

# INPLASY PROTOCOL

To cite: Liu et al. Maternal air pollution exposure and adverse birth outcomes: A meta-analysis. Inplasy protocol 202280064. doi: 10.37766/inplasy2022.8.0064

Received: 17 August 2022

Published: 17 August 2022

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**Support:** 2021-I2M-C&T-B-089.

**Review Stage at time of this  
submission:** Data analysis.

**Conflicts of interest:**  
None declared.

## Maternal air pollution exposure and adverse birth outcomes: A meta-analysis

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**Review question / Objective:** The objective of this study was to conduct a systematic review to provide summarized evidence on the association between air pollution and adverse birth outcomes.

**Rationale:** Maternal exposure to air pollution during pregnancy is associated with an increased risk of adverse birth outcomes such as low birth weight (BW) and preterm birth. These adverse outcomes are associated with increased neonatal morbidity and mortality, possible developmental disorders in childhood, and risk of a variety of diseases, including depression and other psychiatric conditions in adulthood. Her over 20 million infants, representing 15.5% of all births, are born with low body weight (<2500 g). The prevalence in developing countries (16.5%) is more than double her level in developed regions (7%). Preterm birth (PTB) is considered one of the reasons for low BW and also an indirect cause of neonatal mortality. Risk factors for PTB include maternal young age, smoking, and poor housing, as well as medical factors such as induction, premature rupture of membranes, infection, multiple pregnancies, intrauterine death, fetal and uterine abnormalities, and chorioamnionitis.

**INPLASY registration number:** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 17 August 2022 and was last updated on 29 October 2022 (registration number INPLASY202280064).

### INTRODUCTION

**Review question / Objective:** The objective of this study was to conduct a systematic review to provide summarized evidence on

the association between air pollution and adverse birth outcomes.

**Rationale:** Despite the establishment of pathways and biological processes, causality determinations for PM exposure

and birth outcomes were classified as “suggestive, but not sufficient to infer or inadequate to infer” by the United States Environmental Protection Agency (EPA) based on current research. Large birth cohort studies seems to document consistent positive association between PM exposure and term low birth weight. However, some analyses were limited to pregnant women living near air monitoring stations, which may limit applicability of the study findings to broader populations. It is not determined whether the inclusion of macrosomia (defined as birthweight>4000 g) and post-term birth ( $\geq 42$  weeks gestation) attenuate the main association. In addition, the lack of standardized assessment methods may increase maternal exposure assessment error and differences in health effect estimates. Whether relying on fixed-site monitoring data or exposure prediction models including land use regression (LUR) model, inverse distance weighting (IDW) spatial interpolation algorithm, dispersion model, and bayesian model, such methods ignore spatial heterogeneity and the individual difference of time-activity patterns, which may be a source of between-study heterogeneity. Furthermore, we were unable to obtain risk estimates for the effects of particulate matter exposure on low birth weight from current systematic reviews and meta-analyses that have not extensively adjust for potential confounders such as maternal age, gestational age, infant sex, passive smoking, diabetes, hypertension during pregnancy, etc.

**Rationale:** Maternal exposure to air pollution during pregnancy is associated with an increased risk of adverse birth outcomes such as low birth weight (BW) and preterm birth. These adverse outcomes are associated with increased neonatal morbidity and mortality, possible developmental disorders in childhood, and risk of a variety of diseases, including depression and other psychiatric conditions in adulthood. is suggested. Her over 20 million infants, representing 15.5% of all births, are born with low body weight (<2500 g). The prevalence in developing

countries (16.5%) is more than double her level in developed regions (7%). Preterm birth (PTB) is considered one of the reasons for low BW and also an indirect cause of neonatal mortality. Risk factors for PTB include maternal young age, smoking, and poor housing, as well as medical factors such as induction, premature rupture of membranes, infection, multiple pregnancies, intrauterine death, fetal and uterine abnormalities, and chorioamnionitis.

**Condition being studied:** The purpose of this study was to conduct a systematic review in order to offer summarized evidence on the associations between air pollution , PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>2</sub>,SO<sub>2</sub>,etc. with various health outcomes.

## METHODS

**Search strategy:** Search terms included “air pollution” OR “particulate matter” OR “PM” OR “PM<sub>10</sub>” OR “PM<sub>2.5</sub>” OR “TSP” AND “low birth weight ” OR “birth weight” OR “PTB”.

**Participant or population:** pregnant women and their singleton live-births.

**Intervention:** NA.

**Comparator:** OR.

**Study designs to be included:** Estimates of risk expressed as hazard ratios (HRs) or odds ratios (ORs) and their 95% confidence intervals (CI).

**Eligibility criteria:** In general, studies not related to 'air pollution' and 'birth outcomes' were excluded. In addition, daily time-series studies, case reports, case series, and studies presented only in abstract form were excluded.

**Information sources:** Electronic databases.

**Main outcome(s):** TLBW,PTB,LBW,IGUR, Spontaneous abortion, induced abortion, stillbirth, stillbirth, live birth.

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**Additional outcomes:** NA.

**Data management:** NA.

**Quality assessment / Risk of bias analysis:** We use a tailored version of the Risk of bias tool.

**Strategy of data synthesis:** We log transformed ORs and pooled them across studies using random-effects meta-analysis with inverse variance weighting and then exponentiated these values to obtain the pooled ORs. The increments  $\chi^2$  test-based Q statistic and I<sup>2</sup> were used to estimate the heterogeneity among studies.

**Subgroup analysis:** Subgroup analyses were conducted based on the economic status of the country, region of study, exposure assessment, risk of bias.

**Sensitivity analysis:** Sensitivity analysis was performed for each excluded study.

**Country(ies) involved:** China.

**Keywords:** air pollution; pregnancy outcome.

**Contributions of each author:**

**Author 1 - Jing Liu -** Author 1 designed , provided statistical expertise and drafted the manuscript.

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**Author 5 - Qi Sun -** The author contributed to contributed to the data collection and the risk of bias assessment strategy.

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**Author 7 - Jing Dong Dong -** The author provided the risk of bias assessment strategy.

**Author 8 - Tao Pei -** The author designed , read, provided feedback and approved the final manuscript.

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