Preterm Delivery in Relation to Neighbourhood-Level Adult Premature Mortality

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Abstract

Objective: To assess the influence of neighbourhood-level adult premature mortality on a woman's risk of preterm delivery (PTD).

Methods: We included 286 872 singleton live birth deliveries in Toronto, Ontario, between 2002 and 2011. The study exposure was neighbourhood premature mortality rate, expressed in quintiles (Q), among adults aged 20 to 49 years living within each of Toronto's 140 neighbourhoods. The primary study outcome was PTD at 24 to 36 weeks' gestation. Logistic regression analysis generated unadjusted ORs, adjusted ORs, and 95% CIs, controlling for maternal age, parity, marital status, material deprivation index Q, maternal and paternal birthplace, and infant sex.

Results: For all 140 neighbourhoods, the mean rate of premature deaths was 0.66 per 100 females and 1.17 per 100 males aged 20 to 49 years. The rate of PTD increased linearly in relation to the neighbourhood rate of premature mortality among adult females, from 5.3 per 100 in Q1 with the lowest rate of premature mortality to 6.3 per 100 in Q5 (OR 1.22; 95% CI 1.13 to 1.31). The adjusted ORs were attenuated but remained significant (1.13; 95% CI 1.05 to 1.22). A similar pattern was demonstrated for the relation between neighbourhood premature mortality among adult males and PTD.

Conclusion: Women residing in neighbourhoods with high rates of premature adult mortality are at elevated risk of PTD, even after adjusting for measured socioeconomic factors that include marital status and material deprivation.

Résumé

Objectif : Évaluer, au sein d'un quartier distinct, l'influence du taux de mortalité précoce chez les adultes sur le risque d'accouchement prétermé (APT) auquel sont exposées les femmes du quartier en question.

Méthodes : Nous nous sommes penchés sur 286 872 accouchements d'un enfant vivant à la suite d'une grossesse monofœtale constatés à Toronto, en Ontario, entre 2002 et 2011. L'exposition étudiée a été le taux de mortalité prématurée du quartier, exprimé en quintiles (Q), chez les adultes âgés de 20 à 49 ans vivant au sein de chacun des 140 quartiers de Toronto. Le critère d'évaluation principal a été l'APT à 24-36 semaines de gestation. L'analyse de régression logistique a généré des RC non corrigés, des RC corrigés et des IC à 95 %, tout en assurant la neutralisation des effets de l'âge maternel, de la parité, de l'état familial, du Q d'indice de privation matérielle, du lieu de naissance maternel et paternel, et du sexe du nouveau-né.

Résultats : Pour l'ensemble des 140 quartiers, le taux moyen de mortalité prématurée était de 0,66 sur 100 femmes et de 1,17 sur 100 hommes de 20-49 ans. Le taux d'APT a connu une croissance linéaire, en relation avec le taux de quartier de mortalité prématurée chez les femmes adultes : il est passé de 5,3 sur 100 dans le Q1 (taux de mortalité prématurée le plus faible) à 6,3 sur 100 dans le Q5 (RC, 1,22; IC à 95 %, 1,13 à 1,31). Les RC corrigés étaient atténués, mais sont demeurés significatifs (1,13, IC à 95 %, 1,05 à 1,22). Un profil similaire a été constaté pour ce qui est de la relation entre le taux de quartier de mortalité prématurée chez les hommes adultes et le taux d'APT.

Conclusion : Les femmes qui vivent dans des quartiers comptant des taux élevés de mortalité prématurée chez les adultes sont exposées à des risques élevés d'APT, même à la suite de la neutralisation des effets de facteurs socioéconomiques mesurés tels que l'état familial et la privation matérielle.

Key Words: Mortality, premature, premature birth, pregnancy, poverty

Competing Interests: None declared.

Received on September 24, 2015

Accepted on November 9, 2015

http://dx.doi.org/10.1016/j.jogc.2015.12.013

J Obstet Gynaecol Can 2016;38(3):258-264

INTRODUCTION

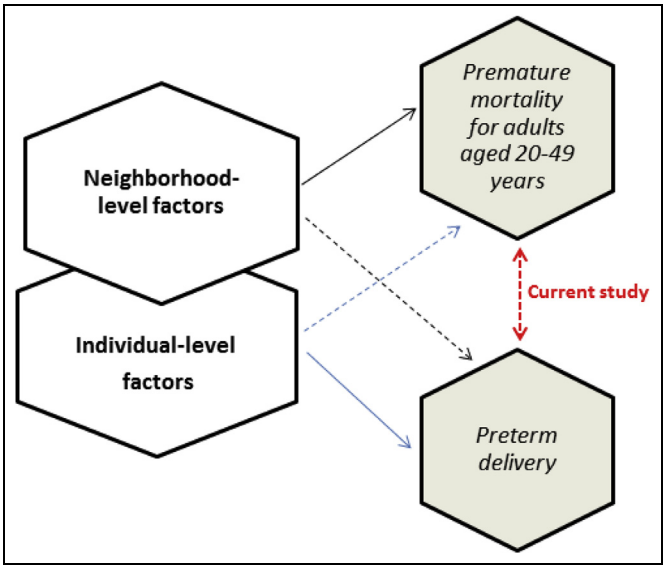
Preterm delivery (PTD) results in higher infant morbidity and mortality; the prevalence of PTD is 6% to 9% in most resource-rich countries.[1,2] The etiology of

PTD is multifactorial, including maternal and fetal medical conditions and psychosocial factors at the individual and neighbourhood level.[3]

Neighbourhood disadvantage is associated with reduced psychological and physical health among its residents.[4–6] Low income status at the neighbourhood level is a risk factor not only for PTD,[7] but also for premature death among adults.[5,8] The influence of living in a low-income neighbourhood on adult premature mortality persists after accounting for individual-level socioeconomic indicators. Neighbourhood poverty predicts depressive symptoms,[9,10] and depression predicts premature mortality[11] and adverse pregnancy outcomes.[12] The leading causes of death in young and middle-aged adults are suicide and drug overdose.[5] Etiologies of PTD among singletons include infection, placental disease, placental abruption,[13] and maternal substance use.[14,15] Maternal tobacco use and drug dependence are significant risk factors for these interrelated adverse neonatal outcomes and are over-represented in low-income neighbourhoods.[16,17]

As conceptualized in Figure 1, there are parallels between premature death in early and middle adulthood and PTD: Each is an untimely health event, arising too soon. Second, both are explained, at least in part, by some common socioenvironmental factors, such as living in a disadvantaged neighbourhood. Hence, by understanding whether neighbourhood premature adult mortality behaves as an indicator of PTD (Figure 1 *in red text*), we may gain insight into modifiable area-level factors beyond classic indicators of poverty that might accordingly be targeted to reduce the risk of PTD and premature death.

Figure 1. Conceptual framework for the relation between neighbourhood-level and individual-level factors and both premature mortality among adults and preterm delivery



We completed a population-based cohort study to assess whether area-level premature adult mortality is associated with a higher risk of PTD and extreme PTD at the individual level.

METHODS

For this study we used data for the entire city of Toronto from 2002 to 2011. Live births were identified using Canadian Vital Statistics birth records and were eligible for inclusion if complete information was available on parental birthplace and if the delivery occurred between 24 and 42 weeks' gestation and resulted in a singleton live born baby weighing between 500 and 7000 g. A birth record requires that two documents be submitted to the Office of the Registrar General, which is part of the Ministry of Government and Consumer Services of Ontario.[18] The first document is from the attendant/certifier (e.g., physician or midwife) and the second is from a parent. Because all records were stripped of parental and child identifiers, a given woman could not be identified and therefore could have contributed more than one live birth delivery during the study period. We categorized each newborn as being live born according to the birth record. In Ontario, approximately 95% of women have an ultrasound examination before 20 weeks' gestation; this provides accurate dating of the pregnancy[19] and allows the clinical attendant's completion of the birth record.

The study exposure was the rate of premature mortality among women and men aged 20 to 49 years within each given neighbourhood in Toronto, where universal health care is available to all permanent residents. Toronto has 140 predefined neighbourhoods created by the Social Policy Analysis and Research unit in the city's Social Development and Administration Division with assistance from Toronto Public Health. Each neighbourhood contains 7000 to 10 000 residents.[20] Premature mortality events among adults aged 20 to 49 years were obtained from Statistics Canada, based on mandatory death certificate registration. Premature mortality was expressed as a rate per 100 male and female adults ages 20 to 49 years and divided into quintiles (Q), with the lowest mortality rate at Q1 and the highest at Q5.

The primary study outcome of interest was PTD live births at 24 to 36 completed weeks' gestation (yes or no), expressed per 100 live birth deliveries. Secondary study