

Effects of exposure to flaring from unconventional oil wells on adverse birth outcomes

Cushing L¹, Vavra-Musser K², Chau K², Franklin M², Johnston J²
¹San Francisco State University, ²University of Southern California

OPS 37: Industrially contaminated sites and health, Room 210, Floor 2, August 26, 2019, 1:30 PM - 3:00 PM

Background/Aim: Unconventional extraction techniques including hydraulic fracturing of “fracking” have led to intensified oil and gas extraction near people’s homes. Excess natural gas is often disposed of at drilling sites through flaring, which releases hazardous air pollutants linked to adverse birth outcomes in other contexts. Flaring may also affect birth through psychosocial stress or disruptions in sleep due to light and odors. We sought to identify whether exposure to flaring was associated with adverse birth outcomes in the Eagle Ford Shale, one of the largest oil producing formations in the United States (USA).

Methods: Satellite observations from the Visible Infrared Imaging Spectroradiometer and administrative birth records from Texas, USA, during March 2012- December 2016 were used to estimate the density of flaring during pregnancy within 5, 10 and 15km for approximately 44,000 pregnant women living in the Eagle Ford region. We estimated the volume of gas combusted near each woman’s residence using a regression-based approach with flare temperature, area, and self-reported flared gas volumes at the field level. We also created production- and distance-weighted metrics of exposure to wells using data from DrillingInfo for comparability with prior studies. We estimated the effects of residential proximity to oil and gas wells, flaring, and flared gas volume during pregnancy on length of gestation, birth weight, and risk of preterm and small for gestational age birth while controlling for known risk factors including maternal age, smoking, and prenatal care.

Results: Preliminary results suggest that compared to the unexposed, women in the third tertile of exposure to flaring within 5km of their residence have a 30% higher odds of preterm birth (OR= 1.3, p <0.05) and pregnancies that are on average 1 day shorter (p < 0.05).

Conclusions: Proximity to flaring during pregnancy is associated with higher risk of preterm birth.

Traffic-related air pollution and birth weight: the roles of noise, placental function, green space, physical activity, and socioeconomic status (FRONTIER)

Dadvand P^{1,2,3}, Gomez Roig M⁴, Foraster M^{1,2,3}, Bustamante M^{1,2,3}, Torres M^{1,2,3}, Esnaola M^{1,2,3}, Moreno T⁵, Basagaña X^{1,2,3}, Nieuwenhuijsen M^{1,2,3}, Sunyer J^{1,2,3}

¹Barcelona Institute of Global Health (ISGlobal), ²Pompeu Fabra University, ³Ciber on Epidemiology and Public Health (CIBERESP), ⁴BCNatal, University of Barcelona, ⁵IDAEA-CSIC

TPS 682: Long-term health effects of air pollutants 2, Exhibition Hall, Ground floor, August 27, 2019, 3:00 PM - 4:30 PM

Background: A substantial body of evidence has associated air pollution to impaired fetal growth; however, there are still important limitations in terms of applied exposure assessment methods, disentangling role of co-exposure such as noise, and evaluating the modifiers, mediators, and mitigators of this association.

Objectives: To provide a comprehensive evaluation of the impact of maternal air pollution exposure on fetal growth. Towards this aim, FRONTIER will (i) disentangle the effects of noise; (ii) identify relevant window(s) of exposure; (iii) evaluate its modification by socioeconomic status, stress, and physical activity; (iv) elucidate the mediatory role of placental function; and (v) explore the potential of greenspace to mitigate it.

Methods: FRONTIER is establishing a cohort of 1000 women in Barcelona, Spain. Fetal growth is characterized by newborn anthropometric measures and ultrasound-based trajectories of fetal development. Placental function is evaluated using Doppler ultrasound

indicators. Hair cortisol levels will be used as an indicator of maternal stress. Time-activity patterns are objectively characterized using smartphones and personal physical activity monitors. We will develop an innovative exposure assessment framework integrating data on time-activity patterns with a hybrid modeling framework and campaigns of personal and home-outdoor air pollution monitoring to estimate maternal exposure level and inhaled dose of NO₂ and PM_{2.5} (mass and constituents) at the main microenvironments for pregnant women. We assess maternal exposure to noise by integrating measurements at participants’ home-outdoor together with modeled microenvironmental levels of noise. We will separately characterize the canopy and greenness surrounding maternal residential address using high-resolution maps. We will develop single- and multi-pollutant models to evaluate the impact of air pollution on fetal growth and the mediatory role of placental function.

Expected impact: FRONTIER is now in recruitment phase. It will generate vigorous evidence base for implementing finely-targeted regulations to tackle effects of air pollution on fetal growth.

Residential surrounding greenspace and the age at menopause: A 20-year European study (ECRHS)

Dadvand P⁷, Triebner K^{1,2}, Markevych I^{3,4}, Hustad S^{1,2}, Forsberg B⁸, Heinrich J^{3,5}, Gómez Real F^{1,6}, on behalf of ECRHS

¹Department of Clinical Science, University of Bergen, ²Core Facility for Metabolomics, University of Bergen, ³Institute and Clinic for Occupational, Social and Environmental Medicine, University Hospital, LMU Munich, ⁴Institute of Epidemiology, Helmholtz Zentrum München - German Research Center for Environmental Health, ⁵Allergy and Lung Health Unit, Melbourne School of Population and Global Health, University of Melbourne, ⁶Department of Gynecology and Obstetrics, Haukeland University Hospital, ⁷Barcelona Institute for Global Health, ⁸Department of Public Health and Clinical Medicine, Umeå University

TPS 702: Green space and population health, Exhibition Hall, Ground floor, August 28, 2019, 3:00 PM - 4:30 PM

Background / Aim: Menopause is associated with a number of adverse health effects and its timing has been reported to be influenced by several lifestyle factors. Whether greenspace exposure is associated with age at menopause has not yet been investigated. The aim was to investigate whether residential surrounding greenspace is associated with the age at menopause and thus reproductive aging.

Methods: This longitudinal study was based on the 20-year follow-up of 1955 aging women from a large, population-based European cohort (ECRHS). Residential surrounding greenspace was abstracted as the average of satellite-based Normalized Difference Vegetation Index (NDVI) across a circular buffer of 300m around the residential addresses of each participant during the course of the study. We applied mixed effects Cox models with centre as random effect, menopause as the survival object, age as time indicator and residential surrounding greenspace as predictor. All models were adjusted for smoking habit, BMI, parity, age at menarche, ever-use of contraception and age at completed full-time education as socio-economic proxy.

Results: An increase of one interquartile range of residential surrounding greenspace was associated with a 13% lower risk of being menopausal [Hazard Ratio 0.87 (95% Confidence Interval 0.79 – 0.95)]. Correspondingly the predicted median age at menopause was 1.4 years older in the highest compared to the lowest NDVI quartile.

Conclusions: Living in greener neighbourhoods is associated with older age at menopause and might therefore decelerate reproductive aging. These are novel findings with broad implications. Further studies are required to replicate our findings while exploring the potential mechanisms underlying this association.