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COVID-19

- 1. Binational survey of personal protective equipment (PPE) pollution driven by the COVID-19 pandemic in coastal environments: Abundance, distribution, and analytical characterization.** De-la-Torre GE et al. J Hazard Mater. 2022 Mar 15;426:128070. doi: 10.1016/j.jhazmat.2021.128070. Epub 2021 Dec 11.
<https://www.sciencedirect.com/science/article/pii/S0304389421030399>
In the present contribution, two nationwide surveys of personal protective equipment (PPE) pollution were conducted in Peru and Argentina aiming to provide valuable information regarding the abundance and distribution of PPE in coastal sites. Additionally, PPE items were recovered from the environment and analyzed by Fourier transformed infrared (FTIR) spectroscopy, Scanning electron microscopy (SEM) with Energy dispersive X-ray (EDX), and X-ray diffraction (XRD), and compared to brand-new PPE in order to investigate the chemical and structural degradation of PPE in the environment. PPE density (PPE m⁻²) found in both countries were comparable to previous studies. FTIR analysis revealed multiple polymer types comprising common PPE, mainly polypropylene, polyamide, polyethylene terephthalate, and polyester. SEM micrographs showed clear weathering signs, such as cracks, cavities, and rough surfaces in face masks and gloves. EDX elemental mapping revealed the presence of elemental additives, such as Ca in gloves and face masks and AgNPs as an antimicrobial agent. Other metals found on the surface of PPE were Mo, P, Ti, and Zn. XRD patterns displayed a notorious decrease in the crystallinity of polypropylene face masks, which could alter its interaction with external contaminants and stability. The next steps in this line of research were discussed.
- 2. Ambient air pollution and COVID-19 incidence during four 2020-2021 case surges.** Sidell MA et al. Environ Res. 2022 Jan 19;208:112758. doi: 10.1016/j.envres.2022.112758. Online ahead of print.
<https://www.sciencedirect.com/science/article/pii/S0013935122000858>

CONCLUSION: Long-term PM2.5 and NO2 exposures were associated with increased risk of COVID-19 incidence across all case surges before February 2021. Short-term PM2.5 and NO2 exposures were also associated. Our findings suggest that air pollution may play a role in increasing the risk of COVID-19 infection.

3. **Race and ethnic minority, local pollution, and COVID-19 deaths in Texas.** Xu A, Loch-Temzelides T, Adiole C, Botton N, Dee SG, Masiello CA, Osborn M, Torres MA, Cohan DS. *Sci Rep.* 2022 Jan 19;12(1):1002. doi: 10.1038/s41598-021-04507-x.

<https://www.nature.com/articles/s41598-021-04507-x>

The costs of COVID-19 are extensive, and, like the fallout of most health and environmental crises in the US, there is growing evidence that these costs weigh disproportionately on communities of color. We investigated whether county-level racial composition and fine particulate pollution (PM2.5) are indicators for COVID-19 incidence and death rates in the state of Texas. Using county-level data, we ran linear regressions of percent minority as well as historic 2000-2016 PM2.5 levels against COVID-19 cases and deaths per capita. We found that a county's percent minority racial composition, defined as the percentage of population that identifies as Black or Hispanic, highly correlates with COVID-19 case and death rates. Using Value-of-Statistical-Life calculations, we found that economic costs from COVID-19 deaths fall more heavily on Black and Hispanic residents in Harris County, the most populous county in Texas. We found no consistent evidence or significant correlations between historic county-average PM2.5 concentration and COVID-19 incidence or death. Our findings suggest that public health and economic aid policy should consider the racially-segregated burden of disease to better mitigate costs and support equity for the duration and aftermath of health crises.

4. **Towards a green and sustainable recovery from COVID-19.** Werikhe A. *Curr Res Environ Sustain.* 2022;4:100124. doi: 10.1016/j.crsust.2022.100124. Epub 2022 Jan 10.

<https://www.sciencedirect.com/science/article/pii/S2666049022000020>

Whilst COVID-19 has left a devastating trail of economic and social losses, it has spurred incidental transitory positive externalities for the environment and climate. Key among these include; improved air and water quality, clearer skies and a projected 8% global blip in carbon emissions by the end of 2020. The global wave of restrictive lock downs implemented to contain the spread of COVID-19 in the short term account for these gains. The lockdowns were defined by limited public and private travel, closure of airports and borders, and a decline in industrial activity. However, most of these climate and environmental gains were secondary effects of the COVID-19 induced lockdowns and not based on decisive deliberate policy action, which casts doubts on their sustainability and ability to contribute to a green economy transition. Sustaining accrued environmental and climate benefits will depend on the direction of the COVID-19 stimuli and recovery packages - whether they are designed to work for the planet or against it. This article therefore elaborates on how state and non-state actors across the globe ought to be agile in building back sustainably to upend the ongoing collision course between the planet and economic development. It emphasizes the use of Sustainable Development Goals and Nationally Determined Contributions on climate change (NDCs) as a compass to shape the direction of COVID-19 recovery packages. It further enumerates six

strategies that must underpin recovery packages to ensure win-win for the economy, society, and the planet.

Health Impacts of Climate Change

5. **Air-polluted environmental heavy metal exposure increase lung cancer incidence and mortality: A population-based longitudinal cohort study.** Lee NW, Wang HY, Du CL, Yuan TH, Chen CY, Yu CJ, Chan CC. *Sci Total Environ.* 2022 Mar 1;810:152186. doi: 10.1016/j.scitotenv.2021.152186. Epub 2021 Dec 6.
RESULTS: Participants residing near the petrochemical industrial area with higher air Cd concentration had relatively higher urinary concentration of Cd. After adjusting for sociodemographic and behavioral factors, tobacco smoking and air pollution remained as potential sources of Cd exposure. An increased prevalence of lung cancer was observed in the highly polluted zone. The risk of lung cancer incidence increased 1.25-fold for each 1 µg/g-creatinine increase in urine Cd level. Patients with lung cancer had significantly higher urinary Cd concentrations. Lung cancer patients with higher urinary Cd level had significantly poor survival (urine Cd level ≥ 1.58 vs <1.58 µg/g-creatinine; survival, medium, 192.0 vs 342.5 days, $p < 0.001$). At the longitudinal follow-up, participants with higher urinary Cd level had a higher risk of lung cancer incidence (urine Cd level ≥ 1.58 vs <1.58 µg/g-creatinine: 3.91% v.s. 0.87%, hazard ratio: 4.65, $p < 0.001$).
CONCLUSIONS: Accumulation of Cd could be a risk of lung cancer occurrence. High exposure to Cd may result in poor prognosis in lung cancer patients.

6. **The concept of one health applied to the problem of zoonotic diseases.** Shaheen MNF. *Rev Med Virol.* 2022 Jan 20:e2326. doi: 10.1002/rmv.2326. Online ahead of print.
<https://onlinelibrary.wiley.com/doi/full/10.1002/rmv.2326>
Zoonotic diseases are a burden on healthcare systems globally, particularly underdeveloped nations. Numerous vertebrate animals (e.g., birds, mammals and reptiles) serve as amplifier hosts or reservoirs for viral zoonoses. The spread of zoonotic disease is associated with environmental factors, climate change, animal health as well as other human activities including globalization, urbanization and travel. Diseases at the human-animal environment interface (e.g., zoonotic diseases, vector-borne diseases, food/water borne diseases) continue to pose risk to animals and humans with a great significant mortality and morbidity. It is estimated that of 1400 infectious diseases known to affect humans, 60% of them are of animal origin. In addition, 75% of the emerging infectious diseases have a zoonotic nature, worldwide. The one health concept plays an important role in the control and prevention of zoonoses by integrating animal, human, and environmental health through collaboration and communication among osteopaths, wildlife, physicians, veterinarians professionals, public health and environmental experts, nurses, dentists, physicists, biomedical engineers, plant pathologists, biochemists, and others. No one sector, organization, or person can address issues at the animal-human-ecosystem interface alone.

7. **Air Pollution and the Risk of Parkinson's Disease: A Review.** Murata H, Barnhill LM, Bronstein JM. *Mov Disord.* 2022 Jan 19. doi: 10.1002/mds.28922. Online ahead of print.

<https://movementdisorders.onlinelibrary.wiley.com/doi/10.1002/mds.28922>

Parkinson's disease, as well as other neurodegenerative disorders, are primarily characterized by pathological accumulation of proteins, inflammation, and neuron loss. Although there are some known genetic risk factors, most cases cannot be explained by genetics alone. Therefore, it is important to determine the environmental factors that confer risk and the mechanisms by which they act. Recent epidemiological studies have found that exposure to air pollution is associated with an increased risk for development of Parkinson's disease, although not all results are uniform. The variability between these studies is likely due to differences in what components of air pollution are measured, timing and methods used to determine exposures, and correction for other variables. There are several potential mechanisms by which air pollution could act to increase the risk for development of Parkinson's disease, including direct neuronal toxicity, induction of systemic inflammation leading to central nervous system inflammation, and alterations in gut physiology and the microbiome. Taken together, air pollution is an emerging risk factor in the development of Parkinson's disease. A number of potential mechanisms have been implicated by which it promotes neuropathology providing biological plausibility, and these mechanisms are likely relevant to the development of other neurodegenerative disorders such as Alzheimer's disease. This field is in its early stages, but a better understanding of how environmental exposures influence the pathogenesis of neurodegeneration is essential for reducing the incidence of disease and finding disease-modifying therapies.

8. **Outdoor ambient air pollution and breast cancer survival among California participants of the Multiethnic Cohort Study.** Cheng I et al. *Environ Int.* 2022 Jan 18;161:107088. doi: 10.1016/j.envint.2022.107088. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0160412022000137>

RESULTS: We identified 1,125 deaths from all causes (474 breast cancer, 272 CVD, 379 non-breast cancer/non-CVD deaths) among the 3,089 breast cancer cases with 8.1 years of average follow-up. LUR and kriged NOX (per 50 ppb) and NO₂ (per 20 ppb), PM_{2.5} (per 10 µg/m³), and PM₁₀ (per 10 µg/m³) were positively associated with risks of all-cause (Hazard Ratio (HR) range = 1.13-1.25), breast cancer (HR range = 1.19-1.45), and CVD mortality (HR range = 1.37-1.60). Associations were statistically significant for LUR NOX and CVD mortality (HR = 1.60; 95% CI: 1.08-2.37) and kriged NO₂ and breast cancer mortality (HR = 1.45; 95% CI 1.02-2.07). Gaseous and PM pollutants were positively associated with breast cancer mortality across racial/ethnic group.

CONCLUSION: In this study, air pollutants have a harmful impact on breast cancer survival. Additional studies should evaluate potential confounding by socioeconomic factors. These data support maintaining clean air laws to improve survival for women with breast cancer.

9. **Understanding the Spectrum of Anxiety Responses to Climate Change: A Systematic Review of the Qualitative Literature.** Soutar C, Wand APF. *Int J Environ Res Public Health.* 2022 Jan 16;19(2):990. doi: 10.3390/ijerph19020990.

<https://www.mdpi.com/1660-4601/19/2/990>

RESULTS: Fifteen studies met the inclusion criteria. The content analysis was organised into two overarching themes. The scope of anxiety included worry about threats to livelihood, worry for

future generations, worry about apocalyptic futures, anxiety at the lack of response to climate change, and competing worries. Themes pertaining to responses to climate change anxiety included symptoms of anxiety, feeling helpless and disempowered, and ways of managing climate change anxiety. Relatively few studies were identified, with limited geographical diversity amongst the populations studied.

CONCLUSIONS: The review furthers understanding of the concept of climate change anxiety and responses to it, highlighting the need for high-quality psychiatric research exploring its clinical significance and potential interventions.

- 10. Association of short-term exposure to air pollution with recurrent ischemic cerebrovascular events in older adults.** Xu R et al. *Int J Hyg Environ Health*. 2022 Jan 16;240:113925. doi: 10.1016/j.ijheh.2022.113925. Online ahead of print.
We found that short-term exposure to ambient air pollutants, especially NO₂, was associated with increased risk of hospital admissions for recurrent ICEs in older adults.
- 11. Association between ambient particulate matter exposure and semen quality in fertile men.** Wu W, Chen Y, Cheng Y, Tang Q, Pan F, Tang N, Sun Z, Wang X, London SJ, Xia Y. *Environ Health*. 2022 Jan 16;21(1):16. doi: 10.1186/s12940-022-00831-5.
<https://ehjournal.biomedcentral.com/articles/10.1186/s12940-022-00831-5>
RESULTS: Higher 90-days average PM_{2.5} was in association with decreased sperm motility (2.21% for total motility, 1.93% for progressive motility per 10 µg/m³ increase, P < 0.001) and four quantitative aspects of sperm motion (curvilinear velocity (VCL), straight line velocity (VSL), average path velocity (VAP), and amplitude of lateral head displacement (ALH), P < 0.01). The association between PM_{2.5} exposure and semen quality were generally stronger for the earlier exposure window (70-90 days prior to ejaculation) than for recent exposure (0-9, 10-14, or 15-69 days). In the subgroup of men who had normal sperm parameters (n = 1019), similar results were obtained. Ninety-days PM₁₀ exposure was associated only with decreased VCL and VAP and was not related to sperm concentration.
CONCLUSIONS: Exposure to PM_{2.5} adversely affects semen quality, specifically lower sperm motility, in fertile men.
- 12. Associations between long-term exposure to low-level air pollution and risk of chronic kidney disease-findings from the Malmö Diet and Cancer cohort.** Xu Y, Andersson EM, Krage Carlsen H, Molnár P, Gustafsson S, Johannesson S, Oudin A, Engström G, Christensson A, Stockfelt L. *Environ Int*. 2022 Jan 15;160:107085. doi: 10.1016/j.envint.2022.107085. Online ahead of print.
<https://www.sciencedirect.com/science/article/pii/S0160412022000101>
CONCLUSION: Residential exposure to outdoor air pollution was associated with increased risk of incident CKD at relatively low exposure levels. Average long-term exposure was more clearly associated with CKD than current exposure or exposure at recruitment. Our findings imply that the health effects of low-level air pollution on CKD are considerable.
- 13. Climate Change and Zoonoses: A Review of Concepts, Definitions, and Bibliometrics.** Leal Filho W, Ternova L, Parasnis SA, Kovaleva M, Nagy GJ. *Int J Environ Res Public Health*. 2022 Jan 14;19(2):893. doi: 10.3390/ijerph19020893.

Climate change can have a complex impact that also influences human and animal health. For example, climate change alters the conditions for pathogens and vectors of zoonotic diseases. Signs of this are the increasing spread of the West Nile and Usutu viruses and the establishment of new vector species, such as specific mosquito and tick species, in Europe and other parts of the world. With these changes come new challenges for maintaining human and animal health. This paper reports on an analysis of the literature focused on a bibliometric analysis of the Scopus database and VOSviewer software for creating visualization maps which identifies the zoonotic health risks for humans and animals caused by climate change. The sources retained for the analysis totaled 428 and different thresholds (N) were established for each item varying from N 5 to 10. The main findings are as follows: First, published documents increased in 2009-2015 peaking in 2020. Second, the primary sources have changed since 2018, partly attributable to the increase in human health concerns due to human-to-human transmission. Third, the USA, the UK, Canada, Australia, Italy, and Germany perform most zoonosis research. For instance, sixty documents and only 17 countries analyzed for co-authorship analysis met the threshold led by the USA; the top four author keywords were "climate change", "zoonosis", "epidemiology", and "one health;" the USA, the UK, Germany, and Spain led the link strength (inter-collaboration); the author keywords showed that 37 out of the 1023 keywords met the threshold, and the authors' keyword's largest node of the bibliometric map contains the following: infectious diseases, emerging diseases, disease ecology, one health, surveillance, transmission, and wildlife. Finally, zoonotic diseases, which were documented in the literature in the past, have evolved, especially during the years 2010-2015, as evidenced by the sharp augmentation of publications addressing ad-hoc events and peaking in 2020 with the COVID-19 outbreak.

14. **Warm Season and Emergency Department Visits to U.S. Children's Hospitals.** Bernstein AS, Sun S, Weinberger KR, Spangler KR, Sheffield PE, Wellenius GA. *Environ Health Perspect.* 2022 Jan;130(1):17001. doi: 10.1289/EHP8083. Epub 2022 Jan 19.
<https://ehp.niehs.nih.gov/doi/full/10.1289/EHP8083>
RESULTS: Extreme heat was associated with an RR of all-cause ED visits of 1.17 (95% CI: 1.12, 1.21) relative to hospital-specific minimum morbidity temperature. Associations were more pronounced for ED visits due to heat-related illness including dehydration and electrolyte disorders (RR = 1.83; 95% CI: 1.31, 2.57), bacterial enteritis (1.35; 95% CI: 1.02, 1.79), and otitis media and externa (1.30; 95% CI: 1.11, 1.52). Taken together, temperatures above the minimum morbidity temperature accounted for an estimated 11.8% [95% empirical 95% confidence interval (eCI): 9.9%, 13.3%] of warm season ED visits for any cause and 31.0% (95% eCI: 17.9%, 36.5%) of ED visits for heat-related illnesses.
CONCLUSION: During the warm season, days with higher temperatures were associated with higher rates of visits to children's hospital EDs. Higher ambient temperatures may contribute to a significant proportion of ED visits among U.S. children and adolescents.
<https://doi.org/10.1289/EHP8083>.
15. **Prenatal Exposure to Air Pollution and Autism Spectrum Disorder: Sensitive Windows of Exposure and Sex Differences.** Rahman MM et al. *Environ Health Perspect.* 2022 Jan;130(1):17008. doi: 10.1289/EHP9509. Epub 2022 Jan 18.

<https://ehp.niehs.nih.gov/doi/full/10.1289/EHP9509>

RESULTS: There were 5,694 ASD diagnoses (4,636 boys, 1,058 girls). Sensitive PM_{2.5} exposure windows associated with ASD were found early in pregnancy, statistically significant throughout the first two trimesters [1-27 wk of gestation, cumulative hazard ratio (HR) = 1.14 [95% confidence interval (CI): 1.06, 1.23] per interquartile range (IQR) (7.4- $\mu\text{g}/\text{m}^3$) increase]. O₃ exposure during 34-37 wk of gestation was associated with increased risk [HR = 1.06 (95% CI: 1.01, 1.11) per IQR (17.4 ppb) increase] but with reduced risk during 20-28 wk of gestation [HR = 0.93 (95% CI: 0.89, 0.98)]. No associations were observed with NO₂. Sex-stratified early gestational PM_{2.5} associations were stronger among boys [boys HR = 1.16 (95% CI: 1.08, 1.26); girls HR = 1.06 (95% CI: 0.89, 1.26)]. O₃ associations in later gestation were observed only in boys [boys HR = 1.10 (95% CI: 1.04, 1.16); girls HR = 0.94 (95% CI: 0.84, 1.05)].

CONCLUSIONS: Exposures to PM_{2.5} in the first two gestational trimesters were associated with increased ASD risk in children, with stronger associations observed for boys. The role of O₃ exposure on ASD risk merits further investigation. <https://doi.org/10.1289/EHP9509>.

16. **Environmental Exposures and Congenital Heart Disease.** Boyd R, McMullen H, Beqaj H, Kalfa D. *Pediatrics*. 2022 Jan 1;149(1):e2021052151. doi: 10.1542/peds.2021-052151.

<https://publications.aap.org/pediatrics/article/149/1/e2021052151/183839/Environmental-Exposures-and-Congenital-Heart>

Congenital heart disease (CHD) is the most common congenital abnormality worldwide, affecting 8 to 12 infants per 1000 births globally and causing >40% of prenatal deaths. However, its causes remain mainly unknown, with only up to 15% of CHD cases having a determined genetic cause. Exploring the complex relationship between genetics and environmental exposures is key in understanding the multifactorial nature of the development of CHD. Multiple population-level association studies have been conducted on maternal environmental exposures and their association with CHD, including evaluating the effect of maternal disease, medication exposure, environmental pollution, and tobacco and alcohol use on the incidence of CHD. However, these studies have been done in a siloed manner, with few examining the interplay between multiple environmental exposures. Here, we broadly and qualitatively review the current literature on maternal and paternal prenatal exposures and their association with CHD. We propose using the framework of the emerging field of the exposome, the environmental complement to the genome, to review all internal and external prenatal environmental exposures and identify potentiating or alleviating synergy between exposures. Finally, we propose mechanistic pathways through which susceptibility to development of CHD may be induced via the totality of prenatal environmental exposures, including the interplay between placental and cardiac development and the internal vasculature and placental morphology in early stages of pregnancy.

WE ACT

17. **The double-edged sword of cardiac surgical care: rethinking sustainability in an ever-growing field.** Chan VF, Vervoort D. *Eur J Cardiothorac Surg*. 2022 Jan 22:ezab531. doi: 10.1093/ejcts/ezab531. Online ahead of print.

Cardiac surgical operations are life-saving but very resource intensive. To understand the environmental impact of cardiac surgical procedures, Grinberg et al. [1] performed an eco-audit in their institution. They found that a single operation had an average emission of 124.3 kg CO₂ equivalents and global warming equivalent of a 1080-km single-passenger plane ride. These findings highlight the need for strategies to improve the environmental sustainability in cardiac surgery.

18. Sustainability of Heating, Ventilation and Air-Conditioning (HVAC) Systems in Buildings-An

Overview. Asim N, Badii M, Mohammad M, Razali H, Rajabi A, Chin Haw L, Jameelah Ghazali M. Int J Environ Res Public Health. 2022 Jan 17;19(2):1016. doi: 10.3390/ijerph19021016.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8776175/>

Increasing demand on heating, ventilation, and air-conditioning (HVAC) systems and their importance, as the respiratory system of buildings, in developing and spreading various microbial contaminations and diseases with their huge global energy consumption share have forced researchers, industries, and policymakers to focus on improving the sustainability of HVAC systems. Understanding and considering various parameters related to the sustainability of new and existing HVAC systems as the respiratory system of buildings are vital to providing healthy, energy-efficient, and economical options for various building types. However, the greatest opportunities for improving the sustainability of HVAC systems exist at the design stage of new facilities and the retrofitting of existing equipment. Considering the high available percentage of existing HVAC systems globally reveals the importance of their retrofitting. The attempt has been made to gather all important parameters that affect decision-making to select the optimum HVAC system development considerations among the various opportunities that are available for sustainability improvement.

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[Scanning the Planet: Radiology's Grand Opportunity to Address Climate Change.](#) Arepally A, Omary RA, Vandenberg MP. J Am Coll Radiol. 2022 Jan;19(1 Pt B):217-219. doi: 10.1016/j.jacr.2021.08.031.

[Uniting the Global Gastroenterology Community to Meet the Challenge of Climate Change and Non-Recyclable Waste.](#) Leddin D et al. Gastroenterology. 2021 Nov;161(5):1354-1360. doi: 10.1053/j.gastro.2021.08.001.

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