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In this article...

Maternal socioeconomic status is a determinant of birth outcomes

Neighbourhood income affects birth outcomes

Education had larger effect than neighbourhood income

Small differences in outcomes between urban and rural mothers with lower education

Targeting mothers at risk

Socioeconomic status and birth outcomes in Quebec

Summary by Kathy White and Russell Wilkins

Maternal socioeconomic status is a determinant of birth outcomes

Maternal socioeconomic status is an important determinant of differences in birth outcomes. Maternal socioeconomic status includes both neighbourhood and individual effects.

Although some studies have looked at the effects of neighbourhood socioeconomic status on birth outcomes, it is still unclear whether these effects are due to the 'contextual' effects of lower income neighbourhoods or the individual characteristics of those living in them.

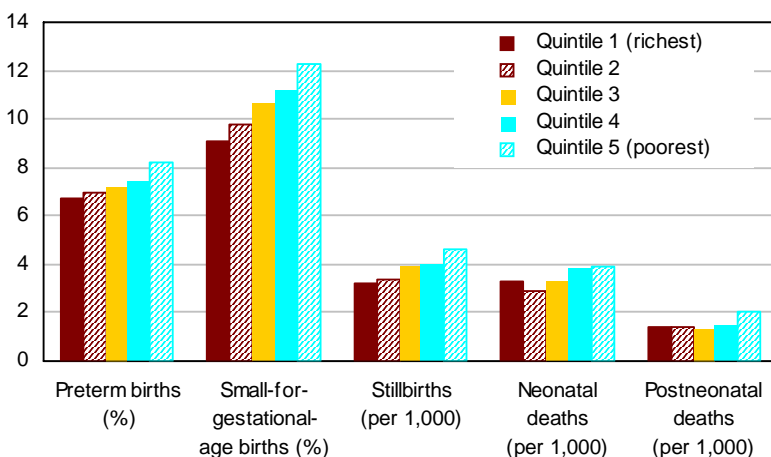
This is the first large population-based study to examine the association between both neighbourhood and individual socioeconomic factors and birth outcomes. We used maternal level of education from birth records in Quebec from 1991 to 2000 as the individual-level measure and neighborhood income as the community-level measure.

Neighbourhood income affects birth outcomes

Mothers living in lower income neighbourhoods were much more likely to be unmarried, to be younger than 20, and to have less than 11 years of education. Rates of adverse outcomes increased across successively poorer neighbourhood income groups for five outcomes: preterm births, small-for-gestational-age births, stillbirths, neonatal deaths, and postneonatal deaths (Figure 1).

Compared with women in the highest neighbourhood income group, women in the lowest neighbourhood income group were significantly more likely to experience preterm births, small-for-gestational-age births, and stillbirths, after adjusting for other factors (Table 1).

Figure 1
Rates of adverse birth outcomes higher among mothers living in lower income neighbourhoods, Quebec, 1991 to 2000



Note: Trends significant at p < 0.001.

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Table 1

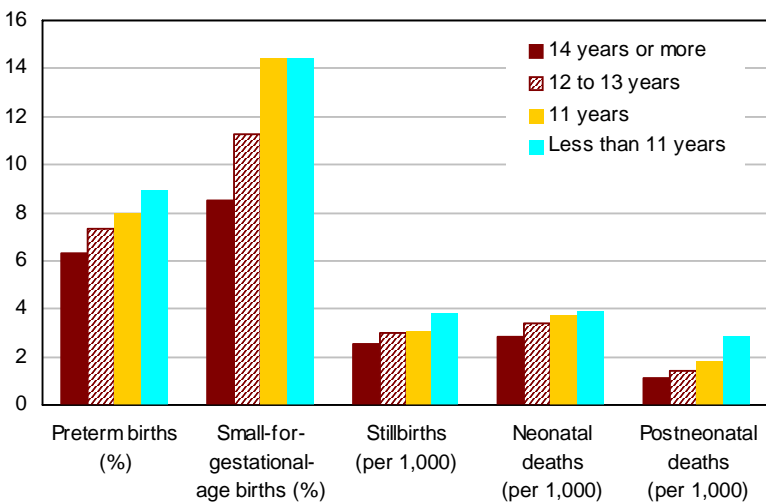
Relative risk of adverse birth outcomes by socioeconomic status, Quebec, 1991 to 2000

	Neighbourhood income* (poorest versus richest quintile)		Maternal education* (less than 11 versus 14 years or more)	
Preterm births	1.14	(1.10–1.17)	1.48	(1.44–1.52)
Small-for-gestational-age births	1.18	(1.15–1.21)	1.86	(1.82–1.91)
Stillbirths	1.30	(1.13–1.48)	1.54	(1.36–1.74)
Neonatal deaths	1.03	(0.90–1.17)	1.36	(1.20–1.54)
Postneonatal deaths	1.08	(0.89–1.30)	2.03	(1.72–2.41)

* Adjusted odds ratios (and 95% confidence intervals) from logistic regression; analyses included the sex, parity (number of previous births) and plurality (single, twins, etc.) of the infant and the ethnicity (mother tongue), age, marital status, maternal education and neighbourhood income of the mother.

Figure 2

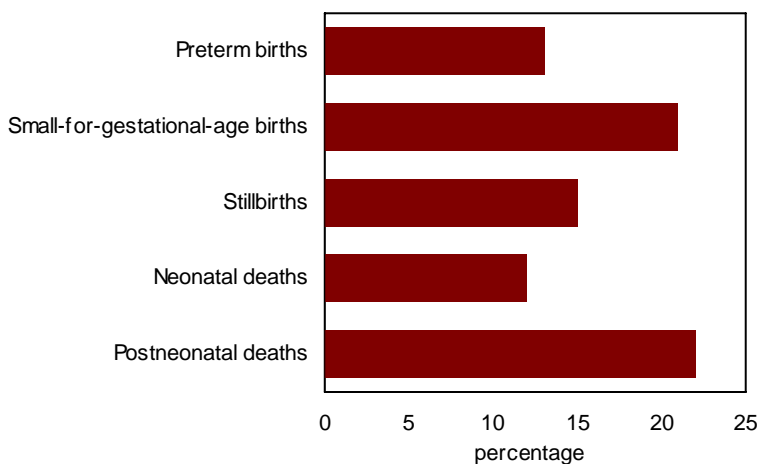
Rates of adverse birth outcomes higher among mothers with less education, Quebec, 1991 to 2000



Note: Trends significant at $p < 0.001$.

Figure 3

Population attributable risk for effect of maternal education on adverse birth outcomes, Quebec, 1991 to 2000



Note: Based on adjusted odds ratios for maternal education, all 3 strata, using 14 years or more as the reference group.

Education had larger effect than neighbourhood income

The impact of maternal education was larger than, and independent of, the effect of neighbourhood income. The risk gradients across maternal education strata (Figure 2) were more striking than across neighbourhood income strata. Compared with mothers who had completed 14 years or more (completed community college or some university), mothers who had not completed high school (less than 11 years of education) were significantly more likely to have preterm births, small-for-gestational-age births, stillbirths, neonatal deaths, and postneonatal deaths (Table 1).

The effects of maternal education were greatest for small-for-gestational-age births and postneonatal deaths.

In terms of the population attributable risk, the effect of maternal education on adverse birth outcomes ranged from 12% for neonatal deaths to 22% for postneonatal deaths (Figure 3). This measure indicates the potential portion of the adverse outcomes that could be avoided if all births had experienced the more favourable rates of the highest education group.

Small differences in outcomes between urban and rural mothers with lower education

Table 2 shows the adjusted odds ratios for the lowest education level (less than high school graduation) compared with the highest level (completion of community college or some university) for the five outcomes and for four specific causes of death among urban and rural populations.

The adjusted odds ratios for maternal education were slightly higher in urban than rural areas for all outcomes except neonatal death (Table 2). In both urban and rural areas, the effect of low maternal education was strongest for small-for-gestational-age births and postneonatal deaths.

Table 2**Relative risk of specific adverse birth outcomes for highest versus lowest maternal education, Quebec, 1991 to 2000**

		Rural*		Urban*
Preterm births	1.46	(1.38–1.54)	1.47	(1.43–1.52)
Small-for-gestational-age births	1.77	(1.69–1.85)	1.82	(1.77–1.87)
Stillbirths	1.27	(1.00–1.62)	1.65	(1.43–1.90)
Neonatal deaths	1.56	(1.24–1.95)	1.27	(1.11–1.47)
Postneonatal deaths	2.07	(1.51–2.84)	2.14	(1.76–2.60)
Congenital conditions	1.21	(0.90–1.63)	1.53	(1.26–1.84)
Asphyxia	1.57	(0.84–2.94)	1.23	(0.85–1.78)
Immaturity-related conditions	2.26	(1.56–3.26)	1.35	(1.07–1.69)
Sudden infant death syndrome (SIDS)	2.69	(1.49–4.88)	2.70	(1.87–3.91)

* Odds ratios (and 95% confidence intervals) from logistic regression, adjusted for sex, parity (number of previous births), and plurality (single, twin, etc.) of infant and ethnicity (mother tongue), age, marital status, and neighbourhood income of mother. Odds ratios are for maternal education of less than 11 years compared with that of 14 years or more.

Low maternal education was associated with immaturity-related conditions and sudden infant death syndrome in both rural and urban areas. The risk of infant death due to immaturity-related conditions was moderately higher in rural than urban areas. This may be influenced by difficulties accessing high quality neonatal intensive care.

Targeting mothers at risk

Interventions that consider mothers at risk from both individual and community perspectives may help reduce inequalities in maternal and fetal health.

This is the first population-based study to demonstrate a greater risk of adverse birth outcomes in poorer neighbourhoods that is in part independent of individual measures of socioeconomic status (maternal education).

However, the effects of maternal education were greater than and independent of the effects of neighbourhood income.

Women with lower education and those living in poorer neighbourhoods may benefit from more clinical vigilance and counseling during the perinatal period. For example, better knowledge of sleep positions might help to address differences in risk of SIDS.

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Methods

Stillbirths, live births, and infant deaths came from birth records for 825,349 births in Quebec from 1991 to 2000. Unlike most Canadian provinces, Quebec includes maternal education on birth registrations. We compared four groups; the lowest of these was less than high school graduation (less than 11 years) and the highest was community college completed or some university (14 years or more).

Birth registrations also provided the postal code of the mother's residence, which allowed us to determine neighbourhood income levels based on census data. We assigned each birth to a census enumeration area based on the postal code of the mother's residence. Neighbourhoods were identified as urban if they were within a community of 10,000 or more, and the rest were considered rural.

The socioeconomic status of the neighbourhood in which the mother lived was determined as follows. The average income for the neighbourhood, adjusted for household size, was calculated using census data. To determine the relative income level of the neighbourhood compared with adjacent ones, we ranked neighbourhoods within each community and divided them into five groups from the richest (quintile 1) to the poorest (quintile 5). These groups thus had one-fifth of the population but not necessarily one-fifth of the births.

The main outcomes were preterm births (gestational age less than 37 weeks), small-for-gestational-age births (birth weight below the tenth percentile), stillbirths, neonatal deaths (before 28 days) and postneonatal deaths (28 days to one year). Specific causes of death examined were congenital conditions, immaturity-related conditions, asphyxia, and sudden infant death syndrome (SIDS).

About this article

This analysis was published recently in the *Canadian Medical Association Journal*. The full article is available free of charge at <http://www.cmaj.ca/cgi/content/full/174/10/1415>. The tables and figures in the full article can be saved as PowerPoint slides by clicking on them and following the instructions.

The work is a collaboration of the Health Analysis and Measurement Group at Statistics Canada, the Department of Epidemiology and Community Medicine at the University of Ottawa, the departments of Epidemiology and Biostatistics and of Pediatrics at McGill University, and the Department of Obstetrics and Gynecology at Sainte Justine Hospital, University of Montreal.

The authors wish to recognize the contribution of the Institut de la statistique du Québec in providing these data for analysis.

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We welcome your comments!
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