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COVID-19

- 1. Unexpected reduction in ozone levels in a mid-size city during COVID-19 lockdown.** Tavella RA, Fernandes CLF, Penteado JO, De Lima Brum R, Florencio Ramires P, Coutelle Honscha L, Dos Santos M, Volcão LM, Muccillo-Baisch AL, Da Silva Júnior FMR. *Int J Environ Health Res.* 2021 Apr 23;1-14. doi: 10.1080/09603123.2021.1917526. Online ahead of print.
The current study evaluated ozone levels through passive samplers installed in 4 different points in a medium-sized city (Rio Grande, Brazil) with naturally low NO₂ levels during a week of COVID-19 lockdown. Additionally, we evaluated the consequences of this response with regard to human health risk assessment and reduction of hospital admissions and ozone-related deaths. The reduction in ozone levels, one month after the implementation of containment measures, varied between 26 and 64% (average of 44%), in the different studied sites. The reduction of human mobility during the pandemic reduced the levels of ozone in Rio Grande city and consequently will bring benefits to health services in the municipality. This unexpected reduction in O₃ levels must be related to the low 'natural' levels of NO₂ in the city, which make the contribution of other precursors important for the fluctuation of O₃ levels.
- 2. Ambient air pollution and cardiovascular disease: learnt from the COVID-19 pandemic.** Ejaz A, Malik AO, Lopez-Candales A. *Postgrad Med.* 2021 Apr 22. doi: 10.1080/00325481.2021.1921504. Online ahead of print.
- 3. Indoor-Generated PM(2.5) During COVID-19 Shutdowns Across California: Application of the PurpleAir Indoor-Outdoor Low-Cost Sensor Network.** Mousavi A, Wu J. *Environ Sci Technol.* 2021 Apr 19. doi: 10.1021/acs.est.0c06937. Online ahead of print.
Although evidences showed an overall reduction in outdoor air pollution levels across the globe due to COVID-19-related lockdown, no comprehensive assessment was available for indoor air quality during the period of stay-at-home orders, despite that the residential indoor environment contributes most to personal exposures. We examined temporal and diurnal variations of indoor PM_{2.5} based on real-time measurements from 139 indoor-outdoor co-

located low-cost PurpleAir sensor sets across California for pre-, during, and post-lockdown periods in 2020 and "business-as-usual" periods in 2019. A two-step method was implemented to systematically control the quality of raw sensor data and calibrate the sensor data against co-located reference instruments. During the lockdown period, 17-24% higher indoor PM2.5 concentrations were observed in comparison to those in the 2019 business-as-usual period. In residential sites, a clear peak in PM2.5 concentrations in the afternoon and elevated evening levels toping at roughly $10 \mu\text{g}\cdot\text{m}^{-3}$ was observed, which reflects enhanced human activity during lunch and dinner time (i.e., cooking) and possibly more cleaning and indoor movement that increase particle generation and resuspension in homes. The contribution of indoor-generated PM2.5 to total indoor concentrations increased as high as 80% during and post-lockdown periods compared to before lockdown.

4. **Indoor air quality improvement in COVID-19 pandemic: Review.** Agarwal N, Meena CS, Raj BP, Saini L, Kumar A, Gopalakrishnan N, Kumar A, Balam NB, Alam T, Kapoor NR, Aggarwal V. *Sustain Cities Soc.* 2021 Jul;70:102942. doi: 10.1016/j.scs.2021.102942. Epub 2021 Apr 15. <https://www.sciencedirect.com/science/article/pii/S2210670721002274>

INTRODUCTION: The advent of COVID-19 has impinged millions of people. The increased concern of the virus spread in confined spaces due to meteorological factors has sequentially fostered the need to improve indoor air quality.

OBJECTIVE: This paper aims to review control measures and preventive sustainable solutions for the future that can deliberately help in bringing down the impact of declined air quality and prevent future biological attacks from affecting the occupant's health.

METHODOLOGY: An ontology chart is constructed based on the set objectives and review of all the possible measures to improve the indoor air quality taking into account the affecting parameters has been done.

OBSERVATIONS: An integrated approach considering non-pharmaceutical and engineering control measures together for a healthy indoor environment should be contemplated rather than discretizing the available solutions. Maintaining social distance by reducing occupant density and implementing a modified ventilation system with advance filters for decontamination of viral load can help in sustaining healthy indoor air quality.

CONCLUSION: The review paper in the main, provides a brief overview of all the improvement techniques bearing in mind thermal comfort and safety of occupants and looks for a common ground for all the technologies based on literature survey and offers recommendation for a sustainable future.

5. **Corona, Climate Change, and Evolved Human Behavior.** Schradin C. *Trends Ecol Evol.* 2021 Apr 14:S0169-5347(21)00077-X. doi: 10.1016/j.tree.2021.03.010. Online ahead of print. Most scientists agree that we have to restrict climate change, but there is much frustration that we are failing. The Corona Crisis exemplifies how human behavior is constrained by its evolution, cognition, and resource availability, explaining why we do not act to avoid climate change for the benefit of future generations.
6. **Infectious disease, the climate, and the future.** Tong S, Ebi K, Olsen J. *Environ Epidemiol.* 2021 Feb 25;5(2):e133. doi: 10.1097/EE9.000000000000133. eCollection 2021 Apr.

https://journals.lww.com/environepidem/Fulltext/2021/04000/Infectious_disease,_the_climate,_and_the_future.4.aspx?

Emergence and resurgence of infectious diseases are serious threats to population health. The ongoing COVID-19 pandemic has caused an enormous human toll and health crisis. Responses to the pandemic are significantly affecting the global economy. What is most concerning about COVID-19 is not the virus itself, but rather that it may compound with other and more serious crises. Climate change will likely affect human health, economy, and the society more than disease outbreaks. Governments at all levels, from local to international, can chart a greener, healthier, and equitable course for the future, investing in strategies and technologies that minimize and prevent risks, including those posed by climate change and the pandemic, promoting obligations to drastically reduce emissions, enhancing societal equality, improving community resilience, and achieving sustainable development goals.

Health Impacts of Climate Change

7. **Effects of air pollutant emission on the prevalence of respiratory and circulatory system diseases in Linyi, China.** Wu X, Li D, Feng M, Liu H, Li H, Yang J, Wu P, Lei X, Wei M, Bo X. *Environ Geochem Health*. 2021 Apr 23. doi: 10.1007/s10653-021-00931-0. Online ahead of print.

As a typical industrial city, Linyi has suffered severe atmospheric pollution in recent years. Meanwhile, a high incidence of respiratory and circulatory diseases has been observed in Linyi. The relationship between air pollutants and the prevalence of respiratory and circulatory system diseases in Linyi is still unclear, and therefore, there is an urgent need to assess the human health risks associated with air pollutants. In this study, the number of outpatient visits and spatial distribution of respiratory and circulatory diseases were first investigated. To clarify the correlation between diseases and air pollutant emissions, the residential intake fraction (IF) of air pollutants was calculated. The results showed that circulatory and respiratory diseases accounted for 62.32% of the total causes of death in 2015. The incidence of respiratory diseases was high in the winter, and outpatient visits were observed for more males (60.9%) than females (39.1%). The spatial distribution suggested that outpatient visits for respiratory and circulatory diseases were concentrated in the main urban area of Linyi, including the Hedong District, Lanshan District, and Luozhuang District, and especially at the junction of these three areas. After calculating the IF combined with the characteristics of pollution sources, meteorological conditions, and population data, a high IF value was concentrated in urban and suburban areas, which was consistent with the high incidence of diseases. Moreover, high R values and a significant correlation ($R > 0.6$, $p < 0.05$) between outpatient visits and residential IF of air pollutants imply similar spatial distributions of outpatient visits and IF value of residents. The spatial similarity of air pollution and outpatient visits suggested that future air pollution control policies should better reflect the health risks of spatial hotspots. This study can provide a potentially important reference for environmental management and air pollution-related health interventions.

8. **Particulate Matter-Induced Cardiovascular Dysfunction: A Mechanistic Insight.** Ain NU, Qamar SUR. *Cardiovasc Toxicol*. 2021 Apr 22. doi: 10.1007/s12012-021-09652-3. Online ahead of print.

Air pollution and particulate matter (PM) are significant factors for adverse health effects most prominently cardiovascular disease (CVD). PM is produced from various sources, which include both natural and anthropogenic. It is composed of biological components, organic compounds, minerals, and metals, which are responsible for inducing inflammation and adverse health effects. However, the adverse effects are related to PM size distribution. Finer particles are a significant cause of cardiovascular events. This review discusses the direct and indirect mechanisms of PM-induced CVD like myocardial infarction, the elevation of blood pressure, cardiac arrhythmias, atherosclerosis, and thrombosis. The two potential mechanisms are oxidative stress and systemic inflammation. Prenatal exposure has also been linked with cardiovascular outcomes later in life. Moreover, we also mentioned the epidemiological studies that strongly associate PM with CVD.

9. **Complex interplay between greenness and air pollution in respiratory health.** Fuertes E, Jarvis D. *Thorax*. 2021 Apr 21;thoraxjnl-2021-217272. doi: 10.1136/thoraxjnl-2021-217272. Online ahead of print.

For many, it seems self-evident that a greener city improves the quality of life and health for its citizens. Epidemiological studies are providing increasing evidence that the presence and amount of vegetation around locations where one spends a lot of time (home, work and school) have numerous beneficial effects on physical and mental health, including increased longevity.¹ Interestingly, the evidence supporting a positive role of vegetation on allergic and respiratory health is much weaker, possibly because of the complex role played by air pollution. Beneficial effects attributed to vegetation may be due to less air pollution, as levels tend to be lower in vegetated areas. Some vegetation types may also actively reduce air pollution levels, although the scientific consensus is that this occurs only to a limited extent.² Air pollutants may also interact with vegetation, such as pollen,³ to influence associations with health. These mechanisms are relevant in urban settings where air pollution levels can be high.

10. **Air Pollution Is Associated with Cognitive Deterioration of Alzheimer's Disease.** Lin FC, Chen CY, Lin CW, Wu MT, Chen HY, Huang P. *Gerontology*. 2021 Apr 21;1-9. doi: 10.1159/000515162. Online ahead of print.

INTRODUCTION: Dementia is one of the major causes of disability and dependency among older people worldwide. Alzheimer's disease (AD), the most common cause of dementia among the elderly, has great impact on the health-care system of developed nations. Several risk factors are suggestive of an increased risk of AD, including APOE- ϵ 4, male, age, diabetes mellitus, hypertension, and low social engagement. However, data on risk factors of AD progression are limited. Air pollution is revealed to be associated with increasing dementia incidence, but the relationship between air pollution and clinical AD cognitive deterioration is unclear.

METHODS: We conducted a case-control and city-to-city study to compare the progression of AD patients in different level of air-polluted cities. Clinical data of a total of 704 AD patients were retrospectively collected, 584 residences in Kaohsiung and 120 residences in Pingtung between 2002 and 2018. An annual interview was performed with each patient, and the Clinical Dementia Rating score (0 [normal] to 3 [severe stage]) was used to evaluate their cognitive deterioration. Air pollution data of Kaohsiung and Pingtung city for 2002-2018 were retrieved from Taiwan Environmental Protection Administration. Annual Pollutant Standards Index (PSI)

and concentrations of particulate matter (PM₁₀), sulfur dioxide (SO₂), ozone (O₃), nitrogen dioxide (NO₂), and carbon monoxide (CO) were obtained.

RESULTS: The PSI was higher in Kaohsiung and compared with Pingtung patients, Kaohsiung patients were exposed to higher average annual concentrations of CO, NO₂, PM₁₀, and SO₂. AD patients living in Kaohsiung suffered from faster cognitive deterioration in comparison with Pingtung patients (log-rank test: $p = 0.016$). When using multivariate Cox proportional hazards regression analysis, higher levels of CO, NO₂, PM₁₀, and SO₂ exposure were associated with increased risk of AD cognitive deterioration. Among all these air pollutants, high SO₂ exposure has the greatest impact while O₃ has a neutral effect on AD cognitive deterioration.

CONCLUSIONS: Air pollution is an environment-related risk factor that can be controlled and is associated with cognitive deterioration of AD. This finding could contribute to the implementation of public intervention strategies of AD.

- 11. Effects of ambient air pollution on emergency room visits of children for acute respiratory symptoms in Delhi, India.** Yadav R, Nagori A, Mukherjee A, Singh V, Lodha R, Kabra SK, Yadav G, Saini JK, Singhal KK, Jat KR, Madan K, George MP, Mani K, Mrigpuri P, Kumar R, Guleria R, Pandey RM, Sarin R, Dhaliwal RS. *Environ Sci Pollut Res Int.* 2021 Apr 21. doi: 10.1007/s11356-021-13600-7. Online ahead of print.

The present study explored the association between daily ambient air pollution and daily emergency room (ER) visits due to acute respiratory symptoms in children of Delhi. The daily counts of ER visits (ERV) of children (≤ 15 years) having acute respiratory symptoms were obtained from two hospitals of Delhi for 21 months. Simultaneously, data on daily concentrations of particulate matter (PM₁₀ and PM_{2.5}), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), carbon monoxide (CO), and ozone (O₃) and weather variables were provided by the Delhi Pollution Control Committee. K-means clustering with time-series approach and multi-pollutant generalized additive models with Poisson link function was used to estimate the 0-6-day lagged change in daily ER visits with the change in multiple pollutants levels. Out of 1,32,029 children screened, 19,120 eligible children having acute respiratory symptoms for ≤ 2 weeks and residing in Delhi for the past 4 weeks were enrolled. There was a 29% and 21% increase in ERVs among children on high and moderate level pollution cluster days, respectively, compared to low pollution cluster days on the same day and previous 1-6 days of exposure to air pollutants. There was percentage increase (95% CI) 1.50% (0.76, 2.25) in ERVs for acute respiratory symptoms for 10 $\mu\text{g}/\text{m}^3$ increase of NO₂ on previous day 1, 46.78% (21.01, 78.05) for 10 $\mu\text{g}/\text{m}^3$ of CO on previous day 3, and 13.15% (9.95, 16.45) for 10 $\mu\text{g}/\text{m}^3$ of SO₂ on same day of exposure. An increase in the daily ER visits of children for acute respiratory symptoms was observed after increase in daily ambient air pollution levels in Delhi.

- 12. Association of Wildfire Air Pollution and Health Care Use for Atopic Dermatitis and Itch.**

Fadadu RP, Grimes B, Jewell NP, Vargo J, Young AT, Abuabara K, Balmes JR, Wei ML. *JAMA Dermatol.* 2021 Apr 21. doi: 10.1001/jamadermatol.2021.0179. Online ahead of print.

<https://jamanetwork.com/journals/jamadermatology/article-abstract/2778632>

IMPORTANCE: Air pollution is a worldwide public health issue that has been exacerbated by recent wildfires, but the relationship between wildfire-associated air pollution and inflammatory skin diseases is unknown.

OBJECTIVE: To assess the associations between wildfire-associated air pollution and clinic visits for atopic dermatitis (AD) or itch and prescribed medications for AD management.

DESIGN, SETTING, AND PARTICIPANTS: This cross-sectional time-series study assessed the associations of air pollution resulting from the California Camp Fire in November 2018 and 8049 dermatology clinic visits (4147 patients) at an academic tertiary care hospital system in San Francisco, 175 miles from the wildfire source. Participants included pediatric and adult patients with AD or itch from before, during, and after the time of the fire (October 2018 through February 2019), compared with those with visits in the same time frame of 2015 and 2016, when no large wildfires were near San Francisco. Data analysis was conducted from November 1, 2019, to May 30, 2020.

EXPOSURES: Wildfire-associated air pollution was characterized using 3 metrics: fire status, concentration of particulate matter less than 2.5 μm in diameter (PM_{2.5}), and satellite-based smoke plume density scores.

MAIN OUTCOMES AND MEASURES: Weekly clinic visit counts for AD or itch were the primary outcomes. Secondary outcomes were weekly numbers of topical and systemic medications prescribed for AD in adults.

RESULTS: Visits corresponding to a total of 4147 patients (mean [SD] age, 44.6 [21.1] years; 2322 [56%] female) were analyzed. The rates of visits for AD during the Camp Fire for pediatric patients were 1.49 (95% CI, 1.07-2.07) and for adult patients were 1.15 (95% CI, 1.02-1.30) times the rate for nonfire weeks at lag 0, adjusted for temperature, relative humidity, patient age, and total patient volume at the clinics for pediatric patients. The adjusted rate ratios for itch clinic visits during the wildfire weeks were 1.82 (95% CI, 1.20-2.78) for the pediatric patients and 1.29 (95% CI, 0.96-1.75) for adult patients. A 10- $\mu\text{g}/\text{m}^3$ increase in weekly mean PM_{2.5} concentration was associated with a 7.7% (95% CI, 1.9%-13.7%) increase in weekly pediatric itch clinic visits. The adjusted rate ratio for prescribed systemic medications in adults during the Camp Fire at lag 0 was 1.45 (95% CI, 1.03-2.05).

CONCLUSIONS AND RELEVANCE: This cross-sectional study found that short-term exposure to air pollution due to the wildfire was associated with increased health care use for patients with AD and itch. These results may provide a better understanding of the association between poor air quality and skin health and guide health care professionals' counseling of patients with skin disease and public health practice.

13. **Long-term exposure to air pollution and mortality in a prospective cohort: The Ontario Health Study.** Zhang Z, Wang J, Kwong JC, Burnett RT, van Donkelaar A, Hystad P, Martin RV, Bai L, McLaughlin J, Chen H. *Environ Int.* 2021 Apr 20;154:106570. doi: 10.1016/j.envint.2021.106570. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0160412021001951>

BACKGROUND: Air pollution has been associated with increased mortality. However, updated evidence from cohort studies with detailed information on various risk factors is needed, especially in regions with low air pollution levels. We investigated the associations between long-term exposure to air pollution and mortality in a prospective cohort.

METHODS: We studied 88,615 participants aged ≥ 30 years from an ongoing cohort study in Ontario, Canada from 2009 to 2017. Exposure to ambient fine particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂) was estimated at participants' residence. Cox proportional hazard

models were used to investigate the associations between air pollution and non-accidental, cardiovascular, and respiratory mortality, adjusted for a wide array of individual-level and contextual covariates. Potential effect modification by socio-demographic and behavioral factors was also examined in exploratory stratified analyses.

RESULTS: The fully adjusted hazard ratios (HRs) per 1 $\mu\text{g}/\text{m}^3$ increment in PM_{2.5} were 1.037 [95% confidence interval (CI): 1.018, 1.057], 1.083 (95% CI: 1.040, 1.128) and 1.109 (95% CI: 1.035, 1.187) for non-accidental, cardiovascular, and respiratory mortality, respectively. Positive associations were also found for NO₂; the corresponding HRs per 1 ppb increment were 1.027 (95% CI: 1.021, 1.034), 1.032 (95% CI: 1.019, 1.046) and 1.044 (95% CI: 1.020, 1.068). We found suggestive evidence of stronger associations in physically active participants, smokers, and those with lower household income.

CONCLUSIONS: Long-term exposure to PM_{2.5} and NO₂ was associated with increased risks for non-accidental, cardiovascular, and respiratory mortality, suggesting potential benefits of further improvement in air quality even in low-exposure environments.

14. **Air pollution, surrounding green, road proximity and Parkinson's disease: a prospective cohort study.** Yu Z, Wei F, Zhang X, Wu M, Lin H, Shui L, Jin M, Wang J, Tang M, Chen K. *Environ Res.* 2021 Apr 19:111170. doi: 10.1016/j.envres.2021.111170. Online ahead of print.

BACKGROUND: Though growing evidence has linked air pollution to Parkinson's disease (PD), the results remain inconsistent. Less is known about the relevance of road proximity and surrounding green. We aimed to investigate the individual and joint associations of air pollution, road proximity and surrounding green with the incidence of PD in a prospective cohort study.

METHODS: We used data from a prospective cohort of 47,516 participants recruited from July 2015 to January 2018 in Ningbo, China. Long-term exposure to particulate matter with aerodynamic diameter $\leq 2.5 \mu\text{m}$ (PM_{2.5}) and $\leq 10 \mu\text{m}$ (PM₁₀) and nitrogen dioxide (NO₂) estimated by land-use regression models, road proximity and surrounding green assessed by Normalized Difference Vegetation Index (NDVI) were calculated based on the residential address for each participant. Cox proportional hazard models were used to analyze the individual and joint effects of air pollution, road proximity, and surrounding green on PD.

RESULTS: In single-exposure models, PM_{2.5}, PM₁₀, NO₂ and road proximity was associated with increased risk of PD (e.g. Hazard Ratio (HR)=1.51, 95%CI:1.02, 2.24 per interquartile range (IQR) increase for PM_{2.5}) while surrounding green was associated with decreased risk of PD (e.g. HR=0.80, 95%CI:0.65, 0.98 per IQR increase for NDVI in 300m buffer). In two-exposure models, the associations of PM_{2.5} and surrounding green persisted while the associations of NO₂ and road proximity attenuated towards unity.

CONCLUSIONS: We found that PM_{2.5} were associated with increased risk of incident PD while surrounding green was associated with decreased risk of PD. Future studies about PD etiology may benefit from including multiple environmental exposures to address potential joint associations.

15. **The first 1000 days of life: traffic-related air pollution and development of wheezing and asthma in childhood. A systematic review of birth cohort studies.** Bettiol A, Gelain E, Milanese E, Asta F, Rusconi F. *Environ Health.* 2021 Apr 17;20(1):46. doi: 10.1186/s12940-021-00728-9.

<https://ehjournal.biomedcentral.com/articles/10.1186/s12940-021-00728-9>

BACKGROUND: The first 1000 days of life -including pregnancy and the first 2 years after birth- represent a critical window for health interventions. This systematic review aimed to summarize the evidence on the relationship between traffic-related air pollutants exposure in the first 1000 days of life and the development of wheezing and asthma, with a particular focus on windows of exposure.

METHODS: Medline and Embase were searched from January 2000 to May 2020 to retrieve population-based birth-cohort studies, including registries, providing quantitative information on the association between exposure to traffic-related air pollutants during pregnancy or early life, and the risk of developing wheezing and asthma in childhood. Screening and selection of the articles were completed independently by three reviewers. The quality of studies was assessed using the Newcastle-Ottawa scale.

RESULTS: Out of 9681 records retrieved, 26 studies from 21 cohorts were included. The most common traffic-related air pollutant markers were particulate matter (PM) and nitric oxides (NOx). The variability in terms of pollutants, exposure assessment methods, and exposure levels chosen to present the results did not allow a meta-analysis. Exposure to PM and NOx in pregnancy (10 cohorts) was consistently associated with an increased risk of asthma development, while the association with wheezing development was unclear. The second trimester of pregnancy seemed to be particularly critical for asthma risk. As for exposure during early life (15 cohorts), most studies found a positive association between PM (7/10 studies) and NOx (11/13 studies) and the risk of asthma development, while the risk of wheezing development was controversial. The period of postnatal exposure, however, was less precisely defined and a partial overlap between the period of exposure measurement and that of outcome development was present in a consistent number of studies (14 out of 15) raising doubts on the associations found.

CONCLUSIONS: Traffic-related air pollution during pregnancy is associated with an increased risk of asthma development among children and adolescents. The relationship between exposure in the first two years of life and the development of wheezing and asthma needs to be confirmed in studies with more precise exposure assessment.

16. **Impact of short-term air pollution exposure on acute coronary syndrome in two cohorts of industrial and non-industrial areas: A time series regression with 6,000,000 person-years of follow-up (ACS - Air Pollution Study).** Kuźma Ł, Wanha W, Kralisz P, Kazmierski M, Bachórzewska-Gajewska H, Wojakowski W, Dobrzycki S. *Environ Res.* 2021 Apr 16:111154. doi: 10.1016/j.envres.2021.111154. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0013935121004485>

BACKGROUND: There is a lack of studies directly comparing the effect of air pollution on acute coronary syndrome (ACS) occurrence in industrial and non-industrial areas.

OBJECTIVES: A comparison of association of air pollution exposure with ACS in two cohorts of industrially different areas.

MATERIALS AND METHODS: The study covered 6,000,000 person-years of follow-up and five pollutants between 2008 and 2017. A time series regression analysis with 7-lag was used to assess the effects air pollution on ACS.

RESULTS: A total of 9,046 patients with ACS were included in the analysis, of whom 3,895 (43.06%) had ST-elevation myocardial infarction (STEMI) - 45.39% from non-industrial area, and 42.37% from industrial area; and 5,151 (56.94%) had non-ST-elevation myocardial infarction (NSTEMI) - 54.61% from non-industrial area and 57.63% from industrial area. The daily concentrations of PM_{2.5}, PM₁₀, NO₂, SO₂, CO were higher in industrial than in non-industrial area (P<0.001). In non-industrial area, an increase of 10 µg/m³ of NO₂ concentration (Odds Ratio (OR)=1.126, 95%CI=1.009-1.257;P=0.034, lag-0) and an increase of 1 mg/m³ in CO concentration (RR=1.055, 95%CI=1.010-1.103;P=0.017, lag-0) were associated with an increase in the number of hospitalization due to NSTEMI (for industrial area increase of 10 µg/m³ in NO₂ (OR=1.062, 95%CI=1.020-1.094;P=0.005, lag-0), SO₂ (OR=1.061, 95%CI=1.010-1.116;P=0.018, lag-4), PM₁₀ (OR=1.010, 95%CI=1.001-1.030;P=0.047, lag-6). In STEMI patients in industrial area, an increased hospitalization was found to be associated with an increase of 10 µg/m³ in SO₂ (OR=1.094, 95%CI=1.030-1.162;P=0.002, lag-1), PM_{2.5} (OR=1.041, 95%CI=1.020-1.073;P<0.001, lag-1), PM₁₀ (OR=1.030, 95%CI=1.010-1.051;P<0.001, lag-1). No effects of air pollution on the number of hospitalization due to STEMI were noted from non-industrial area. CONCLUSION: The risk of air pollution-related ACS was higher in industrial over non-industrial area. The effect of NO₂ on the incidence of NSTEMI was observed in both areas. In industrial area, the effect of PMs and SO₂ on NSTEMI and STEMI were also observed. A clinical effect was more delayed in time in patients with NSTEMI, especially after exposure to PM₁₀. Chronic exposure to air pollution may underlie the differences in the short-term effect between particulate air pollution impact on the incidence of STEMI.

17. **Impaired respiratory health and life course transitions from health to chronic lung disease.** Liu GY, Kalhan R. Chest. 2021 Apr 15:S0012-3692(21)00695-4. doi: 10.1016/j.chest.2021.04.009. Online ahead of print.

[https://journal.chestnet.org/article/S0012-3692\(21\)00695-4/pdf](https://journal.chestnet.org/article/S0012-3692(21)00695-4/pdf)

Primary prevention and interception of chronic lung disease are essential in the effort to reduce the morbidity and mortality caused by respiratory conditions. In this review, we apply a life course approach which examines exposures across the life span to identify risk factors which are associated with not only chronic lung disease but also an intermediate phenotype between ideal lung health and lung disease, termed impaired respiratory health. Notably, risk factors such as exposure to tobacco smoke and air pollution as well as obesity and physical fitness impact respiratory health across the life course by being associated with both abnormal lung growth and lung function decline. We will then discuss the importance of disease interception and identifying those at highest risk in order to halt the development of chronic lung disease. This begins with understanding and detecting impaired respiratory health and we review several promising molecular biomarkers, predictive symptoms and early imaging findings that may lead to a better understanding of this intermediate phenotype.

18. **Drinking water contaminants in California and hypertensive disorders in pregnancy.** Padula AM, Ma C, Huang H, Morello-Frosch R, Woodruff TJ, Carmichael SL. Environ Epidemiol. 2021 Apr 2;5(2):e149. doi: 10.1097/EE9.000000000000149. eCollection 2021 Apr. https://journals.lww.com/environepidem/Fulltext/2021/04000/Drinking_water_contaminants_in_California_and.14.aspx

Environmental pollutants have been associated with hypertensive disorders in pregnancy including gestational hypertension, preeclampsia, and eclampsia, though few have focused on drinking water contamination. Water pollution can be an important source of exposures that may contribute to adverse pregnancy outcomes.

METHODS: We linked water quality data on 13 contaminants and two violations from the California Communities Environmental Health Screening Tool to birth records from vital statistics and hospital discharge records (2007-2012) to examine the relationship between drinking water contamination and hypertensive disorders in pregnancy. We examined contaminants in single- and multipollutant models. Additionally, we examined if the relationship between water contamination and hypertensive disorders in pregnancy differed by neighborhood poverty, individual socioeconomic status, and race/ethnicity.

RESULTS: Arsenic, nitrate, trihalomethane, hexavalent chromium, and uranium were detected in a majority of water systems. Increased risk of hypertensive disorders in pregnancy was modestly associated with exposure to cadmium, lead, trihalomethane, and hexavalent chromium in drinking water after adjusting for covariates in single pollutant models with odds ratios ranging from 1.01 to 1.08. In multipollutant models, cadmium was consistent, lead and trihalomethane were stronger, and additional contaminants were associated with hypertensive disorders in pregnancy including trichloroethylene, 1,2-Dibromo-3-chloropropane, nitrate, and tetrachloroethylene. Other contaminants either showed null results or modest inverse associations. The relationship between water contaminants and hypertensive disorders in pregnancy did not differ by neighborhood poverty.

CONCLUSIONS: We found increased risk of hypertensive disorders in pregnancy associated with exposure to several contaminants in drinking water in California. Results for cadmium, lead, trihalomethane, and hexavalent chromium were robust in multipollutant models.

19. **Estimating PM2.5-related premature mortality and morbidity associated with future wildfire emissions in the western US.** Neumann JE, Amend M, Anenberg S, Kinney PL, Sarofim M, Martinich J, Lukens J, Xu JW, Roman H. *Environ Res Lett.* 2021 Mar 8;16(3):10.1088/1748-9326/abe82b. doi: 10.1088/1748-9326/abe82b.

<https://iopscience.iop.org/article/10.1088/1748-9326/abe82b/meta>

Wildfire activity in the western United States (US) has been increasing, a trend that has been correlated with changing patterns of temperature and precipitation associated with climate change. Health effects associated with exposure to wildfire smoke and fine particulate matter (PM2.5) include short- and long-term premature mortality, hospital admissions, emergency department visits, and other respiratory and cardiovascular incidents. We estimate PM2.5 exposure and health impacts for the entire continental US from current and future western US wildfire activity projected for a range of future climate scenarios through the 21st century. We use a simulation approach to estimate wildfire activity, area burned, fine particulate emissions, air quality concentrations, health effects, and economic valuation of health effects, using established and novel methodologies. We find that climatic factors increase wildfire pollutant emissions by an average of 0.40% per year over the 2006-2100 period under Representative Concentration Pathway (RCP) 4.5 (lower emissions scenarios) and 0.71% per year for RCP8.5. As a consequence, spatially weighted wildfire PM2.5 concentrations more than double for some climate model projections by the end of the 21st century. PM2.5 exposure changes, combined

with population projections, result in a wildfire PM2.5-related premature mortality excess burden in the 2090 RCP8.5 scenario that is roughly 3.5 times larger than in the baseline period. The combined effect of increased wildfire activity, population growth, and increase in the valuation of avoided risk of premature mortality over time results in a large increase in total economic impact of wildfire-related PM2.5 mortality and morbidity in the continental US, from roughly \$7 billion per year in the baseline period to roughly \$36 billion per year in 2090 for RCP4.5, and \$43 billion per year in RCP8.5. The climate effect alone accounts for a roughly 60% increase in wildfire PM2.5-related premature mortality in the RCP8.5 scenario, relative to baseline conditions.

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20. **The pharmacist's role in climate change: A call to action.** Roy C. *Can Pharm J (Ott)*. 2021 Feb 10;154(2):74-75. doi: 10.1177/1715163521990408. eCollection 2021 Mar-Apr.

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