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COVID-19

1. **Air pollution perception in ten countries during the COVID-19 pandemic.** Lou B et al. Ambio. 2021 Jun 21:1-15. doi: 10.1007/s13280-021-01574-2. Online ahead of print.
https://link.springer.com/article/10.1007/s13280-021-01574-2
As largely documented in the literature, the stark restrictions enforced worldwide in 2020 to curb the COVID-19 pandemic also curtailed the production of air pollutants to some extent. This study investigates the perception of the air pollution as assessed by individuals located in ten countries: Australia, Brazil, China, Ghana, India, Iran, Italy, Norway, South Africa and the USA. The perceptions towards air quality were evaluated by employing an online survey administered in May 2020. Participants (N = 9394) in the ten countries expressed their opinions according to a Likert-scale response. A reduction in pollutant concentration was clearly perceived, albeit to a different extent, by all populations. The survey participants located in India and Italy perceived the largest drop in the air pollution concentration; conversely, the smallest variation was perceived among Chinese and Norwegian respondents. Among all the demographic indicators considered, only gender proved to be statistically significant.

2. **SARS-CoV-2 and helminth co-infections, and environmental pollution exposure: An epidemiological and immunological perspective.** Naidoo P, Ghazi T, Chuturgoon AA, Naidoo RN, Ramsuran V, Mpaka-Mbatha MN, Bhengu KN, Nembe N, Duma Z, Pillay R, Singh R, Mkhize-Kwitshana ZL. Environ Int. 2021 Jun 15;156:106695. doi: 10.1016/j.envint.2021.106695. Online ahead of print.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8205275/
Soil-transmitted helminths infect billions of people globally, particularly those residing in low- and middle-income regions with poor environmental sanitation and high levels of air and water pollution. Helminths display potent immunomodulatory activity by activating T helper type 2 (Th2) anti-inflammatory and Th3 regulatory immune responses. The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), the virus that causes Coronavirus disease 2019 (COVID-19), can exacerbate Th1/Th17 pro-inflammatory cytokine production in humans, leading to a

cytokine storm. Air pollutants (particulate matter, oxygen radicals, hydrocarbons and volatile organic compounds) and water pollutants (metals and organic chemicals) can also intensify Th1/Th17 immune response and could exacerbate SARS-CoV-2 related respiratory distress and failure. The present review focused on the epidemiology of SARS-CoV-2, helminths and fine particulate matter 2.5 µm or less in diameter (PM2.5) air pollution exposure in helminth endemic regions, the possible immunomodulatory activity of helminths against SARS-CoV-2 hyper-inflammatory immune response, and whether air and water pollutants can further exacerbate SARS-CoV-2 related cytokine storm and in the process hinder helminths immunomodulatory functionality. Helminth Th2/Th3 immune response is associated with reductions in lung inflammation and damage, and decreased expression levels of angiotensin-converting enzyme 2 (ACE2) receptors (SARS-CoV-2 uses the ACE2 receptors to infect cells and associated with extensive lung damage). However, air pollutants are associated with overexpression of ACE2 receptors in the epithelial cell surface of the respiratory tract and exhaustion of Th2 immune response. Helminth-induced immunosuppression activity reduces vaccination efficacy, and diminishes vital Th1 cytokine production immune responses that are crucial for combating early stage infections. This could be reversed by continuous air pollution exposure which is known to intensify Th1 pro-inflammatory cytokine production to a point where the immunosuppressive activities of helminths could be hindered. Again, suppressed activities of helminths can also be disadvantageous against SARS-CoV-2 inflammatory response. This "yin and yang" approach seems complex and requires more understanding. Further studies are warranted in a cohort of SARS-CoV-2 infected individuals residing in helminths and air pollution endemic regions to offer more insights, and to impact mass periodic deworming programmes and environmental health policies.

3. **Long-term air pollution and other risk factors associated with COVID-19 at the census tract level in Colorado.** Berg K, Romer Present P, Richardson K. Environ Pollut. 2021 Jun 14;287:117584. doi: 10.1016/j.envpol.2021.117584. Online ahead of print. https://www.sciencedirect.com/science/article/pii/S0269749121011660
Previous nationwide studies have reported links between long-term concentrations of fine particulate matter (PM2.5) and COVID-19 infection and mortality rates. In order to translate these results to the state level, we use Bayesian hierarchical models to explore potential links between long-term PM2.5 concentrations and census tract-level rates of COVID-19 outcomes (infections, hospitalizations, and deaths) in Colorado. We explicitly consider how the uncertainty in PM2.5 estimates affects our results by comparing four different PM2.5 surfaces from academic and governmental organizations. After controlling for 20 census tract-level covariates, we find that our results depend heavily on the choice of PM2.5 surface. Using PM2.5 estimates from the United States EPA, we find that a 1 µg/m3 increase in long-term PM2.5 concentrations is associated with a statistically significant 26% increase in the relative risk of hospitalizations and a 34% increase in mortality. Results for all other surfaces and outcomes were not statistically significant. At the same time, we find a clear association between communities of color and COVID-19 outcomes at the Colorado census tract level that is minimally affected by the choice of PM2.5 surface. A per-interquartile range (IQR) increase in the percent of non-African American people of color was associated with a 31%, 43%, and 56% increase in the relative risk of infection, hospitalization, and mortality respectively, while a per-

IQR increase in the proportion of non-Hispanic African Americans was associated with a 4% and 7% increase in the relative risk of infections and hospitalizations. The current disagreement among the different PM2.5 estimates is a key factor limiting our ability to link environmental exposures and health outcomes at the census tract level. These results have strong implications for the implementation of an equitable public health response during the crisis and suggest targeted areas for additional air monitoring in Colorado.

4. **Effects of COVID-19 lockdowns on fine particulate matter concentrations.** Hammer MS, van Donkelaar A, Martin RV, McDuffie EE, Lyapustin A, Sayer AM, Hsu NC, Levy RC, Garay MJ, Kalashnikova OV, Kahn RA. Sci Adv. 2021 Jun 23;7(26):eabg7670. doi: 10.1126/sciadv.abg7670. Print 2021 Jun.
   https://advances.sciencemag.org/content/7/26/eabg7670
   Lockdowns during the COVID-19 pandemic provide an unprecedented opportunity to examine the effects of human activity on air quality. The effects on fine particulate matter (PM2.5) are of particular interest, as PM2.5 is the leading environmental risk factor for mortality globally. We map global PM2.5 concentrations for January to April 2020 with a focus on China, Europe, and North America using a combination of satellite data, simulation, and ground-based observations. We examine PM2.5 concentrations during lockdown periods in 2020 compared to the same periods in 2018 to 2019. We find changes in population-weighted mean PM2.5 concentrations during the lockdowns of -11 to -15 μg/m3 across China, +1 to -2 μg/m3 across Europe, and 0 to -2 μg/m3 across North America. We explain these changes through a combination of meteorology and emission reductions, mostly due to transportation. This work demonstrates regional differences in the sensitivity of PM2.5 to emission sources.

5. **The Climate Response to Emissions Reductions Due to COVID-19: Initial Results From CovidMIP.** Jones CD et al. Geophys Res Lett. 2021 Apr 28;48(8):e2020GL091883. doi: 10.1029/2020GL091883.
   https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020GL091883
   Many nations responded to the corona virus disease-2019 (COVID-19) pandemic by restricting travel and other activities during 2020, resulting in temporarily reduced emissions of CO2, other greenhouse gases and ozone and aerosol precursors. We present the initial results from a coordinated Intercomparison, CovidMIP, of Earth system model simulations which assess the impact on climate of these emissions reductions. 12 models performed multiple initial-condition ensembles to produce over 300 simulations spanning both initial condition and model structural uncertainty. We find model consensus on reduced aerosol amounts (particularly over southern and eastern Asia) and associated increases in surface shortwave radiation levels. However, any impact on near-surface temperature or rainfall during 2020-2024 is extremely small and is not detectable in this initial analysis. Regional analyses on a finer scale, and closer attention to extremes (especially linked to changes in atmospheric composition and air quality) are required to test the impact of COVID-19-related emission reductions on near-term climate.

6. **The US Response to COVID-19 and Climate Change Endangers the Country and the World.** Jamieson D, Jacquet J. One Earth. 2020 Jun 19;2(6):503-505. doi: 10.1016/j.oneear.2020.05.020.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7304394/
Climate change and pandemics require cooperative, integrated responses that in turn require planning, coordination, and the mobilization of expertise. US failures in these domains have compromised the world's ability to cope with both problems. At a minimum, the US needs to re-engage with the Paris Agreement and support the World Health Organization.

Health Impacts of Climate Change

7. **Association between Meniere's disease and air pollution in South Korea.** Lee DH, Han J, Jang MJ, Suh MW, Lee JH, Oh SH, Park MK. Sci Rep. 2021 Jun 23;11(1):13128. doi: 10.1038/s41598-021-92355-0.
https://www.nature.com/articles/s41598-021-92355-0
Meniere's disease is thought to be a disorder of the inner ear function, affected by genetic and environmental factors. Several recent studies have shown that air pollution could affect middle and inner ear diseases. The purpose of this study was to investigate the relationship between the Meniere's disease occurrence and air pollution status in Korea. This study used a time-stratified case-crossover design. Hospital visit data by Meniere's disease were collected from the Korea National Health Insurance Service-National Sample Cohort (NHIS-NSC) database. Daily air pollution data for sulfur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO), ozone (O3), and particulate matter (PM10: ≤ 10 μm in diameter, and PM2.5: ≤ 2.5 μm in diameter) were collected from the National Ambient air quality Monitoring Information System (NAMIS) database. We used two-stage analysis to assess the association between degree of air pollution and the occurrence of Meniere's disease. In the first stage, region-specific analysis was conducted to estimate the odds ratios (ORs) of Meniere's disease risk associated with each air pollutant exposure by using conditional logistic regression for matched case-control sets in 16 regions. In the second stage, region-specific ORs from the first stage were combined and the pooled effect estimates were derived through fixed and random effect meta-analysis. Subgroup analysis was conducted for age, sex, seasonality, and urbanization of residence. In total, 29,646 (32.1% males and 67.9% females) Meniere's disease cases were identified from Korea NHIS-NSC database between 2008 and 2015. Overall, SO2, NO2, CO, and PM10 showed significant correlation with Meniere's disease risk at immediate lags, and weaker correlation at delayed lags, whereas O3 showed slightly negative correlation at the immediate lag (lag0) and PM2.5 did not show strong correlation (SO2: 1.04 [95% confidence interval: 1.01, 1.06]; NO2: 1.08 [1.06, 1.11]; CO: 1.04 [1.02, 1.06]; O3: 0.96 [0.93, 0.99]: statistically significant ORs at lag0 are listed). These positive and negative associations between Meniere's disease and each air pollutant were generally stronger in the age of 40-64, female, summer (June-August) season, and urban subgroups. Our results showed that hospital visits for Meniere's disease were associated with the measured concentrations of ambient air pollutants SO2, NO2, CO, and PM10. Further studies are required to confirm these associations and find their mechanisms.

8. **Indoor and Outdoor Pollution as Risk Factor for Allergic Diseases of the Skin and Lungs.** Schikowski T. Handb Exp Pharmacol. 2021 Jun 23. doi: 10.1007/164_2021_503. Online ahead of print.

Air pollution is worldwide a major public health problem and affects large part of the population. Air pollution does not only harm the respiratory tract system but also the other organs of the body. The damage may result directly from the pollutants toxicity, because the pollutant enters into the organs through a direct route or indirectly through systemic inflammation. There is accumulating evidence suggesting that ambient air pollution not only affects the human lung and the cardiovascular system, but also has negative effects on allergic diseases. In this regard, it has been shown that exposure increases the risk of allergies and eczema in children and adults. However, the mechanism how ambient air pollution affects the skin is not well investigated up to now and needs further research.

9. **Effects of high-frequency temperature variabilities on the morbidity of chronic obstructive pulmonary disease: Evidence in 21 cities of Guangdong, South China.** Tian H, Zhou Y, Wang Z, Huang X, Ge E, Wu S, Wang P, Tong X, Ran P, Luo M. Environ Res. 2021 Jun 23;201:111544. doi: 10.1016/j.envres.2021.111544. Online ahead of print.
   BACKGROUND: While temperature changes have been confirmed as one of the contributory factors affecting human health, the association between high-frequency temperature variability (HFTV, i.e., temperature variation at short time scales such as 1, 2, and 5 days) and the hospitalization of chronic obstructive pulmonary disease (COPD) was rarely reported.
   OBJECTIVES: To evaluate the associations between high-frequency temperature variabilities (i.e., at 1, 2, and 5-day scales) and daily COPD hospitalization.
   METHODS: We collected daily records of COPD hospitalization and meteorological variables from 2013 to 2017 in 21 cities of Guangdong Province, South China. A quasi-Poisson regression with a distributed lag nonlinear model was first employed to quantify the effects of two HFTV measures, i.e., the day-to-day (DTD) temperature change and the intraday-interday temperature variability (IITV), on COPD morbidity for each city. Second, we used multivariate meta-analysis to pool the city-specific estimates, and stratified analyses were performed by age and sex to identify vulnerable groups. Then, the meta-regression with city-level characteristics was employed to detect the potential sources of the differences among 21 cities.
   RESULTS: A monotonic increasing curve of the overall exposure-response association was observed, suggesting that positive HFTV (i.e., increased DTD and IITV) will significantly increase the risk of COPD admission. Negative DTD was associated with reduced COPD morbidity while positive DTD elevated the COPD risk. An interquartile range (IQR) increase in DTD was associated with a 24% (95% CI: 12-38%) increase in COPD admissions. An IQR increase in IITV0-1 was associated with 18% (95% CI: 7-27%) increase in COPD admissions. Males and people aged 0-64 years appeared to be more vulnerable to the DTD effect than others. Potential sources of the disparity among different cities include urbanization level, sex structure, industry structure, gross domestic product (GDP), health care services, and air quality.
   CONCLUSIONS: The increases of DTD and IITV have significant adverse impacts on COPD hospitalization. As climate change intensifies, precautions need to be taken to mitigate the impacts of high-frequency temperature changes.

10. **The widespread and unjust drinking water and clean water crisis in the United States.** Mueller JT, Gasteyer S. Nat Commun. 2021 Jun 22;12(1):3544. doi: 10.1038/s41467-021-23898-z. https://www.nature.com/articles/s41467-021-23898-z

Many households in the United States face issues of incomplete plumbing and poor water quality. Prior scholarship on this issue has focused on one dimension of water hardship at a time, leaving the full picture incomplete. Here we complete this picture by documenting the full scope of water hardship in the United States and find evidence of a regionally-clustered, socially unequal nationwide household water crisis. Using data from the American Community Survey and the Environmental Protection Agency, we show there are 489,836 households lacking complete plumbing, 1,165 community water systems in Safe Drinking Water Act Serious Violation, and 21,035 Clean Water Act permittees in Significant Noncompliance. Further, we demonstrate this crisis is regionally clustered, with the specific spatial pattern varying by the specific form of water hardship. Elevated levels of water hardship are associated with the social dimensions of rurality, poverty, indigeneity, education, and age-representing a nationwide environmental injustice.

11. **Exposure to ambient air pollution during trimesters of pregnancy and childhood allergic diseases in Wuhan, China.** Guo M, Wei L, Yan H, Duan Z, Niu Z, Xiao C. Int J Environ Health Res. 2021 Jun 22:1-11. doi: 10.1080/09603123.2021.1929873. Online ahead of print.
The study explored the associations between maternal exposure to air pollution during different trimesters and allergic diseases including asthma, allergic rhinitis, allergic conjunctivitis or/and eczema. Individual exposure to air pollutants was assessed by an inverse distance weighted (IDW) method using daily concentrations of SO2, NO2, PM10, and PM2.5 from air quality monitoring stations. Multiple logistic regression model was performed to estimate the associations between air pollution during each trimester of pregnancy and childhood allergic diseases. A total of 332 children (51.3%) were reported by their parents having been diagnosed with allergic diseases. After adjusting for covariates, allergic diseases were significantly associated with per interquartile range (IQR) increase in NO2, PM10, PM2.5 during the second trimester with odds ratios (ORs) and 95% confidence intervals (95%CIs) being 1.292 (1.005,1.662), 1.210 (1.042,1,405) and 1.270 (1.004,1.606), respectively. These findings suggest that maternal exposure to certain air pollutants during pregnancy, especially in the second trimester, is associated with childhood allergic diseases.

12. **Climate change and TB: the soil and seed conceptual framework.** Sinha P, Carwile ME, Cintron C, de Perez EC, Hochberg NS. Public Health Action. 2021 Jun 21;11(2):108. doi: 10.5588/pha.21.0030.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8202625/
Climate change can impact the TB pandemic through mechanisms that either aid TB transmission (the seed) or make hosts more vulnerable to TB disease (the soil). Examples of the former include increased risk of displaced populations living in cramped conditions due to severe weather events and increased risk of TB transmission. The latter, vulnerability to TB disease, can be increased by more frequent severe weather events (such as floods), which disrupt access to preventive and therapeutic care. This includes care for prominent TB risk factors such as HIV and diabetes, as well as TB preventive therapy, as described by Harries et al.1 The pace of climate change is rapid and non-linear, meaning that although some of these mechanisms may currently appear negligible, they can suddenly and increasingly hamper global TB elimination efforts.

13. **Increased risk of eosinophilic esophagitis with poor environmental quality as measured by the Environmental Quality Index.** Nance D, Rappazzo KM, Jensen ET, Hoffman K, Cotton CC, Krajewski AK, Turner KO, Genta RM, Lobdell DT, Dellon ES. Dis Esophagus. 2021 Jun 21:doab041. doi: 10.1093/dote/doab041. Online ahead of print.
Geographic differences in eosinophilic esophagitis (EoE) prevalence suggest the possibility that environmental exposures contribute to EoE pathogenesis. We aimed to examine the association between environmental quality and risk of EoE, using the Environmental Quality Index (EQI), which provides quantification of environmental quality in five domains: air, land, water, built, and sociodemographic for all counties in the United States. To do this, we performed a case-control study in a large pathology database. EoE cases were defined by ≥15 eosinophils per high-power field with other pathologic diagnoses excluded; controls did not have EoE. The pathology data were geocoded and linked with the EQI by county of residence. Logistic regression was used to estimate odds ratio (OR and 95% confidence interval [CI]) of EoE with overall EQI and for each domain, after adjusting for sex, age, and proportion minority race or ethnicity at the county level (higher EQI score indicates worse environmental quality). Of 29,802 EoE cases and 593,329 controls analyzed, odds of EoE were highest in the worst quintile of EQI (OR 1.25; 95% CI: 1.04-1.50), which was largely explained by poor scores in the water domain (OR: 1.33; 1.17-1.50). Conversely, odds of EoE were reduced with higher scores in the air domain (OR: 0.87, 0.74-1.03) and land domain (OR 0.87; 0.76-0.99). Poor EQI, mostly reflected by poor water quality, was associated with increased odds of EoE, while poor air and land quality were inversely associated with EoE. Additional work to identify specific water pollutants that may have an etiologic role in EoE may be warranted.

14. **Sepsis-related hospital admissions and ambient air pollution: a time series analysis in 6 Chinese cities.** Wang Y, Liu Z, Yang L, Zhou J, Li J, Liao HL, Tian XJ. BMC Public Health. 2021 Jun 21;21(1):1182. doi: 10.1186/s12889-021-11220-x.
https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-11220-x
BACKGROUND: Some prevalent but rarely studied causes of hospital admissions, such as sepsis is still unknown whether affected by air pollution.
METHODS: We used time-series regression within generalized additive models to estimate the effect of air pollutant level on the sepsis-related hospital admissions, for the years 2017-18, using data from six cities in Sichuan, China. Potential effect modifications by age and sex were also explored. The effects of air pollutant on hospital stays for sepsis were also quantified.
RESULTS: Positive associations between short-term exposure to NO2 and O3 and risk of sepsis-related hospital admissions and stays were found. Each 10 μg/m3 increase in short-term NO2 at lag 03 and O3 at lag 4 was associated with an increase of 2.76% (95% CI: 0.67, 4.84%) and 0.64% (95% CI: 0.14, 1.14%) hospital admissions, respectively. An increase of 0.72% (95% CI: 0.05, 1.40%) hospital stay was associated with 10 μg/m3 increase in O3 concentration at lag 4. Besides, the adverse effect of exposure to NO2 was more significant in males and population aged less than 14 years; while more significant in females and population aged 14 ~ 65 and over 65 years for exposure to O3. These associations remained stable after the adjustment of other air pollutants.8.

CONCLUSION: Exposure to ambient NO2 and O3 may cause substantial sepsis hospitalizations, and hospital stays in Sichuan, China. These associations were different in subgroup by age and sex.

15. **Heat health risk assessment analysing heatstroke patients in Fukuoka City, Japan.** Toosty NT, Hagishima A, Tanaka KI. PLoS One. 2021 Jun 21;16(6):e0253011. doi: 10.1371/journal.pone.0253011. eCollection 2021.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0253011
BACKGROUND: Climate change, as a defining issue of the current time, is causing severe heat-related illness in the context of extremely hot weather conditions. In Japan, the remarkable temperature increase in summer caused by an urban heat island and climate change has become a threat to public health in recent years.
METHODS: This study aimed to determine the potential risk factors for heatstroke by analysing data extracted from the records of emergency transport to the hospital due to heatstroke in Fukuoka City, Japan. In this regard, a negative binomial regression model was used to account for overdispersion in the data. Age-structure analyses of heatstroke patients were also embodied to identify the sub-population of Fukuoka City with the highest susceptibility.
RESULTS: The daily maximum temperature and wet-bulb globe temperature (WBGT), along with differences in both the mean temperature and time-weighted temperature from those of the consecutive past days were detected as significant risk factors for heatstroke. Results indicated that there was a positive association between the resulting risk factors and the probability of heatstroke occurrence. The elderly of Fukuoka City aged 70 years or older were found to be the most vulnerable to heatstroke. Most of the aforementioned risk factors also encountered significant and positive associations with the risk of heatstroke occurrence for the group with highest susceptibility.
CONCLUSION: These results can provide insights for health professionals and stakeholders in designing their strategies to reduce heatstroke patients and to secure the emergency transport systems in summer.

16. **Assessing the health impacts attributable to PM(2.5) and ozone pollution in 338 Chinese cities from 2015 to 2020.** Guan Y, Xiao Y, Wang Y, Zhang N, Chu C. Environ Pollut. 2021 Jun 19;287:117623. doi: 10.1016/j.envpol.2021.117623. Online ahead of print.
China has effectively reduced the fine particulate (PM2.5) pollution from 2015 to 2020. Ozone pollution and related health impacts have become severe contemporaneously. The coordinated control of PM2.5 and ozone is becoming a new issue for China's air pollution control. This study quantitatively assessed the health impacts attributed to PM2.5 and ozone pollution in 338 Chinese cities from 2015 to 2020 and estimated the possible health benefits from achieving dual concentration targets during 2021-2025. Results show PM2.5 caused a total health impact of 2.45 × 107 disability-adjusted life years (DALYs) in 2020. All-cause and respiratory ozone-related health impact in 2020 was 1.04 × 107 DALYs and 1.56 × 106 DALYs. Between 2015 and 2020, the PM2.5-related health impacts decreased by 14.97%, while those ozone-related increased by 94.61% and 96.54% for all-cause and respiratory. Cities in the North China Plain have suffered higher health impacts attributable to PM2.5 and ozone pollution, indicating that the two-pollutant coordinated control is primarily needed. By achieving aggressive

concentration target (decreasing 10%) between 2020 and 2025, China will reduce the PM2.5-related health impacts in 338 cities by 1.56 × 106 DALYs (improving 6.37%). By achieving general target (decreasing 10% or within the Interim target-1 of World Health Organization), the PM2.5-related health benefit will be 7.98 × 105 DALYs (improving 3.25%). The deteriorating ozone health risks will also be improved. Controlling air pollution in large cities and regional center cities can achieve remarkable health benefits. Due to the inter-region, inter-province, and inter-city difference of health impacts, targeted and differentiated pollution prevention and control need to be implemented.

17. **Reduced ambient PM(2.5,) better lung function, and decreased risk of chronic obstructive pulmonary disease.** Bo Y, Chang LY, Guo C, Lin C, Lau AKH, Tam T, Lao XQ. Environ Int. 2021 Jun 18;156:106706. doi: 10.1016/j.envint.2021.106706. Online ahead of print.
https://www.sciencedirect.com/science/article/pii/S0160412021003317
BACKGROUND: Several studies reported that long-term exposure to fine particulate matter (PM2.5) was associated with an increased risk of chronic obstructive pulmonary disease (COPD). It remains unclear whether reduced PM2.5 can decrease the risk of COPD development.
OBJECTIVE: To investigate the associations of dynamic changes (including deterioration and improvement) in long-term exposure to ambient PM2.5 with changes in lung function and the incidence of COPD.
METHODS: A total of 133,119 adults (aged 18 years or older) were recruited in Taiwan between 2001 and 2014. All participants underwent at least two standard medical examinations including spirometry test. We estimated PM2.5 concentrations using a high-resolution (1 km2) satellite-based spatio-temporal model. The change in PM2.5 (ΔPM2.5) was defined as the difference in concentration of PM2.5 between the respective visit and the previous visit. We used a multivariable mixed linear model and time-varying Cox model to investigate the associations of change in PM2.5 with annual change of lung function and the incidence of COPD, respectively.
RESULT: The PM2.5 concentration in Taiwan increased during 2002-2004 and began to decrease around 2005. Every 5-μg/m3/year decrease in the annual change of PM2.5 (i.e., ΔPM2.5/year of 5 μg/m3/year) was associated with an average increase of 19.93 mL/year (95 %CI: 17.42,22.43) in forced expiratory volume in 1 s (FEV1), 12.76 mL/year (95 %CI: 9.84,15.66) in forced vital capacity (FVC), 70.22 mL/s/year (95 %CI: 64.69,76.16) in midexpiratory flow between 25 and 75% of the forced vital capacity (MEF25-75), 0.27%/year (95 %CI: 0.21%, 0.32%) in FEV1/FVC/year. Every 5 μg/m3 decrease in PM2.5 (i.e., ΔPM2.5 of 5 μg/m3) was associated with a 12% (95 %CI: 7%, 17%) reduced risk of COPD development. The stratified and sensitivity analyses generally yielded similar results.
CONCLUSION: An improvement in PM2.5 pollution exposure was associated with an attenuated decline in lung function parameters of FEV1, FVC, MEF25-75, and FEV1/FVC, and a decreased risk of COPD development. Our findings suggest that strategies aimed at reducing air pollution may effectively combat the risk of COPD development.

18. **When particulate matter strikes cities: Social disparities and health costs of air pollution.** Giaccherini M, Kopinska J, Palma A. J Health Econ. 2021 Jun 5;78:102478. doi: 10.1016/j.jhealeco.2021.102478. Online ahead of print.
    We investigate the heterogeneous effects of particle pollution on Italian daily hospitalizations and their costs by exploiting public transportation strikes as plausibly-exogenous shocks in pollution exposure. We find that a one standard deviation increase in PM10 causes additional 0.79 hospitalizations per 100,000 residents, and the effect is stronger for the elderly, low educated individuals and migrants. Furthermore, we find that young individuals, an arguably healthy age group, exhibit economically meaningful responses to air pollution with an effect ranging between 0.45 and 1.04. Our results imply a large role of avoidance behavior driving heterogeneous marginal health effects. Total daily costs of a one standard deviation increase in PM10 represent 0.5% of the total daily health expenditure, and 85% of this additional spending comes from more patients hospitalized, while the remaining 15% can be attributable to more costly, and likely more complex, hospitalizations.

19. **Severe Air Pollution and Psychological Distress in China: The Interactive Effects of Coping and Perceived Controllability.** Zhu Z, Zhao Y. Front Psychol. 2021 Jun 2;12:601964. doi: 10.3389/fpsyg.2021.601964. eCollection 2021.
    https://www.frontiersin.org/articles/10.3389/fpsyg.2021.601964/full
    The coping styles of focusing on a stressor (i.e., trauma focus), and moving beyond the emotional impact of a stressor (i.e., forward focus), have both been found beneficial to psychological adjustment. This study investigated whether these two coping styles are similarly associated with adjustment across levels of perceived controllability and beyond European-American contexts. During China's peak of air pollution in 2014, we surveyed 250 young- to middle- aged adults online to measure their coping behaviors, smog perceptions, and psychological distress, and collected objective data of pollution severity in the respondents' cities. Results showed that forward-focus coping was generally associated with lower distress and trauma-focus coping was associated with greater distress. Perceived controllability significantly moderated the associations between trauma focus (but not forward focus) and distress. These findings suggest that while forward focus correlated with beneficial adjustment outcomes in coping with air pollution, the extensive processing of event-related cognitions and emotions in trauma focus may be detrimental, especially for events perceived to be less controllable. We discussed the implications of our findings within an interdependent cultural context.

20. **Exposure to traffic-related air pollution and bacterial diversity in the lower respiratory tract of children.** Niemeier-Walsh C, Ryan PH, Meller J, Ollberding NJ, Adhikari A, Reponen T. PLoS One. 2021 Jun 24;16(6):e0244341. doi: 10.1371/journal.pone.0244341. eCollection 2021.
    https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0244341
    BACKGROUND: Exposure to particulate matter has been shown to increase the adhesion of bacteria to human airway epithelial cells. However, the impact of traffic-related air pollution (TRAP) on the respiratory microbiome is unknown.
    METHODS: Forty children were recruited through the Cincinnati Childhood Allergy and Air Pollution Study, a longitudinal cohort followed from birth through early adolescence. Saliva and

induced sputum were collected at age 14 years. Exposure to TRAP was characterized from birth through the time of sample collection using a previously validated land-use regression model. Sequencing of the bacterial 16S and ITS fungal rRNA genes was performed on sputum and saliva samples. The relative abundance of bacterial taxa and diversity indices were compared in children with exposure to high and low TRAP. We also used multiple linear regression to assess the effect of TRAP exposure, gender, asthma status, and socioeconomic status on the alpha diversity of bacteria in sputum.
RESULTS: We observed higher bacterial alpha diversity indices in sputum than in saliva. The diversity indices for bacteria were greater in the high TRAP exposure group than the low exposure group. These differences remained after adjusting for asthma status, gender, and mother's education. No differences were observed in the fungal microbiome between TRAP exposure groups.
CONCLUSION: Our findings indicate that exposure to TRAP in early childhood and adolescence may be associated with greater bacterial diversity in the lower respiratory tract. Asthma status does not appear to confound the observed differences in diversity. These results demonstrate that there may be a TRAP-exposure related change in the lower respiratory microbiota that is independent of asthma status.

21. **Making the climate crisis personal through a focus on human health.** Limaye VS. Clim Change. 2021;166(3-4):43. doi: 10.1007/s10584-021-03107-y. Epub 2021 Jun 17. https://link.springer.com/article/10.1007/s10584-021-03107-y
Climate change-driven health impacts are serious, widespread, and costly. Importantly, such damages are largely absent from policy debates around the costs of delay and inaction on this crisis. While climate change is a global problem, its impacts are localized and personal, and there is growing demand for specific information on how climate change affects human health in different places. Existing research indicates that climate-fueled health problems are growing, and that investments in reducing carbon pollution and improving community resilience could help to avoid tens to hundreds of billions of dollars in climate-sensitive health impacts across the USA each year, including those stemming from extreme heat, air pollution, hurricanes, and wildfires. Science that explores the underappreciated local health impacts and health-related costs of climate change can enhance advocacy by demonstrating the need to both address the root causes of climate change and enhance climate resilience in vulnerable communities. The climate crisis has historically been predominantly conceived as a global environmental challenge; examination of climate impacts on public health enables researchers to localize this urgent problem for members of the public and policymakers. In turn, approaches to climate science that focus on health can make dangerous climate impacts and the need for cost-effective solutions more salient and tangible.

WE ACT

22. **Nurses Promoting Inclusive, Safe, Resilient, and Sustainable Cities and Communities: Taking Action on COVID-19, Systemic Racism, and Climate Change.** Schenk EC, Potter TM, Cook C, Huffling K, Rosa WE. Am J Nurs. 2021 Jul 1;121(7):66-69. doi: 10.1097/01.NAJ.0000758540.26343.2e.

https://journals.lww.com/ajnonline/Fulltext/2021/07000/Nurses_Promoting_Inclusive,_Safe,_Resilient,_and.36.aspx

This article is one in a series in which contributing authors discuss how the United Nations (UN) Sustainable Development Goals (SDGs) are linked to everyday clinical issues; national public health emergencies; and other nursing issues, such as leadership, shared governance, and advocacy. The 2030 Agenda for Sustainable Development, a 15-year plan of action to achieve the goals, was unanimously adopted by all UN member states in September 2015 and took effect on January 1, 2016. The Agenda consists of 17 SDGs addressing social, economic, and environmental determinants of health and 169 associated targets focused on five themes: people, planet, peace, prosperity, and partnership. The SDGs build on the work of the UN Millennium Development Goals, which were in effect from 2000 to 2015. The current article highlights SDG 11-making "cities and human settlements inclusive, safe, resilient and sustainable."

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