
TITLE**Assessing the impact of race, social factors and air pollution on birth outcomes: a population-based study****AUTHOR(S)**

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ABSTRACTBackground:

Adverse birth outcomes are a major public health concern as they are associated with an increased risk of neonatal mortality and long term morbidity. Previous studies have linked air pollution with harmful effects on pregnancy and poor birth outcomes. Individual level maternal factors, such as being African American, having low income, and having low education attainment, and area level characteristics, such as low neighborhood socioeconomic status (SES), have been associated with adverse birth outcomes including low birth weight (LBW; birth weight < 2500 grams), small for gestational age (SGA; < 10th percentile of birth weight for gestational age), and pre-term birth (PTB; < 37 weeks gestation). Due to the potential interrelatedness of these individual and area level risk factors, care should be taken to understand the joint effect of SES and air pollution exposure on adverse birth outcomes.

Objective:

To assess the joint effects of air pollution exposure and measures of SES in a population level analysis of pregnancy outcomes in North Carolina.

Methods:

To capture birth outcome and personal data, the authors investigated North Carolina Detailed Birth Records (NCDBR) for all live births from the North Carolina State Center for Health Statistics for the years 2002-2006. Multiple births and in-utero diagnosis of congenital anomalies were excluded so that only those with reasonable expectation to go to term and deliver at a normal birth weight would be studied. Maternal characteristics included residential address at time of birth, age, marital status, education, race and ethnicity, tobacco use, parity, and the trimester in which prenatal care began. Infant characteristics included clinical estimate of gestational age in weeks, infant sex, birth weight, indication of congenital anomalies, plurality, and date of birth. The US Census was used to capture neighborhood characteristics. Air quality monitoring data was obtained through the US Environmental Protection Agency for the years 2001-2006 and included daily predicted particulate matter (PM_{2.5}) and ozone (O₃) measurements at the census level for the entire state of North Carolina. Geocoding computer software was then used to link birth place and air pollution data. Statistical models were developed to analyze the joint effects of these individual level and area level factors, along with estimated measures of air pollution exposures, on birth outcomes.

Results:

Adverse birth outcomes were associated with maternal race (greater among non-Hispanic black women), maternal education, and individual and neighborhood household income. Predicted concentrations of particulate matter and ozone exposure contributed an additional harmful effect on birth outcomes after accounting for race and individual and area level SES.

Conclusion:

The results show a stable association between air pollution exposure and adverse birth outcomes, with socially disadvantaged populations being at even greater risk.

POLICY IMPLICATIONS

This study's findings are consistent with that of previous research showing associations between poor ambient air quality and adverse birth outcomes, and builds upon it by including social determinants of pregnancy outcomes in the analyses.

Although national health based standards have been promulgated under the U.S. Clean Air Act, many urban areas continue to be plagued with disproportionate levels of air pollution. For example, in 2012 approximately 28.2 million people lived in counties where PM_{2.5} concentrations exceeded standards, and nearly 4 in 10 people in the United States (38%) live in areas with unhealthy levels of ozone. Many of these "hot spots" are located in low income and minority neighborhoods adjacent to highways or polluting industries. Residents of these neighborhoods already face higher risk of poor birth outcomes due to individual and/or area level risk factors, and this study confirms that air pollution exposure increases this risk.

Children's unique vulnerabilities and exposures must be considered when setting air quality standards, and such standards must place human health, especially the health of vulnerable populations, first. Additionally, improving and expanding the pollution monitoring network and improving regulation compliance, especially in the communities where our most vulnerable populations reside, may reduce the number of poor birth outcomes and resultant health and developmental problems.

REFERENCE

Article available in [Environmental Health](#).

KEY WORD(S)

[Air Pollution](#), [Preterm births](#), [Low birthweight](#), [Small for gestational age](#), [SES and disparities in birth outcomes](#)