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Respiratory health, pulmonary function and local engagement in urban communities near oil development

Jill E. Johnston ^a  , Temuulen Enebish ^a, Sandrah P. Eckel ^a, Sandy Navarro ^b, Bhavna Shamasunder ^c

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Highlights

- Urban oil and gas development occurs in close proximity to homes in Los Angeles.
- Residents living near an active oil well reported more wheezing symptoms.
- Living near oil develop was associated with lower lung function.
- Oil development activities may contribute to respiratory health problems.

Abstract

Background

Modern oil development frequently occurs in close proximity to human populations. Los Angeles, California is home to the largest urban oil field in the country with thousands of active oil and gas wells in very close proximity to homes, schools and parks, yet few studies have investigated potential health impacts. The neighborhoods along the Las Cienagas oil fields are situated in South LA, densely populated by predominantly low-income Black and Latinx families, many of whom are primarily Spanish-speakers.

Methods

A cross-sectional community-based study was conducted between January 2017 and August 2019 among residents living <1000m from two oil wells (one active, one idle) in the Las Cienagas oil field. We collected self-reported acute health symptoms and measured FEV1 (forced expiratory volume in the first second of exhalation) and FVC (forced vital capacity). We related lung function measures to distance and direction from an oil and gas development site using generalized linear models adjusted for covariates.

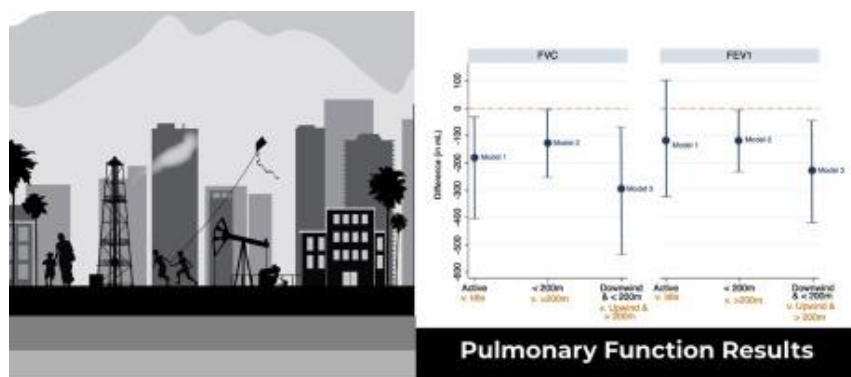
Results

A total of 961 residents from two neighborhoods participated, the majority of whom identify as Latinx. Participants near active oil development reported significantly higher prevalence of wheezing, eye and nose irritation, sore throat and dizziness in the past 2 weeks. Among 747 valid spirometry tests, we observe that living near (less than 200m) of oil operations was associated with, on average, -112mL lower FEV1 (95% CI: -213, -10) and -128 mL lower FVC (95% CI: -252, -5) compared to residents living more than 200m from the sites after adjustments for covariates, including age, sex, height, proximity to freeway, asthma status and smoking status. When accounting for predominant wind direction and proximity, we observe that residents living downwind and less than 200m from oil operations have, on average, -414mL lower FEV1 (95% CI: -636, -191) and -400 mL lower FVC (95% CI: -652, -147) compared to residents living upwind and more than 200m from the wells.

Conclusions

Living nearby and downwind of urban oil and gas development sites is associated with lower lung function among residents, which may contribute to environmental health disparities.

Graphical abstract



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Funding

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Methods

To examine the possible chronic deleterious effects of oil drilling operations in close proximity to neighborhoods in urban Los Angeles, we analyzed the relationship between OGD sites' proximity with self-reported acute symptoms and pulmonary function test results among diverse residents. A cross-sectional community-based study was conducted between January 2017 and August 2019 near two oil sites in the Las Cienegas oil field in South Los Angeles, CA. One OGD well site (in the North University ...

Characteristics of the study population

A total of 972 residents participated in this study to measure lung function and self-reported acute mental and physical health symptoms from 488 distinct addresses (Table 1). 11 participants were subsequently excluded for living outside of the study area after subsequent confirmation of residential address. The mean age of the participants was 39 years with 29% of the participants being children (<18 years) and 22% over the age of 60. The majority (62%) were female and 100% identified as ...

Discussion

Although petroleum extraction is increasingly common in urbanized areas, few studies exist on the health consequences for nearby residents (Colborn et al., 2011; McKenzie et al., 2012; Werner et al., 2015). In this community-driven epidemiological study, we report both self-reported acute symptoms and pulmonary function measurements of a diverse cohort of residents living near both an active and idle drill site that draw from Las Cienagas oil field in urban South Los Angeles. We identify that ...

Conclusions

Together, our findings suggest that living near urban oil drilling sites is significantly associated with reduced lung function in South Los Angeles. This community-academic research improves understanding of impacts from living nearby drilling operations on the health and welfare of this community, which is critical to inform public health relevant strategies to address community concerns. We observe a similar pattern among those living near the active and idle sites suggesting potential ...

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. ...

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Citation Excerpt :

...Oil and gas production and flaring [118] have been associated with preterm births [119] and other adverse birth outcomes [120,121]. Living near an oil well is associated with lower lung function [122] and asthma [123,124]. Elevated ozone levels (often linked to oil and gas production) are also associated with asthma exacerbation [125]....

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...Recent studies have found that residing in proximity to oil and gas wells is associated with adverse cardiovascular, psychological, perinatal, and other health outcomes (Casey et al., 2015, 2018; Currie et al., 2017; Denham et al., 2021; McKenzie et al., 2014, 2018, 2019; Tang et al., 2020; Whitworth et al., 2017; Willis et al., 2021). Studies in California have found higher risk of preterm birth and low birthweight with exposure to upstream oil production, as well as impaired lung function and higher asthma prevalence (Gonzalez et al., 2020; Johnston et al., 2021; Shamasunder et al., 2018; Tran et al., 2020). Several possible mechanisms have been hypothesized for the observed associations between proximity to wells and adverse health outcomes, including emissions of ambient air contaminants during various stages of upstream oil and gas production (Adgate et al., 2014; Allshouse et al., 2019; Gonzalez et al., 2020; Johnston et al., 2019; McKenzie et al., 2012)....

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