.0	0.97 (0.84–1.12)	0.93 (0.81–1.08)
2019/20	29.4	0.92 (0.80–1.05)	0.91 (0.79–1.04)	26.1	0.90 (0.79–1.04)	0.85 (0.74–0.99)
2020/21	28.9	0.90 (0.79–1.04)	0.89 (0.77–1.02)	25.4	0.88 (0.76–1.01)	0.81 (0.70–0.94)
2021/22	28.4	0.89 (0.78–1.02)	0.86 (0.75–0.99)	25.3	0.87 (0.76–1.01)	0.80 (0.69–0.92)
2022/23	28.1	0.88 (0.76–1.01)	0.84 (0.73–0.97)	24.2	0.84 (0.72–0.97)	0.76 (0.65–0.88)
Immigrant category						
Economic	31.6	1.12 (1.03–1.23)	0.97 (0.88–1.06)	28.4	1.18 (1.07–1.30)	0.99 (0.90–1.10)
Family	35.9	1.28 (1.18–1.40)	0.98 (0.89–1.08)	31.3	1.30 (1.18–1.42)	0.99 (0.89–1.10)
Refugee	42.2	1.52 (1.36–1.69)	1.01 (0.89–1.14)	37.0	1.55 (1.37–1.74)	1.02 (0.89–1.17)
Other or NPR	34.2	1.22 (1.01–1.46)	0.86 (0.72–1.05)	30.5	1.26 (1.04–1.53)	0.88 (0.72–1.08)
Nonimmigrant	28.2	Ref.	Ref.	24.3	Ref.	Ref.
Marital status at time of delivery						
Not married	32.0	1.15 (1.09–1.20)	1.06 (1.00–1.12)	26.8	1.09 (1.04–1.15)	1.01 (0.95–1.07)
Married	28.0	Ref.	Ref.	24.6	Ref.	Ref.
Unknown	30.7	1.10 (1.03–1.17)	1.07 (1.00–1.14)	25.8	1.05 (0.98–1.12)	1.00 (0.93–1.08)
After-tax household income						
Q1 (lowest)	34.2	1.24 (1.16–1.32)	1.16 (1.07–1.26)	28.4	1.17 (1.09–1.26)	1.10 (1.01–1.20)
Q2	29.7	1.07 (1.00–1.14)	1.07 (1.00–1.15)	25.6	1.05 (0.98–1.13)	1.04 (0.97–1.12)
Q3	29.2	1.05 (0.99–1.12)	1.09 (1.02–1.16)	25.2	1.04 (0.97–1.11)	1.06 (0.99–1.13)
Q4	27.3	0.98 (0.93–1.04)	1.02 (0.96–1.08)	24.0	0.99 (0.93–1.05)	1.01 (0.95–1.08)
Q5 (highest)	27.8	Ref.	Ref.	24.4	Ref.	Ref.
Experience of assault						
Yes	63.1	2.24 (1.76–2.85)	1.86 (1.46–2.38)	49.0	1.99 (1.52–2.61)	1.76 (1.33–2.32)
No	29.1	Ref.	Ref.	25.1	Ref.	Ref.

Table 3 (part 2 of 3): Crude and adjusted odds of severe maternal morbidity (SMM) among Black people compared with White people, Canada (excluding Quebec), 2012 to 2023

Variable	Model 1: SMM from conception to 6 weeks postpartum*			Model 2: SMM from labour and delivery to 6 weeks postpartum†		
	Rate per 1000 births	Crude OR (95% CI)	Adjusted OR (95% CI)	Rate per 1000 births	Crude OR (95% CI)	Adjusted OR (95% CI)
Province of residence						
Alberta	35.2	1.18 (1.12–1.25)	1.20 (1.13–1.26)	28.7	1.11 (1.05–1.18)	1.08 (1.02–1.15)
British Columbia	23.2	0.77 (0.72–0.82)	0.79 (0.74–0.85)	20.7	0.80 (0.74–0.86)	0.75 (0.70–0.81)
Manitoba	23.6	0.78 (0.71–0.87)	0.82 (0.74–0.92)	20.7	0.80 (0.71–0.89)	0.84 (0.75–0.95)
New Brunswick	28.0	0.94 (0.82–1.06)	1.18 (1.04–1.35)	27.0	1.04 (0.92–1.19)	1.18 (1.03–1.35)
Nova Scotia	26.1	0.87 (0.78–0.97)	0.89 (0.79–0.99)	23.5	0.91 (0.80–1.02)	0.91 (0.81–1.03)
Ontario	29.9	Ref.	Ref.	25.9	Ref.	Ref.
Saskatchewan	26.0	0.87 (0.78–0.96)	0.95 (0.86–1.06)	23.9	0.92 (0.83–1.02)	1.03 (0.92–1.14)
Newfoundland and Labrador, Prince Edward Island, and Territories	25.7	0.86 (0.75–0.98)	0.88 (0.77–1.01)	22.6	0.87 (0.76–1.01)	0.88 (0.76–1.02)
Diabetes						
Preexisting	79.5	2.98 (2.54–3.48)	2.37 (2.02–2.79)	70.5	3.06 (2.60–3.61)	1.84 (1.56–2.18)
Gestational	38.4	1.38 (1.28–1.48)	1.25 (1.16–1.34)	34.1	1.42 (1.32–1.54)	1.13 (1.04–1.22)
None	28.1	Ref.	Ref.	24.2	Ref.	Ref.
Preexisting hypertension						
Yes	91.6	3.43 (3.02–3.89)	2.65 (2.32–3.02)	80.3	3.45 (3.01–3.94)	2.22 (1.92–2.55)
No	28.6	Ref.	Ref.	24.7	Ref.	Ref.
Parity						
Nulliparous	34.8	1.41 (1.35–1.46)	1.64 (1.56–1.71)	30.6	1.46 (1.40–1.52)	1.22 (1.16–1.29)
Parous	25.0	Ref.	Ref.	21.2	Ref.	Ref.
Previous cesarean delivery						
Yes	35.9	1.29 (1.23–1.36)	1.59 (1.50–1.68)	31.9	1.34 (1.27–1.42)	0.83 (0.76–0.90)
No	28.0	Ref.	Ref.	24.0	Ref.	Ref.
Assisted reproductive technology						
Yes	61.0	2.25 (2.07–2.43)	1.72 (1.58–1.88)	57.0	2.45 (2.25–2.66)	1.58 (1.44–1.73)
No	28.1	Ref.	Ref.	24.1	Ref.	Ref.
Multifetal gestation						
Singleton	28.2	Ref.	Ref.	24.2	Ref.	Ref.
Multiple	84.7	3.19 (2.91–3.50)	2.76 (2.50–3.04)	79.0	3.45 (3.13–3.80)	2.30 (2.07–2.56)
Induction of labour						
Yes	–	–	–	29.8	1.29 (1.24–1.35)	1.37 (1.30–1.45)
No	–	–	–	23.2	Ref.	Ref.
Augmentation of labour						
Yes	–	–	–	19.6	0.69 (0.65–0.72)	0.94 (0.89–0.99)
No	–	–	–	28.4	Ref.	Ref.
Epidural						
Yes	–	–	–	22.6	0.81 (0.78–0.85)	0.89 (0.85–0.94)
No	–	–	–	27.8	Ref.	Ref.
Episiotomy						
Yes	–	–	–	22.6	0.89 (0.82–0.97)	1.17 (1.06–1.30)
No	–	–	–	25.4	Ref.	Ref.

higher socioeconomic position does not confer equivalent health benefits across racial groups because it may not fully mitigate the effects of structural and interpersonal racism on maternal health.[40] The trend among Black people is consistent with the Diminishing Returns Hypothesis,[41] which posits that the health benefits of higher socioeconomic status are less pronounced, or

Table 3 (part 3 of 3): Crude and adjusted odds of severe maternal morbidity (SMM) among Black people compared with White people, Canada (excluding Quebec), 2012 to 2023

	Model 1: SMM from conception to 6 weeks postpartum*			Model 2: SMM from labour and delivery to 6 weeks postpartum†		
Variable	Rate per 1000 births	Crude OR (95% CI)	Adjusted OR (95% CI)	Rate per 1000 births	Crude OR (95% CI)	Adjusted OR (95% CI)
Prolonged second stage of labour						
Yes	–	–	–	30.0	1.21 (1.10–1.33)	1.20 (1.08–1.33)
No	–	–	–	25.0	Ref.	Ref.
Mode of birth						
SVD	–	–	–	14.6	Ref.	Ref.
Vacuum‡	–	–	–	33.5	1.42 (1.29–1.58)	1.25 (1.12–1.39)
Forceps	–	–	–	20.7	2.34 (2.06–2.65)	1.94 (1.68–2.23)
Cesarean delivery	–	–	–	48.6	3.33 (3.18–3.49)	3.24 (3.06–3.44)
Fetal presentation						
Cephalic	–	–	–	24.0	Ref.	Ref.
Breech	–	–	–	46.2	1.97 (1.82–2.13)	0.92 (0.84–1.01)
Transverse	–	–	–	56.4	2.44 (1.97–3.02)	1.17 (0.94–1.47)

Note: CI = confidence interval, NPR = nonpermanent resident, OR = odds ratio, Ref. = reference category, SVD = spontaneous vaginal delivery.
*Model 1 (n = 1 494 175) adjusted for maternal age, immigration status or category, marital status, after-tax household income quintile, experience of assault 2 years before delivery, province of residence, parity, multifetal gestation, diabetes, pre-existing hypertension, previous cesarean delivery, and assisted reproductive technology.
†Model 2 (n = 1 478 290) adjusted for model 1 covariates, induction of labour, augmentation of labour, epidural, episiotomy, prolonged second stage of labour, mode of birth, and fetal presentation.
‡Sequential instrument delivery was collapsed with vacuum delivery.

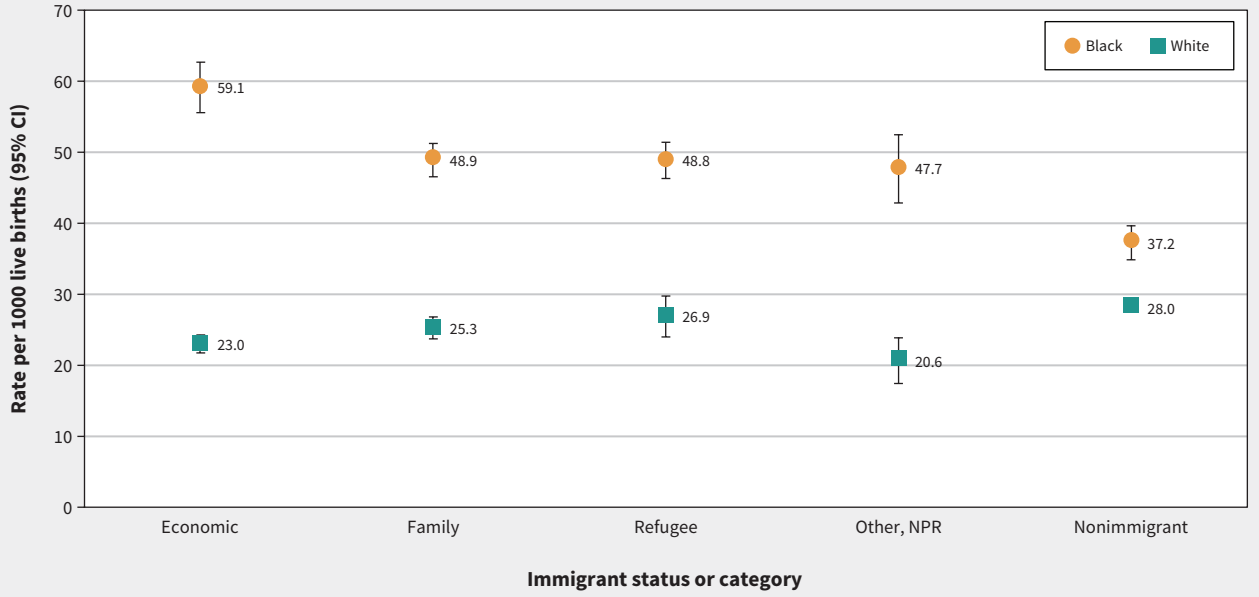

Figure 4: Rate of severe maternal morbidity by immigrant status or category and race, Canada (excluding Quebec), 2012 to 2023. Other immigrant (e.g., humanitarian) and nonpermanent residents (NPRs) were collapsed into 1 group to meet minimum cell counts. Note: CI = confidence interval.

even absent, for racialized populations. Although our data did not allow for direct assessment of the mechanisms underlying this pattern, the cumulative physiologic and psychological effects of racism may play a role.[41] Differences in the distribution of unmeasured sociodemographic and clinical characteristics across income strata may have also contributed to this pattern.

The disparity in rates of SMM among Black and White people was similarly unexplained by immigration category. Black people had consistently higher rates than White people within each category, with larger disparities observed among immigrants than nonimmigrants. This suggests that the intersection of race and immigrant status may contribute to elevated vulnerability to SMM. Potential mechanisms include barriers related to health care navigation, language, social support, and experiences of discrimination, although we could not directly examine these factors in our study.

We found that, although preexisting comorbidity and sociodemographic characteristics varied between Black and White people, the increased risk of SMM among Black people was still present after adjustment. Racial disparities in SMM appeared more pronounced among cesarean deliveries, but these findings should be interpreted cautiously. Differences by mode of delivery may reflect differences in underlying clinical circumstances and labour management. Factors contributing to inequities may also become more consequential in higher-risk clinical situations. Additionally, we found that the disparity in rates of SMM persisted after removing conditions with a higher prevalence among Black people (i.e., sickle cell disease, HIV, and preeclampsia). The consistent pattern of elevated risk across SMM types suggests broader structural determinants rather than condition-specific pathways.

Although our analysis could not directly identify the mechanisms underlying the observed disparities, quantifying and characterizing inequities in SMM is an important first step toward more detailed investigation. Our results are consistent with a broader body of evidence that structural and systemic factors, including anti-Black racism, contribute to inequities in maternal health. Prior research has documented experiences of dismissal, objectification, and inequitable care among Black people in diverse health care settings.[42] Potential differences in care processes, quality of treatment, and broader social and structural conditions are important areas for further investigation. Care models that acknowledge and address anti-Black racism as a determinant of health may be warranted.[43] Equity-focused health system strategies that have been found to be effective in addressing anti-Black racism include routine collection and use of race-based data, engagement with Black communities, and evaluation of care processes to identify and address inequities in care delivery.[44]

Limitations

An important limitation is that race, as a social rather than biological construct, serves as an imperfect proxy for a complex range of structural, social, environmental, and lived experiences. As such, the higher rates of SMM observed among Black people should not be interpreted as reflecting inherent biological differences. Rather, race likely captures the cumulative effects of factors that were incompletely measured or unavailable in our data, including experiences of structural and interpersonal racism, differential access to health and social resources, chronic stress, and other social determinants of health. Because our conceptualization of race was based on social ascription, interpretation of findings

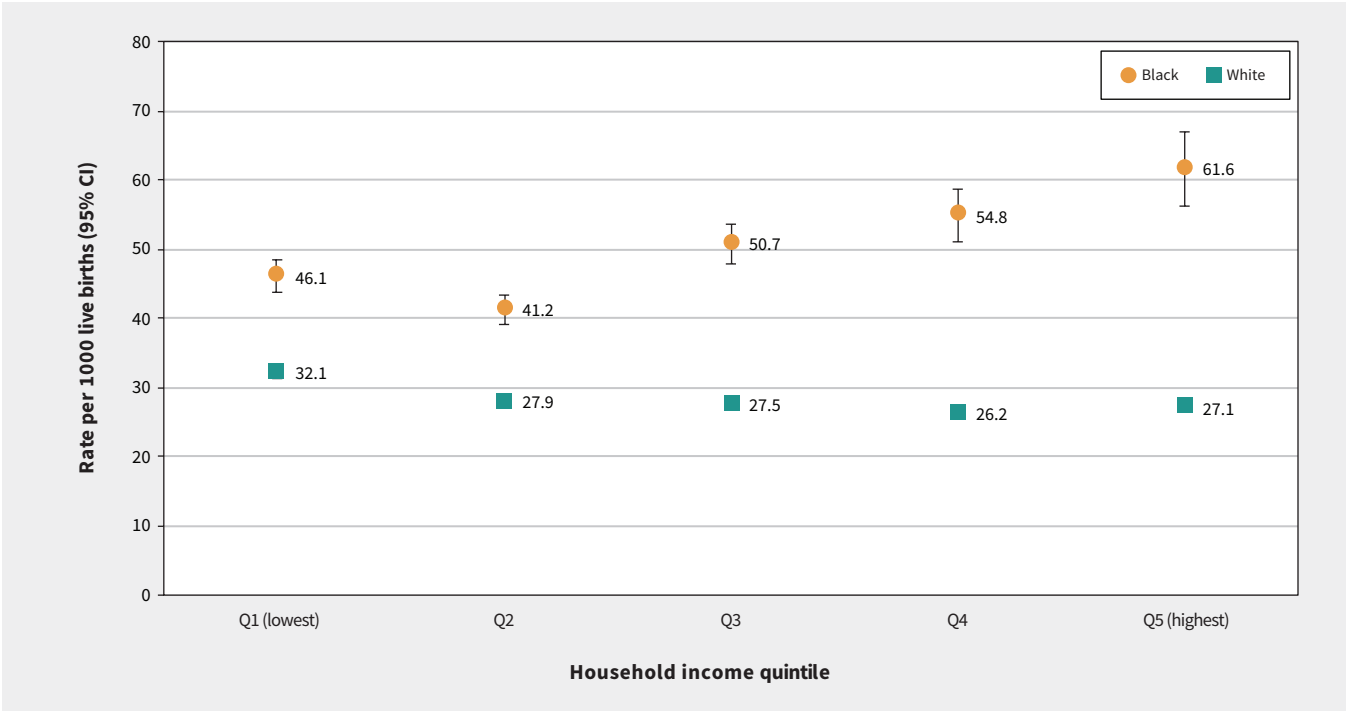

Figure 5: Rate of severe maternal morbidity by after-tax household income and race, Canada (excluding Quebec), 2012 to 2023. Note: CI = confidence interval.

among people of mixed racial identity was limited by our inability to determine how they are perceived within this construct.

Although we included a range of sociodemographic and clinical factors in our multivariable models, some relevant variables were not available, including body mass index, adequacy of prenatal care, and duration of labour. Residual confounding is possible but unlikely to fully account for the observed inequities. Because the study population was restricted to live births, disparities may be underestimated, given higher rates of miscarriage and stillbirth among Black people, which are associated with SMM.[27,45–48] As hospital and emergency department records from Quebec were not available in the linked data set, findings from this study may not be generalizable to people in Quebec, where approximately 25% of Canada's Black population reside. This group may face distinct structural and health care–related contexts.[49,50] We applied 2021 Census weights to data from 2012 to 2023, which may have introduced minor bias owing to demographic shifts over the study period. We did not assess intersectional factors (e.g., language, religion, country of origin), limiting understanding of heterogeneity within Black populations. Finally, some misclassification of diagnoses and intervention codes was possible; however, this was unlikely to differ systematically by race, given the use of standardized abstraction procedures.[51,52]

Conclusion

We observed that, compared with White people, rates of SMM events were consistently higher among Black people in Canada during the antepartum, intrapartum, and postpartum periods, after adjusting for potential confounders. The consistency of these disparities across regions and sociodemographic groups suggests broader structural influences on maternal health. Addressing these inequities will require strengthening accountability and investment in equity-informed and culturally responsive care models, supported by the responsible collection and use of race-based health data. Key priorities include routine monitoring and public reporting of maternal outcomes by race, implementation of anti-racism and cultural safety initiatives within maternity care settings, meaningful partnerships with Black communities in the design and evaluation of services, and ensuring equitable access to high-quality prenatal, intrapartum, and postpartum care.

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