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NATIONAL PARTICLE COMPONENT TOXICITY (NPACT) STUDY FINDINGS IN TWO CARDIOVASCULAR COHORTS USING ALTERNATIVE EXPOSURE ESTIMATION APPROACHES

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Background. It is not known which constituents of fine particulate matter (PM2.5) are most harmful to cardiovascular health. We study this in two cohorts - the Multi-Ethnic Study of Atherosclerosis (MESA) and the Women's Health Initiative (WHI).

Objectives. To estimate the associations between exposure to PM2.5 constituents and sub-clinical markers of atherosclerosis and cardiovascular events.

Methods. Cohort-oriented monitor samples and spatio-temporal models were used to estimate individual-level concentrations of elemental carbon (EC), organic carbon (OC), sulfur and silicon in six MESA cities (Baltimore, Chicago, Los Angeles, New York, St. Paul, Winston-Salem). In WHI, a national kriging model was used to estimate concentrations of PM2.5 constituents. Secondary exposure estimation approaches were also used. Primary endpoints were carotid intima-media thickness (CIMT) and coronary artery calcium (CAC) in MESA (n=6,814), and incident cardiovascular disease (CVD) in WHI (n=93,676).

Results. Of the PM2.5 constituents, OC in the MESA cohort was most consistently associated with CIMT, although there were also associations of silicon and sulfur with CIMT. No PM2.5 constituents were associated with CAC. In the WHI cohort, OC was mainly only associated with CVD mortality (IQR relative risk 1.23 [1.07, 1.41]), whereas sulfur was associated with total CVD events, but not mortality. Evidence for associations of silicon and EC was weaker. Associations were similar using secondary exposure estimates.

Conclusions. Some combustion-derived PM2.5 constituents or secondary organic aerosols, as reflected by OC, may have more cardiovascular toxicity than PM2.5 constituents from other sources. Health findings of PM2.5 constituents were not sensitive to exposure estimation approach.

Keywords: air pollution, particulate matter, atherosclerosis, cardiovascular disease

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