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Highlights

- Prenatal wildfire smoke exposure affected three-quarters of US births in 2012–2020
- Prenatal smoke exposure increased sharply nationwide after 2016
- Over 4 million births in 2016–2020 had ≥7 prenatal wildfire smoke days
- Exposure was highest among AIAN infants and those born in rural counties
- Exposure was highest in the Upper and Western Midwest and Rocky Mountains

Prevalence and National Trends in Prenatal Wildfire Smoke Exposure Among Live Births

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ABSTRACT

Introduction: Wildfire smoke is an increasing source of pollution in the United States and can affect communities far from active fires. The developing fetus is vulnerable to prenatal smoke exposure, yet existing evidence is focused on a few western states. This population-based retrospective cohort study documents national patterns and trends in prenatal wildfire smoke exposure across geographic and sociodemographic groups.

Methods: Satellite-based wildfire smoke plumes were combined with restricted-use vital statistics microdata for 34,440,915 live births in the contiguous United States from 2012–2020. Prenatal exposure was measured as the number of days during gestation with medium or heavy wildfire smoke in the mother's county of residence. Changes in median smoke-days, the share of infants prenatally exposed to ≥7 smoke-days, and wildfire-attributed $PM_{2.5}$ on smoke-days overall and by maternal and county characteristics were examined. Statistical significance was assessed using t-tests and quantile regression. Analysis was performed from March to November 2024.

Results: 25.5 million infants (74.2%) had prenatal smoke exposure. 4.3 million (22.7%) births had at least 7 days of exposure in 2016-2020, a significant increase from 2012-2015 ($p<0.001$). Median exposure significantly increased from 0.6 days in 2012-2015 to 2.0 days in 2016-2020 ($p<0.001$). Non-Hispanic American Indian/Alaska Native infants, infants living in rural counties, and states in the Upper and Western Midwest and Rocky Mountains faced the highest prenatal exposures.

Conclusions: Prenatal wildfire smoke exposure is widespread, increasing, and not confined to regions near active fires. These findings highlight a growing national public health concern and underscore the need for preparedness, targeted prevention, and risk-appropriate care across communities.

Keywords: wildfire smoke, prenatal, health disparities, birth outcomes

INTRODUCTION

Over the past several decades, wildfires have increased in size and intensity. These large fires generate smoke plumes that travel long distances and affect nearly all communities in the United States.[1] By 2016, pollution from wildfire smoke had slowed, stalled or even reversed improvements in air quality in most US states.[2]

The developing fetus is vulnerable to the health risks posed by wildfire smoke. Smoke exposure has been linked to preterm birth and low birth weight.[3–9] For example, recent evidence from California suggests that an additional week of prenatal smoke exposure increases preterm birth rates by a relative 3.4%.[3] While wildfire smoke is a recognized health risk in affected areas, its long-range transport[10] suggests millions may be prenatally exposed even far from active fires.

While the geographic spread of wildfire smoke has been well documented[1,2,11–19], the prevalence of exposure in specific population groups is less well known. Specific data on the number of people exposed and their characteristics is critical for developing a robust public health mitigation strategy and targeting health system resources in an efficient manner. This is especially true for this population given that neonatal intensive care resources are highly

regionalized and even basic perinatal services are sparse or completely absent in many communities.[20–24] The objective of this study was to document patterns and trends in prenatal wildfire smoke exposure among infants born in the contiguous United States from 2012 to 2020. These data will help inform public health officials and health system administrators tasked with targeting resources efficiently.

METHODS

This study was deemed exempt from human subjects review by the University of Maryland Institutional Review Board. STROBE reporting guidelines were followed.

Study Sample

Data on births came from birth certificates organized in the National Center for Health Statistics restricted-use vital statistics micro-data. These data include records for nearly all live births in the United States, with information on the month and year of birth, mother's residence county, gestation length, and selected demographic characteristics of the mother. Births were assumed to occur on the 15th of the month to define the prenatal period. All births in 2012-2020 to mothers residing in the contiguous United States that had valid gestational ages between 24 and 43 weeks were used.

Measures

Data on wildfire smoke were obtained from the National Oceanic and Atmospheric Administration's (NOAA) Hazard Mapping System (HMS).[25] Each day, smoke plume boundaries are digitized and classified as light, medium, or heavy by NOAA analysts using

satellite imagery. The density labels roughly correspond to $PM_{2.5}$ concentrations of 5, 16, and 21 $\mu g/m^3$, respectively. Data from 2011-2020 was used because the density labels were first used in 2011. HMS smoke polygons were overlaid with census tract boundaries. A tract was defined as experiencing a smoke-day if any portion intersected a plume on a given day. Because HMS satellites produce lower-quality data for Alaska and Hawaii, analyses were limited to the contiguous U.S. The analysis was supplemented with information on wildfire-attributed $PM_{2.5}$ developed in prior research.[14] These data describe the $PM_{2.5}$ in $\mu g/m^3$ attributed to wildfire smoke on each day and tract, based on ground monitors, HMS satellite data, and machine learning methods.

Smoke plume data were aggregated to the tract-month level by summing medium or heavy smoke-days in each census tract and month. Only medium or heavy plumes were considered to more accurately capture ground conditions as light smoke is more likely to be aloft.[26] To measure smoke intensity, wildfire smoke-attributed $PM_{2.5}$ was aggregated to the tract-month level by averaging across days with a medium or heavy plume overhead. Because the natality data do not identify geographies smaller than county, the count of smoke-days and the average $PM_{2.5}$ observed on a smoke-day was aggregated from the tract-month level to the county-month level by taking the population-weighted average across all tracts in a county. Thus, for each county-month, the average number of smoke-days and $PM_{2.5}$ exposure on smoke-days experienced by residents in that county was calculated.

The smoke measures were then combined with the vital statistics data. For each birth, the month and year of conception was assigned using the obstetric best estimate for weeks of gestation. The number of smoke-days and average wildfire-attributed $PM_{2.5}$ in each month between the conception month and birth month for the mother's residential county was then

merged and summed to calculate the number of smoke-days experienced during gestation. The primary measures of exposure were 1) the total number of smoke-days experienced during the prenatal period and 2) an indicator for infants with more than 7 days of prenatal smoke exposure. Prior research found the median infant born in California from 2006-2012 had 7 days of prenatal wildfire smoke exposure.[3] Thus, the analysis estimates the share of infants prenatally exposed to conditions that are at least as bad as those in California, an area widely recognized as carrying heavy smoke burdens. Smoke intensity was evaluated by calculating mean wildfire-attributed $PM_{2.5}$ exposure on smoke-days throughout gestation. Additional secondary measures included: 1) whether an infant prenatally experienced a "smoke wave" of ≥2 consecutive days, 2) the same for ≥7 consecutive days, and 3) the number of smoke-days experienced in each trimester.

Demographic characteristics from the birth certificate were considered, including mother's age (<25, 25-34, 35+), and race/ethnicity (non-Hispanic White, non-Hispanic African American, non-Hispanic American Indian/Alaska Native, non-Hispanic Asian/Pacific Islander, and Hispanic, using bridged race). Although maternal educational attainment is the only economic measure on the birth certificate, it was revised in 1989 and adopted by states gradually through 2016. Starting in 2009, the CDC omitted education information for states that had not adopted the revision. Educational attainment was therefore excluded from primary analyses. Instead, economic conditions were measured by classifying counties into terciles of median household income using the Census Bureau's 2016 Small Area Income and Poverty Estimates.[27] County rurality was classified using 2010 Rural–Urban Commuting Area codes developed by the USDA.[28] Counties were defined as urban if all census tracts in a county were classified as metropolitan or micropolitan, as rural if all census tracts are classified as small town or rural, and

all other counties as mixed. Finally, states were categorized into eight climate regions as defined in prior work (Appendix Figure 1).[26]

Statistical Analysis

Changes in the median number of smoke-days experienced during gestation and the share with ≥7 days of exposure for births in 2012-2015 versus 2016-2020 were compared, overall and by subgroup for mother's demographic characteristics and county-level characteristics. In addition, the change in smoke intensity on smoke-days, as measured by $PM_{2.5}$ in $\mu g/m^3$, for the median birth in each period was assessed. In addition to comparing group-specific changes over time, the study assessed whether measures of smoke exposure and intensity differed within each period for births to mothers with different demographic or county-level characteristics. Statistical significance was assessed using quantile regression for changes in medians and t-tests for changes in proportions using a two-sided test. P-values less than 0.05 were considered statistically significant. Analyses were performed using Stata/MP v19.5.

RESULTS

The sample contained 34,440,915 births (Appendix Table 1), with 15.7 million occurring during 2012-2015 and 18.8 million during 2016-2020. Maternal race/ethnicity, age, county income, rurality, and climate region distributions were stable across periods. Overall, mothers identified as non-Hispanic White (53.7%), non-Hispanic African American (15.2%), non-Hispanic Asian or Pacific Islander (6.6%), non-Hispanic American Indian/Alaska Native (AIAN) (0.9%), and Hispanic (23.6%).

In each year, over half of births were prenatally exposed to at least some medium or heavy wildfire smoke (Figure 1). Exposure increased sharply over time: by 2018, over 85% of

births experienced some prenatal exposure, and the share exposed to ≥7 smoke-days rose from under 10% in 2012–2015 to over 30% in 2018–2020. Overall, 4.3 million births, almost one quarter of births during 2016–2020, were exposed to ≥7 prenatal smoke-days. These increases were not driven by shifts in the geographic distribution of births (Appendix Table 1).

Smoke exposure varied widely across counties (Figure 2). Between periods, in 97% of counties the median birth experienced increased exposure. In over a quarter of counties (25.7%, representing 17.6% of births in 2016-2020) the median birth experienced increases of at least five smoke-days, and nearly two thirds (63.7%, representing 54.7% of births) experienced at least a 10 percentage-point increase in the share of births exposed to ≥7 smoke-days. The highest exposure levels and largest increases occurred in counties in the Rocky Mountains and Upper Midwest.

Nationally, median prenatal smoke exposure increased from 0.6 days in 2012–2015 to 2.0 days in 2016–2020, a statistically significant increase of 1.4 days ($p<0.001$; Table 1). The share of infants prenatally exposed to ≥7 smoke-days increased from 2.9% to 22.7%, an increase of 19.8 percentage points ($p<0.001$). Despite rising exposure frequency, average wildfire-attributed $PM_{2.5}$ on smoke-days declined modestly for the median birth (from 4.5 to 4.0 μg/m³), masking substantial regional heterogeneity. Smoke-day $PM_{2.5}$ increased in regions proximate to active fires (Pacific, Mountain, and West North Central) and declined in regions more affected by long-range transport (e.g., Northeast and South Atlantic).

Baseline smoke exposure varied across demographic and county characteristics. For median smoke-days and the share with ≥7 smoke-days, Hispanic infants had the lowest baseline prenatal exposure (0.1 days and 1.9%, respectively), while non-Hispanic AIAN infants had the highest (1.0 days and 4.3%). Both measures of prenatal exposure for Hispanic infants and the

risk of ≥7 prenatal smoke-days for non-Hispanic AIAN infants were statistically different than that of non-Hispanic White infants (1.0 days and 3.6%). Births in higher-income and rural counties also experienced greater baseline prenatal exposure. Although rural counties had the highest exposure levels, rural infants overall accounted for a small share of births. Over 90% of births in each county income third occurred in urban or mixed counties, so income gradients largely reflected exposures in non-rural areas. Exposure also varied across climate regions, with the highest baseline levels observed in the West North Central region.

All subgroups experienced statistically significant increases in prenatal smoke exposure over time. Increases were largest among AIAN infants and those born in rural counties. By 2016–2020, AIAN infants experienced a median of 3.6 prenatal smoke-days, and 39.9% were prenatally exposed to ≥7 smoke-days: an increase of 2.6 days ($p<0.001$) and 27.6 percentage-points ($p<0.001$) relative to 2012–2015. Rural infants experienced similarly large increases, with prenatal exposure for the median birth increasing by 2.5 days ($p<0.001$) and the risk of ≥7 prenatal smoke-days increasing by 28.9 percentage-points ($p<0.001$). Regionally, the largest increases occurred in the West North Central and East North Central regions, where median prenatal exposure increased by 4.8 days and the share prenatally exposed to ≥7 smoke-days increased 37.2 percentage-points.

Despite substantial increases in exposure, the pattern of exposure across groups was similar across periods. Increases in prenatal smoke-days experienced by the median birth were comparable across county income levels. However, births in higher-income counties experienced larger increases at the upper tail of the prenatal exposure distribution: the risk of ≥7 prenatal smoke-days increased by 21.3 percentage-points for births to mothers in the top third, compared to 18.5 percentage-points for the middle third and 13.0 percentage-points in the bottom third.

State rankings highlight distinct relative and absolute burdens (Figure 3). States in the Upper and Western Midwest, such as North Dakota, South Dakota, Minnesota, Wisconsin, and Iowa, consistently ranked highest by median exposure and risk of ≥7 smoke-days, while populous states such as California, New York, and Illinois had the largest absolute numbers of prenatally exposed infants. Estimates of the number of infants with prenatal exposure are critically important to health authorities that must allocate resources and direct prevention efforts.

The prevalence of smoke waves increased markedly (Appendix Table 2). The share of births prenatally exposed to a smoke wave of ≥2 consecutive days rose 26.8 percentage points, from 14.8% to 41.6% ($p<0.001$). No births in 2012–2015 experienced prenatal exposure to a ≥7-day smoke wave, compared with 3.4% of births in 2016–2020 ($p<0.001$). These heavy exposures were most concentrated in regions proximate to active wildfires. Trimester-specific analyses showed little change for medium or heavy prenatal smoke exposure, though inclusion of light smoke revealed increased exposure across all trimesters (Appendix Table 3). In the 39 states that had consistent education data over the study, prenatal smoke exposure was greatest for mothers with a college degree (Appendix Table 4). However, changes over time were similar across educational levels. Remaining results were robust to alternative specifications: using a fixed 40-week window for gestation for all infants (Appendix Table 5), and for alternative definitions of smoke-days (Appendix Tables 6–8, with state rankings reproduced in Appendix Figures 2–3).

DISCUSSION

The 2023 Canadian smoke plumes that traveled across the upper Midwest and East Coast highlighted that wildfire smoke can affect nearly any community in the United States, including

those far from active fires. Although the long-range transport of smoke is well-documented,[10] nationally representative assessments on prenatal smoke exposure have been limited, despite clear evidence that the developing fetus is particularly vulnerable to smoke.[3–9] This lack of population-level evidence has constrained the ability of state and county health authorities to anticipate service needs, plan prevention interventions, and target resources effectively.[29]

This study provides the most comprehensive assessment of prenatal wildfire smoke exposure to date. Between 2012 and 2020, the vast majority (74.2%) of births in the contiguous United States, more than 25.5 million infants, experienced at least some prenatal smoke exposure, with exposure increasing substantially over time. By 2018, over 85% of births had some exposure, and nearly one quarter of infants born during 2016–2020 experienced seven or more prenatal smoke-days. Median gestational exposure increased from 0.6 smoke-days in 2012–2015 to 2.0 smoke-days in 2016–2020.

As smoke-days have become more prevalent, average $PM_{2.5}$ on smoke-days declined slightly, though trends varied widely by region. Heterogeneity across regions might reflect that some areas are proximate to active fires while others experience smoke from long-range transport, where plumes are higher and ground-level $PM_{2.5}$ concentrations lower. Despite this average decline, the average smoke-day in 2016–2020 still represented a substantial pollution burden, roughly equivalent to 50% of nationwide average ambient $PM_{2.5}$ levels.[30]

Although smoke exposure was widespread across socio-demographic groups, two populations experienced especially high burdens. By 2016–2020, the median non-Hispanic American Indian/Alaska Native (AIAN) infant experienced 3.6 prenatal smoke-days, and nearly one-third were exposed to seven or more prenatal days. These exposures compound existing health disparities, as AIAN infants face infant mortality rates more than twice those of non-

Hispanic White infants.[31] 35% of AIAN mothers do not receive prenatal care early in pregnancy due to complex combination of structural barriers,[32] limiting access to timely education and services that could mitigate smoke-related risks. Rural infants also experienced elevated prenatal exposure, with a median of 4.0 smoke-days and 35% exposed to seven or more days for those born in 2016–2020, raising concerns given limited perinatal health care capacity in many rural communities.[21–24]

In contrast to historical patterns of air pollution, which have disproportionately affected urban and socioeconomically disadvantaged populations,[33–35] wildfire smoke exposure is more geographically diffuse. As wildfire emissions increase, apparent reductions in pollution disparities may reflect worsening air quality among populations that historically have had lower exposure, rather than improvements among groups with historically high exposure.

States in the Rocky Mountains and Upper and Western Midwest have the highest exposure levels, revealing that smoke risk is not confined to areas most commonly associated with wildfires. Rather, these high-exposure regions are situated along major smoke transport pathways from the western United States and Canada.[1] However, it remains unclear whether the health effects of smoke in these regions are comparable to those observed in more frequently studied areas of the U.S. West Coast, given differences in smoke composition and intensity. Regional variation in smoke-attributed $PM_{2.5}$ highlights the need for additional research on health impacts across diverse settings.

Applying estimates from California indicating that each additional smoke-day increases the risk of preterm birth by approximately 0.5%[3] suggests an estimated 27,997 preterm births nationally between 2012 and 2020 are attributable to wildfire smoke, with 5,465 preterm births (0.4% of all preterm births) in 2012-2015 and 22,533 preterm births (1.2% of all preterm births)

in 2016-2020. Although individual-level risks associated with a single smoke-day are modest, the widespread nature of exposure implies a substantial population-level burden, with implications for both short- and long-term health outcomes through adulthood.[36–38]

Limitations

This study had several limitations. The study relied on NOAA-produced satellite data which is used for official purposes and is widely used in the research literature.[39,40] However, challenges persist related to detecting plume elevation, cloud cover, nighttime detection, and satellite replacement.[2,39] Misclassification was limited by restricting analyses to medium and heavy smoke plumes that are more likely to represent ground conditions. However, because HMS cannot precisely observe surface smoke, smoke-day counts may overstate ground-level exposure. Despite the limitations of these data, they provide a readily available source of information that could be used by local authorities to track exposure burdens in their community. The study was also limited by the exact day of birth not being observed. However, setting birth dates to the 15th of the month is the least biased option if birth dates are uniform within month, and results were robust to alternative assumptions regarding gestational length. Finally, because the analysis relies on birth certificate data, it is limited to live births and does not capture pregnancies ending in abortion, miscarriage, or stillbirth.

As wildfire size and intensity continue to increase due to climate change, land management practices, and expanding development in the wildland–urban interface,[11,41,42] prenatal exposure to wildfire smoke is likely to remain a growing public health concern. This study suggests that millions of infants are being prenatally exposed to wildfire smoke nationwide. Public health agencies and clinicians can help mitigate risks through patient

education, air filtration, and preventative interventions, but increasing exposure will also require timely access to risk-appropriate perinatal care and adaptations in clinical practice.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process: During the preparation of this work the author(s) used ChatGPT in order to make author-written text more concise. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

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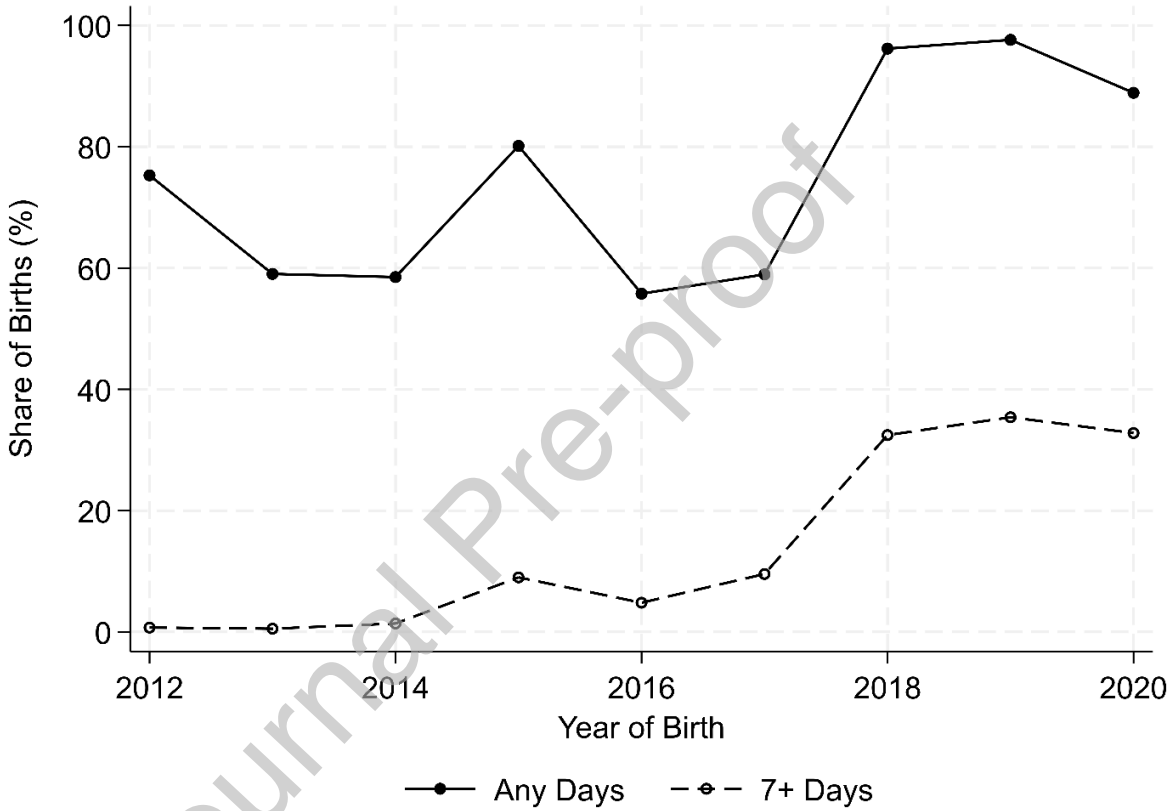

Figure 1. Share of Births Exposed to In-Utero Wildfire Smoke.

Notes: Smoke-days are only counted for medium or heavy plumes as indicated by HMS. Reported gestation in weeks was used to determine conception month.

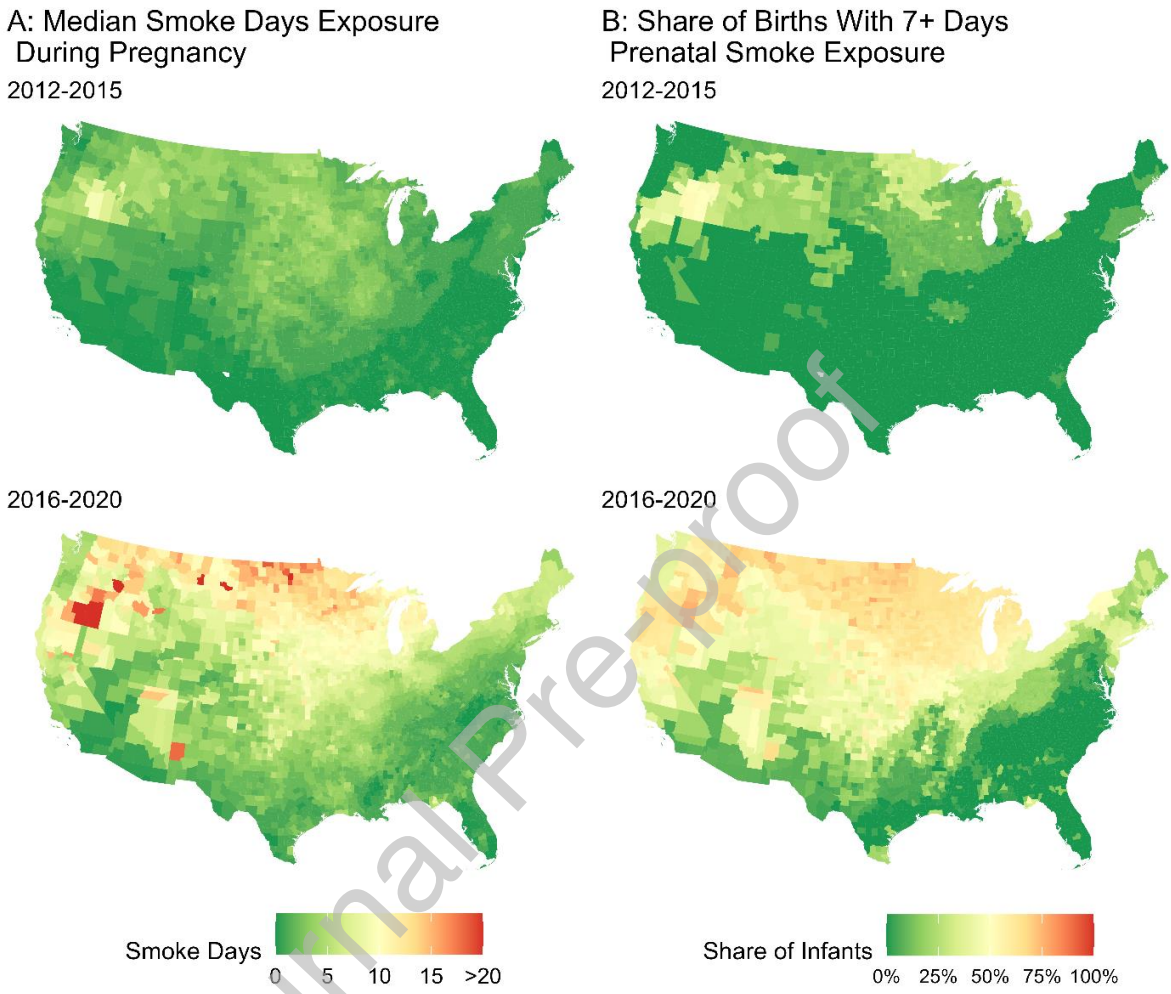

Figure 2. Geographic Distribution of Exposure, by Period

Notes: Smoke-days are only counted for medium or heavy plumes as indicated by HMS. Reported gestation in weeks was used to determine conception month.

Table 1. Prenatal Wildfire Smoke Exposure by Maternal and County Characteristics

	Median Smoke Exposure (Days [IQR])			7+ Days of Prenatal Exposure (%)			Median Smoke PM2.5 (µg/ m^3)		
Group	**2012-2015**	**2016-2020**	**Change**	**2012 - 2015**	**2016 - 2020**	**Change**	**2012 - 2015**	**2016 - 2020**	**Change**
All	0.6 [0.0, 2.0]	2.0 [0.1, 6.5]	**1.4**	2.9	22.7	**19.8**	4.5	4.0	**-0.6**
Maternal Race/Ethnicity									
Hispanic	0.1 [0.0, 1.0] [a]	1.2 [0.1, 5.5] [a]	**1.1**	1.9 [a]	19.8 [a]	**18.0**	3.6 [a]	4.0 [a]	**0.4**
Non-Hispanic African American	0.4 [0.0, 1.5] [a]	1.9 [0.0, 5.0] [a]	**1.4**	2.3 [a]	17.1 [a]	**14.8**	4.6 [a]	3.7 [a]	**-0.8**
Non-Hispanic AIAN	1.0 [0.0, 2.3]	3.6 [0.6, 9.0] [a]	**2.6**	4.3 [a]	31.9 [a]	**27.6**	4.5 [a]	4.7 [a]	**0.2**
Non-Hispanic AAPI	0.4 [0.0, 1.4] [a]	2.0 [0.1, 7.0] [a]	**1.6**	2.6 [a]	25.2 [a]	**22.6**	4.3 [a]	4.3 [a]	**-0.0**
Non-Hispanic White	1.0 [0.0, 2.0]	2.6 [0.1, 7.0]	**1.6**	3.6	25.0	**21.5**	4.7	3.9	**-0.8**
Maternal Age									
<25	0.5 [0.0, 1.8] [b]	2.0 [0.0, 6.0]	**1.5**	2.4 [b]	20.6 [b]	**18.2**	4.5 [b]	4.0 [b]	**-0.5**
25-34	0.7 [0.0, 2.0]	2.0 [0.1, 6.7]	**1.3**	3.1	23.2	**20.1**	4.6	4.0	**-0.6**
35+	0.5 [0.0, 2.0] [b]	2.0 [0.1, 6.9]	**1.5**	3.2 [b]	23.9 [b]	**20.7**	4.5 [b]	3.9 [b]	**-0.6**
Median Income (County Level)									
Bottom Third	0.2 [0.0, 1.3] [c]	2.0 [0.0, 4.6]	**1.8**	1.4 [c]	14.4 [c]	**13.0**	4.6 [c]	3.9 [c]	**-0.6**
Middle Third	0.5 [0.0, 2.0] [c]	2.1 [0.0, 6.0] [c]	**1.6**	3.0 [c]	21.5 [c]	**18.5**	4.6 [c]	3.9 [c]	**-0.6**
Top Third	0.8 [0.0, 2.0]	2.0 [0.1, 7.0]	**1.2**	3.2	24.5	**21.3**	4.5	4.0	**-0.5**
Rural (County Level)									
Predominantly Urban	1.0 [0.0, 2.0]	2.0 [0.0, 6.4]	**1.0**	3.0	22.2	**19.2**	4.8	3.8	**-1.0**
Mixed	0.1 [0.0, 1.4] [d]	1.9 [0.1, 6.5] [d]	**1.8**	2.7 [d]	22.9 [d]	**20.2**	3.9 [d]	4.1 [d]	**0.1**
Predominantly Rural	1.5 [0.0, 3.3] [d]	4.0 [1.0, 10.1] [d]	**2.5**	6.1 [d]	35.0 [d]	**28.9**	5.0 [d]	4.4 [d]	**-0.6**
Climate Region									
Pacific	0.0 [0.0, 0.9] [e]	1.8 [0.2, 8.7] [e]	**1.8**	0.6 [e]	28.7 [e]	**28.1**	3.3 [e]	5.6 [e]	**2.3**
Mountain	0.3 [0.0, 2.0] [e]	1.7 [0.1, 7.4] [e]	**1.4**	3.9 [e]	25.6 [e]	**21.6**	4.1 [e]	5.1 [e]	**1.0**
West North Central	3.0 [1.3, 4.2] [e]	7.7 [1.2, 13.2] [e]	**4.8**	11.5 [e]	52.7 [e]	**41.2**	4.8 [e]	4.7 [e]	**-0.1**
West South Central	0.6 [0.0, 1.0] [e]	1.5 [0.2, 3.9] [e]	**0.8**	0.0 [e]	7.5 [e]	**7.5**	3.4 [e]	4.0 [e]	**0.6**
East North Central	1.5 [0.6, 4.3] [e]	6.1 [1.0, 10.6] [e]	**4.6**	7.4 [e]	44.6 [e]	**37.2**	4.7 [e]	3.3 [e]	**-1.4**
East South Central	0.2 [0.0, 1.1] [e]	2.0 [0.0, 4.0] [e]	**1.8**	0.0 [e]	5.1 [e]	**5.1**	4.5 [e]	4.0 [e]	**-0.5**
Northeast	1.0 [0.0, 2.0]	3.5 [0.1, 7.5]	**2.5**	4.0	29.1	**25.1**	5.4	3.2	**-2.2**

South Atlantic	0.0 [0.0, 1.0] [e]	0.8 [0.0, 2.3] [e]	**0.8**	0.0 [e]	1.1 [e]	**1.1**	5.4 [e]	3.3 [e]	**-2.0**

Notes: All statistical significance was assessed at p<0.05. Boldface indicates statistically significant change over time. [a] Statistically significant compared to births born to non-Hispanic White mothers. [b] Statistically significant compared to births born to mothers age 25-34. [c] Statistically significant compared to births born to mothers in the top third of the county-level median household income distribution. [d] Statistically significant compared to births born to mothers residing in predominantly urban counties [e] Statistically significant compared to births born to mothers residing in the Northeast. Confidence intervals and p-values calculated for changes in medians using quantile regression, and calculated for changes in proportions using t-tests from ordinary least squares regression. AIAN = American Indian/Alaska Native; AAPI = Asian American, Native Hawaiian, and Pacific Islander.

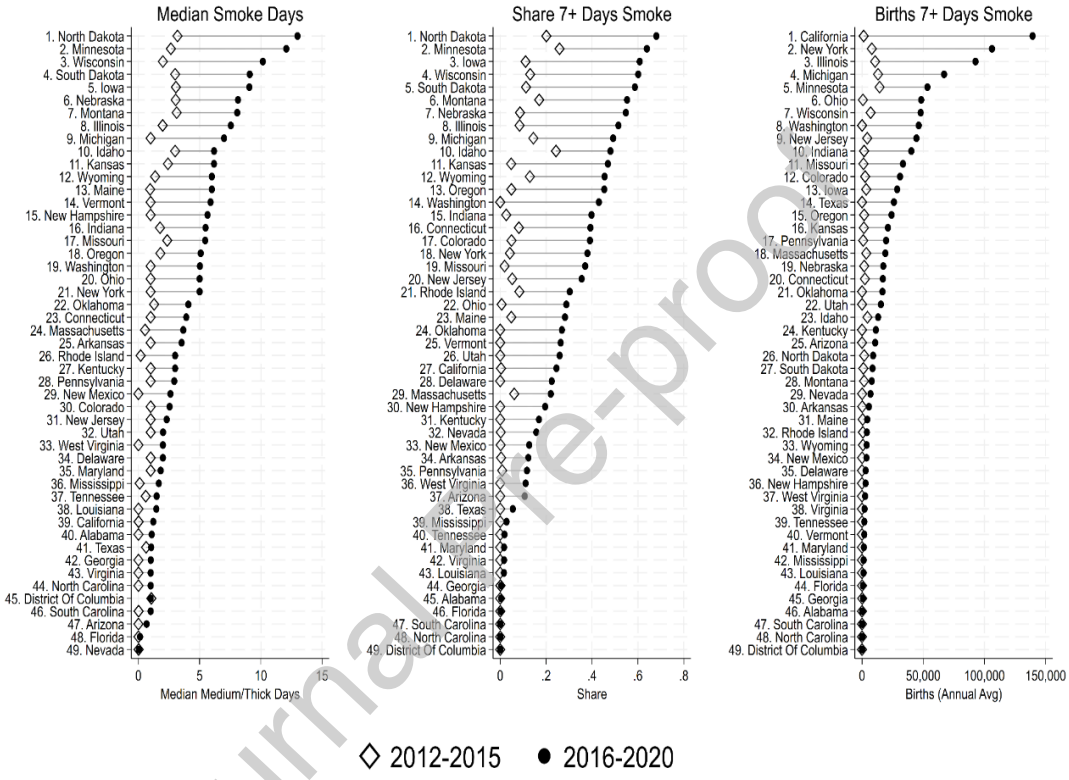

Figure 3. Wildfire Smoke Burden by State.

Notes: Smoke-days are only counted for medium or heavy plumes as indicated by HMS.

CRediT author statement for

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Declaration of interests

☒ 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.

☐ The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: