

Environmental Stewardship Resource Desk

#32 | 9.15.2021 to 9.21.2021

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COVID-19

1. **Near-roadway air pollution associated with COVID-19 severity and mortality - Multiethnic cohort study in Southern California.** Chen Z, Huang BZ, Sidell MA, Chow T, Eckel SP, Pavlovic N, Martinez MP, Lurmann F, Thomas DC, Gilliland FD, Xiang AH. Environ Int. 2021 Sep 4;157:106862. doi: 10.1016/j.envint.2021.106862. Online ahead of print.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8416551/>

BACKGROUND: Air pollution exposure has been associated with increased risk of COVID-19 incidence and mortality by ecological analyses. Few studies have investigated the specific effect of traffic-related air pollution on COVID-19 severity.

OBJECTIVE: To investigate the associations of near-roadway air pollution (NRAP) exposure with COVID-19 severity and mortality using individual-level exposure and outcome data.

METHODS: The retrospective cohort includes 75,010 individuals (mean age 42.5 years, 54% female, 66% Hispanic) diagnosed with COVID-19 at Kaiser Permanente Southern California between 3/1/2020-8/31/2020. NRAP exposures from both freeways and non-freeways during 1-year prior to the COVID-19 diagnosis date were estimated based on residential address history using the CALINE4 line source dispersion model. Primary outcomes include COVID-19 severity defined as COVID-19-related hospitalizations, intensive respiratory support (IRS), intensive care unit (ICU) admissions within 30 days, and mortality within 60 days after COVID-19 diagnosis. Covariates including socio-characteristics and comorbidities were adjusted for in the analysis.

RESULT: One standard deviation (SD) increase in 1-year-averaged non-freeway NRAP (0.5 ppb NO_x) was associated with increased odds of COVID-19-related IRS and ICU admission [OR (95% CI): 1.07 (1.01, 1.13) and 1.11 (1.04, 1.19) respectively] and increased risk of mortality (HR = 1.10, 95% CI = 1.03, 1.18). The associations of non-freeway NRAP with COVID-19 outcomes were largely independent of the effect of regional fine particulate matter and nitrogen dioxide exposures. These associations were generally consistent across age, sex, and race/ethnicity

subgroups. The associations of freeway and total NRAP with COVID-19 severity and mortality were not statistically significant.

CONCLUSIONS: Data from this multiethnic cohort suggested that NRAP, particularly non-freeway exposure in Southern California, may be associated with increased risk of COVID-19 severity and mortality among COVID-19 infected patients. Future studies are needed to assess the impact of emerging COVID-19 variants and chemical components from freeway and non-freeway NRAP.

2. **Perceptions of Change in the Natural Environment produced by the First Wave of the COVID-19 Pandemic across Three European countries. Results from the GreenCOVID study.** Garrido-Cumbrera M, Foley R, Braçe O, Correa-Fernández J, López-Lara E, Guzman V, González Marín A, Hewlett D. *Urban For Urban Green*. 2021 Sep;64:127260. doi: 10.1016/j.ufug.2021.127260. Epub 2021 Jul 23.

<https://www.sciencedirect.com/science/article/pii/S1618866721002879>

Although different studies have evaluated the positive impacts of the COVID-19 pandemic and lockdown measures on reducing noise pollution and traffic levels and improving air quality, how populations have perceived such changes in the natural environment has not been adequately evaluated. The present study provides a more in-depth exploration of human population perception of enhanced natural exposure (to animal life and nature sounds) and reduced harmful exposure (by improved air quality and reduced traffic volume) as a result of the COVID-19 pandemic lockdown. The data is drawn from 3,109 unselected adults who participated in the GreenCOVID survey from April to July 2020 in England, Ireland, and Spain. The findings suggest that the positive impacts to the natural environment as a result of the lockdown have been better received by the population in Spain and Ireland, in comparison to England. Participants who resided in urban areas had better perceived improvements in nature sounds, air quality, and traffic volume compared to those in rural areas. Older populations and those with lower smoking and alcohol consumption were found to perceive this improvement the most. Furthermore, the greater perception of improvements in environmental elements was also associated with better self-perceived health and improved wellbeing. In the binary logistic regression, living in Ireland or Spain, urban areas, female gender, older age, and good overall wellbeing were associated with a greater perception of improvements in the natural environment, while the factors most associated with a greater perception of reduced harmful exposure were living in Spain, had a good self-perceived health status and older age.

3. **Extreme Heat at Outdoor COVID-19 Vaccination Sites.** Keith L, Iroz-Elardo N, Austof E, Sami I, Arora M. *J Clim Chang Health*. 2021 Aug 28:100043. doi: 10.1016/j.joclim.2021.100043. Online ahead of print.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8401084/>

Extreme heat is an increasing climate risk due to climate change and the urban heat island (UHI) effect and can jeopardize points of dispensing (PODs) for COVID-19 vaccination distribution and broader public health emergency preparedness (PHEP) response operations. These PODs were often located on large parking lot sites with high heat severity and did not take heat mitigation or management strategies into account for unacclimated workers and volunteers. To investigate the personal heat exposure of workers, volunteers, and clients at three PODs in

Tucson, Arizona, we collected ambient air temperatures, wet bulb globe temperatures (WBGT), surface temperatures, and thermal images. We also made qualitative observations and compared data against daily meteorological records. Ambient air temperatures at all three PODs exceeded the meteorological recorded high. WBGT on average were 8°F (4.4°C) higher in full sun locations than shaded locations such as tents. Evaporative cooling decreased ambient air temperatures by 2°F (1.2°C) when placed one per tent, but decreased ambient air temperatures by 7°F (3.9°C) when placed en masse in a larger tent. Vehicle surface temperatures exceeded recommended safe limits of 140°F (60°C) at all three sites, with a maximum temperature recorded at 170.9°F (77.2°C). Public health professionals should consider heat resilience, including heat mitigation and management measures, in POD and PHEP response operations to reduce exposure. This includes considering the UHI effect in the siting of PODs, applying heat mitigation strategies in the design of PODs such as the adaptive use of solar panels for shading, and improving heat safety guidance for workers and volunteers.

Health Impacts of Climate Change

4. **Health Benefits in California of Strengthening the Fine Particulate Matter Standards.** Zhu S, Kinnon MM, Paradise A, Dabdub D, Samuelsen GS. *Environ Sci Technol.* 2021 Sep 10. doi: 10.1021/acs.est.1c03177. Online ahead of print.
The Clean Air Act requires the United States Environmental Protection Agency to review routinely the National Ambient Air Quality Standards, including fine particulate matter (PM_{2.5}). A non-governmental Independent Particulate Matter Review Panel recently concluded that the current PM_{2.5} standards do not protect public health adequately and recommended revising the daily standard from 35 to 25-30 µg/m³ and the annual standard from 12 to 8-10 µg/m³. To assess the public health implications of adopting the PM_{2.5} standards proposed by the panel, the health benefits are quantified from their implementation based on both current (observed) and future (simulated) air quality data for California. The findings indicate that strengthening the standards would provide significant public health benefits valued at \$42-\$149 billion. Additionally, the stronger standards are shown to benefit environmental justice via health savings that are allocated more within environmentally and socioeconomically disadvantaged communities.
5. **The Acute Effects of Exercising in Air Pollution: A Systematic Review of Randomized Controlled Trials.** Hung A, Nelson H, Koehle MS. *Sports Med.* 2021 Sep 9. doi: 10.1007/s40279-021-01544-4. Online ahead of print.
BACKGROUND: The acute effects of air pollution (AP) exposure during physical activity have been studied. However, comprehensive systematic reviews are lacking, particularly regarding moderate-to-vigorous physical activity (MVPA).
OBJECTIVE: Our objective was to determine the acute health- and exercise-related effects of AP exposure during a bout of MVPA in healthy individuals.
METHODS: We searched for randomized controlled trials in MEDLINE, Embase, Cochrane CENTRAL, SPORTDiscus, Agricultural and Environmental Science Database, ClinicalTrials.gov, International Standard Randomised Controlled Trial Number Registry, and the World Health Organization (WHO) International Clinical Trials Registry Platform up to July 2020 without

language or date restrictions. Studies including healthy subjects engaging in a bout of MVPA while exposed to one or more of the following air pollutants were eligible: particulate matter, black carbon, carbon monoxide, nitrogen dioxide, ozone, diesel exhaust, and traffic-related air pollution (TRAP). Main outcome measures were markers of pulmonary function, symptoms, cardiovascular function, cognitive function, systemic inflammation, and exercise response. The evidence was synthesized by vote counting based on direction of effect.

RESULTS: In total, 53 studies were included in the systematic review. Studies employed a heterogeneous mix of exercise protocols, AP interventions, and measured outcomes. Pooled results suggest ozone exposure during MVPA has an adverse effect on pulmonary function (100% [95% confidence interval (CI) 88-100], $p < 0.001$; high-certainty evidence) and reported symptoms (88% [95% CI 69-96], $p < 0.001$; low-certainty evidence). The effect of exposure to carbon monoxide, nitrogen dioxide, small engine exhaust, or diesel exhaust during MVPA on health- and exercise-related outcomes is uncertain because of insufficient evidence and the low to very low certainty of available evidence.

DISCUSSION: The evidence is strongest for ozone, exposure to which generally induced a reduction in pulmonary function and increased symptoms during MVPA. The research related to other outcome domains remains inconclusive. Although long-term exposure to AP is proven to be hazardous, the evidence for healthy individuals to forgo MVPA during periods of high (non-ozone) pollution remains weak.

- 6. The acute effects of particulate matter air pollution on ambulatory blood pressure: A multicenter analysis at the hourly level.** Hu J, Xue X, Xiao M, Wang W, Gao Y, Kan H, Ge J, Cui Z, Chen R. *Environ Int.* 2021 Sep 8;157:106859. doi: 10.1016/j.envint.2021.106859. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0160412021004840>

Epidemiological evidence from ambulatory blood pressure monitoring is needed to clarify the associations of particulate air pollution with blood pressure and potential lag patterns. We examined the associations of fine and coarse particulate matter (PM_{2.5}, PM_{2.5-10}) with ambulatory blood pressure among 7108 non-hypertensive participants from 7 Chinese cities between April 2016 and November 2020. Hourly concentrations of PM_{2.5} and PM_{2.5-10} were obtained from the nearest monitoring stations. We measured four blood pressure indicators, including systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and pulse pressure (PP). Linear mixed-effect models combined with distributed lag models were applied to analyze the data. Generally, very short-term exposure to PM_{2.5} was significantly associated with elevated blood pressure. These effects occurred on the same hour of blood pressure measurement, attenuated gradually, and became insignificant approximately at lag 12 h. An interquartile range (IQR, 33 $\mu\text{g}/\text{m}^3$) increase of PM_{2.5} was significantly associated with cumulative increments of 0.58 mmHg for SBP, 0.31 mmHg for DBP, 0.38 mmHg for MAP, and 0.33 mmHg for PP over lag 0 to 12 h. The exposure-response relationship curves were almost linear without thresholds, but tended to be flat at very high concentrations. No significant associations were observed for PM_{2.5-10}. Our study provides independent and robust associations between transient PM_{2.5} exposure and elevated blood pressure within the first 12 h, and reinforces the evidence for a linear and non-threshold exposure-response

relationship, which may have implications for blood pressure management and hypertension prevention in susceptible population.

7. **Long-term exposure to low-level ambient air pollution and incidence of stroke and coronary heart disease: a pooled analysis of six European cohorts within the ELAPSE project.** Wolf K et al. *Lancet Planet Health*. 2021 Sep;5(9):e620-e632. doi: 10.1016/S2542-5196(21)00195-9.

[https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(21\)00195-9/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(21)00195-9/fulltext)

BACKGROUND: Long-term exposure to outdoor air pollution increases the risk of cardiovascular disease, but evidence is unclear on the health effects of exposure to pollutant concentrations lower than current EU and US standards and WHO guideline limits. Within the multicentre study Effects of Low-Level Air Pollution: A Study in Europe (ELAPSE), we investigated the associations of long-term exposures to fine particulate matter (PM_{2.5}), nitrogen dioxide (NO₂), black carbon, and warm-season ozone (O₃) with the incidence of stroke and acute coronary heart disease.

METHODS: We did a pooled analysis of individual data from six population-based cohort studies within ELAPSE, from Sweden, Denmark, the Netherlands, and Germany (recruited 1992-2004), and harmonised individual and area-level variables between cohorts. Participants (all adults) were followed up until migration from the study area, death, or incident stroke or coronary heart disease, or end of follow-up (2011-15). Mean 2010 air pollution concentrations from centrally developed European-wide land use regression models were assigned to participants' baseline residential addresses. We used Cox proportional hazards models with increasing levels of covariate adjustment to investigate the association of air pollution exposure with incidence of stroke and coronary heart disease. We assessed the shape of the concentration-response function and did subset analyses of participants living at pollutant concentrations lower than predefined values.

FINDINGS: From the pooled ELAPSE cohorts, data on 137 148 participants were analysed in our fully adjusted model. During a median follow-up of 17.2 years (IQR 13.8-19.5), we observed 6950 incident events of stroke and 10 071 incident events of coronary heart disease. Incidence of stroke was associated with PM_{2.5} (hazard ratio 1.10 [95% CI 1.01-1.21] per 5 µg/m³ increase), NO₂ (1.08 [1.04-1.12] per 10 µg/m³ increase), and black carbon (1.06 [1.02-1.10] per 0.5 10⁻⁵/m increase), whereas coronary heart disease incidence was only associated with NO₂ (1.04 [1.01-1.07]). Warm-season O₃ was not associated with an increase in either outcome. Concentration-response curves indicated no evidence of a threshold below which air pollutant concentrations are not harmful for cardiovascular health. Effect estimates for PM_{2.5} and NO₂ remained elevated even when restricting analyses to participants exposed to pollutant concentrations lower than the EU limit values of 25 µg/m³ for PM_{2.5} and 40 µg/m³ for NO₂.

INTERPRETATION: Long-term air pollution exposure was associated with incidence of stroke and coronary heart disease, even at pollutant concentrations lower than current limit values.

8. **Risk and burden of hospital admissions associated with wildfire-related PM(2.5) in Brazil, 2000-15: a nationwide time-series study.** Ye T, Guo Y, Chen G, Yue X, Xu R, Coêlho MSZS, Saldiva PHN, Zhao Q, Li S. *Lancet Planet Health*. 2021 Sep;5(9):e599-e607. doi: 10.1016/S2542-5196(21)00173-X.

[https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(21\)00173-X/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(21)00173-X/fulltext)

BACKGROUND: In the context of climate change and deforestation, Brazil is facing more frequent and unprecedented wildfires. Wildfire-related PM_{2.5} is associated with multiple adverse health outcomes; however, the magnitude of these associations in the Brazilian context is unclear. We aimed to estimate the association between daily exposure to wildfire-related PM_{2.5} and cause-specific hospital admission and attributable health burden in the Brazilian population using a nationwide dataset from 2000 to 2015.

METHODS: In this nationwide time-series analysis, data for daily all-cause, cardiovascular, and respiratory hospital admissions were collected through the Brazilian Unified Health System from 1814 municipalities in Brazil between Jan 1, 2000, and Dec 31, 2015. Daily concentrations of wildfire-related PM_{2.5} were estimated using the 3D chemical transport model GEOS-Chem at a 2·0° latitude by 2·5° longitude resolution. A time-series analysis was fitted using quasi-Poisson regression to quantify municipality-specific effect estimates, which were then pooled at the regional and national levels using random-effects meta-analyses. Analyses were stratified by sex and ten age groups. The attributable fraction and attributable cases of hospital admissions due to wildfire-related PM_{2.5} were also calculated.

FINDINGS: At the national level, a 10 µg/m³ increase in wildfire-related PM_{2.5} was associated with a 1·65% (95% CI 1·51-1·80) increase in all-cause hospital admissions, a 5·09% (4·73-5·44) increase in respiratory hospital admissions, and a 1·10% (0·78-1·42) increase in cardiovascular hospital admissions, over 0-1 days after the exposure. The effect estimates for all-cause hospital admission did not vary by sex, but were particularly high in children aged 4 years or younger (4·88% [95% CI 4·47-5·28]), children aged 5-9 years (2·33% [1·77-2·90]), and people aged 80 years and older (3·70% [3·20-4·20]) compared with other age groups. We estimated that 0·53% (95% CI 0·48-0·58) of all-cause hospital admissions were attributable to wildfire-related PM_{2.5}, corresponding to 35 cases (95% CI 32-38) per 100 000 residents annually. The attributable rate was greatest for municipalities in the north, south, and central-west regions, and lowest in the northeast region. Results were consistent for all-cause and respiratory diseases across regions, but remained inconsistent for cardiovascular diseases.

INTERPRETATION: Short-term exposure to wildfire-related PM_{2.5} was associated with increased risks of all-cause, respiratory, and cardiovascular hospital admissions, particularly among children (0-9 years) and older people (≥80 years). Greater attention should be paid to reducing exposure to wildfire smoke, particularly for the most susceptible populations.

- 9. Mortality risk attributable to wildfire-related PM(2.5) pollution: a global time series study in 749 locations.** Chen G et al. *Lancet Planet Health*. 2021 Sep;5(9):e579-e587. doi: 10.1016/S2542-5196(21)00200-X.

[https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(21\)00200-X/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(21)00200-X/fulltext)

BACKGROUND: Many regions of the world are now facing more frequent and unprecedentedly large wildfires. However, the association between wildfire-related PM_{2.5} and mortality has not been well characterised. We aimed to comprehensively assess the association between short-term exposure to wildfire-related PM_{2.5} and mortality across various regions of the world.

METHODS: For this time series study, data on daily counts of deaths for all causes, cardiovascular causes, and respiratory causes were collected from 749 cities in 43 countries and regions during 2000-16. Daily concentrations of wildfire-related PM_{2.5} were estimated using the three-dimensional chemical transport model GEOS-Chem at a 0·25° × 0·25° resolution. The

association between wildfire-related PM_{2.5} exposure and mortality was examined using a quasi-Poisson time series model in each city considering both the current-day and lag effects, and the effect estimates were then pooled using a random-effects meta-analysis. Based on these pooled effect estimates, the population attributable fraction and relative risk (RR) of annual mortality due to acute wildfire-related PM_{2.5} exposure was calculated.

FINDINGS: 65.6 million all-cause deaths, 15.1 million cardiovascular deaths, and 6.8 million respiratory deaths were included in our analyses. The pooled RRs of mortality associated with each 10 µg/m³ increase in the 3-day moving average (lag 0-2 days) of wildfire-related PM_{2.5} exposure were 1.019 (95% CI 1.016-1.022) for all-cause mortality, 1.017 (1.012-1.021) for cardiovascular mortality, and 1.019 (1.013-1.025) for respiratory mortality. Overall, 0.62% (95% CI 0.48-0.75) of all-cause deaths, 0.55% (0.43-0.67) of cardiovascular deaths, and 0.64% (0.50-0.78) of respiratory deaths were annually attributable to the acute impacts of wildfire-related PM_{2.5} exposure during the study period.

INTERPRETATION: Short-term exposure to wildfire-related PM_{2.5} was associated with increased risk of mortality. Urgent action is needed to reduce health risks from the increasing wildfires.

10. **Estimated Mortality and Morbidity Attributable to Smoke Plumes in the United States: Not Just a Western US Problem.** O'Dell K, Bilsback K, Ford B, Martenies SE, Magzamen S, Fischer EV, Pierce JR. *Geohealth*. 2021 Sep 1;5(9):e2021GH000457. doi: 10.1029/2021GH000457. eCollection 2021 Sep.

<https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021GH000457>

As anthropogenic emissions continue to decline and emissions from landscape (wild, prescribed, and agricultural) fires increase across the coming century, the relative importance of landscape-fire smoke on air quality and health in the United States (US) will increase. Landscape fires are a large source of fine particulate matter (PM_{2.5}), which has known negative impacts on human health. The seasonal and spatial distribution, particle composition, and co-emitted species in landscape-fire emissions are different from anthropogenic sources of PM_{2.5}. The implications of landscape-fire emissions on the sub-national temporal and spatial distribution of health events and the relative health importance of specific pollutants within smoke are not well understood. We use a health impact assessment with observation-based smoke PM_{2.5} to determine the sub-national distribution of mortality and the sub-national and sub-annual distribution of asthma morbidity attributable to US smoke PM_{2.5} from 2006 to 2018. We estimate disability-adjusted life years (DALYs) for PM_{2.5} and 18 gas-phase hazardous air pollutants (HAPs) in smoke. Although the majority of large landscape fires occur in the western US, we find the majority of mortality (74%) and asthma morbidity (on average 75% across 2006-2018) attributable to smoke PM_{2.5} occurs outside the West, due to higher population density in the East. Across the US, smoke-attributable asthma morbidity predominantly occurs in spring and summer. The number of DALYs associated with smoke PM_{2.5} is approximately three orders of magnitude higher than DALYs associated with gas-phase smoke HAPs. Our results indicate awareness and mitigation of landscape-fire smoke exposure is important across the US.

11. **Climate Change and Women's Health: A Scoping Review.** Desai Z, Zhang Y. *Geohealth*. 2021 Sep 1;5(9):e2021GH000386. doi: 10.1029/2021GH000386. eCollection 2021 Sep.

<https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021GH000386>

Climate change is a significant global health threat that is, underpinned by the existing issue of gender inequality. A scoping review was conducted to better understand the relationship between climate change and women's health. We found a notably higher proportion of existing studies focused on low- and middle-income countries (LMICs). Most of the studies included were published after 2010, with predominantly qualitative study designs. Four key themes were identified, including women's exposure to climate change risks, the impacts on women's health, factors contributing to the vulnerability, and responding strategies in addressing climate change. The scoping review indicates that women's health is at higher risks due to the vulnerability to climate change, especially in LMICs. Meanwhile, it is beneficial to have insights from women in terms of adaptation and mitigation strategies to build stronger resilience. Mixed methods are strongly recommended to support evidence-based policy making in responding to climate change.

12. **Climate Change and Obesity.** Koch CA, Sharda P, Patel J, Gubbi S, Bansal R, Bartel MJ. *Horm Metab Res.* 2021 Sep;53(9):575-587. doi: 10.1055/a-1533-2861. Epub 2021 Sep 8.

<https://www.thieme-connect.com/products/ejournals/pdf/10.1055/a-1533-2861.pdf>

Global warming and the rising prevalence of obesity are well described challenges of current mankind. Most recently, the COVID-19 pandemic arose as a new challenge. We here attempt to delineate their relationship with each other from our perspective. Global greenhouse gas emissions from the burning of fossil fuels have exponentially increased since 1950. The main contributors to such greenhouse gas emissions are manufacturing and construction, transport, residential, commercial, agriculture, and land use change and forestry, combined with an increasing global population growth from 1 billion in 1800 to 7.8 billion in 2020 along with rising obesity rates since the 1980s. The current Covid-19 pandemic has caused some decline in greenhouse gas emissions by limiting mobility globally via repetitive lockdowns. Following multiple lockdowns, there was further increase in obesity in wealthier populations, malnutrition from hunger in poor populations and death from severe infection with Covid-19 and its virus variants. There is a bidirectional relationship between adiposity and global warming. With rising atmospheric air temperatures, people typically will have less adaptive thermogenesis and become less physically active, while they are producing a higher carbon footprint. To reduce obesity rates, one should be willing to learn more about the environmental impact, how to minimize consumption of energy generating carbon dioxide and other greenhouse gas emissions, and to reduce food waste. Diets lower in meat such as a Mediterranean diet, have been estimated to reduce greenhouse gas emissions by 72%, land use by 58%, and energy consumption by 52%.

13. **Estimates of Type 2 Diabetes Mellitus Burden Attributable to Particulate Matter Pollution and Its 30-Year Change Patterns: A Systematic Analysis of Data From the Global Burden of Disease Study 2019.** Wu Y, Fu R, Lei C, Deng Y, Lou W, Wang L, Zheng Y, Deng X, Yang S, Wang M, Zhai Z, Zhu Y, Xiang D, Hu J, Dai Z, Gao J. *Front Endocrinol (Lausanne).* 2021 Aug 13;12:689079. doi: 10.3389/fendo.2021.689079. eCollection 2021.

<https://www.frontiersin.org/articles/10.3389/fendo.2021.689079/full>

BACKGROUND: Epidemiological trends of type 2 diabetes mellitus attributable to fine particulate matter (PM_{2.5}) pollution remain unclear. Here, we estimated spatiotemporal trends of type 2 diabetes mellitus burden attributable to PM_{2.5} pollution, including ambient particulate matter pollution (APMP) and household air pollution (HAP), from 1990-2019. **METHODS:** Data were obtained from the Global Burden of Disease Study 2019 and were analyzed by age, sex, year, and location. Joinpoint regression analysis was applied in the analysis of temporal trends in type 2 diabetes mellitus burden over the 30 years. **RESULTS:** Globally, PM_{2.5} pollution contributed to 292.5 thousand deaths and 13 million disability-adjusted life-years (DALYs) in 2019. APMP ranked third among all risk factors, causing an increase in type 2 diabetes mellitus burden from 1990, whereas the impact of HAP significantly fell during the same period. Both APMP and HAP contributed the most to deaths and DALYs of type 2 diabetes mellitus among older people. However, the age-standardized death and DALY rates of type 2 diabetes mellitus attributable to APMP were greater among males and people in the middle socio-demographic index countries, especially in Southern Sub-Saharan Africa. For HAP, type 2 diabetes mellitus burden was modestly higher in females and was highest in Oceania, which was the only region with an increase from 1990. **CONCLUSIONS:** PM_{2.5} pollution resulted in substantial and increasing type 2 diabetes mellitus burden worldwide. Hence, governments and health systems should take steps to reduce air pollution to mitigate this increasing burden.

WE ACT

- 14. Secure human attachment can promote support for climate change mitigation.** Nisa CF, Bélanger JJ, Schumpe BM, Sasin EM. *Proc Natl Acad Sci U S A.* 2021 Sep 14;118(37):e2101046118. doi: 10.1073/pnas.2101046118.

<https://www.pnas.org/content/118/37/e2101046118>

Attachment theory is an ethological approach to the development of durable, affective ties between humans. We propose that secure attachment is crucial for understanding climate change mitigation, because the latter is inherently a communal phenomenon resulting from joint action and requiring collective behavioral change. Here, we show that priming attachment security increases acceptance (Study 1: n = 173) and perceived responsibility toward anthropogenic climate change (Study 2: n = 209) via increased empathy for others. Next, we demonstrate that priming attachment security, compared to a standard National Geographic video about climate change, increases monetary donations to a proenvironmental group in politically moderate and conservative individuals (Study 3: n = 196). Finally, through a preregistered field study conducted in the United Arab Emirates (Study 4: n = 143,558 food transactions), we show that, compared to a message related to carbon emissions, an attachment security-based message is associated with a reduction in food waste. Taken together, our work suggests that an avenue to promote climate change mitigation could be grounded in core ethological mechanisms associated with secure attachment.

- 15. Occupation in Natural Environments; Health Equity and Environmental Justice.** Hammell KW. *Can J Occup Ther.* 2021 Sep 6:84174211040000. doi: 10.1177/00084174211040000. Online ahead of print.

<https://journals.sagepub.com/doi/full/10.1177/00084174211040000>

Background. Occupations undertaken in natural environments can positively impact physical and mental health, improve cognitive functioning, contribute spiritual and cultural benefits, and increase belonging, self-worth, and the meaningfulness of occupations. However, occupational opportunities in healthy natural spaces are inequitably distributed; and the deleterious effects of climate change and environmental degradation are borne disproportionately by socioeconomically disadvantaged people. Purposes. To highlight evidence that occupational engagement in nature is a determinant of health, foreground environmental injustices and identify some implications for occupational therapy. Key issues. Cross-disciplinary, cross-cultural research and critical environmental justice scholarship indicate that healthy nature is an inequitably distributed determinant of occupation, wellbeing, and human health. This merits critical attention from occupational therapy. Implications. By researching, identifying, and addressing occupational and health inequities arising from environmental degradation, climate change and inequitable access to health-promoting natural environments occupational therapists could contribute valuable, occupational perspectives to initiatives addressing human rights and environmental justice.

16. Climate Change and State of the Science for Children's Health and Environmental Health Equity. Fuller MG, Cavanaugh N, Green S, Duderstadt K. *J Pediatr Health Care*. 2021 Sep 5:S0891-5245(21)00190-5. doi: 10.1016/j.pedhc.2021.08.003. Online ahead of print.

<https://www.clinicalkey.com/#!/content/journal/1-s2.0-S0891524521001905>

INTRODUCTION: Climate change is impacting the physical and mental health of children and families. This is a state of the science update regarding the impacts of climate change for pediatric-focused health care providers and advanced practice registered nurses.

METHOD: Using an equity lens, the authors reviewed and synthesized current literature regarding the adverse impacts of climate change.

RESULTS: The poor and communities of color are disproportionately impacted by climate change. Physical health impacts include increased vector and water-borne infectious diseases, increases in asthma and respiratory infections, and undernutrition. Social disruptions lead to human trafficking. Climate change is associated with mental health concerns, including anxiety and posttraumatic stress after natural disasters.

DISCUSSION: As clinicians, pediatric-focused providers, and advanced practice registered nurses should use multipronged and interdisciplinary approaches to address or prevent the adverse impacts of climate change. Advocacy at all government levels is necessary to safeguard children and vulnerable populations.

17. Correlates of Levels of Willingness to Engage in Climate Change Actions in the United States.

Latkin CA, Dayton L, Lee DI, Yi G, Uzzi M. *Int J Environ Res Public Health*. 2021 Aug 31;18(17):9204. doi: 10.3390/ijerph18179204.

<https://www.mdpi.com/1660-4601/18/17/9204>

While the majority of the American public believe climate change is occurring and are worried, few are engaged in climate change action. In this study, we assessed factors associated with the level of willingness to engage in climate change actions using an online, longitudinal US study of adults. Climate change action outcomes included the level of willingness to post materials

online, take political actions, talk with peers about climate change, and donate to or help an organization. Predictors included climate change attitudes, environmental attitudes, political ideology, political party affiliation, and demographic variables. Most (72%) of the 644 respondents only talked about climate change with peers a few times a year or less, though 65% were very or extremely worried about climate change. Many respondents indicated a willingness to do somewhat or a lot more, from 38% willing to talk to peers to 25% for willing to take political actions. In multinomial regression models, the Climate Change Concern scale was strongly and consistently associated with willingness to engage in climate change action. These findings indicate a need to both identify those who are willing to act and finding activities that fit with their interests and availability.

18. **Presence of airborne microplastics in human lung tissue.** Amato-Lourenço LF, Carvalho-Oliveira R, Júnior GR, Dos Santos Galvão L, Ando RA, Mauad T. *J Hazard Mater.* 2021 Aug 15;416:126124. doi: 10.1016/j.jhazmat.2021.126124. Epub 2021 May 24.

Plastics are ubiquitously used by societies, but most of the plastic waste is deposited in landfills and in the natural environment. Their degradation into submillimetre fragments, called microplastics, is a growing concern due to potential adverse effects on the environment and human health. Microplastics are present in the air and may be inhaled by humans, but whether they have deleterious effects on the respiratory system remain unknown. In this study, we determined the presence of microplastics in human lung tissues obtained at autopsies. Polymeric particles (n = 33) and fibres (n = 4) were observed in 13 of 20 tissue samples. All polymeric particles were smaller than 5.5 µm in size, and fibres ranged from 8.12 to 16.8 µm. The most frequently determined polymers were polyethylene and polypropylene. Deleterious health outcomes may be related to the heterogeneous characteristics of these contaminants in the respiratory system following inhalation.

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