

Environmental Stewardship Resource Desk

#53 | 2.9.2022 to 2.15.2022

Prepared by [System Library Services](#)

Visit the [Environmental Stewardship site](#)

New Research

Environmental Stewardship publications by Providence caregivers – see [Digital Commons](#)

COVID-19

- 1. Exposure to particulate matter: Direct and indirect role in the COVID-19 pandemic.** Santurtún A, Colom ML, Fdez-Arroyabe P, Real AD, Fernández-Olmo I, Zarrabeitia MT. Environ Res. 2022 Apr 15;206:112261. doi: 10.1016/j.envres.2021.112261. Epub 2021 Oct 20.
<https://www.sciencedirect.com/science/article/pii/S0013935121015620>
Knowing the transmission factors and the natural environment that favor the spread of a viral infection is crucial to stop outbreaks and develop effective preventive strategies. This work aims to evaluate the role of Particulate Matter (PM) in the COVID-19 pandemic, focusing especially on that of PM as a vector for SARS-CoV-2. Exposure to PM has been related to new cases and to the clinical severity of people infected by SARS-CoV-2, which can be explained by the oxidative stress and the inflammatory response generated by these particles when entering the respiratory system, as well as by the role of PM in the expression of ACE-2 in respiratory cells in human hosts. In addition, different authors have detected SARS-CoV-2 RNA in PM sampled both in outdoor and indoor environments. The results of various studies lead to the hypothesis that the aerosols emitted by an infected person could be deposited in other suspended particles, sometimes of natural but especially of anthropogenic origin, that form the basal PM. However, the viability of the virus in PM has not yet been demonstrated. Should PM be confirmed as a vector of transmission, prevention strategies ought to be adapted, and PM sampling in outdoor environments could become an indicator of viral load in a specific area.
- 2. Air pollution perception in ten countries during the COVID-19 pandemic.** Lou B et al. Ambio. 2022 Mar;51(3):531-545. doi: 10.1007/s13280-021-01574-2. Epub 2021 Jun 21.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8216327/>
As largely documented in the literature, the stark restrictions enforced worldwide in 2020 to curb the COVID-19 pandemic also curtailed the production of air pollutants to some extent. This study investigates the perception of the air pollution as assessed by individuals located in ten countries: Australia, Brazil, China, Ghana, India, Iran, Italy, Norway, South Africa and the USA.

The perceptions towards air quality were evaluated by employing an online survey administered in May 2020. Participants (N = 9394) in the ten countries expressed their opinions according to a Likert-scale response. A reduction in pollutant concentration was clearly perceived, albeit to a different extent, by all populations. The survey participants located in India and Italy perceived the largest drop in the air pollution concentration; conversely, the smallest variation was perceived among Chinese and Norwegian respondents. Among all the demographic indicators considered, only gender proved to be statistically significant.

3. **A Spatiotemporal Analytical Outlook of the Exposure to Air Pollution and COVID-19 Mortality in the USA.** Chakraborty S, Dey T, Jun Y, Lim CY, Mukherjee A, Dominici F. *J Agric Biol Environ Stat.* 2022 Jan 28:1-21. doi: 10.1007/s13253-022-00487-1. Online ahead of print.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8795746/>

The world is experiencing a pandemic due to Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), also known as COVID-19. The USA is also suffering from a catastrophic death toll from COVID-19. Several studies are providing preliminary evidence that short- and long-term exposure to air pollution might increase the severity of COVID-19 outcomes, including a higher risk of death. In this study, we develop a spatiotemporal model to estimate the association between exposure to fine particulate matter PM_{2.5} and mortality accounting for several social and environmental factors. More specifically, we implement a Bayesian zero-inflated negative binomial regression model with random effects that vary in time and space. Our goal is to estimate the association between air pollution and mortality accounting for the spatiotemporal variability that remained unexplained by the measured confounders. We applied our model to four regions of the USA with weekly data available for each county within each region. We analyze the data separately for each region because each region shows a different disease spread pattern. We found a positive association between long-term exposure to PM_{2.5} and the mortality from the COVID-19 disease for all four regions with three of four being statistically significant. Data and code are available at our GitHub repository. Supplementary materials accompanying this paper appear on-line.

SUPPLEMENTARY INFORMATION: The online version contains supplementary material available at 10.1007/s13253-022-00487-1.

4. **Personal experience with Covid-19 is associated with increased environmental concern and pro-environmental behavioral intentions.** Shulman D, Halperin E, Reifen-Tagar M. *Curr Res Ecol Soc Psychol.* 2022;3:100031. doi: 10.1016/j.cresp.2021.100031. Epub 2022 Jan 1.

<https://www.sciencedirect.com/science/article/pii/S2666622721000241>

Climate change attributable to human activities has created a global threat to humanity and the natural world. However, there is a tendency for people to view climate change as a threat primarily affecting those in far-away places and there is reluctance to engage in pro-environmental action, which is often costly. It is therefore crucial to understand the factors that shape willingness to engage in pro-environmental behavior. Existing research suggests that personal experience with the consequences of climate change may increase pro-environmental action, however it is unknown whether personal experiences in other non-environmental domains may have similar effects. The circumstances of the Covid-19 pandemic allowed us to conduct a quasi-natural experiment to examine the effects of personal experience with a

different global threat, namely Covid-19, on environmental responses. Across two studies conducted among UK and US participants, we found that personal experience of Covid-19 was associated with pro-environmental behavioral intentions, and that this relationship was mediated by increased environmental concern. We found that personal experience with Covid-19 was associated with stronger self-transcendence values of universalism and benevolence, which played a further mediating role between personal experience with the virus and environmental concern. These findings suggest that personal experience with at least some global threats, even when not directly related to climate change, may increase concern for distant others and also sensitize people to environmental issues and motivate pro-environmental action.

Health Impacts of Climate Change

5. **Combined effects of air pollution and extreme heat events among ESKD patients within the Northeastern United States.** Remigio RV, He H, Raimann JG, Kotanko P, Maddux FW, Sapkota AR, Liang XZ, Puett R, He X, Sapkota A. *Sci Total Environ.* 2022 Mar 15;812:152481. doi: 10.1016/j.scitotenv.2021.152481. Epub 2021 Dec 16.
RESULTS: From 2001 to 2016, the sample population consisted of 43,338 ESKD patients. We recorded 5217 deaths and 78,433 hospital admissions. A 10-unit increase in PM2.5 concentration was associated with a 5% increase in ACM (rate ratio [RRLag0-3]: 1.05, 95% CI: 1.00-1.10) and same-day O3 (RRLag0: 1.02, 95% CI: 1.01-1.03) after adjusting for extreme heat exposures. Mortality models suggest evidence of interaction and effect measure modification, though not always simultaneously. ACM risk increased up to 8% when daily ozone concentrations exceeded National Ambient Air Quality Standards established by the United States, but the increases in risk were considerably higher during EHE days across lag periods. CONCLUSION: Our findings suggest interdependent effects of EHE and air pollution among ESKD patients for all-cause mortality risks. National level assessments are needed to consider the ESKD population as a sensitive population and inform treatment protocols during extreme heat and degraded pollution episodes.
6. **Climate change accelerates winter transmission of a zoonotic pathogen.** Sipari S, Khalil H, Magnusson M, Evander M, Hörnfeldt B, Ecke F. *Ambio.* 2022 Mar;51(3):508-517. doi: 10.1007/s13280-021-01594-y. Epub 2021 Jul 6.
<https://link.springer.com/article/10.1007/s13280-021-01594-y>
Many zoonotic diseases are weather sensitive, raising concern how their distribution and outbreaks will be affected by climate change. At northern high latitudes, the effect of global warming on especially winter conditions is strong. By using long term monitoring data (1980-1986 and 2003-2013) from Northern Europe on temperature, precipitation, an endemic zoonotic pathogen (Puumala orthohantavirus, PUUV) and its reservoir host (the bank vole, *Myodes glareolus*), we show that early winters have become increasingly wet, with a knock-on effect on pathogen transmission in its reservoir host population. Further, our study is the first to show a climate change effect on an endemic northern zoonosis, that is not induced by increased host abundance or distribution, demonstrating that climate change can also alter transmission intensity within host populations. Our results suggest that rainy early winters

accelerate PUUV transmission in bank voles in winter, likely increasing the human zoonotic risk in the North.

7. **Defining a new perspective in Environmental Health: the healing environment.** Antonelli M, Barbieri G, Donelli D. *Int J Biometeorol.* 2022 Feb 4. doi: 10.1007/s00484-022-02251-z. Online ahead of print.

With pollution-related health problems on the rise, the focus of modern Environmental Health (EH) has mostly been placed on toxicology and exposure science. Despite the importance of toxicological aspects, the environment should be studied not only to identify pollution-related hazards, but also to investigate potentially therapeutic and health-enhancing effects of its elements. Generally speaking, it is possible to benefit from a natural environment with a full-immersion experience or with a single-element interaction. Recently, scientific evidence is accumulating on the beneficial effects of natural settings for well-being promotion and psycho-physical health, especially for stress reduction and prevention of stress-related conditions. In light of these considerations, the paradigm of EH can change: the environment we live in should be considered not only as a precious resource to be protected against pollution (thus preventing the consequent health hazards), but, in a proactive vision, also as a potential source of elements capable of actively maintaining and promoting health and well-being.

8. **Air quality improvement and cognitive decline in community-dwelling older women in the United States: A longitudinal cohort study.** Younan D et al. *PLoS Med.* 2022 Feb 3;19(2):e1003893. doi: 10.1371/journal.pmed.1003893. eCollection 2022 Feb.

<https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1003893>

CONCLUSIONS: In this study, we found that greater improvement in long-term AQ in late life was associated with slower cognitive declines in older women. This novel observation strengthens the epidemiologic evidence of an association between air pollution and cognitive aging.

9. **Long-term exposure to air pollution and the blood lipid levels of healthy young men.** Kim KN, Ha B, Seog W, Hwang IU. *Environ Int.* 2022 Feb 2;161:107119. doi: 10.1016/j.envint.2022.107119. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0160412022000459>

RESULTS: The linear mixed models revealed that a 10- $\mu\text{g}/\text{m}^3$ increase in fine particulate matter $\leq 2.5 \mu\text{m}$ (PM_{2.5}) decreased high-density lipoprotein cholesterol (HDL-C) levels by -0.66% (95% confidence interval [CI]: -1.21, -0.10), and a 10-ppb increase in nitrogen dioxide (NO₂) increased total cholesterol (TC) levels by 1.04% (95% CI: 0.24, 1.84). In the quantile regression models, associations were also found at specific deciles. PM_{2.5} exposure contributed to higher TC, NO₂ resulted in higher triglycerides and lower HDL-C, and ozone (O₃) led to lower HDL-C. The association between O₃ and TC differed according to BMI (p-value for interaction = 0.03); among those with a BMI $\geq 25.0 \text{ kg}/\text{m}^2$, a 10-ppb increase in O₃ increased TC by 1.09% (95% CI: 0.20, 1.09).

DISCUSSION: These results shed new light on the importance of controlling air pollution, which can contribute to abnormal blood lipid levels, an independent risk factor for cardiovascular disease.

- 10. Impacts of Environmental Insults on Cardiovascular Aging.** Lan Y, Wu S. *Curr Environ Health Rep.* 2022 Feb 1. doi: 10.1007/s40572-022-00335-x. Online ahead of print.
RECENT FINDINGS: Recent studies generally support positive associations of exposure to multiple chemical environmental stressors (air pollution, EDCs, toxic metals) and extreme temperatures with increased risks of cardiovascular mortality and morbidity in the population. Environmental stressors have also been associated with a number of cardiovascular aging-related subclinical changes including biomarkers in the population, which are supported by evidence from relevant experimental studies. The elderly and patients are the most vulnerable demographic groups to majority environmental stressors. Future studies should account for the totality of individuals' exposome in addition to single chemical pollutants or environmental factors. Specific factors most responsible for the observed health effects related to cardiovascular aging remain to be elucidated.
- 11. Air pollution and recurrence of cardiovascular events after ST-segment elevation myocardial infarction.** Zhang H, Yi M, Wang Y, Zhang Y, Xiao K, Si J, Shi N, Sun L, Miao Z, Zhao T, Sun X, Liu Z, Gao J, Li J. *Atherosclerosis.* 2022 Feb;342:1-8. doi: 10.1016/j.atherosclerosis.2021.12.012. Epub 2021 Dec 21.
<https://www.sciencedirect.com/science/article/pii/S0021915021015070>
CONCLUSIONS: Short- and long-term exposure to air pollutants except ozone increases the risks of recurrent cardiovascular events in STEMI survivors. Better environmental policies and secondary prevention strategies should be developed to protect STEMI survivors as a susceptible population.
- 12. Influence of PM(1) exposure on total and cause-specific respiratory diseases: a systematic review and meta-analysis.** Hu Y, Wu M, Li Y, Liu X. *Environ Sci Pollut Res Int.* 2022 Feb;29(10):15117-15126. doi: 10.1007/s11356-021-16536-0. Epub 2021 Oct 9.
<https://link.springer.com/article/10.1007/s11356-021-16536-0>
An increasing number of studies examined the potential effects of PM1 (submicronic particulate matter with an aerodynamic diameter $\leq 1 \mu\text{m}$) on the risk of respiratory diseases; however, the results have been inconclusive. This study aimed to determine the overall association between PM1 with total and cause-specific respiratory diseases. A systematic review and meta-analysis was conducted with 68 related articles retrieved, and six articles met the full inclusion criteria for the final analysis. For a $10 \mu\text{g}/\text{m}^3$ increase in PM1, the pooled odds ratio (OR) was 1.05 (95% CI 0.98-1.12) for total respiratory diseases, 1.25 (95% CI 1.00-1.56) for asthma, and 1.07 (95% CI 1.04-1.10) for pneumonia with the I² value of 87%, 70%, and 0%, respectively. Subgroup analyses showed that long-term exposure to PM1 was associated with increased risk of asthma (OR 1.47, 95% CI 1.33-1.63) with an I² value of 0%, while short-term exposure to PM1 was not associated with asthma (OR 1.07, 95% CI 0.89-1.27) with the I² value of 0%. Egger's test showed that publication bias existed ($P = 0.041$); however, the funnel plot was symmetrical with the inclusion of the moderator. In conclusion, elevated levels of PM1 may increase morbidity in total and cause-specific respiratory diseases in the population.

13. **Impact of Long-Term Exposure to Air Pollution on Cognitive Decline in Older Adults Without Dementia.** Park SY, Han J, Kim SH, Suk HW, Park JE, Lee DY. *J Alzheimers Dis.* 2022 Jan 28. doi: 10.3233/JAD-215120. Online ahead of print.
<https://content.iospress.com/articles/journal-of-alzheimers-disease/jad215120>
RESULTS: In total, 884,053 (74.3±7.1 years; 64.1% females) and 398,889 (72.3±6.4 years; 67.0% females) older individuals were included in the cross-sectional and longitudinal analyses, respectively. Older individuals exposed to higher levels of NO₂, SO₂, CO, and PM₁₀ showed lower baseline MMSE scores. During follow-up, exposure to higher levels of NO₂, SO₂, CO, and PM₁₀ was associated with greater decreases in MMSE scores in older individuals; for O₃, the opposite pattern was observed.
CONCLUSION: Our findings suggest that exposure to high levels of air pollutants can worsen the cognitive performance of older adults without dementia. Efforts to reduce air pollution in LMICs that have similar levels of pollutants to South Korea are necessary to reduce the burden on older adults with cognitive impairment.
14. **Calling Attention to the Role of Race-Driven Societal Determinants of Health on Aggressive Tumor Biology: A Focus on Black Americans.** Ashing KT, Jones V, Bedell F, Phillips T, Erhunmwunsee L. *JCO Oncol Pract.* 2022 Jan;18(1):15-22. doi: 10.1200/OP.21.00297. Epub 2021 Jul 13.
<https://ascopubs.org/doi/full/10.1200/OP.21.00297>
Blacks have the highest incidence and mortality from most cancers. The reasons for these disparities remain unclear. Blacks are exposed to adverse social determinants because of historic and contemporary racist policies; however, how these determinants affect the disparities that Blacks experience is understudied. As a result of discriminatory community policies, like redlining, Blacks have higher exposure to air pollution and neighborhood deprivation. Studies investigating how these factors affect tumor biology are emerging. We highlight the literature that connects racism-related community exposure to the tumor biology in breast, lung, prostate, and colorectal cancer. Further investigations that clarify the link between adverse social determinants that result from systemic racism and aggressive tumor biology are required if health equity is to be achieved. Without recognition that racism is a public health risk with carcinogenic impact, health care delivery and cancer care will never achieve excellence. In response, health systems ought to establish corrective actions to improve Black population health and bring medical justice to marginalized racialized groups.
15. **Prenatal ambient air pollution and maternal depression at 12 months postpartum in the MADRES pregnancy cohort.** Bastain TM et al. *Environ Health.* 2021 Nov 27;20(1):121. doi: 10.1186/s12940-021-00807-x.
<https://ehjournal.biomedcentral.com/articles/10.1186/s12940-021-00807-x>
RESULTS: We found over a two-fold increased odds of depression at 12 months postpartum associated with second trimester NO₂ exposure (OR = 2.63, 95% CI: 1.41-4.89) and pregnancy average NO₂ (OR = 2.04, 95% CI: 1.13-3.69). Higher second trimester PM_{2.5} exposure also was associated with increased depression at 12 months postpartum (OR = 1.56, 95% CI: 1.01-2.42). The effect for second trimester PM₁₀ was similar and was borderline significant (OR = 1.58, 95% CI: 0.97-2.56).

CONCLUSIONS: In a low-income cohort consisting of primarily Hispanic/Latina women in urban Los Angeles, we found that prenatal ambient air pollution, especially mid-pregnancy NO₂ and PM_{2.5}, increased the risk of depression at 12 months after childbirth. These results underscore the need to better understand the contribution of modifiable environmental risk factors during potentially critical exposure periods.

16. **Correlating heatwaves and relative humidity with suicide (fatal intentional self-harm).** Florido Ngu F, Kelman I, Chambers J, Ayeb-Karlsson S. *Sci Rep.* 2021 Nov 15;11(1):22175. doi: 10.1038/s41598-021-01448-3.

<https://www.nature.com/articles/s41598-021-01448-3>

Erratum in

Sci Rep. 2021 Dec 1;11(1):23542.

Empirical evidence suggests that the effects of anthropogenic climate change, and heat in particular, could have a significant impact on mental health. This article investigates the correlation between heatwaves and/or relative humidity and suicide (fatal intentional self-harm) on a global scale. The covariance between heat/humidity and suicide was modelled using a negative binomial Poisson regression with data from 60 countries between 1979-2016. Statistically significant increases and decreases in suicide were found, as well as many cases with no significant correlation. We found that relative humidity showed a more significant correlation with suicide compared to heatwaves and that both younger age groups and women seemed to be more significantly affected by changes in humidity and heatwave counts in comparison with the rest of the population. Further research is needed to provide a larger and more consistent basis for epidemiological studies; to understand better the connections among heat, humidity and mental health; and to explore in more detail which population groups are particularly impacted and why.

17. **Association of Ambient Fine Particulate Matter (PM_{2.5}) with Elevated Fecal Hemoglobin Concentration and Colorectal Carcinogenesis: A Population-Based Retrospective Cohort Study.** Ku MS, Liu CY, Hsu CY, Chiu HM, Chen HH, Chan CC. *Cancer Control.* 2021 Jan-Dec;28:10732748211041232. doi: 10.1177/10732748211041232.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8450689/>

The roles of ambient fine particulate matter (PM_{2.5}) in the prevention of colorectal cancer (CRC) have been scarcely highlighted as there is short of empirical evidence regarding the influences of PM_{2.5} on multistep carcinogenic processes of CRC. A retrospective cohort design with multistate outcomes was envisaged by linking monthly average PM_{2.5} concentrations at 22 city/county level with large-scale cohorts of cancer-screened population to study the influences of PM_{2.5} on short-term inflammatory process and multistep carcinogenic processes of CRC. Our study included a nationwide CRC screening cohort of 4,628,995 aged 50-69 years who attended first screen between 2004 and 2009 and continued periodical screens until 2016. We aimed to illustrate the carcinogenesis of PM_{2.5} related to CRC by applying both hierarchical logistical and multistate Markov regression models to estimate the effects of air pollution on fecal immunochemical test (FIT) positive (a proxy of inflammatory marker) and pre-clinical and clinical states of CRC in the nationwide cohort. We found a significant association of high PM_{2.5} exposure and FIT-positive by an increased risk of 11% [95% confidence interval (CI), 10-12].

PM2.5 enhanced the risk of being preclinical state by 14% (95% CI, 10-18) and that of subsequent progression from pre-clinical to clinical state by 21% (95% CI, 14-28). Furthermore, the elevated risks for CRC carcinogenesis were significantly higher for people living in high PM2.5 pollution areas in terms of yearly averages and the number days above 35 µg/m³ than those living in low PM2.5 pollution areas. We concluded that both short-term and long-term PM2.5 exposure were associated with multistep progression of CRC, which were useful to design precision primary and secondary prevention strategies of CRC for people who are exposed to high PM2.5 pollution.

WE ACT

18. **Surgeons' perspectives on operating room waste: Multicenter survey.** Meyer MJ, Chafitz T, Wang K, Alamgir N, Malapati P, Gander JW, Ward DT, Gandhi S. *Surgery*. 2022 Jan 26;S0039-6060(21)01255-1. doi: 10.1016/j.surg.2021.12.032. Online ahead of print. <https://www.clinicalkey.com/#!/content/playContent/1-s2.0-S0039606021012551>
CONCLUSION: Surgeons understand there is significant waste in the operating room and are willing to change their workflow to reduce waste. Changes in operating room practices that reduce waste will be beneficial to health systems' finances and their efforts to improve population health through a reduction in consumption and pollution. Efforts should be directed toward reducing operating room waste with an initial focus on the elimination of unnecessary waste of sterile surgical supplies. Further work is needed to determine the precise sources of perioperative waste and what initiatives can be implemented to reduce this burden while maintaining high-value patient care.

[Lancet Planetary Health](#) – open-access, interdisciplinary journal focused on sustainability

News

[WHO concerned over COVID-19 health-care waste.](#) Zarocostas J. *Lancet*. 2022 Feb 5;399(10324):507. doi: 10.1016/S0140-6736(22)00225-2.

[A series of narrative reviews on air pollution and respiratory health for Pulmonology: Why it is important and who should read it.](#) Viegi G, Taborda-Barata L. *Pulmonology*. 2022 Feb 1:S2531-0437(22)00010-1. doi: 10.1016/j.pulmoe.2021.12.010. Online ahead of print.

[Climate Resilience: It Is Time for a National Approach.](#) Deitchman SD, Kirsch TD, Auerbach PS, Hill AC. *Health Secur*. 2021 Nov;19(6):652-660. doi: 10.1089/hs.2021.0108. Epub 2021 Oct 25.

If you would like to receive a **customized Environmental Stewardship Topic Alert** related to your specialty or area of interest, would like a **literature search** conducted, or have difficulty **accessing** any of the above articles please contact us at librarian@providence.org

Find previous weeks [here](#).