

## Environmental Stewardship Resource Desk

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### New Research

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#### COVID-19

- 1. A hot topic at the environment-health nexus: Investigating the impact of climate change on infectious diseases.** Grobusch LC, Grobusch MP. Int J Infect Dis. 2021 Dec 29:S1201-9712(21)01250-9. doi: 10.1016/j.ijid.2021.12.350. Online ahead of print.  
<https://www.sciencedirect.com/science/article/pii/S1201971221012509>

CLIMATE CHANGE AND INFECTIOUS DISEASES: Infectious diseases represent only one facet of the threats arising from climate change. Direct impacts from climate change include the more frequent occurrence and increased magnitude of extreme weather events, as well as changing temperatures and precipitation patterns. For climate-sensitive infectious diseases, these changes implicate a shift in geographic and temporal distribution, seasonality, and transmission intensity.

SIZING UP THE PROBLEM: Susceptibility to deleterious effects of climate change is a net result not only of the interplay of environmental factors but also governed by human, societal, and economic factors, with social inequalities being a major determinant of vulnerability. The global South is already disproportionately affected by the climate crisis. The financial capacity to pursue adaptation options is also limited and unevenly distributed.

CONCLUSIONS: Climate change-induced mortality and morbidity from both infectious and non-infectious diseases, amongst other adverse scenarios, is expected to rise globally in the future. The coming decade will be crucial for using all opportunities left to develop and implement adequate mitigation- and adaptation strategies.
- 2. The COVID-19 pandemic reshapes the plastic pollution research - A comparative analysis of plastic pollution research before and during the pandemic.** Wang Q, Zhang M, Li R. Environ Res. 2021 Dec 29:112634. doi: 10.1016/j.envres.2021.112634. Online ahead of print.  
<https://www.sciencedirect.com/science/article/pii/S0013935121019356>

The emergence of the COVID-19 pandemic has exacerbated global plastic pollution. So has the COVID-19 pandemic changed the study of plastic pollution? This work aims to explore the

impact of the pandemic on plastic pollution research through a comprehensively assess the status and outlook of plastic pollution research before and during the COVID-19 pandemic. The results of mining the publications on the subject of plastic pollution in the Web of Science database indicate that the COVID-19 pandemic has reshaped the plastic pollution research: (i) The COVID-19 pandemic has changed the trend of publication output for plastic pollution research. The number of publications on plastic pollution has increased substantially since the COVID-19 pandemic; (ii) The COVID-19 pandemic has reversed the global research landscape on the plastic pollution. Since the outbreak of pandemic, more and more countries have begun to pay attention to the plastic pollution. Prior to the pandemic, developed countries were the global leaders in plastic pollution research. During the pandemic, developing countries accounted for an important share in the quality, quantity and international cooperation of publications; (iii) The COVID-19 pandemic has redefined the major hotspots of plastic pollution research. Since the pandemic, there has been a significant change in research focus. Addressing plastic pollution has become a major research component. In-depth research on microplastics has been carried out during the pandemic. The results of mining the publications on the subject of plastic pollution also show that there is no effective solution to plastic pollution caused by the COVID-19, but especially considering the severity of the plastic pollution problem, it is very necessary to continue to carry out more research.

- 3. Did Climate Change Influence the Emergence, Transmission, and Expression of the COVID-19 Pandemic?** Gupta S, Rouse BT, Sarangi PP. *Front Med (Lausanne)*. 2021 Dec 8;8:769208. doi: 10.3389/fmed.2021.769208. eCollection 2021.

<https://www.frontiersin.org/articles/10.3389/fmed.2021.769208/full>

The human race has survived many epidemics and pandemics that have emerged and reemerged throughout history. The novel coronavirus Severe Acute Respiratory Syndrome SARS-CoV-2/COVID-19 is the latest pandemic and this has caused major health and socioeconomic problems in almost all communities of the world. The origin of the virus is still in dispute but most likely, the virus emerged from the bats and also may involve an intermediate host before affecting humans. Several other factors also may have affected the emergence and outcome of the infection but in this review, we make a case for a possible role of climate change. The rise in industrialization-related human activities has created a marked imbalance in the homeostasis of environmental factors such as temperature and other weather and these might even have imposed conditions for the emergence of future coronavirus cycles. An attempt is made in this review to explore the effect of ongoing climate changes and discuss if these changes had a role in facilitating the emergence, transmission, and even the expression of the COVID-19 pandemic. We surmise that pandemics will be more frequent in the future and more severely impactful unless climate changes are mitigated.

- 4. Healthcare Workers' Experiences and Views of Using Surgical Masks and Respirators, and Their Attitudes on the Sustainability: A Semi-Structured Survey Study during COVID-19.**

Venesoja A, Grönman K, Tella S, Hiltunen S, Koljonen K, Butylina S, Rotinen L, Torkki P, Laatikainen K. *Nurs Rep*. 2021 Aug 7;11(3):615-628. doi: 10.3390/nursrep11030059.

<https://www.mdpi.com/2039-4403/11/3/59>

A universal mask use was instituted in healthcare during COVID-19 pandemic in 2020. The extensive growth in the consumption of surgical masks and respirators brought new challenges. Healthcare workers had to get accustomed to wearing the facemasks continuously, raising concerns on the patient, occupational, and environmental safety. The aim of this study is to describe frontline healthcare workers and other authorities' views and experiences on continuous use of surgical masks and respirators (facemasks) and their attitudes towards environmental and sustainability issues. A cross-sectional web-based survey was conducted in Finland during the COVID-19 pandemic in autumn 2020. The respondents (N = 120) were recruited via social media, and the data were collected using a purpose-designed questionnaire. Descriptive statistics and inductive content analysis were used to analyze the quantitative data and qualitative data, respectively. The healthcare workers perceived their own and patient safety, and comfortability of facemasks as important, but according to their experiences, these properties were not evident with the current facemasks. They considered protection properties more important than environmental values. However, biodegradability and biobased material were seen as desired properties in facemasks. Based on the results, the current facemasks do not meet users' expectations well enough. Especially the design, breathability, and sustainability issues should be taken more into account.

### Health Impacts of Climate Change

5. **Characterizing Trends in Lung Cancer Mortality Attributable to Airborne Environmental Carcinogens.** Veith M, McAlarney D, Xue X, Rohan TE, Hosgood HD 3rd. *Int J Environ Res Public Health*. 2021 Dec 14;18(24):13162. doi: 10.3390/ijerph182413162. <https://www.mdpi.com/1660-4601/18/24/13162>  
Tracheal, bronchus, and lung (TBL) cancer is the leading cause of cancer death globally, but trends in TBL mortality attributable to tobacco, ambient particulate matter pollution (APMP), and household air pollution (HAP) were unequally distributed within global population subgroups over the last three decades. We used data from the Global Burden of Disease 2019 study to quantify the impact of sex, time, sociodemographic development index (SDI), and age for each exposure from 1990-2019. During that interval, tobacco dominated the TBL cancer mortality landscape, with its minimum global age-adjusted death rate of 16.71 deaths/100,000 (95% Uncertainty Interval (UI): 15.27-18.13) outstripping maximums of 3.85 deaths/100,000 (UI: 2.82-4.83) and 2.54 deaths/100,000 (UI: 1.69-3.54) for APMP and HAP, respectively. In 2019, tobacco male TBL death rates exceeded female rates by a factor of 4.4:1. Ratios of 1.9:1 for APMP and 2.1:1 for HAP were seen. Our analysis indicates that both-sex middle SDI and female low, low-middle, and high-middle SDI populations are suffering increasing tobacco TBL burden. Efforts producing successful global reductions in HAP-associated TBL mortality should continue, with attention to low SDI female death rate increases. Finally, except for high SDI populations, global APMP-attributable TBL cancer burden is increasing and represents a major health concern.
6. **Long-Term Exposure to Low-Level NO<sub>2</sub> and Mortality among the Elderly Population in the Southeastern United States.** Qian Y, Li H, Rosenberg A, Li Q, Sarnat J, Papatheodorou S,

Schwartz J, Liang D, Liu Y, Liu P, Shi L. Environ Health Perspect. 2021 Dec;129(12):127009. doi: 10.1289/EHP9044. Epub 2021 Dec 28.

<https://ehp.niehs.nih.gov/doi/full/10.1289/EHP9044>

RESULTS: About 71.1% of the Medicare beneficiaries in the southeastern United States were always exposed to low-level NO<sub>2</sub> over the study period. We observed an association between long-term exposure to low-level NO<sub>2</sub> and all-cause mortality, with a hazard ratio (HR) = 1.042 (95% CI: 1.040, 1.045) in single-pollutant models and a HR = 1.047 (95% CI: 1.045, 1.049) in multipollutant models (adjusting for PM<sub>2.5</sub> and O<sub>3</sub>), per 10-ppb increase in annual NO<sub>2</sub> concentrations. The penalized spline indicates a linear exposure-response relationship across the entire NO<sub>2</sub> exposure range. Medicare enrollees who were White, female, and residing in urban areas were more vulnerable to long-term NO<sub>2</sub> exposure.

CONCLUSION: Using a large and representative cohort, we provide epidemiological evidence that long-term exposure to NO<sub>2</sub>, even below the national and global ambient air quality guidelines, was approximately linearly associated with a higher risk of mortality among older adults, independent of PM<sub>2.5</sub> and O<sub>3</sub> exposure. Improving air quality by reducing NO<sub>2</sub> emissions, therefore, may yield significant health benefits. <https://doi.org/10.1289/EHP9044>.

- 7. Ambient Cumulative PM<sub>2.5</sub> Exposure and the Risk of Lung Cancer Incidence and Mortality: A Retrospective Cohort Study.** Huang HL, Chuang YH, Lin TH, Lin C, Chen YH, Hung JY, Chan TC. Int J Environ Res Public Health. 2021 Nov 25;18(23):12400. doi: 10.3390/ijerph182312400.

<https://www.mdpi.com/1660-4601/18/23/12400>

Smoking, sex, air pollution, lifestyle, and diet may act independently or in concert with each other to contribute to the different outcomes of lung cancer (LC). This study aims to explore their associations with the carcinogenesis of LC, which will be useful for formulating further preventive strategies. This retrospective, longitudinal follow-up cohort study was carried out by connecting to the MJ Health Database, Taiwan Cancer Registry database, and Taiwan cause of death database from 2000 to 2015. The studied subjects were persons attending the health check-ups, distributed throughout the main island of Taiwan. Cox proportional hazards regression models were used to investigate the risk factors associated with LC development and mortality after stratifying by smoking status, with a special emphasis on ambient two-year average PM<sub>2.5</sub> exposure, using a satellite-based spatiotemporal model at a resolution of 1 km<sup>2</sup>, and on dietary habit including consumption of fruits and vegetables. After a median follow-up of 12.3 years, 736 people developed LC, and 401 people died of LC-related causes. For never smokers, the risk of developing LC (aHR: 1.32, 95%CI: 1.12-1.56) and dying from LC-related causes (aHR: 1.28, 95%CI: 1.01-1.63) rises significantly with every 10 µg/m<sup>3</sup> increment of PM<sub>2.5</sub> exposure, but not for ever smokers. Daily consumption of more than two servings of vegetables and fruits is associated with lowering LC risk in ever smokers (aHR: 0.68, 95%CI: 0.47-0.97), and preventing PM<sub>2.5</sub> exposure is associated with lowering LC risk for never smokers.

- 8. Adaptation and the Mortality Effects of Temperature Across U.S. Climate Regions.** Heutel G, Miller NH, Molitor D. Rev Econ Stat. 2021 Oct 19;103(4):740-753. doi: 10.1162/rest\_a\_00936. Epub 2021 Sep 28.

We estimate how the mortality effects of temperature vary across U.S. climate regions to assess local and national damages from projected climate change. Using 22 years of Medicare

data, we find that both cold and hot days increase mortality. However, hot days are less deadly in warm places while cold days are less deadly in cool places. Incorporating this heterogeneity into end-of-century climate change assessments reverses the conventional wisdom on climate damage incidence: cold places bear more, not less, of the mortality burden. Allowing places to adapt to their future climate substantially reduces the estimated mortality effects of climate change.

9. **Potential Impact of Climate Change on Human Trafficking: A Narrative Review.** Sheu JC, Torres MIM, Gordon MR, Nguyen PT, Coverdale JH. *J Nerv Ment Dis.* 2021 May 1;209(5):324-329. doi: 10.1097/NMD.0000000000001312.

[https://journals.lww.com/jonmd/Fulltext/2021/05000/Potential\\_Impact\\_of\\_Climate\\_Change\\_on\\_Human.3.aspx](https://journals.lww.com/jonmd/Fulltext/2021/05000/Potential_Impact_of_Climate_Change_on_Human.3.aspx)

Climate change is a threat to the public health with wide-reaching impacts that are becoming more studied and recognized. An aspect of climate change that has not yet gained adequate scholarly attention is its potential impact on human trafficking. We review the potential impact of climate change on risk factors to human trafficking including poverty, gender inequality, political instability, migration or forced displacement, and weather disasters. We conclude that climate change is a crucially important consideration in understanding the complex and multifactorial risks for human trafficking. These findings add to the priority for health professionals to embrace efforts to prevent and to mitigate the effects of climate change and to take account of these risk factors in screening and identifying trafficked persons.

10. **Geospatial analysis of individual-based Parkinson's disease data supports a link with air pollution: A case-control study.** Fleury V, Himsl R, Joost S, Nicastro N, Bereau M, Guessous I, Burkhard PR. *Parkinsonism Relat Disord.* 2021 Feb;83:41-48. doi: 10.1016/j.parkreldis.2020.12.013. Epub 2021 Jan 12.

<https://www.sciencedirect.com/science/article/pii/S135380202100002X>

**METHODS:** PD cases were identified through Geneva University Hospitals, private neurologists and nursing homes medical records (n = 1115). Controls derived from a population-based study (n = 12,614) and a comprehensive population census dataset (n = 237,771). All individuals were geographically localized based on their place of residence. Spatial Getis-Ord  $G_i^*$  statistics were used to identify clusters of high versus low disease prevalence. Confounder-adjustment was performed for age, sex, nationality and income. Tukey's honestly significant difference was used to determine whether nitrogen dioxide and particulate matters PM10 concentrations were different within PD hotspots, coldspots or neutral areas.

**RESULTS:** Confounder-adjustment greatly reduced the spatial association.

Characteristics of the geographic space influenced PD prevalence in 6% of patients. PD hotspots were concentrated in the urban centre. There was a significant difference in mean annual nitrogen dioxide and PM10 levels (+3.6  $\mu\text{g}/\text{m}^3$  [ $p < 0.001$ ] and +0.63  $\mu\text{g}/\text{m}^3$  [ $p < 0.001$ ] respectively) between PD hotspots and coldspots.

**CONCLUSION:** PD prevalence exhibited a spatial dependence for a small but significant proportion of patients. A positive association was detected between PD clusters and air pollution. Our data emphasize the multifactorial nature of PD and support a link between PD and air pollution.

## WE ACT

11. **Operating Room Waste Generated Across Otolaryngology Cases.** Ryan MT, Malmrose J, Riley CA, Tolisano AM. *Mil Med.* 2021 Dec 30:usab548. doi: 10.1093/milmed/usab548. Online ahead of print.

**BACKGROUND:** Hospital waste adds to the ecological footprint of the healthcare system, whereas inattention to recyclables may increase costs. The primary objective of this study was to assess the amount of recyclable and nonrecyclable intraoperative waste produced across representative otolaryngology surgical procedures.

**METHODS:** Representative surgical cases across four otolaryngology subspecialties at a tertiary care military medical institution were prospectively identified. Waste was collected, divided, and weighed across two categories: recyclable and nonrecyclable. This study was performed in conjunction with a hospital-approved quality improvement project.

**RESULTS:** The study included 22 otolaryngology surgeries performed across four otolaryngology subspecialties: facial plastics, pediatrics, otology, and head and neck oncology. Overall, 197.4 kg of waste was collected of which 40.2 kg (20%) was recyclable and 157.2 kg (80%) was nonrecyclable. An average of 1.8 kg of recyclable materials and 7.1 kg of nonrecyclable materials were collected per case.

**CONCLUSION:** This study supports that otolaryngology surgical procedures generate a significant amount of waste, a large component of which is recyclable. It highlights the need for proper disposal of this waste and the implementation of a recycling program at our institution with the potential for both ecologic and economic benefits.

12. **The Ethical Duty to Reduce the Ecological Footprint of Industrialized Healthcare Services and Facilities.** Katz C. *J Med Philos.* 2021 Dec 28:jhab037. doi: 10.1093/jmp/jhab037. Online ahead of print.

According to the widely accepted principles of beneficence and distributive justice, I argue that healthcare providers and facilities have an ethical duty to reduce the ecological footprint of the services they provide. I also address the question of whether the reductions in footprint need or should be patient-facing. I review Andrew Jameton and Jessica Pierce's claim that achieving ecological sustainability in the healthcare sector requires rationing the treatment options offered to patients. I present a number of reasons to think that we should not ration health care to achieve sufficient reductions in a society's overall consumption of ecological goods. Moreover, given the complexities of ecological rationing, I argue that there are good reasons to think that the ethical duty to reduce the ecological footprint of health care should focus on only nonpatient-facing changes. I review a number of case studies of hospitals who have successfully retrofitted facilities to make them more efficient and reduced their resource and waste streams.

13. **Challenges to Protecting the Right to Health under the Climate Change Regime.** Wu CF. *Health Hum Rights.* 2021 Dec;23(2):121-138.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8694293/>

Researchers and global policy makers are increasingly documenting negative health impacts from climate change, raising concerns for realizing the right to health. Importantly, courts have held that anthropogenic activities affecting climate may threaten a population's standard of health and compromise its inviolable right to health. However, legal hurdles-such as the fragmentation of climate change and human rights laws and the difficulties in proving causal links-hamper efforts to litigate right to health claims in the context of climate change. To address these challenges, this article assesses the detrimental effects of climate change from an international human rights perspective and analyzes climate change litigation to explore potential avenues to press for the right to health in the face of climate change.

14. **Climate Justice, Humans Rights, and the Case for Reparations.** Chapman AR, Ahmed AK. *Health Hum Rights*. 2021 Dec;23(2):81-94.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8694300/>

The global community is facing an existential crisis that threatens the web of life on this planet. Climate change, in addition to being a fundamental justice and ethical issue, constitutes a human rights challenge. It is a human rights challenge because it undermines the ability to promote human flourishing and welfare through the implementation of human rights, particularly the right to life and the right to health. It is also a human rights challenge because climate change disproportionately impacts poor and the vulnerable people in both low-income and high-income countries. Those living in many low-income countries are subject to the worst impacts of climate change even though they have contributed negligibly to the problem. Further, low-income countries have the fewest resources and capabilities at present to adapt or cope with the severe, long-lasting impacts of climate change. Building on human rights principles of accountability and redress for human rights violations, this paper responds to this injustice by seeking to make long-neglected societal amends through the implementation of the concept of climate reparations. After discussing the scientific evidence for climate change, its environmental and socioeconomic impacts, and the ethical and human rights justifications for climate reparations, the paper proposes the creation of a new global institutional mechanism, the Global Climate Reparations Fund, which would be linked with the United Nations Human Rights Council, to fund and take action on climate reparations. This paper also identifies which parties are most responsible for the current global climate crisis, both historically and currently, and should therefore fund the largest proportion of climate-related reparations.

15. **Climate change and cancer: converging policies.** Vineis P, Huybrechts I, Millett C, Weiderpass E. *Mol Oncol*. 2021 Mar;15(3):764-769. doi: 10.1002/1878-0261.12781. Epub 2020 Sep 22.

<https://febs.onlinelibrary.wiley.com/doi/full/10.1002/1878-0261.12781>

Intervening on risk factors for noncommunicable diseases (including cancer) in industrialized countries could achieve a reduction of between 30% and 40% of premature deaths. In the meantime, the need to intervene against the threat of climate change has become obvious. CO<sub>2</sub> emissions must be reduced by 45% by the year 2030 and to zero by 2050 according to recent agreements. We propose an approach in which interventions are designed to prevent diseases and jointly mitigate climate change, the so-called cobenefits. The present article describes some examples of how climate change mitigation and cancer prevention could go hand in hand: tobacco control, food production, and transportation (air pollution). Many others

can be identified. The advantage of the proposed approach is that both long-term (climate) and short-term (health) benefits can be accrued with appropriate intersectoral policies.

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**News & Commentary**

[Pandemics, climate change, and antibiotic resistance.](#) Blunden C. Br J Gen Pract. 2021 Dec 31;72(714):26-27. doi: 10.3399/bjgp22X718145. Print 2022 Jan.

[Climate Change Health Effects and What You Can Do.](#) Chinthrajah S, Garcia E, Hasan Z, Hy A, Wong L. Am J Respir Crit Care Med. 2022 Jan 1;205(1):P1-P2. doi: 10.1164/rccm.2051P1.

[Environmental Pollution, Climate Change, and a Critical Role for the Endocrinologist.](#) Stewart PM, Mirmira RG, Kaiser UB; Editor-in-Chief and Deputy Editors, The Journal of Clinical Endocrinology & Metabolism. J Clin Endocrinol Metab. 2021 Nov 19;106(12):3381-3384. doi: 10.1210/clinem/dgab721.

[Restoring biodiversity and slowing climate change are crucial to protect health.](#) Butler CD, Jaakkola JJK, Boylan S, McFarlane RA, Potter JD. Lancet. 2021 Nov 13;398(10313):1802. doi: 10.1016/S0140-6736(21)02250-9. Epub 2021 Nov 3.

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