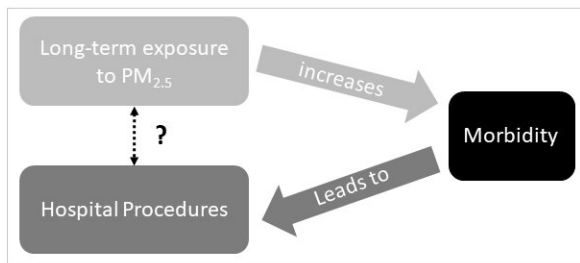


# Particulate matter linked to increased hospital procedures in heart failure patients

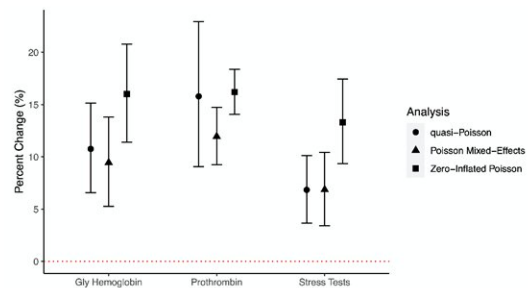
May 3 2023

Associations between long-term fine particulate matter exposure and hospital procedures in heart failure (HF) patients



**Conclusion**  
 Long-term exposure to PM<sub>2.5</sub> is associated with the increased performance of glycosylated hemoglobin tests, prothrombin time tests, and stress tests among HF patients. This suggests that the increased cardiometabolic morbidity attributed to PM<sub>2.5</sub> is reflected in hospital procedures

**University of North Carolina Healthcare System (2004-2016)**  
 20,920 HF Patients.  
 15,979 with at least 1 of 53 common procedures



While particulate air pollution has known associations with morbidity and hospitalizations, its resulting links with hospital procedures are unknown. This study examines links between particulate air pollution and hospital procedures among heart failure patients. Credit: Samantha Catalano, CC-BY 4.0 (<https://creativecommons.org/licenses/by/4.0/>)

Long-term exposure to fine particulate matter air pollution was associated with an increase in hospital procedures in heart failure

patients, according to a study published May 3, 2023, in the open-access journal *PLOS ONE* by Samantha Catalano from the University of North Carolina at Chapel Hill, U.S., and colleagues.

Tiny airborne particles smaller than  $2.5\mu\text{m}$  in diameter ( $\text{PM}_{2.5}$ ) are air pollutants generated by traffic, industry activity, combustion, and more. Though exposure to  $\text{PM}_{2.5}$  has been associated with illness and death worldwide, few studies have quantified this link using hospital procedures. In this study, the authors analyzed the effect of long-term  $\text{PM}_{2.5}$  exposure on hospital procedures in patients with heart failure.

The researchers examined [electronic health records](#) for 20,920 patients diagnosed with heart failure, 15,979 of whom subsequently received at least one of 53 common (frequency > 10%) procedures within the University of North Carolina Healthcare System from 2004 to 2016. Researchers used each patient's address alongside the date of their [heart failure](#) diagnosis to map and analyze environmental exposure data alongside their health records.

The analysis revealed that three specific procedures were significantly more likely to be performed on patients with increased  $\text{PM}_{2.5}$  exposure: [stress tests](#) (6.84% increase per  $1\ \mu\text{g}/\text{m}^3$  increase in  $\text{PM}_{2.5}$ ), glycosylated hemoglobin tests, which screen for diabetes (10.8% increase), and prothrombin time tests, which evaluate blood clotting (15.8% increase). Prothrombin time tests remained significantly linked to this exposure even after adjusting for access to health care and healthy food based on county.

Since all three of these tests relate to [diagnostic testing](#) for cardiorespiratory health, the authors posit that their results provide evidence of patients with high  $\text{PM}_{2.5}$  exposure experiencing more cardiovascular morbidity, prompting health care professionals to perform more [diagnostic tests](#).

The [health records](#) that form the basis of this research did not include individual-level socioeconomic data, nor data on procedures that may have been performed outside of the University of North Carolina Healthcare System (unless the records were transferred). Nonetheless, these results will assist future researchers in better estimating the burden of PM<sub>2.5</sub> exposure on patients and hospital systems.

The authors add, "Associations between PM<sub>2.5</sub> and hospital procedures can give us unique insight into the impacts of PM<sub>2.5</sub> exposure on both patients and the health care system. We observed increased performance of diagnostic procedures with increased PM<sub>2.5</sub> exposure, which fit with the known mechanisms of PM<sub>2.5</sub> exposure. This research provides evidence that hospital procedures can be a unique lens through which to view the health effects of air pollution exposure."

**More information:** Associations between long-term fine particulate matter exposure and hospital procedures in heart failure patients, *PLOS ONE* (2023). [DOI: 10.1371/journal.pone.0283759](https://doi.org/10.1371/journal.pone.0283759)

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