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## New Research

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### COVID-19

1. **Climate change during the COVID-19 outbreak: scoping future perspectives.** Usman M, Husnain M, Riaz A, Riaz A, Ali Y. Environ Sci Pollut Res Int. 2021 May 2:1-12. doi: 10.1007/s11356-021-14088-x. Online ahead of print.
https://link.springer.com/article/10.1007/s11356-021-14088-x
Neither war nor recession or any kind of prior disaster has been considered a prelude to the looming threat of climate change over the past era as coronavirus (hereafter COVID-19) has in only a few months. Although numerous studies have already been published on this topic, there has not been compelling evidence critically assessing the impact of COVID-19 by and on climate change. The present study fills this gap by taking a more holistic approach to elaborate factors, e.g., natural and anthropogenic factors, ocean submesoscales, radiative forces, and greenhouse gas/CO2 emissions, that may affect climate change in a more prevalent and pronounced manner. Based on the statistical data collected from the NASA Earth Observatory, the European Space Agency, and the Global Carbon Project, the findings of this study reveal that the climate/environment has improved during COVID-19, including better environmental quality and water quality with low carbon emissions and sound pollution. In the lockdown during the epidemic, the emissions of nitrogen dioxide (NO2) and carbon dioxide (CO2) significantly decreased because of the lower usage of transportation, decreased electricity demand, and halted industrial activities. The policy implications of this study suggested that keeping the climate healthy even in the post-COVID-19 era is a serious concern that needs to be addressed by investing in clean and green projects, ensuring green energy evolution, dealing with a large volume of medical waste, building health-ensuring and livable societies, and halting the funding of pollution. For governmental and regulatory bodies, these factors will provide a strong foundation to build safer, healthier, and environmentally friendly societies for generations to come.

2. **Exposure to air pollution and COVID-19 severity: a review of current insights, management and challenges.** Ali N, Fariha KA, Islam F, Mishu MA, Mohanto NC, Hosen MJ, Hossain K. Integr Environ Assess Manag. 2021 Apr 29. doi: 10.1002/ieam.4435. Online ahead of print.
https://setac.onlinelibrary.wiley.com/doi/abs/10.1002/ieam.4435
Several epidemiological studies have suggested a link between air pollution and respiratory tract infections. The outbreak of coronavirus disease 2019 (COVID-19) poses a great threat to public health worldwide. However, some parts of the globe have been worse affected in terms of prevalence and deaths than others. The causes and conditions of such variations have yet to be explored. Although some studies indicated a possible correlation between air pollution and COVID-19 severity, there is as yet insufficient data for a meaningful answer. This review summarized the impact of air pollution on COVID-19 infections and severity, as well discussed the possible management strategies and challenges involved. The available literature that investigated the correlation between air pollution and COVID infections and mortality were included in the review. The studies reviewed here suggest that exposure to air pollution, particularly to PM2.5 and NO2 is positively correlated with COVID-19 infections and mortality. Some data indicate that air pollution can play an important role in the airborne transmission of SARS-CoV-2. A high percentage of COVID-19 incidences have been reported in the most polluted areas, where patients needed hospital admission. The available data also shows that both short-term and long-term air pollution may enhance COVID-19 severity. However, most of the studies that showed a link between air pollution and CVID-19 infections and mortality did not consider potential confounders during the correlation analysis. Therefore, more specific studies need to be performed focusing on some additional confounders such as individual age, population density, pre-existing comorbidities to determine the impact of air pollution on COVID-19 infections and deaths. This article is protected by copyright. All rights reserved.

3. **Greenspace exposure and COVID-19 mortality in the United States: January-July 2020.** Russette H, Graham J, Holden Z, Semmens EO, Williams E, Landguth EL. Environ Res. 2021 Apr 28;198:111195. doi: 10.1016/j.envres.2021.111195. Online ahead of print.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8079939/
BACKGROUND: Mortality from the novel coronavirus disease-2019 (COVID-19) continues to rise across the United States. Evidence is emerging that environmental factors may contribute to susceptibility to disease and mortality. Greenspace exposure promotes enhanced immunity and may protect against risk of mortality among those with COVID-19.
OBJECTIVES: Our objective was to determine if high county level greenspace exposure is associated with reduced risk of COVID-19 mortality.
METHODS: Greenspace exposure was characterized in 3049 counties across the conterminous United States using Leaf Area Index (LAI) deciles that were derived from satellite imagery via Moderate Resolution Imaging Spectroradiometer from 2011 to 2015. COVID-19 mortality data were obtained from the Center for Systems Science and Engineering at Johns Hopkins University. We used a generalized linear mixed model to evaluate the association between county level LAI and COVID-19 mortality rate in analyses adjusted for 2015-2019 county level average total county population, older population, race, overcrowding in home, Medicaid, education, and physical inactivity.

RESULTS: A dose-response association was found between greenness and reduced risk of COVID-19 mortality. COVID-19 mortality was negatively associated with LAI deciles 8 [MRR = 0.82 (95% CI: 0.72, 0.93)], 9 [MRR = 0.78 (95% CI: 0.68, 0.89)], and 10 [MRR = 0.59 (95% CI: 0.50, 0.69)]. Aside from LAI decile 5, no associations were found between the remaining LAI deciles and COVID-19 mortality. Increasing prevalence of counties with older age residents, low education attainment, Native Americans, Black Americans, and housing overcrowding were significantly associated with increased risk of COVID-19 mortality, whereas Medicaid prevalence was associated with a reduced risk.
DISCUSSION: Counties with a higher amount of greenspace may be at a reduced risk of experiencing mortality due to COVID-19.

4. **Estimating marine plastic pollution from COVID-19 face masks in coastal regions.** Chowdhury H, Chowdhury T, Sait SM. Mar Pollut Bull. 2021 Apr 24;168:112419. doi:10.1016/j.marpolbul.2021.112419. Online ahead of print.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8064874/
Face masks are playing an essential role in preventing the spread of COVID-19. Face masks such as N95, and surgical masks, contain a considerable portion of non-recyclable plastic material. Marine plastic pollution is likely to increase due to the rapid use and improper dispensing of face masks, but until now, no extensive quantitative estimation exists for coastal regions. Linking behaviour dataset on face mask usage and solid waste management dataset, this study estimates annual face mask utilization and plastic pollution from mismanaged face masks in coastal regions of 46 countries. It is estimated that approximately 0.15 million tons to 0.39 million tons of plastic debris could end up in global oceans within a year. With lower waste management facilities, the number of plastic debris entering the ocean will rise. Significant investments are required from global communities in improving the waste management facilities for better disposal of masks and solid waste.

5. **Ivermectin & COVID-19: Let's keep a One Health perspective.** Domingo-Echaburu S, Orive G, Lertxundi U. Sustain Chem Pharm. 2021 Jun;21:100438. doi: 10.1016/j.scp.2021.100438. Epub 2021 Apr 18.
https://www.sciencedirect.com/science/article/pii/S2352554121000656
Despite uncertainty about its clinical benefit, ivermectin has been used for COVID 19, even in prophylaxis. The European Medicines Agency (EMA) has advised against its use for the prevention or treatment of COVID-19 outside randomised clinical trials. Although the potential negative environmental effects of ivermectin have been widely recognised when used in veterinary medicine, scarce attention has been devoted to the potential ecotoxicological impact of human use. We believe is time to include One Health's philosophy in our daily practice. In the specific case of ivermectin & COVID 19, environmental aspects should also be on the table.

6. **Health, Transport and the Environment: The Impacts of the COVID-19 Lockdown on Air Pollution.** De Maria L, Caputi A, Tafuri S, Cannone ESS, Sponselli S, Delfino MC, Pipoli A, Bruno V, Angiuli L, Mucci N, Ledda C, Vimercati L. Front Public Health. 2021 Apr 13;9:637540. doi: 10.3389/fpubh.2021.637540. eCollection 2021.
https://www.frontiersin.org/articles/10.3389/fpubh.2021.637540/full

Lockdown measures were initiated in Italy on March 9th after the start of the SARS-CoV-2 epidemic to flatten the epidemic curve. The aim of the present study was to assess the impact of restrictive measures in the Apulia Region, southern Italy, on air quality from March to April 2020. We applied a dual-track approach. We assessed citizen mobility and vehicle traffic with mobility network data and information obtained from satellite tracking, and we evaluated and compared pollutant concentration data as measured by monitoring stations maintained by the Regional Agency for Environmental Protection and Prevention of Apulia (ARPA). The results showed a decrease in the weekly mean NO2 concentration recorded by urban traffic stations during the lockdown period. In particular, in the city of Bari, the average NO2 concentration decreased from 62.2 μg/m3 in March 2019 to 48.2 μg/m3 in March 2020. Regarding PM10 levels, the average concentrations at the individual traffic stations showed no particular variation compared to those in the same months of the previous year, except for Bari-Caldarola Station in March 2019/2020 (p-value < 0.001) and in April 2019/2020 (p-value = 0.04). In particular the average in March 2019 was ~26.9 μg/m3, while that in March 2020 was ~22.9 μg/m3. For April, the average concentration of PM10 in 2019 was 27.9 μg/m3, while in 2020, the average was ~22.4 μg/m3. This can be explained by the fact that PM10 levels are influenced by multiple variables such as weather and climate conditions and desert dust advections.

## Health Impacts of Climate Change

7. **Climate change and the emergence of fungal pathogens.** Nnadi NE, Carter DA. PLoS Pathog. 2021 Apr 29;17(4):e1009503. doi: 10.1371/journal.ppat.1009503. eCollection 2021 Apr. https://journals.plos.org/plospathogens/article?id=10.1371/journal.ppat.1009503
The role of the environment in emerging and reemerging infectious diseases is increasingly recognized [1,2]. Climate change, defined by the United Nations Framework Convention on Climate Change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" [3] may create environmental pressures that result in new diseases caused by fungi [4]. While viral and bacterial diseases receive most attention as the potential cause of plagues and pandemics, fungi can arguably pose equal or even greater threats: There are no vaccines available yet for fungal pathogens, the arsenal of antifungal agents is extremely limited, and fungi can live saprotrophically, producing large quantities of infectious spores and do not require host-to-host contact to establish infection [5]. Indeed, fungi seem to be uniquely capable of causing complete host extinction [6]. For the vast majority of fungal species, the capacity to grow at elevated temperatures limits their ability to infect and establish in mammals. However, fungi can be trained to evolve thermotolerance, and gradual adaptation to increasing temperature caused by climate change could lead to an increase of organisms that can cause disease [7,8]. In addition, climate change can increase the geographic range of pathogenic species or their vectors, leading to the emergence of diseases in areas where they have not previously been reported [7]. Environmental disruptions due to climate change such as floods, storms, and hurricanes can disperse and aerosolize fungi or implant them via traumatic wounds, resulting in infections by previously very rare or unknown fungal species. Fig 1 summarizes the potential

effects of climate change, showing examples of emerging fungi and their consequences, along with the potential for new and currently unknown species to emerge.

8. **Climate Change and Human Well-Being in the 2020s: Lessons From 2020.** Sheehan MC. Int J Health Serv. 2021 Apr 28:207314211012155. doi: 10.1177/00207314211012155. Online ahead of print.
   https://journals.sagepub.com/doi/full/10.1177/00207314211012155
   Behind the coronavirus headlines the year 2020 set multiple extreme weather records, including unprecedented wildfires in Australia and California, massive flooding in China, and back-to-back hurricanes in Central America. The impacts on the well-being of local populations have been devastating. We reviewed these extreme weather events, together with the year's newly published climate and health science reports, and identified three important themes for building health resilience in the decade ahead: (1) preparing for greater magnitude and intensity of climate hazards, extreme events, and population health impacts; (2) better anticipating cascading and compound impacts on population well-being, particularly for the most vulnerable; and (3) identifying appropriate, effective preparedness tools and strategies. While decarbonizing the economy is the urgent goal to protect both human and planetary health from a changing climate, 2020 demonstrates that recognizing the likely magnitude and complexity of future extreme weather events, and preparing local public health agencies and communities with the knowledge and tools to respond to them, will be essential in this critical decade.

9. **Increased ratio of summer to winter deaths due to climate warming in Australia, 1968-2018.** Hanigan IC, Dear KBG, Woodward A. Aust N Z J Public Health. 2021 Apr 26. doi: 10.1111/1753-6405.13107. Online ahead of print.
   https://onlinelibrary.wiley.com/doi/full/10.1111/1753-6405.13107
   OBJECTIVE: To determine if global warming has changed the balance of summer and winter deaths in Australia.
   METHODS: Counts of summer and winter cause-specific deaths of subjects aged 55 and over for the years 1968-2018 were entered into a Poisson time-series regression. Analysis was stratified by states and territories of Australia, by sex, age and cause of death (respiratory, cardiovascular, and renal diseases). The warmest and coldest subsets of seasons were compared.
   RESULTS: Warming over 51 years was associated with a long-term increase in the ratio of summer to winter mortality from 0.73 in the summer of 1969 to 0.83 in the summer of 2018. The increase occurred faster in years that were warmer than average.
   CONCLUSIONS: Mortality in the warmest and coldest times of the year is converging as annual average temperatures rise. Implications for public health: If climate change continues, deaths in the hottest months will come to dominate the burden of mortality in Australia.

10. **Effect of Air Pollution on Obesity in Children: A Systematic Review and Meta-Analysis.** Parasin N, Amnuaylojaroen T, Saokaew S. Children (Basel). 2021 Apr 23;8(5):327. doi: 10.3390/children8050327.
    https://www.mdpi.com/2227-9067/8/5/327/htm

Air pollution exposure has been identified as being associated with childhood obesity. Nevertheless, strong evidence of such an association is still lacking. To analyze whether air pollution exposure affects childhood obesity, we conducted a systematic review and meta-analysis utilizing the PRISMA guidelines. Of 7343 studies identified, eight studies that investigated the effects of air pollutant characteristics, including PM2.5, PM10, PMcoarse, PMabsorbance, NOx, and NO2, on childhood obesity were included. The polled effects showed that air pollution is correlated with a substantially increased risk of childhood obesity. PM2.5 was found to be associated with a significantly increased risk (6%) of childhood obesity (OR 1.06, 95% CI 1.02-1.10, p = 0.003). In addition, PM10, PM2.5absorbance, and NO2 appeared to significantly increase the risk of obesity in children (OR 1.07, 95% CI 1.04-1.10, p < 0.00; OR 1.23, 95% CI 1.06-1.43, p = 0.07; and OR 1.10, 95% CI 1.04-1.16, p < 0.001, respectively). PMcoarse and NOx also showed trends towards being associated with an increased risk of childhood obesity (OR 1.07, 95% CI 0.95-1.20, p = 0.291, and OR 1.00, 95% CI 0.99-1.02, p = 0.571, respectively). Strong evidence was found to support the theory that air pollution exposure is one of the factors that increases the risk of childhood obesity.

11. **Air pollution and DNA methylation in adults: A systematic review and meta-analysis of observational studies.** Wu Y, Qie R, Cheng M, Zeng Y, Huang S, Guo C, Zhou Q, Li Q, Tian G, Han M, Zhang Y, Wu X, Li Y, Zhao Y, Yang X, Feng Y, Liu D, Qin P, Hu D, Hu F, Xu L, Zhang M. Environ Pollut. 2021 Apr 15;284:117152. doi: 10.1016/j.envpol.2021.117152. Online ahead of print. This systematic review and meta-analysis aimed to investigate the association between air pollution and DNA methylation in adults from published observational studies. PubMed, Web of Science and Embase databases were systematically searched for available studies on the association between air pollution and DNA methylation published up to March 9, 2021. Three DNA methylation approaches were considered: global methylation, candidate-gene, and epigenome-wide association studies (EWAS). Meta-analysis was used to summarize the combined estimates for the association between air pollutants and global DNA methylation levels. Heterogeneity was assessed with the Cochran Q test and quantified with the I2 statistic. In total, 38 articles were included in this study: 16 using global methylation, 18 using candidate genes, and 11 using EWAS, with 7 studies using more than one approach. Meta-analysis revealed an imprecise but inverse association between exposure to PM2.5 and global DNA methylation (for each 10-μg/m3 PM2.5, combined estimate: 0.39; 95% confidence interval: 0.97 - 0.19). The candidate-gene results were consistent for the ERCC3 and SOX2 genes, suggesting hypermethylation in ERCC3 associated with benzene and that in SOX2 associated with PM2.5 exposure. EWAS identified 201 CpG sites and 148 differentially methylated regions that showed differential methylation associated with air pollution. Among the 307 genes investigated in 11 EWAS, a locus in nucleoredoxin gene was found to be positively associated with PM2.5 in two studies. Current meta-analysis indicates that PM2.5 is imprecisely and inversely associated with DNA methylation. The candidate-gene results consistently suggest hypermethylation in ERCC3 associated with benzene exposure and that in SOX2 associated with PM2.5 exposure. The Kyoto Encyclopedia of Genes and Genomes (KEGG) network analyses revealed that these genes were associated with African trypanosomiasis, Malaria, Antifolate resistance, Graft-versus-host disease, and so on. More evidence is needed to clarify the association between air pollution and DNA methylation.

12. **PM(2.5) polluters disproportionately and systemically affect people of color in the United States.** Tessum CW, Paolella DA, Chambliss SE, Apte JS, Hill JD, Marshall JD. Sci Adv. 2021 Apr 28;7(18):eabf4491. doi: 10.1126/sciadv.abf4491. Print 2021 Apr.
https://advances.sciencemag.org/content/7/18/eabf4491
Racial-ethnic minorities in the United States are exposed to disproportionately high levels of ambient fine particulate air pollution (PM2.5), the largest environmental cause of human mortality. However, it is unknown which emission sources drive this disparity and whether differences exist by emission sector, geography, or demographics. Quantifying the PM2.5 exposure caused by each emitter type, we show that nearly all major emission categories-consistently across states, urban and rural areas, income levels, and exposure levels-contribute to the systemic PM2.5 exposure disparity experienced by people of color. We identify the most inequitable emission source types by state and city, thereby highlighting potential opportunities for addressing this persistent environmental inequity.

13. **Association of Air Pollution Exposure in Childhood and Adolescence With Psychopathology at the Transition to Adulthood.** Reuben A, Arseneault L, Beddows A, Beevers SD, Moffitt TE, Ambler A, Latham RM, Newbury JB, Odgers CL, Schaefer JD, Fisher HL. JAMA Netw Open. 2021 Apr 1;4(4):e217508. doi: 10.1001/jamanetworkopen.2021.7508.
https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2779249
IMPORTANCE: Air pollution exposure damages the brain, but its associations with the development of psychopathology are not fully characterized.
OBJECTIVE: To assess whether air pollution exposure in childhood and adolescence is associated with greater psychopathology at 18 years of age.
DESIGN, SETTING, AND PARTICIPANTS: The Environmental-Risk Longitudinal Twin Study is a population-based cohort study of 2232 children born from January 1, 1994, to December 4, 1995, across England and Wales and followed up to 18 years of age. Pollution data generation was completed on April 22, 2020; data were analyzed from April 27 to July 31, 2020.
EXPOSURES: High-resolution annualized estimates of outdoor nitrogen oxides (NOx) and particulate matter with aerodynamic diameter less than 2.5 µm (PM2.5) linked to home addresses at the ages of 10 and 18 years and then averaged.
MAIN OUTCOMES AND MEASURES: Mental health disorder symptoms assessed through structured interview at 18 years of age and transformed through confirmatory factor analysis into continuous measures of general psychopathology (primary outcome) and internalizing, externalizing, and thought disorder symptoms (secondary outcomes) standardized to a mean (SD) of 100 (15). Hypotheses were formulated after data collection, and analyses were preregistered.
RESULTS: A total of 2039 participants (1070 [52.5%] female) had full data available. After adjustment for family and individual factors, each interquartile range increment increase in NOx exposure was associated with a 1.40-point increase (95% CI, 0.41-2.38; P = .005) in general psychopathology. There was no association between continuously measured PM2.5 and general psychopathology (b = 0.45; 95% CI, -0.26 to 1.11; P = .22); however, those in the highest quartile of PM2.5 exposure scored 2.04 points higher (95% CI, 0.36-3.72; P = .02) than those in the bottom 3 quartiles. Copollutant models, including both NOx and PM2.5, implicated NOx

alone in these significant findings. NOx exposure was associated with all secondary outcomes, although associations were weakest for internalizing (adjusted b = 1.07; 95% CI, 0.10-2.04; P = .03), medium for externalizing (adjusted b = 1.42; 95% CI, 0.53-2.31; P = .002), and strongest for thought disorder symptoms (adjusted b = 1.54; 95% CI, 0.50-2.57; P = .004). Despite NOx concentrations being highest in neighborhoods with worse physical, social, and economic conditions, adjusting estimates for neighborhood characteristics did not change the results. CONCLUSIONS AND RELEVANCE: Youths exposed to higher levels of outdoor NOx experienced greater psychopathology at the transition to adulthood. Air pollution may be a nonspecific risk factor for the development of psychopathology.

14. **Ecological Barrier Deterioration Driven by Human Activities Poses Fatal Threats to Public Health due to Emerging Infectious Diseases.** Zhang D, Yang Y, Li M, Lu Y, Liu Y, Jiang J, Liu R, Liu J, Huang X, Li G, Qu J. Engineering (Beijing). 2021 Jan 5. doi: 10.1016/j.eng.2020.11.002. Online ahead of print.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8060651/
The recent outbreak of coronavirus disease 2019 (COVID-19) and concerns about several other pandemics in the 21st century have attracted extensive global attention. These emerging infectious diseases threaten global public health and raise urgent studies on unraveling the underlying mechanisms of their transmission from animals to humans. Although numerous works have intensively discussed the cross-species and endemic barriers to the occurrence and spread of emerging infectious diseases, both types of barriers play synergistic roles in wildlife habitats. Thus far, there is still a lack of a complete understanding of viral diffusion, migration, and transmission in ecosystems from a macro perspective. In this review, we conceptualize the ecological barrier that represents the combined effects of cross-species and endemic barriers for either the natural or intermediate hosts of viruses. We comprehensively discuss the key influential factors affecting the ecological barrier against viral transmission from virus hosts in their natural habitats into human society, including transmission routes, contact probability, contact frequency, and viral characteristics. Considering the significant impacts of human activities and global industrialization on the strength of the ecological barrier, ecological barrier deterioration driven by human activities is critically analyzed for potential mechanisms. Global climate change can trigger and expand the range of emerging infectious diseases, and human disturbances promote higher contact frequency and greater transmission possibility. In addition, globalization drives more transmission routes and produces new high-risk regions in city areas. This review aims to provide a new concept for and comprehensive evidence of the ecological barrier blocking the transmission and spread of emerging infectious diseases. It also offers new insights into potential strategies to protect the ecological barrier and reduce the wide-ranging risks of emerging infectious diseases to public health.

## WE ACT

15. **The green footprint of anaesthesia.** Van Zundert A. Anaesth Crit Care Pain Med. 2021 Apr 25:100872. doi: 10.1016/j.accpm.2021.100872. Online ahead of print.
https://www.clinicalkey.com/#!/content/journal/1-s2.0-S235255682100076X

Hospitals account for almost half of GHG healthcare emissions.11 Operating theatres (OTs) generate ± 30% of a hospital's total waste production, 18-20 at a rate of 13.6 kg per patient per day and a total median carbon intensity per operation of 160 kg CO2e.16,21 Sulbaek Andersen et al.10 estimated the total emissions of inhaled anaesthetics (30 million anaesthetic procedures per year) in the USA, to have a climate impact equivalent to 660.000 tons CO2e.

16. **Self-Cleaning Coatings and Surfaces of Modern Building Materials for the Removal of Some Air Pollutants.** Rabajczyk A, Zielecka M, Klapsa W, Dziechciarz A. Materials (Basel). 2021 Apr 23;14(9):2161. doi: 10.3390/ma14092161.
https://www.mdpi.com/1996-1944/14/9/2161
Air quality is one of the most important problems of the modern world, as it determines human health and changes occurring in other elements of nature, including climate change. For this reason, actions are taken to reduce the amount of harmful substances in the air. One such action is the use of building materials with special properties achieved by the application of self-cleaning coatings and photocatalytic additives. This article presents achievements in the field of additives and modifiers for building materials, whose task is to improve air quality. Concrete, cement, paints, and facade coatings modified based on the achievements of nanotechnology have been analyzed in terms of new properties and the possibility of their application in the area of modern environmental requirements. Both positive aspects and doubts were described in the scope of the effective reduction of the amount of gases such as VOC, NOx, dust and microorganisms.

17. **Core Competencies for Health Workers to Deal with Climate and Environmental Change.** Jagals P, Ebi K. Int J Environ Res Public Health. 2021 Apr 7;18(8):3849. doi: 10.3390/ijerph18083849.
https://www.mdpi.com/1660-4601/18/8/3849
Rapid, detrimental climate change and environmental degradation pose real threats to the health, environment, social, economic and technological wellbeing of society (HESET). It has become even more imperative that the health workforce (public health and medical healthcare as well as auxiliary and support workers) be 'climate-environment' competent to fulfil their role in managing the environmental public health risks and impacts as climate and environment inevitably continue to change. We developed a broad six-domain competency framework consisting of (1) climate and environment sciences, (2) drivers of climate change (3) evidence, projections and assessments (4) iterative risk management (5) mitigation, adaptation and health co-benefits and (6) collective strategies-harnessing international/regional/local agreements and frameworks. The framework can be used by health/medical trainers to design cross-sectoral sub-competencies and learning content for training health workers to function at local, regional and global levels. Reaching, maintaining and improving the different levels of competency, the health workforce will be increasingly invaluable partners in intra- as well as inter-sectoral responses to climate and environmental risks and impacts.

18. **Remote Clinics During Coronavirus Disease 2019: Lessons for a Sustainable Future.** Curtis A, Parwaiz H, Winkworth C, Sweeting L, Pallant L, Davoudi K, Smith E, Chin K, Kelsey M, Stevenson A. Cureus. 2021 Mar 25;13(3):e14114. doi: 10.7759/cureus.14114.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8075762/

Background The coronavirus disease 2019 (COVID-19) pandemic has led to a focus on non-face-to-face (NF2F) orthopedic clinics. In this study, our aim was to establish whether NF2F clinics are sustainable according to the "triple bottom line" framework by taking into account the impact on patients, the planet, and the financial cost. Methodology This retrospective cohort study was carried out at a large district general hospital with 261 patients identified as having undergone face-to-face (F2F) or NF2F orthopedic consultations (April 2020). These patients were contacted by telephone to establish their experience, mode of transport, and preference for future consultations. Data were also collected relating to environmental and financial costs to the patient and the trust. Results The final analysis included 180 (69%) patients: 42% had an F2F consultation and 58% NF2F consultation. There was no significant difference between each group in terms of convenience, ease of communication, subjective patient safety, or overall satisfaction rating ($p > 0.05$). Overall, 80% of NF2F patients would be happy with virtual consultations in the future. The mean journey distance was 18.6 miles leading to a reduction in total carbon emissions of 563.9 kgCO2e (66%), equating to 2,106 miles in a medium-sized car. The hospital visit carbon cost (heating, lighting, and waste generation) was reduced by 3,967 kgCO2e (58%). The financial cost (petrol and parking) was also reduced by an average of £8.96 per person. Conclusions NF2F consultations are aligned to the National Health Service's "Long Term Plan": (i) delivering high patient satisfaction with equivalent outcomes as F2F consultations; (ii) reducing carbon emissions from transportation and hospital running; and (iii) becoming cheaper.

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**News & Commentary**

Control pollution, protect children, save lives. Bush A. BMJ. 2021 Apr 30;373:n1110. doi: 10.1136/bmj.n1110.

Transformative climate adaptation in the United States: Trends and prospects. Shi L, Moser S. Science. 2021 Apr 29:eabc8054. doi: 10.1126/science.abc8054. Online ahead of print.

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