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COVID-19

- 1. The association between air pollution and COVID-19 related mortality in Santiago, Chile: A daily time series analysis.** Dales R, Blanco-Vidal C, Romero-Meza R, Schoen S, Lukina A, Cakmak S. Environ Res. 2021 May 8;198:111284. doi: 10.1016/j.envres.2021.111284. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0013935121005788>

BACKGROUND: Exposure to ambient air pollution is a risk factor for morbidity and mortality from lung and heart disease.

RESEARCH QUESTION: Does short term exposure to ambient air pollution influence COVID-19 related mortality?

STUDY DESIGN AND METHODOLOGY: Using time series analyses we tested the association between daily changes in air pollution measured by stationary monitors in and around Santiago, Chile and deaths from laboratory confirmed or suspected COVID-19 between March 16 and August 31, 2020. Results were adjusted for temporal trends, temperature and humidity, and stratified by age and sex.

RESULTS: There were 10,069 COVID-19 related deaths of which 7659 were laboratory confirmed. Using distributed lags, the cumulative relative risk (RR) (95% CI) of mortality for an interquartile range (IQR) increase in CO, NO₂ and PM_{2.5} were 1.061 (1.033-1.089), 1.067 (1.023-1.103) and 1.058 (1.034-1.082), respectively There were no significant differences in RR by sex.. In those at least 85 years old, an IQR increase in NO₂ was associated with a 12.7% (95% CI 4.2-22.2) increase in daily mortality.

CONCLUSION: This study provides evidence that daily increases in air pollution increase the risk of dying from COVID-19, especially in the elderly.
- 2. Investigating Air Pollution as a Contributor to Health Disparities During the COVID-19 Pandemic.** Marwah H, Rosseau N, Mangipudi S, Ward C, Keswani A. Ann Allergy Asthma Immunol. 2021 May 6:S1081-1206(21)00338-0. doi: 10.1016/j.anai.2021.04.030. Online ahead of print.

[https://www.annallergy.org/article/S1081-1206\(21\)00338-0/fulltext](https://www.annallergy.org/article/S1081-1206(21)00338-0/fulltext)

The high rates of morbidity and mortality from COVID-19 among Black patients has been a ubiquitous component of media coverage of the global pandemic.¹ While the association between race and COVID-19 is likely multifactorial due to household crowding, socioeconomic status and percentage of essential workers,² the association between air pollution, and the disproportionate exposure of COVID-19 for minority communities, has not been adequately explored. Emerging evidence has shown there is a relationship between exposure to increased levels of air pollution and adverse COVID-19 outcomes, and displayed that race is a significant predictor of living in a polluted area within the United States.¹ Prolonged exposure to air pollution leads to chronic inflammatory stimulation with a link between race, pollution, and respiratory conditions in vulnerable populations.³ Though race is often cited as an independent risk factor for poor outcomes in respiratory diseases such as asthma, environmental factors that disproportionately impact communities of color play a significant role in health disparities across the U.S. As such, the higher rates of pollution in areas with a greater proportion of Black residents may also contribute to the data indicating poor COVID-19 outcomes among Black patients.¹ A nationwide cross-sectional study showed that a 1µg/m³ increase in PM_{2.5} was significantly correlated with an 11% increase in the COVID-19 death rate.⁴ Regional percentage of Black residents was an additional predictor of COVID-19 mortality.⁴ Populations exposed to increased air pollution levels in China and Italy were shown to have a higher COVID-19 incidence and mortality.^{3,5}

3. **Effect of environmental and socio-economic factors on the spreading of COVID-19 at 70 cities/provinces.** Ahmed J, Jaman MH, Saha G, Ghosh P. *Heliyon*. 2021 May;7(5):e06979. doi: 10.1016/j.heliyon.2021.e06979. Epub 2021 May 5.

[https://www.cell.com/heliyon/fulltext/S2405-8440\(21\)01082-3](https://www.cell.com/heliyon/fulltext/S2405-8440(21)01082-3)

The main goal of this article is to demonstrate the impact of environmental and socio-economic factors on the spreading of COVID-19. In this research, data has been collected from 70 cities/provinces of different countries around the world that are affected by COVID-19. In this research, environmental data such as temperatures, humidity, air quality and population density and socio-economic data such as GDP (PPP) per capita, per capita health expenditure, life expectancy and total test in each of these cities/provinces are considered. This data has been analyzed using statistical models such as Poisson and negative binomial models. It is found that a negative binomial regression model is the best fit for our data. Our results reveal higher population density to be an important factor for the quick spread of COVID-19 as maintenance of social distancing requirements are more difficult in urban areas. Moreover, GDP (PPP) and PM_{2.5} are linked with fewer cases of COVID-19 whereas PM₁₀, and total number of tests are strongly associated with the increase of COVID-19 case counts.

4. **Effects of COVID-19 on the environment: An overview on air, water, wastewater, and solid waste.** Elsaid K, Olabi V, Sayed ET, Wilberforce T, Abdelkareem MA. *J Environ Manage*. 2021 Apr 30;292:112694. doi: 10.1016/j.jenvman.2021.112694. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0301479721007568>

The COVID-19 pandemic has hit the world hardly as of the beginning of 2020 and quickly spread worldwide from its first-reported point in early Dec. 2019. By mid-March 2021, the COVID-19

almost hit all countries worldwide, with about 122 and 2.7 million confirmed cases and deaths, respectively. As a strong measure to stop the infection spread and deaths, many countries have enforced quarantine and lockdown of many activities. The shutdown of these activities has resulted in large economic losses. However, it has been widely reported that these measures have resulted in improved air quality, more specifically in highly polluted areas characterized by massive population and industrial activities. The reduced levels of carbon, nitrogen, sulfur, and particulate matter emissions have been reported and confirmed worldwide in association with lockdown periods. On the other hand, ozone levels in ambient air have been found to increase, mainly in response to the reduced nitrogen emissions. In addition, improved water quality in natural water resources has been reported as well. Wastewater facilities have reported a higher level of organic load with persistent chemicals due to the increased use of sanitizers, disinfectants, and antibiotics. The solid waste generated due to the COVID-19 pandemic was found to increase both qualitatively and quantitatively. This work presents and summarizes the observed environmental effects of COVID-19 as reported in the literature for different countries worldwide. The work provides a distinct overview considering the effects imposed by COVID-19 on the air, water, wastewater, and solid waste as critical elements of the environment.

Health Impacts of Climate Change

- 5. Long-term air pollution and road traffic noise exposure and COPD: the Danish Nurse Cohort.**
Liu S, Lim YH, Pedersen M, Jørgensen JT, Amini H, Cole-Hunter T, Mehta AJ, So R, Mortensen LH, Westendorp RGJ, Loft S, Bräuner EV, Ketzler M, Hertel O, Brandt J, Jensen SS, Christensen JH, Sigsgaard T, Geels C, Frohn LM, Brborić M, Radonić J, Sekulic MT, Bønnelykke K, Backalarz C, Simonsen MK, Andersen ZJ. *Eur Respir J.* 2021 May 13:2004594. doi: 10.1183/13993003.04594-2020. Online ahead of print.
BACKGROUND: While air pollution has been linked to the development of chronic obstructive pulmonary disease (COPD), evidence on the role of environmental noise is just emerging. We examined the associations of long-term exposure to air pollution and road traffic noise with COPD incidence.
METHODS: We defined COPD incidence for 24 538 female nurses from the Danish Nurse Cohort (age>44 years) as the first hospital contact between baseline (1993 or 1999) and 2015. We estimated residential annual mean concentrations of particulate matter with diameter<2.5 µm (PM_{2.5}) since 1990 and nitrogen dioxide (NO₂) since 1970 by the Danish DEHM/UBM/AirGIS modeling system, and road traffic noise (Lden) since 1970 by the Nord2000 model. Time-varying Cox regression models were applied to assess the associations of air pollution and road traffic noise with COPD incidence.
RESULTS: 977 nurses developed COPD during 18.6 years' mean follow-up. We observed associations with COPD for all three exposures with hazard ratios (HRs) and 95% confidence intervals (CIs) of 1.19 (1.01, 1.41) per 6.26 µg·m⁻³ for PM_{2.5}, 1.13 (1.05, 1.20) per 8.19 µg·m⁻³ for NO₂, and 1.15 (1.06, 1.25) per 10 dB for Lden. Associations with NO₂ and Lden attenuated slightly after mutual adjustment, but were robust to adjustment for PM_{2.5}. Associations with PM_{2.5} were attenuated to null after adjustment for either NO₂ or Lden. No potential interaction effect was observed between air pollutants and noise.

CONCLUSIONS: Long-term exposure to air pollution, especially traffic-related NO₂, and road traffic noise were independently associated with COPD.

6. **Effects of Short-Term Air Pollution Exposure on Venous Thromboembolism: A Case-Crossover**

Study. Johnson SA, Mendoza D, Zhang Y, Pirozzi CS. *Ann Am Thorac Soc.* 2021 May 13. doi: 10.1513/AnnalsATS.202010-1337OC. Online ahead of print.

RATIONALE: Exposure to outdoor air pollution is associated with increased cardiovascular disease, respiratory illness, and mortality. The effect of air pollution on venous thromboembolism (VTE) is less certain.

OBJECTIVES: To test for associations between short-term exposure to air pollution and VTE.

METHODS: Retrospective case-crossover study of adult patients with an objectively confirmed VTE event. Exposure to mean and maximum PM_{2.5} and ozone were estimated with inverse distance squared weighting from multiple stationary air quality monitors. Conditional logistic regression with a 7-day individual lag model estimated the odds ratio of VTE occurrence during the case period relative to the referent period. Prespecified subgroup analysis was performed to further test associations in higher risk patients.

RESULTS: A total of 2,803 VTE events met inclusion criteria for analysis. Deep vein thrombosis was identified in 1,966 (70.1%) and pulmonary embolism in 915 (32.6%) subjects. Median age was 57 years. Small negative associations were observed for maximum PM_{2.5} exposure at 1 day (odds ratio [95% confidence interval]; OR=0.992 [0.986-0.997]) and mean PM_{2.5} exposure at 1 day (OR=0.982 [0.97-0.994]), 5 days (OR=0.987 [0.975-0.999]), 6 days (OR=0.984 [0.972-0.996]), 7 days (OR=0.982 [0.971-0.994]), prior to VTE diagnosis. Similar negative associations were observed for 8-hour mean (OR=0.989 [0.981-0.997]) and 8-hour maximum (OR=0.992 [0.985-0.999]) ozone exposure 4 days prior to VTE diagnosis. Positive relationships (ORs~1.02) between 8-hour mean and maximum ozone exposure 6-7 days preceding VTE diagnosis were observed in a recently hospitalized subgroup.

CONCLUSIONS: Short-term exposure to PM_{2.5} and ozone does not appear to be associated with an overall increased risk of VTE. Further well-designed studies are needed to test whether previously reported associations between VTE and air pollution exist.

7. **Chronic airflow obstruction and ambient particulate air pollution.** Amaral AFS, Burney PGJ,

Patel J, Minelli C, Mejza F, Mannino DM, Seemungal TAR, Mahesh PA, Lo LC, Janson C, Juvekar S, Denguezli M, Harrabi I, Wouters EFM, Cherkaski H, Mortimer K, Jogi R, Bateman ED, Fuertes E, Al Ghobain M, Tan W, Obaseki DO, El Sony A, Studnicka M, Aquart-Stewart A, Koul P, Lawin H, Nafees AA, Awopeju O, Erhabor GE, Gislason T, Welte T, Gulsvik A, Nielsen R, Gnatiuc L, Kocabas A, Marks GB, Sooronbaev T, Mbatchou Ngahane BH, Barbara C, Buist AS; BOLD (Burden of Obstructive Lung Disease) Collaborative Research Group; BOLD (Burden of Obstructive Lung Disease) Collaborative Research Group members. *Thorax.* 2021 May 11:thoraxjnl-2020-216223. doi: 10.1136/thoraxjnl-2020-216223. Online ahead of print.

<https://thorax.bmj.com/content/early/2021/05/11/thoraxjnl-2020-216223>

Smoking is the most well-established cause of chronic airflow obstruction (CAO) but particulate air pollution and poverty have also been implicated. We regressed sex-specific prevalence of CAO from 41 Burden of Obstructive Lung Disease study sites against smoking prevalence from the same study, the gross national income per capita and the local annual mean level of

ambient particulate matter (PM_{2.5}) using negative binomial regression. The prevalence of CAO was not independently associated with PM_{2.5} but was strongly associated with smoking and was also associated with poverty. Strengthening tobacco control and improved understanding of the link between CAO and poverty should be prioritised.

8. **Climate change, human migration, and skin disease: is there a link?** Dayrit JF, Sugiharto A, Coates SJ, Lucero-Prisno DE 3rd, Davis MDD, Andersen LK. *Int J Dermatol*. 2021 May 10. doi: 10.1111/ijd.15543. Online ahead of print.
<https://onlinelibrary.wiley.com/doi/10.1111/ijd.15543>
Climate change, exemplified by higher average global temperatures resulting in more frequent extreme weather events, has the potential to significantly impact human migration patterns and health. The consequences of environmental catastrophes further destabilize regions with pre-existing states of conflict due to social, political, and/or economic unrest. Migrants may carry diseases from their place of origin to their destinations and once there may be susceptible to diseases in which they had not been previously exposed to. Skin diseases are among the most commonly observed health conditions observed in migrant populations. To improve awareness among dermatologists of the burden of skin diseases among migrants, the group searched the English language scientific literature to identify articles linking climate change, migration, and skin disease. Skin diseases associated with human migration fall into three major categories: (i) communicable diseases, (ii) noncommunicable diseases, and (iii) environmentally mediated diseases. Adopting comprehensive global strategies to improve the health of migrants requires urgent attention.
9. **Association between long-term exposure to high levels of ambient air pollution and incidence of lung cancer in a population-based cohort.** Yang S, Kim OJ, Shin M, Kim WJ, Kim SY. *Environ Res*. 2021 May 8;198:111214. doi: 10.1016/j.envres.2021.111214. Online ahead of print.
Although outdoor air pollution including particulate matter (PM) was classified as carcinogenic to humans based on accumulating epidemiological evidence, these findings were suggested mostly from low-dose environments in North America and Europe. We aimed to examine the association of long-term exposure to PM ≤ 10 and 2.5 μm in diameter (PM₁₀ and PM_{2.5}) and nitrogen dioxide (NO₂) with lung cancer incidence using a population-based cohort in the Seoul Metropolitan Area (SMA), South Korea. Our study included 83,478 people residing in the SMA and followed up for 2007-2015 from the National Health Insurance Service-National Sample Cohort. This cohort was constructed based on the National Health Insurance database that contains sociodemographic and medical information under universal health coverage. Individual long-term concentrations of PM₁₀, PM_{2.5}, and NO₂ were estimated at people's district-level and annually-updated residential addresses for the previous 5 years by using previously-validated prediction models. We applied a time-dependent Cox proportional hazards model and estimated hazard ratios (HRs) per 10 $\mu\text{g}/\text{m}^3$ and 10 ppb increases in PM and NO₂, respectively, after adjusting for individual characteristics. During 9 years of follow-up, 489 lung cancer new cases occurred (714,012 person-year). The adjusted HRs for PM₁₀ were greater than 1 but statistically non-significant (HR = 1.15; 95% CI = 0.88-1.52). We also did not find associations for PM_{2.5} and NO₂. Despite null associations for the total population, our subgroup analysis suggested associations with PM in family members with cancer (PM₁₀: HR =

2.59, 95% CI = 1.26-5.32; PM2.5: 5.55, 1.09-27.91) and in those who have smoked more than 1 pack per day (1.77, 0.96-3.25; 3.81, 1.00-14.44) or for less than 20 years (2.81; 1.13-7.07; 2.02, 0.21-19.23). Our study based on a highly urbanized population exposed to relatively high air pollution provides no evidence of the association between PM and lung cancer incidence in the total population but indicates the potential susceptibility in heavy smokers for relatively short periods and family members of cancer patients. Future studies should re-examine the association using improved exposure assessment and extended population.

10. **Effects of air pollution on mortality of patients with chronic kidney disease: A large observational cohort study.** Jung J, Park JY, Kim YC, Lee H, Kim E, Kim YS, Lee JP, Kim H. *Sci Total Environ.* 2021 Apr 30;786:147471. doi: 10.1016/j.scitotenv.2021.147471. Online ahead of print.

<https://www.sciencedirect.com/science/article/abs/pii/S0048969721025420>

Due to industrialization, the burden of diseases associated with air pollution is increasing. Although the risk associated with air pollution in the general population has been actively investigated, few studies have been conducted on the effects of exposure to air pollution in patients with chronic kidney disease (CKD) in East Asia. A total of 29,602 patients with CKD in Seoul participated in a retrospective cohort at three medical centers. We assessed the association of individualized exposure to five types of air pollutants (PM2.5, PM10, NO2, SO2, and CO) using inverse distance weighting (IDW) on mortality in CKD patients in the Cox proportional hazard model that was adjusted for sex, age, eGFR, hemoglobin, hypertension, diabetes, and area-level characteristics. During the 6.14 ± 3.96 years, 3863 deaths (13%) were observed. We confirmed the significant effects of PM2.5 (hazard ratio [HR] 1.17, 95% confidence interval [CI] 1.07-0.29) and CO (HR 1.17, 95% CI 1.00-1.38) on mortality in CKD patients. Different associations were found when stratified by age, body mass index, smoking, and drinking status. Long-term exposure to air pollutants had negative effects on mortality in patients with CKD. These effects were prominent in patients aged over 65 years, patients with a lean body, and those who did not drink alcohol.

11. **Understanding linkages between environmental risk factors and noncommunicable diseases- A review.** Dhimal M, Neupane T, Lamichhane Dhimal M. *FASEB Bioadv.* 2021 Mar 4;3(5):287-294. doi: 10.1096/fba.2020-00119. eCollection 2021 May.

<https://faseb.onlinelibrary.wiley.com/doi/full/10.1096/fba.2020-00119>

Environmental factors such as climate change are now underway, which have substantial impacts on health and well-being of human kind, but still imprecisely quantified, implications for human health. At present, one of the most significant discussions among scientists worldwide is interdependency of escalating environmental risk factors and the increasing rates of noncommunicable diseases (NCDs), which are the leading cause of death and disability worldwide. Climate change also triggers the occurrence of NCDs through a variety of direct and indirect pathways. Therefore, it is likely that the interdependence of climate change, environmental risk factors, and NCDs as a whole poses great threat to global health. Hence, this paper aims to review the latest evidence on impacts of environmental risk factors on NCDs and methods used in establishing the cause or correlation of environmental risk factors and NCDs. The literature review leveraged online databases such as PubMed and Google Scholar with

articles that matched keywords "climate change", "environmental risk factors," and "noncommunicable diseases". This review shows that the burden of NCDs is increasing globally and attribution of environmental risk factors such as climate change is significant. Understanding the nature of the relation between NCDs and the environment is complex and has relied on evidence generated from multiple study designs. This paper reviews eight types of study designs that can be used to identify and measure causal and correlational nature between environment and NCDs. Future projections suggest that increases in temperatures will continue and also increase the public health burden of NCDs.

WE ACT

12. **Climate Change, Air Pollution, and Physical Inactivity: Is Active Transportation Part of the Solution?** Alessio HM, Bassett DR, Bopp MJ, Parr BB, Patch GS, Rankin JW, Rojas-Rueda D, Roti MW, Wojcik JR. *Med Sci Sports Exerc.* 2021 Jun 1;53(6):1170-1178. doi: 10.1249/MSS.0000000000002569.

<https://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&AN=00005768-202106000-00008&LSLINK=80&D=ovft>

Active transportation is defined as self-propelled, human-powered transportation modes, such as walking and bicycling. In this article, we review the evidence that reliance on gasoline-powered transportation is contributing to global climate change, air pollution, and physical inactivity and that this is harmful to human health. Global climate change poses a major threat to human health and in the future could offset the health gains achieved over the last 100 yr. Based on hundreds of scientific studies, there is strong evidence that human-caused greenhouse gas emissions are contributing to global climate change. Climate change is associated with increased severity of storms, flooding, rising sea levels, hotter climates, and drought, all leading to increased morbidity and mortality. Along with increases in atmospheric CO₂, other pollutants such as nitrogen dioxide, ozone, and particulate matter (e.g., PM_{2.5}) are released by combustion engines and industry, which can lead to pulmonary and cardiovascular diseases. Also, as car ownership and vehicle miles traveled have increased, the shift toward motorized transport has contributed to physical inactivity. Each of these global challenges has resulted in, or is projected to result in, millions of premature deaths each year. One of the ways that nations can mitigate the health consequences of climate change, air pollution, and chronic diseases is through the use of active transportation. Research indicates that populations that rely heavily on active transportation enjoy better health and increased longevity. In summary, active transportation has tremendous potential to simultaneously address three global public health challenges of the 21st century.

13. **Climate Change Impact of Virtual Urology Meetings.** Patel SH, Gallo K, Becker R, Borin J, Loeb S. *Eur Urol.* 2021 May 10:S0302-2838(21)00312-2. doi: 10.1016/j.eururo.2021.04.033. Online ahead of print.

<https://www.clinicalkey.com/#!/content/journal/1-s2.0-S0302283821003122>

We obtained data from the largest global urological meetings, the American Urological Association (AUA) and the European Association of Urology (EAU), on the geographic distribution of participants in their respective 2019 meetings. Using an online calculator [1], we

estimated carbon emissions per person and summed the data to estimate total carbon emissions. The Environmental Protection Agency calculator was used to estimate equivalence to other types of emissions [2].

14. **Sustainable Diets for Cardiovascular Disease Prevention and Management.** Mendoza-Vasconez AS, Landry MJ, Crimarco A, Bladier C, Gardner CD. *Curr Atheroscler Rep.* 2021 May 10;23(7):31. doi: 10.1007/s11883-021-00929-0.
PURPOSE OF REVIEW: Healthy dietary patterns are recommended for prevention of cardiovascular disease, which remains the leading cause of morbidity and mortality globally. In this review, we discuss dietary patterns that are not only optimal for CVD prevention and management but also sustainable in maximizing health, environmental, and economic benefits.
RECENT FINDINGS: The growing literature on sustainable diets in the context of environmental sustainability includes subtopics of climate change, land use, biodiversity loss, freshwater use, and reactive nitrogen emissions. Similarly, economic sustainability, beyond the retail cost of food, extends to healthcare costs and the economic costs of environmental destruction related to current agricultural practices and food choices. Dietary patterns that are high in plant foods and low in animal foods could maximize health, environmental, and economic benefits; however, questions remain about how to best promote these patterns to achieve wider adoption in an environmentally and economically sustainable way.

15. **Behaviour change to address climate change.** Whitmarsh L, Poortinga W, Capstick S. *Curr Opin Psychol.* 2021 Apr 14;42:76-81. doi: 10.1016/j.copsyc.2021.04.002. Online ahead of print. <https://www.sciencedirect.com/science/article/pii/S2352250X21000427>
Addressing climate change requires profound behaviour change, not only in consumer action, but also in action as members of communities and organisations, and as citizens who can influence policies. However, while many behavioural models exist to explain and predict mitigation and adaptation behaviours, we argue that their utility in establishing meaningful change is limited due to their being too reductive, individualistic, linear, deliberative and blind to environmental impact. This has led to a focus on suboptimal intervention strategies, particularly informational approaches. Addressing the climate crisis requires a focus on high-impact behaviours and high-emitting groups; interdisciplinary interventions that address the multiple drivers, barriers and contexts of behaviour; and timing to ensure interventions are targeted to moments of change when habits are weaker.

[Lancet Planetary Health](#) – *open-access, interdisciplinary journal focused on sustainability*

News & Commentary

[Toward Urban Planetary Health Solutions to Climate Change and Other Modern Crises.](#) Patz JA, Siri JG. *J Urban Health.* 2021 May 14:1-4. doi: 10.1007/s11524-021-00540-3. Online ahead of print.

[Nature-based solutions can help cool the planet - if we act now.](#) Girardin CAJ, Jenkins S, Seddon N, Allen M, Lewis SL, Wheeler CE, Griscom BW, Malhi Y. Nature. 2021 May;593(7858):191-194. doi: 10.1038/d41586-021-01241-2.

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