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Adverse birth outcomes associated with ambient air pollution at levels below air quality guidelines

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Background: Gaps exist concerning the relationship between maternal exposure to air pollution and birth outcomes, including the importance of low-level exposure. We aimed to explore the association between maternal exposure to ambient nitrogen dioxide (NO_2) and fine particulate matter ($PM_{2.5}$) and selected birth outcomes in Victoria, Australia.

Methods: We included all births occurring in Victoria, Australia from 1st March 2012 to 31st December 2015 using routinely collected government data. Outcomes included birthweight, small for gestational age (SGA), term low birth weight (tLBW), large for gestational age, and spontaneous preterm birth. Annual ambient NO_2 and $PM_{2.5}$ was assigned to maternal residence at birth. Maternal, meteorological and temporal variables were included in final log-binomial models.

Results: There were 285,594 births. Average annual ambient NO_2 exposure was 6.0 parts per billion (ppb, IQR 3.9 ppb) and $PM_{2.5}$

was 6.9 μg/m^3 (IQR 1.3). IQR increases in ambient NO_2 and $PM_{2.5}$ were associated with fetal growth restriction, including decrements in birth weight, increased risk of SGA and tLBW. Women with gestational diabetes and hypertensive disorders of pregnancy had greater decrements in birth weight associated with exposure.

Conclusions: Maternal exposure to low-level ambient air pollution at levels below national and international air quality guidelines was associated with fetal growth restriction.

Key messages: Exposure to low-level ambient air pollution was associated with fetal growth restriction and women with obstetric complications were more susceptible.

These findings may inform iterative revisions of air quality guidelines.