75th AAN ANNUAL MEETING ABSTRACT

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Abstract Title: Fine Particulate Matter and Parkinson Disease Risk in Medicare Beneficiaries

Press Release Title: Study Finds Air Pollution Exposure Linked to Parkinson's Risk, Identifies U.S. Hot Spot: *Mississippi-Ohio River Valley Has Higher Rates of Disease*

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Objective: To identify the national geographic patterns of Parkinson disease (PD) and test for nationwide and region-specific associations with particulate matter $(PM)_{2.5}$.

Background: Numerous studies suggest that environmental exposures play a critical role in PD pathogenesis. Large population-based discovery studies have the potential to identify novel PD risk factors. Medicare is the only population-based national healthcare system in the U.S. making it ideal for nationwide geographic studies of PD risk factors.

Design/Methods: We conducted a population-based geographic study of 22,546,965 Medicare beneficiaries and identified 83,674 with incident PD in 2009. Beneficiaries were geocoded to county and zip+4 of residence in the contiguous U.S. We used a multimethod approach that included R-package integrated nested Laplace approximation (R-INLA) to create age, sex, race, smoking, and healthcare utilization adjusted relative risk (RR) for county-level regression and geographical analyses with $PM_{2.5}$ as the exposure of interest. To supplement these findings, we performed an individual-level case-control analysis using logistic regression to verify county-level $PM_{2.5}$ results.

Results: We identified a PD hot spot in the Mississippi-Ohio River Valley and found a nationwide association between incident PD and average annual $PM_{2.5}$, whereby the RR for PD increased by 25% (95% CI 23%, 26%) when comparing the lowest to the highest quartile of $PM_{2.5}$. The strongest association between $PM_{2.5}$ and PD was found in the Rocky Mountain Region. $PM_{2.5}$ was also associated with PD in the Mississippi-Ohio River Valley where the association was weaker, due to an apparent ceiling effect at ~12 to 19$\mu g/m^3$ of $PM_{2.5}$. Individual-level results confirmed that PD increased by 25% (95% CI 20%, 29%) when comparing the lowest to the highest decile of $PM_{2.5}$.

Conclusions: Using state-of-the-art geospatial analytical techniques, we identified a nationwide association between PD and $PM_{2.5}$, which varied in strength by region. A deeper investigation into the specific subfractions of $PM_{2.5}$ may provide insight into regional variability in the PM2.5-PD association.

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