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COVID-19

1. **One Health: EAACI Position Paper on coronaviruses at the human-animal interface, with a specific focus on comparative and zoonotic aspects of SARS-Cov-2.** Korath ADJ, Janda J, Untersmayr E, Sokolowska M, Feleszko W, Agache I, Adel Seida A, Hartmann K, Jensen-Jarolim E, Pali-Schöll I. Allergy. 2021 Jun 28. doi: 10.1111/all.14991. Online ahead of print.

<https://onlinelibrary.wiley.com/doi/full/10.1111/all.14991>

The latest outbreak of a coronavirus disease in 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), evolved into a worldwide pandemic with massive effects on health, quality of life, and economy. Given the short period of time since the outbreak, there are several knowledge gaps on the comparative and zoonotic aspects of this new virus. Within the One Health concept, the current EAACI position paper dwells into the current knowledge on SARS-CoV-2's receptors, symptoms, transmission routes for human and animals living in close vicinity to each other, usefulness of animal models to study this disease and management options to avoid intra- and interspecies transmission. Similar pandemics might appear unexpectedly and more frequently in the near future due to climate change, consumption of exotic foods and drinks, globe-trotter travel possibilities, the growing world population, the decreasing production space, declining room for wildlife and free-ranging animals, and the changed lifestyle including living very close to animals. Therefore, both the society and the health authorities need to be aware and well prepared for similar future situations, and research needs to focus on prevention and fast development of treatment options (medications, vaccines).

2. **COVID-19's Impact on American Women's Food Insecurity Foreshadows Vulnerabilities to Climate Change.** Belsey-Priebe M, Lyons D, Buonocore JJ. Int J Environ Res Public Health. 2021 Jun 26;18(13):6867. doi: 10.3390/ijerph18136867.

<https://www.mdpi.com/1660-4601/18/13/6867>

The COVID-19 pandemic is wreaking havoc on human lives and the global economy, laying bare existing inequities, and galvanizing large numbers to call for change. Women are feeling the effects of this crisis more than others. This paper explores the pre-COVID relationships and amplified negative feedback loops between American women's economic insecurity, lack of safety, and food insecurity. We then examine how COVID-19 is interacting with these intersecting risks and demonstrate how climate change will likely similarly intensify these feedback loops. The COVID-19 pandemic may be revealing vulnerabilities that societies will face in the wake of an increasingly warming world. It is also an opportunity to build resilience, inclusiveness, and equity into our future, and can help inform how to include gender equity in both COVID-19 and climate recovery policies. Finally, we identify possible strategies to build resilience, specifically highlighting that gendered economic empowerment may create a buffer against environmental health hazards and discuss how these strategies could be integrated into a women-centered Green New Deal.

3. **Environmental impacts of coronavirus disease 2019 (COVID-19).** Singh V, Mishra V. *Bioresour Technol Rep.* 2021 Sep;15:100744. doi: 10.1016/j.biteb.2021.100744. Epub 2021 Jun 25. <https://www.sciencedirect.com/science/article/pii/S2589014X21001225>
The coronavirus disease (COVID-19), a variant of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) originated in Wuhan city of China and has now transmitted over the world. Till the April 24, 2020, nearly 144,367,284 confirmed positive cases with 3,066,270 deaths worldwide. The recent studies have reported that SARS-CoV-2 is transmitted through respiratory droplets. Several vaccines are available now. However, the vaccination process has not completed yet. Worldwide lockdown was initiated to restrict gathering, transport and industrial activities. Lockdown due to COVID-19 showed reduction in environmental pollution. The quality of air and water improved in metro cities and in rivers during COVID-19. This review not only provides the updated information related to impact of COVID-19 on air, water and noise pollution, generation of biomedical waste and global environmental sustainable development but also it covers the basic mechanism of COVID-19 transmission.
4. **The COVID-19 pandemic and single-use plastic waste in households: A preliminary study.** Leal Filho W, Salvia AL, Minhas A, Paço A, Dias-Ferreira C. *Sci Total Environ.* 2021 Jun 21;793:148571. doi: 10.1016/j.scitotenv.2021.148571. Online ahead of print. <https://www.sciencedirect.com/science/article/pii/S0048969721036433>
The Coronavirus pandemic promoted an unprecedented change in consumption habits, especially as lockdowns contributed to the increase in online shopping and in delivery services. One of the consequences is the substantial amounts of plastic waste produced, which can undermine the efforts to reduce plastic pollution. In this context, this commentary explores, as a preliminary study, the impacts of the Coronavirus pandemic in relation to single-use plastic waste in households by means of an international survey with 202 participants distributed over 41 countries worldwide.
5. **Eco-friendly vaccination: Tackling an unforeseen adverse effect.** Phadke R, Dos Santos Costa AC, Dapke K, Ghosh S, Ahmad S, Tsagkaris C, Raiya S, Maheswari MS, Essar MY, Ahmad S. *J Clim Chang Health.* 2021 Mar;1:100005. doi: 10.1016/j.joclim.2021.100005. Epub 2021 Mar 19.

<https://www.sciencedirect.com/science/article/pii/S2667278221000031>

The beginning of 2021 was marked by COVID-19 vaccination campaigns worldwide. The pace of production has been accelerated, in order to meet global needs and achieve the desired levels of immunization of the general population against COVID-19 within the year. Several debatable aspects of this endeavor, from logistics to health promotion have been addressed so far. However, the environmental repercussions of plastic syringes used for massive COVID-19 vaccinations are yet to be discussed. This article delves into the impact of the increasing medical waste, associated with massive COVID-19 vaccination on the environment, citing the practices followed and its possible solutions. The increasing production of nonbiodegradable materials is inevitably going to affect the world we live in. Moreover, this article highlights the importance of developing sustainable methods of vaccination and disposal, providing examples and evidence based recommendations. Along with educating the unaware proportion of the population, there is a need to develop sustainable and recyclable products for a better tomorrow.

6. **Association Between Air Pollution and Acute Coronary Syndromes During Lockdown for COVID-19: Results From the Terni Hub Center.** Arrivi A, Dominici M, Bier N, Truglio M, Vaudo G, Pucci G. *Front Public Health.* 2021 Jun 24;9:683683. doi: 10.3389/fpubh.2021.683683. eCollection 2021.

<https://www.frontiersin.org/articles/10.3389/fpubh.2021.683683/full>

Background: During the lockdown for COVID-19, a massive decrease in hospital admissions for acute coronary syndrome (ACS) and a drop in air pollution were both detected in Italy. Our aim was to investigate the possible association between these two events at the Province of Terni, one of the most polluted urban and industrial area in Central Italy. Methods: We analyzed data of daily 24-h urban air concentrations of particulate matter (PM)₁₀ and PM_{2.5} from fixed station monitoring network located in the main city centers of the Terni province, and accesses for ACS at the catheterization laboratory of the Cardiological Hub Center of the Terni University Hospital during lockdown. A comparison was made with data corresponding to the same lockdown time period of years 2019, 2018, and 2017. Results: Invasive procedures for ACS decreased in 2020 (n = 49) as compared with previous years (n = 93 in 2019, n = 109 in 2018, and n = 89 in 2017, p < 0.001). Conversely, reductions in average PM₁₀ (20.7 µg/m³) and PM_{2.5} (14.7 µg/m³) in 2020 were consistent with a long-term decreasing trend, being comparable to those recorded in 2019 and 2018 (all p > 0.05) and slightly lower than 2017 (p < 0.05). The Granger-causality test demonstrated the lack of association between time-varying changes in air pollution and the number of procedures for ACS. Conclusions: Our results did not support the hypothesis that reduction in invasive procedures for ACS during lockdown was linked to an air cleaning effect. Reasons other than reduced air pollution should be sought to explain the observed decrease in ACS procedures.

7. **Investigating similarities and differences in individual reactions to the COVID-19 pandemic and the climate crisis.** Geiger N, Gore A, Squire CV, Attari SZ. *Clim Change.* 2021;167(1-2):1. doi: 10.1007/s10584-021-03143-8. Epub 2021 Jul 2.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8253462/>

How can individuals' responses to the coronavirus disease-19 (COVID-19) pandemic be used to inform constructive responses for climate action? We present an exploratory, mixed-methods investigation (N = 1784 US adults) into similarities and differences in individuals' reactions to COVID-19 and climate change in June 2020. Participants identified many similarities between the issues, indicating that both are harmful to public health, politically polarizing, have global impacts, and have solutions. Participants also perceived many differences between the two threats: many perceived COVID-19 as medical, natural, and on a shorter timescale, while many perceived climate change as environmental, human caused, and on a longer timescale. Emotional reactions to each topic predict topic-relevant behaviors, but more strongly, and with a broader range of emotional reactions, for climate change than COVID-19. Open-ended responses show that hope was elicited for both issues in response to contemplating taking collective and individual actions, and despair was elicited for both issues in response to perceiving that others do not take the issues seriously. Finally, participants perceived that they were engaging in relatively more COVID-19 mitigation behaviors and some climate change mitigation behaviors than others (i.e., the "better-than-average" effect). Many participants believed others were relatively unconcerned about both threats because of the invisibility of the threats, ignorance, and elite cues (e.g., then-President Trump downplaying the threat).

Health Impacts of Climate Change

8. **A global child health perspective on climate change, migration and human rights.** Uddin R, Philipsborn R, Smith D, Mutic A, Thompson LM. *Curr Probl Pediatr Adolesc Health Care*. 2021 Jul 6:101029. doi: 10.1016/j.cppeds.2021.101029. Online ahead of print.

<https://www.clinicalkey.com/#!/content/journal/1-s2.0-S1538544221000845>

Current indicators of anthropogenic climate change are foreboding and demand immediate collaborative action and policy change to reduce carbon emissions rapidly. Human and environmental effects of climate change are already widespread. Large-scale disruptive disasters and weather-related events have downstream and cascading effects on livelihoods, national economies, population health and global human rights. These effects create human displacement and migration crises with far-reaching implications for children. Displacement and migration, both within and across national borders, have sequelae for the physical and mental health of children. Young children are vulnerable-both physiologically and developmentally immature-and dependent on others for safety and resources. They also are least responsible for the climate crisis. Child health threats stemming from displacement and migration exemplify questions of social and intergenerational injustice inherent in the climate crisis. Pediatric health care providers are increasingly called upon to care for children and ensure access to care for children who have experienced displacement from climate change, even as dire predictions for the future are escalating climate adaptation efforts. Pediatric health care providers have a role in these efforts-to identify and advocate for those children most at risk from climate change and to bolster clinical care and education strategies to prevent harm to our patients and children. This paper provides a global perspective on climate change for pediatric providers, including how climate change reflects and reinforces colonial legacies that harm child health. We provide action steps for those providers who care for children who have been displaced in the U.S. and who advocate for children's health globally.

9. **Exposure to air pollution and incidence of atopic dermatitis in the general population: A national population-based retrospective cohort study.** Park SK, Kim JS, Seo HM. *J Am Acad Dermatol.* 2021 Jul 6:S0190-9622(21)02066-1. doi: 10.1016/j.jaad.2021.05.061. Online ahead of print.

[https://www.jaad.org/article/S0190-9622\(21\)02066-1/fulltext](https://www.jaad.org/article/S0190-9622(21)02066-1/fulltext)

BACKGROUND: To date, there is little evidence to determine whether atopic dermatitis (AD) can be caused by exposure to air pollutants including gases and particulate matter (PM).

OBJECTIVE: We aimed to evaluate the relationship between air pollutants and incidence of AD using the National Health Insurance Service-National Sample Cohort (NHIS-NSC) database.

METHODS: We included 209,168 subjects from the general population previously not diagnosed with AD from 2008 to 2013. Long-term average concentration of air pollutants before diagnosis was calculated for each subject.

RESULTS: For 1,030,324 person-years, incident case of AD was observed in 3,203 subjects.

There was a significant positive association between incidence of AD and long-term average concentration of PM_{2.5} [HR=1.420 (95% CI 1.392-1.448) for 1 µg/m³], PM₁₀ [HR=1.333 (95% CI 1.325-1.341) for 1 µg/m³], SO₂ [HR=1.626 (95% CI 1.559-1.695) for 1 ppb], NO₂ [HR=1.200 (95% CI 1.187-1.212) for 1 ppb], and CO [HR=1.005 (95% CI 1.004-1.005) for 1 ppb] after adjusting for age, sex, income, comorbid diseases and meteorological variables.

LIMITATIONS: The NHIS database lacks detailed information on individual subjects.

CONCLUSIONS: This study demonstrated that long-term exposure to air pollutants including gases and particulate matter is an independent risk factor for developing AD.

10. **Short-term exposure to PM(2.5) components and renal health: Findings from the Veterans Affairs Normative Aging Study.** Gao X, Koutrakis P, Coull B, Lin X, Vokonas P, Schwartz J, Baccarelli AA. *J Hazard Mater.* 2021 Jul 3;420:126557. doi: 10.1016/j.jhazmat.2021.126557. Online ahead of print.

There is little evidence on the short-term impact of fine particulate matter (PM_{2.5}) on renal health, and the potential interactions and various influences of PM_{2.5} components on renal health have not been examined. We investigated whether short-term (≤28 days) ambient PM_{2.5} and 15 PM_{2.5} components were associated with serum uric acid (SUA), blood urea nitrogen (BUN), estimated glomerular filtration rate (eGFR), and odds of incident chronic kidney disease (CKD) using both mixed-effect and Bayesian kernel machine regression (BKMR) models in the Normative Aging Study. This analysis included 2466 study visits from 808 older males enrolled during 1998-2016 with available data. BKMR showed positive relationships of PM_{2.5} mixture with SUA and odds of CKD, and an inverse relationship with eGFR. In the 28-day exposure window, an interquartile range (IQR) increase in vanadium was associated with a 0.244-mg/dL higher SUA. IQR increases in sulfur and lead were associated with a 1.281- and 1.008-mL/min/1.73 m² decrease in eGFR, respectively. The same change in sulfur was also associated with a 39% higher odds of CKD. Our findings provide solid evidence supporting short-term adverse effects of PM_{2.5} on renal health and further highlight that components from oil combustion and regional pollution may be major contributors.

11. **The global threat from plastic pollution.** MacLeod M, Arp HPH, Tekman MB, Jahnke A. *Science*. 2021 Jul 2;373(6550):61-65. doi: 10.1126/science.abg5433.

<https://science.sciencemag.org/content/373/6550/61>

Plastic pollution accumulating in an area of the environment is considered "poorly reversible" if natural mineralization processes occurring there are slow and engineered remediation solutions are improbable. Should negative outcomes in these areas arise as a consequence of plastic pollution, they will be practically irreversible. Potential impacts from poorly reversible plastic pollution include changes to carbon and nutrient cycles; habitat changes within soils, sediments, and aquatic ecosystems; co-occurring biological impacts on endangered or keystone species; ecotoxicity; and related societal impacts. The rational response to the global threat posed by accumulating and poorly reversible plastic pollution is to rapidly reduce plastic emissions through reductions in consumption of virgin plastic materials, along with internationally coordinated strategies for waste management.

12. **Plastic ingestion as an evolutionary trap: Toward a holistic understanding.** Santos RG, Machovsky-Capuska GE, Andrades R. *Science*. 2021 Jul 2;373(6550):56-60. doi: 10.1126/science.abh0945.

Human activities are changing our environment. Along with climate change and a widespread loss of biodiversity, plastic pollution now plays a predominant role in altering ecosystems globally. Here, we review the occurrence of plastic ingestion by wildlife through evolutionary and ecological lenses and address the fundamental question of why living organisms ingest plastic. We unify evolutionary, ecological, and cognitive approaches under the evolutionary trap theory and identify three main factors that may drive plastic ingestion: (i) the availability of plastics in the environment, (ii) an individual's acceptance threshold, and (iii) the overlap of cues given by natural foods and plastics.

13. **Estimating the Acute Health Impacts of Fire-Originated PM_{2.5} Exposure During the 2017 California Wildfires: Sensitivity to Choices of Inputs.** Cleland SE, Serre ML, Rappold AG, West JJ. *Geohealth*. 2021 Jul 1;5(7):e2021GH000414. doi: 10.1029/2021GH000414. eCollection 2021 Jul.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8247531/>

Exposure to wildfire smoke increases the risk of respiratory and cardiovascular hospital admissions. Health impact assessments, used to inform decision-making processes, characterize the health impacts of environmental exposures by combining preexisting epidemiological concentration-response functions (CRFs) with estimates of exposure. These two key inputs influence the magnitude and uncertainty of the health impacts estimated, but for wildfire-related impact assessments the extent of their impact is largely unknown. We first estimated the number of respiratory, cardiovascular, and asthma hospital admissions attributable to fire-originated PM_{2.5} exposure in central California during the October 2017 wildfires, using Monte Carlo simulations to quantify uncertainty with respect to the exposure and epidemiological inputs. We next conducted sensitivity analyses, comparing four estimates of fire-originated PM_{2.5} and two CRFs, wildfire and nonwildfire specific, to understand their impact on the estimation of excess admissions and sources of uncertainty. We estimate the fires accounted for an excess 240 (95% CI: 114, 404) respiratory, 68 (95% CI: -10, 159) cardiovascular, and 45 (95% CI: 18, 81) asthma hospital admissions, with 56% of admissions occurring in the Bay Area.

Although differences between impact assessment methods are not statistically significant, the admissions estimates' magnitude is particularly sensitive to the CRF specified while the uncertainty is most sensitive to estimates of fire-originated PM_{2.5}. Not accounting for the exposure surface's uncertainty leads to an underestimation of the uncertainty of the health impacts estimated. Employing context-specific CRFs and using accurate exposure estimates that combine multiple data sets generates more certain estimates of the acute health impacts of wildfires.

14. **Projecting the risk of mosquito-borne diseases in a warmer and more populated world: a multi-model, multi-scenario intercomparison modelling study.** Colón-González FJ, Sewe MO, Tompkins AM, Sjödin H, Casallas A, Rocklöv J, Caminade C, Lowe R. *Lancet Planet Health*. 2021 Jul;5(7):e404-e414. doi: 10.1016/S2542-5196(21)00132-7.

[https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(21\)00132-7/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(21)00132-7/fulltext)

BACKGROUND: Mosquito-borne diseases are expanding their range, and re-emerging in areas where they had subsided for decades. The extent to which climate change influences the transmission suitability and population at risk of mosquito-borne diseases across different altitudes and population densities has not been investigated. The aim of this study was to quantify the extent to which climate change will influence the length of the transmission season and estimate the population at risk of mosquito-borne diseases in the future, given different population densities across an altitudinal gradient.

METHODS: Using a multi-model multi-scenario framework, we estimated changes in the length of the transmission season and global population at risk of malaria and dengue for different altitudes and population densities for the period 1951-99. We generated projections from six mosquito-borne disease models, driven by four global circulation models, using four representative concentration pathways, and three shared socioeconomic pathways.

FINDINGS: We show that malaria suitability will increase by 1.6 additional months (mean 0.5, SE 0.03) in tropical highlands in the African region, the Eastern Mediterranean region, and the region of the Americas. Dengue suitability will increase in lowlands in the Western Pacific region and the Eastern Mediterranean region by 4.0 additional months (mean 1.7, SE 0.2). Increases in the climatic suitability of both diseases will be greater in rural areas than in urban areas. The epidemic belt for both diseases will expand towards temperate areas. The population at risk of both diseases might increase by up to 4.7 additional billion people by 2070 relative to 1970-99, particularly in lowlands and urban areas.

INTERPRETATION: Rising global mean temperature will increase the climatic suitability of both diseases particularly in already endemic areas. The predicted expansion towards higher altitudes and temperate regions suggests that outbreaks can occur in areas where people might be immunologically naive and public health systems unprepared. The population at risk of malaria and dengue will be higher in densely populated urban areas in the WHO African region, South-East Asia region, and the region of the Americas, although we did not account for urban-heat island effects, which can further alter the risk of disease transmission.

FUNDING: UK Space Agency, Royal Society, UK National Institute for Health Research, and Swedish Research Council.

- 15. Ambient particulate matter air pollution is associated with increased risk of papillary thyroid cancer.** Karzai S, Zhang Z, Sutton W, Prescott J, Segev DL, McAdams-DeMarco M, Biswal SS, Ramanathan M Jr, Mathur A. *Surgery*. 2021 Jun 28;S0039-6060(21)00415-3. doi: 10.1016/j.surg.2021.05.002. Online ahead of print.
- BACKGROUND:** The association between exposure to air pollution and papillary thyroid carcinoma is unknown. We sought to estimate the relationship between long-term exposure to the fine (diameter <2.5 μm) particulate matter component of air pollution and the risk of papillary thyroid cancer.
- METHODS:** Adult (age ≥ 18) patients with newly diagnosed papillary thyroid carcinoma between January 1, 2013 and December 31, 2016 across a single health system were identified using electronic medical records. Data from 1,990 patients with papillary thyroid carcinoma were compared with 3,980 age- and sex-matched control subjects without any evidence of thyroid disease. Cumulative fine (diameter <2.5 μm) particulate matter exposure was estimated by incorporating patients' residential zip codes into a deep learning neural networks model, which uses both meteorological and satellite-based measurements. Conditional logistic regression was performed to assess for association between papillary thyroid carcinoma and increasing fine (diameter <2.5 μm) particulate matter concentrations over 1, 2, and 3 years of cumulative exposure preceding papillary thyroid carcinoma diagnosis.
- RESULTS:** Increased odds of developing papillary thyroid carcinoma was associated with a 5 $\mu\text{g}/\text{m}^3$ increase of fine (diameter <2.5 μm) particulate matter concentrations over 2 years (adjusted odds ratio = 1.18, 95% confidence interval: 1.00-1.40) and 3 years (adjusted odds ratio = 1.23, 95% confidence interval: 1.05-1.44) of exposure. This risk differed by smoking status (pinteraction = 0.04). Among current smokers (n = 623), the risk of developing papillary thyroid carcinoma was highest (adjusted odds ratio = 1.35, 95% confidence interval: 1.12-1.63).
- CONCLUSION:** Increasing concentration of fine (diameter <2.5 μm) particulate matter in air pollution is significantly associated with the incidence of papillary thyroid carcinoma with 2 and 3 years of exposure. Our novel findings provide additional insight into the potential associations between risk factors and papillary thyroid carcinoma and warrant further investigation, specifically in areas with high levels of air pollution both nationally and internationally.

- 16. Why We Will Continue to Lose Our Battle with Cancers if We Do Not Stop Their Triggers from Environmental Pollution.** Cazzolla Gatti R. *Int J Environ Res Public Health*. 2021 Jun 5;18(11):6107. doi: 10.3390/ijerph18116107. <https://www.mdpi.com/1660-4601/18/11/6107>
- Besides our current health concerns due to COVID-19, cancer is a longer-lasting and even more dramatic pandemic that affects almost a third of the human population worldwide. Most of the emphasis on its causes has been posed on genetic predisposition, chance, and wrong lifestyles (mainly, obesity and smoking). Moreover, our medical weapons against cancers have not improved too much during the last century, although research is in progress. Once diagnosed with a malignant tumour, we still rely on surgery, radiotherapy, and chemotherapy. The main problem is that we have focused on fighting a difficult battle instead of preventing it by controlling its triggers. Quite the opposite, our knowledge of the links between environmental pollution and cancer has surged from the 1980s. Carcinogens in water, air, and soil have continued to accumulate disproportionately and grow in number and dose, bringing us to today's

carnage. Here, a synthesis and critical review of the state of the knowledge of the links between cancer and environmental pollution in the three environmental compartments is provided, research gaps are briefly discussed, and some future directions are indicated. New evidence suggests that it is relevant to take into account not only the dose but also the time when we are exposed to carcinogens. The review ends by stressing that more dedication should be put into studying the environmental causes of cancers to prevent and avoid curing them, that the precautionary approach towards environmental pollutants must be much more reactionary, and that there is an urgent need to leave behind the outdated petrochemical-based industry and goods production.

- 17. Particulate matter air pollutants and cardiovascular disease: Strategies for intervention.** Aryal A, Harmon AC, Dugas TR. *Pharmacol Ther.* 2021 Jul;223:107890. doi: 10.1016/j.pharmthera.2021.107890. Epub 2021 May 14.

Air pollution is consistently linked with elevations in cardiovascular disease (CVD) and CVD-related mortality. Particulate matter (PM) is a critical factor in air pollution-associated CVD. PM forms in the air during the combustion of fuels as solid particles and liquid droplets and the sources of airborne PM range from dust and dirt to soot and smoke. The health impacts of PM inhalation are well documented. In the US, where CVD is already the leading cause of death, it is estimated that PM_{2.5} (PM < 2.5 µm in size) is responsible for nearly 200,000 premature deaths annually. Despite the public health data, definitive mechanisms underlying PM-associated CVD are elusive. However, evidence to-date implicates mechanisms involving oxidative stress, inflammation, metabolic dysfunction and dyslipidemia, contributing to vascular dysfunction and atherosclerosis, along with autonomic dysfunction and hypertension. For the benefit of susceptible individuals and individuals who live in areas where PM levels exceed the National Ambient Air Quality Standard, interventional strategies for mitigating PM-associated CVD are necessary. This review will highlight current state of knowledge with respect to mechanisms for PM-dependent CVD. Based upon these mechanisms, strategies for intervention will be outlined. Citing data from animal models and human subjects, these highlighted strategies include: 1) antioxidants, such as vitamins E and C, carnosine, sulforaphane and resveratrol, to reduce oxidative stress and systemic inflammation; 2) omega-3 fatty acids, to inhibit inflammation and autonomic dysfunction; 3) statins, to decrease cholesterol accumulation and inflammation; 4) melatonin, to regulate the immune-pineal axis and 5) metformin, to address PM-associated metabolic dysfunction. Each of these will be discussed with respect to its potential role in limiting PM-associated CVD.

- 18. Scientists' warning on extreme wildfire risks to water supply.** Robinne FN, Hallema DW, Bladon KD, Flannigan MD, Boisramé G, Bréthaut CM, Doerr SH, Di Baldassarre G, Gallagher LA, Hohner AK, Khan SJ, Kinoshita AM, Mordecai R, Nunes JP, Nyman P, Santín C, Sheridan G, Stoof CR, Thompson MP, Waddington JM, Wei Y. *Hydrol Process.* 2021 May;35(5):e14086. doi: 10.1002/hyp.14086. Epub 2021 May 16.

<https://onlinelibrary.wiley.com/doi/full/10.1002/hyp.14086>

2020 is the year of wildfire records. California experienced its three largest fires early in its fire season. The Pantanal, the largest wetland on the planet, burned over 20% of its surface. More than 18 million hectares of forest and bushland burned during the 2019-2020 fire season in

Australia, killing 33 people, destroying nearly 2500 homes, and endangering many endemic species. The direct cost of damages is being counted in dozens of billion dollars, but the indirect costs on water-related ecosystem services and benefits could be equally expensive, with impacts lasting for decades. In Australia, the extreme precipitation ("200 mm day⁻¹ in several locations") that interrupted the catastrophic wildfire season triggered a series of watershed effects from headwaters to areas downstream. The increased runoff and erosion from burned areas disrupted water supplies in several locations. These post-fire watershed hazards via source water contamination, flash floods, and mudslides can represent substantial, systemic long-term risks to drinking water production, aquatic life, and socio-economic activity. Scenarios similar to the recent event in Australia are now predicted to unfold in the Western USA. This is a new reality that societies will have to live with as uncharted fire activity, water crises, and widespread human footprint collide all-around of the world. Therefore, we advocate for a more proactive approach to wildfire-watershed risk governance in an effort to advance and protect water security. We also argue that there is no easy solution to reducing this risk and that investments in both green (i.e., natural) and grey (i.e., built) infrastructure will be necessary. Further, we propose strategies to combine modern data analytics with existing tools for use by water and land managers worldwide to leverage several decades worth of data and knowledge on post-fire hydrology.

19. **The Air We Breathe: Air Pollution as a Prevalent Proinflammatory Stimulus Contributing to Neurodegeneration.** Jankowska-Kieltyka M, Roman A, Nalepa I. *Front Cell Neurosci.* 2021 Jun 24;15:647643. doi: 10.3389/fncel.2021.647643. eCollection 2021.

<https://www.frontiersin.org/articles/10.3389/fncel.2021.647643/full>

Air pollution is regarded as an important risk factor for many diseases that affect a large proportion of the human population. To date, accumulating reports have noted that particulate matter (PM) is closely associated with the course of cardiopulmonary disorders. As the incidence of Alzheimer's disease (AD), Parkinson's disease (PD), and autoimmune disorders have risen and as the world's population is aging, there is an increasing interest in environmental health hazards, mainly air pollution, which has been slightly overlooked as one of many plausible detrimental stimuli contributing to neurodegenerative disease onset and progression. Epidemiological studies have indicated a noticeable association between exposure to PM and neurotoxicity, which has been gradually confirmed by in vivo and in vitro studies. After entering the body directly through the olfactory epithelium or indirectly by passing through the respiratory system into the circulatory system, air pollutants are subsequently able to reach the brain. Among the potential mechanisms underlying particle-induced detrimental effects in the periphery and the central nervous system (CNS), increased oxidative stress, inflammation, mitochondrial dysfunction, microglial activation, disturbance of protein homeostasis, and ultimately, neuronal death are often postulated and concomitantly coincide with the main pathomechanisms of neurodegenerative processes. Other complementary mechanisms by which PM could mediate neurotoxicity and contribute to neurodegeneration remain unconfirmed. Furthermore, the question of how strong and proven air pollutants are as substantial adverse factors for neurodegenerative disease etiologies remains unsolved. This review highlights research advances regarding the issue of PM with an emphasis on neurodegeneration markers, symptoms, and mechanisms by which air pollutants could mediate

damage in the CNS. Poor air quality and insufficient knowledge regarding its toxicity justify conducting scientific investigations to understand the biological impact of PM in the context of various types of neurodegeneration.

20. **Particulate Air Pollution and Osteoporosis: A Systematic Review.** Pang KL, Ekeuku SO, Chin KY. Risk Manag Healthc Policy. 2021 Jun 24;14:2715-2732. doi: 10.2147/RMHP.S316429. eCollection 2021.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8238075/>

Air pollution is associated with inflammation and oxidative stress, which predispose to several chronic diseases in human. Emerging evidence suggests that the severity and progression of osteoporosis are directly associated with inflammation induced by air pollutants like particulate matter (PM). This systematic review examined the relationship between PM and bone health or fractures. A comprehensive literature search was conducted from January until February 2021 using the PubMed, Scopus, Web of Science, Google Scholar and Cochrane Library databases. Human cross-sectional, cohort and case-control studies were considered. Of the 1500 papers identified, 14 articles were included based on the inclusion and exclusion criteria. The air pollution index investigated by most studies were PM_{2.5} and PM₁₀. Current studies demonstrated inconsistent associations between PM and osteoporosis risk or fractures, which may partly due to the heterogeneity in subjects' characteristics, study design and analysis. In conclusion, there is an inconclusive relationship between osteoporosis risk and fracture and PM exposures which require further validation.

21. **Air Pollution and Emergency Department Visits for Disease of the Genitourinary System.**

Szyszkowicz M, Schoen S, de Angelis N. Environ Health Insights. 2021 Jun 16;15:11786302211025360. doi: 10.1177/11786302211025360. eCollection 2021.

<https://journals.sagepub.com/doi/full/10.1177/11786302211025360>

The aim of this study is to determine associations between ambient air pollution and the number of emergency department (ED) visits for diseases of the genitourinary tract in Toronto, Canada. We used the National Ambulatory Care Reporting System (NACRS) database to obtain the related ED visits and developed statistical models using daily data on ED visits, temperature, relative humidity, and outdoor air pollution concentration levels. The NACRS database contains data on hospital-based and community-based ambulatory care. The environmental data were retrieved from the National Air Pollution Surveillance (NAPS) program. The NAPS is the main source of ambient air quality data in Canada. We considered 2 air quality health indexes and 6 air pollutants: daily means of fine particulate matter PM_{2.5}, O₃, CO, NO₂, SO₂, and also maximum 8-hour average ozone. For every air pollutant, we fit 270 models (15 lags × 18 strata). We found that same-day air pollution concentrations have the highest number of statistically significantly positive associations with ED visits for genitourinary health outcomes. A total of 133 positive associations were identified over the 14 days lag. In subgroup (strata) analysis, females older than 60 years of age were found to have the most positive associations. In particular, nitrogen dioxide was found to be highly associated with ED visits for females over 60; an increase in NO₂ was associated with an increased relative risk (RR) of ED visits when lagged over 0, 1, and 2 days (RR = 1.040 [95% confidence interval: 1.028, 1.052], 1.020 [1.009, 1.032], and 1.025 [1.013, 1.036], respectively). The values of risks are reported for a 1

interquartile range increase in concentration (8.8 ppb). Our results suggest that urban ambient air pollution affect the number of ED visits due to genitourinary system conditions.

WE ACT

22. **A pediatrician's guide to climate change-informed primary care.** Philipsborn RP, Cowenhoven J, Bole A, Balk SJ, Bernstein A. *Curr Probl Pediatr Adolesc Health Care*. 2021 Jul 7:101027. doi: 10.1016/j.cppeds.2021.101027. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S1538544221000821>

Despite the urgency of the climate crisis and mounting evidence linking climate change to child health harms, pediatricians do not routinely engage with climate change in the office. Each primary care visit offers opportunities to screen for and support children burdened with risks to health that are increasingly intense due to climate change. Routine promotion of healthy behaviors also aligns with some needed-and powerful-solutions to the climate crisis. For some patients, including those engaged in athletics, those with asthma and allergies, or those with complex healthcare needs, preparedness for environmental risks and disasters worsened by climate change is a critical component of disease prevention and management. For all patients, anticipatory guidance topics that are already mainstays of pediatric best practices are related closely to needed guidance to keep children safe and promote health in the setting of compounding risks due to climate change. By considering climate change in routine care, pediatricians will be updating practice to align with evidence-based literature and better serving patients. This article provides a framework for pediatricians to provide climate-informed primary care during the structure of pediatric well child and other visits.

23. **The intersection of pediatrics, climate change, and structural racism: Ensuring health equity through climate justice.** Gutschow B, Gray B, Ragavan MI, Sheffield PE, Philipsborn RP, Jee SH. *Curr Probl Pediatr Adolesc Health Care*. 2021 Jul 5:101028. doi: 10.1016/j.cppeds.2021.101028. Online ahead of print.

<https://www.clinicalkey.com/#!/content/journal/1-s2.0-S1538544221000833>

Understanding and intervening at the intersection of climate change and child health disparities require pediatric providers to broaden their competency with structural determinants of health - even in the clinic. The environmental effects of climate change at the community level intersect in complex ways with structural racism and social influences of health. Climate injustice is further evident in policies and practices that disproportionately affect low-income communities and communities of color through exposure to harmful pollutants from industrial plants, heavy vehicular traffic, and flooding waterways, as well as to harm from degraded civic infrastructure such as leaking water lines and unsafe bridges. To support child health, pediatric providers must recognize the environmental health harms posed to children and multiplied by climate change as well as identify opportunities to center the voices of families and communities to dismantle these inequities. In this article, three case examples demonstrate the links between structural racism, climate change and child health. We then use a healing centered engagement approach to offer specific suggestions for how pediatric providers can actively promote health and resilience, advocate for patient needs, and contribute to efforts to change structural racism in existing practices and institutions.

24. **Preparing end-stage heart failure patients and care providers in the era of climate change-driven hurricanes.** Alnajar A, Bud Frazier OH, Elgalad A, Smith PA, Shultz JM. *J Card Surg.* 2021 Jul 3. doi: 10.1111/jocs.15784. Online ahead of print.
<https://onlinelibrary.wiley.com/doi/full/10.1111/jocs.15784>
Patients with end-stage congestive heart failure are at elevated risk for harm when extreme storms threaten and strike their communities. Individuals with compromised heart function require customized hurricane protection and preparedness approaches. We provide mitigation strategies for providers and their teams, as well as the patients themselves to ensure their safety and uninterrupted access to healthcare resources and quality care during hurricane impact and in the aftermath.
25. **Operating in a Climate Crisis: A State-of-the-Science Review of Life Cycle Assessment within Surgical and Anesthetic Care.** Drew J, Christie SD, Tyedmers P, Smith-Forrester J, Rainham D. *Environ Health Perspect.* 2021 Jul;129(7):76001. doi: 10.1289/EHP8666. Epub 2021 Jul 12.
<https://ehp.niehs.nih.gov/doi/full/10.1289/EHP8666>
BACKGROUND: Both human health and the health systems we depend on are increasingly threatened by a range of environmental crises, including climate change. Paradoxically, health care provision is a significant driver of environmental pollution, with surgical and anesthetic services among the most resource-intensive components of the health system.
OBJECTIVES: This analysis aimed to summarize the state of life cycle assessment (LCA) practice as applied to surgical and anesthetic care via review of extant literature assessing environmental impacts of related services, procedures, equipment, and pharmaceuticals.
METHODS: A state-of-the-science review was undertaken following a registered protocol and a standardized, LCA-specific reporting framework. Three bibliographic databases (Scopus®, PubMed, and Embase®) and the gray literature were searched. Inclusion criteria were applied, eligible entries critically appraised, and key methodological data and results extracted.
RESULTS: From 1,316 identified records, 44 studies were eligible for inclusion. The annual climate impact of operating surgical suites ranged between 3,200,000 and 5,200,000 kg CO₂e. The climate impact of individual surgical procedures varied considerably, with estimates ranging from 6 to 1,007 kg CO₂e. Anesthetic gases; single-use equipment; and heating, ventilation, and air conditioning system operation were the main emissions hot spots identified among operating room- and procedure-specific analyses. Single-use equipment used in surgical settings was generally more harmful than equivalent reusable items across a range of environmental parameters. Life cycle inventories have been assembled and associated climate impacts calculated for three anesthetic gases (2 - 85 kg CO₂e/MAC-h) and 20 injectable anesthetic drugs (0.01 - 3.0 kg CO₂e/gAPI).
DISCUSSION: Despite the recent proliferation of surgical and anesthesiology-related LCAs, extant studies address a miniscule fraction of the numerous services, procedures, and products available today. Methodological heterogeneity, external validity, and a lack of background life cycle inventory data related to many essential surgical and anesthetic inputs are key limitations of the current evidence base. This review provides an indication of the spectrum of environmental impacts associated with surgical and anesthetic care at various scales.
<https://doi.org/10.1289/EHP8666>.

26. **Assessment of environmental sustainability in renal healthcare.** Nagai K, Suzuki H, Ueda A, Agar JWM, Itsubo N. *J Rural Med.* 2021 Jul;16(3):132-138. doi: 10.2185/jrm.2020-049. Epub 2021 Jul 1.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8249367/>

The health effects of climate change are becoming increasingly important; there are direct effects from heatwaves and floods, and indirect effects from the altered distribution of infectious diseases and changes in crop yield. Ironically, the healthcare system itself carries an environmental burden, contributing to environmental health impacts. Life cycle assessment is a widely accepted and well-established method that quantitatively evaluates environmental impact. Given that monetary evaluations have the potential to motivate private companies and societies to reduce greenhouse gas emissions using market mechanisms, instead of assessing the carbon footprint alone, we previously developed a life cycle impact assessment method based on an endpoint that integrates comprehensive environmental burdens into a single index-the monetary cost. Previous investigations estimated that therapy for chronic kidney disease had a significant carbon footprint in the healthcare sector. We have been aiming to investigate on the environmental impact of chronic kidney disease based on field surveys from the renal department in a hospital and several health clinics in Japan. To live sustainably, it is necessary to establish cultures, practices, and research that aims to conserve resources to provide environmentally friendly healthcare in Japan.

27. **Nursing students' perception of climate change and sustainability actions - A mismatched discourse: A qualitative, descriptive exploratory study.** Anåker A, Spante M, Elf M. *Nurse Educ Today.* 2021 Jun 18;105:105028. doi: 10.1016/j.nedt.2021.105028. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0260691721002859>

BACKGROUND: Climate change is described as the biggest global challenge for human health in the upcoming decade. Nurses play a central role in mitigating the effect of climate change on the healthcare sector and adapting to the phenomenon. Therefore, nursing students must be prepared for a new professional role keeping climate change in mind; consequently, it is important to study students' perceptions of climate change and sustainability.

OBJECTIVES: To explore nursing students' perceptions of climate change and sustainability and examine how they perceive their role as nursing students in working towards a more sustainable development within the healthcare sector.

DESIGN: It is a qualitative, descriptive exploratory study.

SETTINGS: A nursing program at a university in central Sweden.

PARTICIPANTS: Nursing students.

METHODS: Individual in-depth interviews and one group interview were conducted for the study.

RESULTS: The main findings revealed that students saw themselves living in a mismatched discourse. They perceived the future of humanity as gloomy but thought that sustainability is the society's joint obligation to achieve the right to a good life for all people equally.

CONCLUSIONS: Nursing students perceived themselves as important actors in the work of climate change and sustainability. Thus, nursing education needs to integrate the impact of

climate change on healthcare and promote sustainability into the curriculum for preparing students to take responsibility for sustainability in society.

28. **A Qualitative Study on Concerns, Needs, and Expectations of Hospital Patients Related to Climate Change: Arguments for a Patient-Centered Adaptation.** Lenzer B, Hoffmann C, Hoffmann P, Müller-Werdan U, Rupprecht M, Witt C, Herzig C, Liebers U. *Int J Environ Res Public Health*. 2021 Jun 5;18(11):6105. doi: 10.3390/ijerph18116105. <https://www.mdpi.com/1660-4601/18/11/6105>

This study explores the concerns, needs, and expectations of inpatients with the goal to develop a patient-centered climate change adaptation agenda for hospitals. Statements of patients from geriatrics, internal medicine, psychiatry, and surgery (N = 25) of a German tertiary care hospital were analyzed using semi-structured interviews and the framework method. Areas of future adaptation were elaborated in joint discussions with transdisciplinary experts. Concerns included the foresight of severe health problems. The requested adaptations comprised the change to a patient-centered care, infrastructural improvements including air conditioning, and adjustments of the workflows. Guidelines for the behavior of patients and medical services appropriate for the climatic conditions were demanded. The patient-centered agenda for adaptation includes the steps of partnering with patients, reinforcing heat mitigation, better education for patients and medical staff, and adjusting work processes. This is the first study demonstrating that hospital patients are gravely concerned and expect adjustments according to climate change. Since heat is seen as a major risk by interviewees, the fast implementation of published recommendations is crucial. By synthesizing inpatients' expectations with scientific recommendations, we encourage patient-centered climate change adaptation. This can be the start for further collaboration with patients to create climate change resilient hospitals.

29. **Environmentally sustainable dermatology.** Allwright E, Abbott RA. *Clin Exp Dermatol*. 2021 Jul;46(5):807-813. doi: 10.1111/ced.14516. Epub 2021 Jan 12. <https://onlinelibrary.wiley.com/doi/epdf/10.1111/ced.14516>

In 2017, health and social care organizations contributed 6.3% of carbon emissions in England. Efforts to reduce the environmental footprint of the National Health Service (NHS) have been broadly focused on reducing demand, through prevention and patient empowerment, and modifying supply side factors by focusing on lean care systems and low carbon alternatives. This narrative review concentrates on supply side factors to identify sustainable practices with a focus on actions that could be implemented in dermatology departments. For this study, a literature review was conducted in MEDLINE in April 2020. The search terms included 'environmental sustainability' and 'climate change' with 'dermatology', 'telemedicine', 'NHS', 'surgery' and 'operating theatres'. Out of 95 results, 20 were deemed relevant to the review. Although the review showed that there is clearly growing interest in environmental sustainability, the identified literature lacked examples of comprehensive implementation and evaluation of initiatives. The literature discussed distinct areas including transport, waste management and procurement as part of a lean healthcare system. A number of papers highlighted the potential contribution of carbon-reducing actions without citing verifiable outcome data. This narrative review highlights the need for detailed environmental impact

assessments of treatment options in dermatology, in tandem with economic analysis. In conclusion, we have identified a clear need for evidence-based guidance setting out implementable actions with identifiable benefits achievable within local clinical teams. This will require engagement between clinicians, patients and healthcare organizations.

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[Climate change made North America's deadly heatwave 150 times more likely.](#) Schiermeier Q. Nature. 2021 Jul 8. doi: 10.1038/d41586-021-01869-0. Online ahead of print.

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