National Toxicology Program
U.S. Department of Health and Human Services

LITERATURE SEARCH RESULTS FOR THE

SYSTEMATIC REVIEW OF TRAFFIC-RELATED AIR POLLUTION AND HYPERTENSIVE DISORDERS OF PREGNANCY

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Office of Health Assessment and Translation
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National Institute of Environmental Health Sciences
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LITERATURE SEARCH RESULTS

Literature Search

Literature search strategies were developed to identify all relevant published evidence on traffic-related air pollution associated with hypertensive disorders of pregnancy through 1) review of PubMed's Medical Subject Headings (MeSH) for relevant and appropriate terms, 2) extraction of key terminology from relevant reviews and a set of previously identified primary data studies that are known to be relevant to the topic ("test set"), and 3) review of search strategies presented in other reviews. The search strategy was run, and the results were assessed to ensure that 100% of the previously identified relevant primary studies were retrieved. Three databases were searched through January 28, 2019 using a strategy customized for each database: PubMed, Scopus, and Web of Science. The search strategy is reported in **Appendix 1**. No publication year limits or language restrictions were imposed. The literature search was developed in collaboration with a librarian trained in systematic review methodology.

More detailed methods are described in the protocol (https://ntp.niehs.nih.gov/go/721550) posted in June 2016.

Databases Searched

- PubMed
- Scopus
- Web of Science

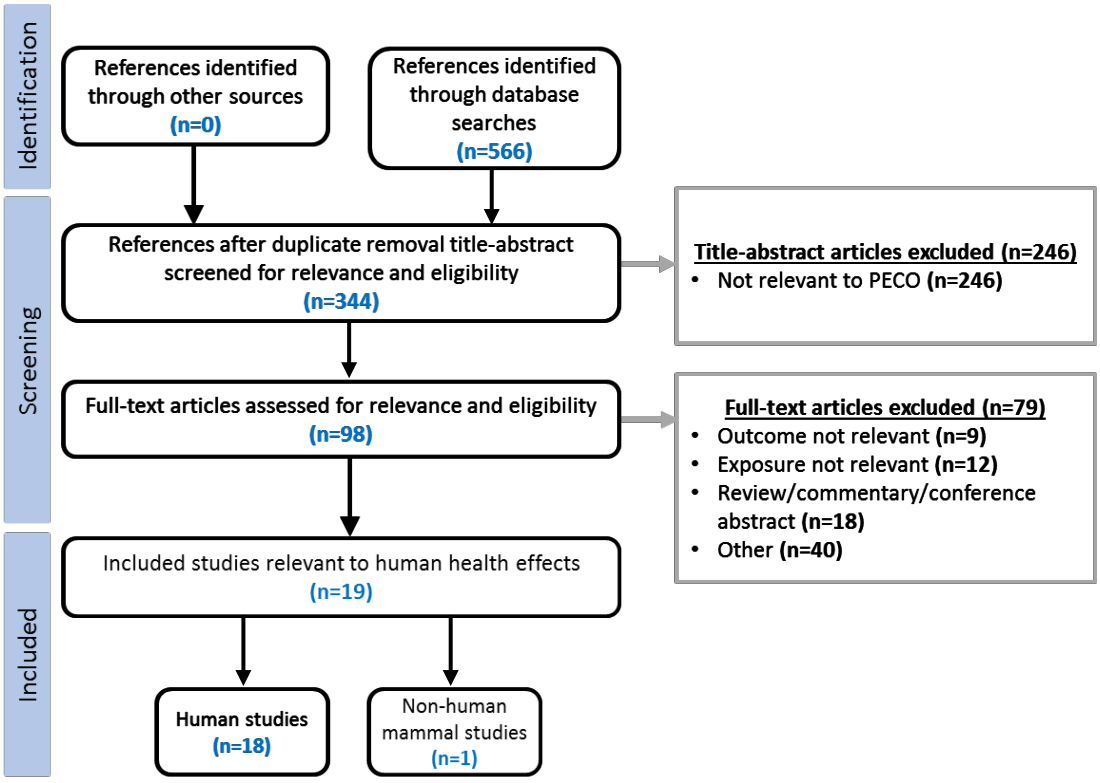
Searching Other Resources

The reference lists of all included studies, relevant reviews, commentaries, and other non-research articles identified during the initial search were searched manually to find additional studies that were not identified through the electronic searches. Studies were evaluated using the same inclusion and exclusion criteria that were used for screening records retrieved from the electronic search. Relevant studies identified through these steps were marked as "provided from other sources" in the study selection flow diagram.

Literature Search Results

The electronic database searches retrieved 344 individual references. From the total references retrieved, 246 were excluded during the title and abstract screening and 79 studies were excluded during the fill text review for not satisfying the PECO criteria. The screening results are outlined in the study selection diagram with reasons for exclusion documented at the full text review level (**Figure 1**). After full text review, 19 studies were considered relevant, which included 18 human studies and 1 animal study. One human study evaluated 2 distinct populations, so there were 19 human datasets within the 18 human studies. The list of included references is provided below.

Figure 1. Study Selection Diagram



REFERENCES INCLUDED AFTER FULL-TEXT REVIEW

List of Included Studies

Studies in Humans

Assibey-Mensah V, Glantz JC, Hopke PK, Jusko TA, Thevenet-Morrison K, Chalupa D, Rich DQ. 2019. Ambient wintertime particulate air pollution and hypertensive disorders of pregnancy in Monroe County, New York. *Environ. Res.* 168: 25-31.

Choe SA, Kauderer S, Eliot MN, Glazer KB, Kingsley SL, Carlson L, Awad YA, Schwartz JD, Savitz DA, Wellenius GA. 2018. Air pollution, land use, and complications of pregnancy. *Sci. Total Environ.* 645: 1057-1064.

Dadvand P, Figueras F, Basagana X, Beelen R, Martinez D, Cirach M, Schembari A, Hoek G, Brunekreef B, Nieuwenhuijsen MJ. 2013. Ambient air pollution and preeclampsia: A spatiotemporal analysis. *Environ. Health Perspect.* 121(11-12): 1365-1371.

Huang, X., J. Qiu, Y. Zhang, W. Qiu, X. He, Y. Wang, Q. Sun, N. Zhao, H. Cui, S. Liu, Z. Tang, Y. Chen, L. Yue, Z. Da, L. Lv, X. Lin, C. Zhang, H. Zhang, R. Xu, D. Zhu, X. Xu, R. Lin, T. Yao, J. Su, Y. Dang, X. Han, H. Zhang, H. Bai, W. Wang, Y. Wang, X. Liu, B. Ma, H. Huang, J. Liang, M. Jiang, S. Ma, M. L. Bell, C. Kim, Q. Liu and Y. Zhang (2015). Ambient air pollutant PM10 and risk of pregnancy-induced hypertension in urban China. *Environmental Research Letters* 10(8): 084025.

Madsen C, Haberg SE, Aamodt G, Stigum H, Magnus P, London SJ, Nystad W, Nafstad P. 2018. Preeclampsia and hypertension during pregnancy in areas with relatively low levels of traffic air pollution. *Matern Child Health J* 22(4): 512-519.

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Miranda ML, Edwards SE, Chang HH, Auten RL. 2013. Proximity to roadways and pregnancy outcomes. *J. Expo. Sci. Environ. Epidemiol.* 23(1): 32-38.

Olsson D, Mogren I, Eneroth K, Forsberg B. 2015. Traffic pollution at the home address and pregnancy outcomes in Stockholm, Sweden. *BMJ open* 5(8): e007034.

Pedersen M, Halldorsson TI, Olsen SF, Hjortebjerg D, Ketzel M, Grandstrom C, Raaschou-Nielsen O, Sorensen M. 2017. Impact of road traffic pollution on pre-eclampsia and pregnancy-induced hypertensive disorders. *Epidemiology* 28(1): 99-106.

Pereira G, Haggar F, Shand AW, Bower C, Cook A, Nassar N. 2013. Association between pre-eclampsia and locally derived traffic-related air pollution: A retrospective cohort study. *J. Epidemiol. Community Health* 67(2): 147-152.

Rudra CB, Williams MA, Sheppard L, Koenig JQ, Schiff MA. 2011. Ambient carbon monoxide and fine particulate matter in relation to preeclampsia and preterm delivery in western Washington State. *Environ. Health Perspect.* 119(6): 886-892.

Savitz DA, Elston B, Bobb JF, Clougherty JE, Dominici F, Ito K, Johnson S, McAlexander T, Ross Z, Shmool JL, Matte TD, Wellenius GA. 2015. Ambient fine particulate matter, nitrogen dioxide, and hypertensive disorders of pregnancy in New York City. *Epidemiology* 26(5): 748-757.

Sears CG, Braun JM, Ryan PH, Xu Y, Werner EF, Lanphear BP, Wellenius GA. 2018. The association of traffic-related air and noise pollution with maternal blood pressure and hypertensive disorders of pregnancy in the HOME study cohort. *Environ. Int.* 121(Pt 1): 574-581.

van den Hooven EH, Jaddoe VW, de Kluizenaar Y, Hofman A, Mackenbach JP, Steegers EA, Miedema HM, Pierik FH. 2009. Residential traffic exposure and pregnancy-related outcomes: A prospective birth cohort study. *Environ. Health* 8: 59.

van den Hooven EH, de Kluizenaar Y, Pierik FH, Hofman A, van Ratingen SW, Zandveld PY, Mackenbach JP, Steegers EA, Miedema HM, Jaddoe VW. 2011. Air pollution, blood pressure, and the risk of hypertensive complications during pregnancy: The generation R study. *Hypertension* 57(3): 406-412.

Wu J, Wilhelm M, Chung J, Ritz B. 2011. Comparing exposure assessment methods for traffic-related air pollution in an adverse pregnancy outcome study. *Environ. Res.* 111(5): 685-692.

Wu M, Ries JJ, Proietti E, Vogt D, Hahn S, Hoesli I. 2016. Development of late-onset preeclampsia in association with road densities as a proxy for traffic-related air pollution. *Fetal Diagn. Ther.* 39(1): 21-27.

Yorifuji T, Naruse H, Kashima S, Murakoshi T, Doi H. 2015. Residential proximity to major roads and obstetrical complications. *Sci. Total Environ.* 508: 188-192.

Study in Non-human Animals

Venditti CC, Casselman R, Young I, Karumanchi SA, Smith GN. 2014. Carbon monoxide prevents hypertension and proteinuria in an adenovirus sFlt-1 preeclampsia-like mouse model. *PLoS One* 9(9).

APPENDICES

Appendix 1. Literature Search Strategy

The search terms and databases searched are provided below.

Database	Search Terms
Pubmed	"air pollution"[mh:noexp] OR "air pollutants"[mh:noexp] OR (("air pollution"[tiab] OR "air pollutant"[tiab] OR "air pollutants"[tiab]) NOT (indoor*[tiab] OR household[tiab])) OR "particulate matter"[mh:noexp] OR smog[mh] OR soot[mh] OR "particulate matter"[tiab] OR PM2.5[tiab] OR "PM(2.5)"[tiab] OR PM10[tiab] OR "PM(10)"[tiab] OR smog[tiab] OR soot[tiab] OR "carbon black"[tiab] OR "black carbon"[tiab] OR "elemental carbon"[tiab] OR ((air[tiab] OR airborne[tiab] OR coarse[tiab] OR ultrafine[tiab] OR fine[tiab]) AND (particle*[tiab] OR particulate*[tiab])) OR "vehicle emissions"[mh] OR motor vehicles[mh] OR ((vehicle[tiab] OR vehicles[tiab] OR vehicular[tiab] OR auto[tiab] OR automobile[tiab] OR bus[tiab] OR buses[tiab] OR car[tiab] OR truck*[tiab] OR engine[tiab] OR transport[tiab]) AND (emissions[tiab] OR exhaust[tiab] OR fume*[tiab])) OR (traffic[tiab] NOT (safety[tiab] OR accident*[tiab] OR injur*[tiab] OR collision*[tiab] OR crash*[tiab])) OR ((proximity OR near) AND (road*[tiab] OR highway*[tiab] OR freeway*[tiab] OR motorway*[tiab])) OR ((air[tiab] OR outdoor[tiab] OR ambient[tiab] OR pollut*[tiab] OR emissions[tiab] OR exhaust*[tiab]) AND ("sulfur dioxide"[mh] OR "sulfur dioxide"[tiab] OR S02[tiab] OR ozone[mh] OR ozone[tiab] OR O3[tiab] OR "hydrogen sulfide"[mh] OR "hydrogen sulfide"[tiab] OR H2S[tiab] OR "carbon monoxide"[mh] OR "carbon monoxide"[tiab] OR "nitric oxide"[tiab] OR "nitrogen oxide"[tiab] OR "nitrogen oxides"[tiab] OR "nitrogen dioxide"[mh] OR "nitrogen dioxide"[tiab] OR NOx[tiab] OR "NO(x)"[tiab] OR NO2[tiab])) OR "volatile organic compounds"[mh] OR "fossil fuels"[mh] OR "volatile organic compounds"[tiab] OR gasoline*[tiab] OR diesel[tiab] OR petrol*[tiab] OR Polycyclic hydrocarbons, aromatic[mh:noexp] OR "benzo(a)pyrene"[mh] OR benzene[mh] OR "polycyclic aromatic hydrocarbons"[tiab] OR "benzopyrene"[tiab] OR "benzo a pyrene"[tiab] OR "3,4-benzopyrene"[tiab] OR benzene[tiab] AND "Hypertension, Pregnancy-Induced"[Mesh] OR "Gestational Hypertension"[tiab] OR "pregnancy-induced hypertension"[tiab] OR (pregnan*[tiab] AND hypertens*[tiab]) OR pre-eclampsia[tiab] OR preeclampsia[tiab] OR (pregnan*[tiab] AND toxemia*[tiab])

Database	Search Terms
Scopus	(("air pollution" OR "air pollutant" OR "air pollutants") AND NOT (indoor* OR household)) OR "particulate matter" OR PM2.5 OR "PM(2.5)" OR PM10 OR "PM(10)" OR smog OR soot OR "carbon black" OR "black carbon" OR "elemental carbon" OR ((air OR airborne OR coarse OR ultrafine OR fine) AND (particle* OR particulate*)) OR ((vehicle OR vehicles OR vehicular OR auto OR automobile OR bus OR buses OR car OR truck* OR engine OR transport) AND (emissions OR exhaust OR fume*)) OR (traffic AND NOT (safety OR accident* OR injur* OR collision* OR crash*)) OR ((proximity OR near) AND (road* OR highway* OR freeway* OR motorway*)) OR ((air OR outdoor OR ambient OR pollut* OR emissions OR exhaust*) AND ("sulfur dioxide" OR S02 OR ozone OR O3 OR "hydrogen sulfide" OR H2S OR "carbon monoxide" OR "nitric oxide" OR "nitrogen oxide" OR "nitrogen oxides" OR "nitrogen dioxide" OR NOx OR "NO(x)" OR NO2)) OR "volatile organic" OR "fossil fuel" OR "fossil fuels" OR gasoline* OR diesel OR petrol* OR "polycyclic aromatic hydrocarbons" OR "benzopyrene" OR "benzo a pyrene" OR "3,4-benzopyrene" OR benzene AND "Gestational Hypertension" OR "pregnancy-induced hypertension" OR (pregnan* w/8 hypertens*) OR pre-eclampsia OR preeclampsia OR (pregnan* w/8 toxemia*)
Web of Science	(("air pollution" OR "air pollutant" OR "air pollutants") NOT (indoor* OR household)) OR "particulate matter" OR PM2.5 OR "PM(2.5)" OR PM10 OR "PM(10)" OR smog OR soot OR "carbon black" OR "black carbon" OR "elemental carbon" OR ((air OR airborne OR coarse OR ultrafine OR fine) AND (particle* OR particulate*)) OR ((vehicle OR vehicles OR vehicular OR auto OR automobile OR bus OR buses OR car OR truck* OR engine OR transport) AND (emissions OR exhaust OR fume*)) OR (traffic NOT (safety OR accident* OR injur* OR collision* OR crash*)) OR ((proximity OR nearby) AND (road* OR highway* OR freeway* OR motorway*)) OR ((air OR outdoor OR ambient OR pollut* OR emissions OR exhaust*) AND ("sulfur dioxide" OR S02 OR ozone OR O3 OR "hydrogen sulfide" OR H2S OR "carbon monoxide" OR "nitric oxide" OR "nitrogen oxide" OR "nitrogen oxides" OR "nitrogen dioxide" OR NOx OR NO2)) OR "volatile organic" OR "fossil fuel" OR "fossil fuels" OR gasoline* OR diesel OR petrol* OR "polycyclic aromatic hydrocarbons" OR "benzopyrene" OR "benzo a pyrene" OR "3,4-benzopyrene" OR benzene AND "Gestational Hypertension" OR "pregnancy-induced hypertension" OR (pregnan* near/8 hypertens*) OR pre-eclampsia OR preeclampsia OR (pregnan* near/8 toxemia*)