

## Abstract

**BACKGROUND:** Particulate matter  $\leq 2.5$   $\mu\text{m}$  in aerodynamic diameter (PM<sub>2.5</sub>) has been variably associated with preterm birth (PTB).

**OBJECTIVE:** We classified PTB into four categories (20-27, 28-31, 32-34, and 35-36 weeks completed gestation) and estimated risk differences (RDs) for each category in association with a 1- $\mu\text{g}/\text{m}^3$  increase in PM<sub>2.5</sub> exposure during each week of gestation.

**METHODS:** We assembled a cohort of singleton pregnancies that completed  $\geq 20$  weeks of gestation during 2000-2005 using live birth certificate data from three states (Pennsylvania, Ohio, and New Jersey) ( $n = 1,940,213$ ; 8% PTB). We estimated mean PM<sub>2.5</sub> exposures for each week of gestation from monitor-corrected Community Multi-Scale Air Quality modeling data. RDs were estimated using modified Poisson linear regression and adjusted for maternal race/ethnicity, marital status, education, age, and ozone.

**RESULTS:** RD estimates varied by exposure window and outcome period. Average PM<sub>2.5</sub> exposure during the fourth week of gestation was positively associated with all PTB outcomes, although magnitude varied by PTB category [e.g., for a 1- $\mu\text{g}/\text{m}^3$  increase, RD = 11.8 (95% CI: -6, 29.2); RD = 46 (95% CI: 23.2, 68.9); RD = 61.1 (95% CI: 22.6, 99.7); and RD = 28.5 (95% CI: -39, 95.7) for preterm births during 20-27, 28-31, 32-34, and 35-36 weeks, respectively]. Exposures during the week of birth and the 2 weeks before birth also were positively associated with all PTB categories.

**CONCLUSIONS:** Exposures beginning around the time of implantation and near birth appeared to be more strongly associated with PTB than exposures during other time periods. Because particulate matter exposure is ubiquitous, evidence of effects of PM<sub>2.5</sub> exposure on PTB, even if small in magnitude, is cause for concern.