

## Dust Storms and Human Health: A Call for More Consistent, Higher-Quality Studies

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The respiratory tract and immune system both take a hard hit during a dust storm.<sup>1</sup> Bits of soil and dirt kicked up by the wind can carry bacteria, fungi, and other pathogens. People can also be exposed to chemical pollutants that attach themselves to dust particles.<sup>2</sup> A growing body of literature has associated dust storms originating in Asia, Africa, and other dry regions with respiratory problems such as asthma and chronic obstructive pulmonary disease.<sup>3</sup> In a systematic review and meta-analysis published recently in *Environmental Health Perspectives*,<sup>4</sup> investigators have corralled the evidence reported in papers focused on exposures to dust specifically from Asia.

“We found a positive association between Asian dust exposure and mortality and hospital admissions for circulatory and respiratory events,” says senior author Masahiro Hashizume, an environmental health scientist at the University of Tokyo in Japan. However, the papers included in both the review and the meta-analysis varied in quality, pointing to the need for robust standardized protocols in studying dust.

The researchers began their study by conducting a systematic review of the research literature published since 1980. Their literature search identified 1,537 publications potentially related to Asian dust and a variety of health outcomes. The authors included primary research reports of human exposures to dust or sand in Asia and adverse health outcomes. Next, they used a

National Institutes of Health quality assessment tool<sup>5</sup> to rate the papers that met the inclusion criteria for the meta-analysis. Ultimately, they included 89 papers in the review and 21 in the meta-analysis.

The selected studies fell into three categories of health outcome: mortality, hospital admissions/visits, or symptoms/dysfunction. In the quality assessment, the researchers rated almost two-thirds of the studies that measured mortality as “good.” Almost one-third of hospitalization papers and fewer than one-tenth of the general health impacts papers were rated as good. The lower-quality papers suffered from problems such as a lack of controlling for confounders or poor description of how confounders or bias were controlled, so the temporal relationship between the exposure and the outcome could not be determined. In addition, many were cross-sectional in design. The papers also showed a lack of consistency in how exposures and even the dust itself were defined.

The meta-analysis estimated a 2.33% pooled increase in mortality from circulatory and respiratory conditions on days with high dust concentrations and a 3.99% pooled increase in deaths 3 days after a high-dust day. Hashizume et al. also found evidence of increases in hospitalizations and reduced peak expiratory flow (a sign of difficulty breathing). However, the authors pointed out that the meta-analysis included too few papers to draw firm conclusions.



In an assessment of Chinese dust storm records dating back 2,250 years,<sup>7</sup> investigators found an association between dust storm intensity and human activity. In periods of rapid population growth, storm intensity tended to increase. Periods of civil unrest, on the other hand, were associated with reduced intensity, perhaps as abandoned cities and farm fields reverted to soil-stabilizing grasslands. Image: Courtesy Metropolitan Museum of Art.

The bulk of existing studies on the health effects of particulate matter have focused on human-produced particles such as combustion-derived air pollution and cigarette smoke. Because dust occurs naturally, Thomas Gill, an environmental geologist at the University of Texas at El Paso, says that only in the last decade or two have researchers finally begun to seriously consider it as a potential human health issue. “This is one of the most thorough reviews I have seen on the subject [of dust],” says Gill, who was not involved with the study. “We need more systematic analyses like this to let us answer some major questions we have on the subject.”

Although it is too early to say for certain, there is evidence<sup>6</sup> that dust storms are becoming more frequent due to climate change and the loss of vegetation, says Cynthia Isley, a research fellow at Australia’s Macquarie University, who was not involved in the study. “Perhaps [that evidence] will be the push that we need to start cleaning up our act,” she says.

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