Hearts over Time
Cardiovascular Mortality Risk Linked to Long-Term PM$_{2.5}$ Exposure

Adverse respiratory effects and short-term hospital admissions have been linked to acute exposure to fine particulate matter (PM$_{2.5}$), but few studies have examined mortality risks associated with chronic exposure. Now, in Canada's first national-level cohort study of the subject, investigators report an association between cardiovascular mortality and long-term exposure to PM$_{2.5}$ [*EHP* 120(5):708–714; Crouse et al.].

Most research examining associations between ambient air pollution and human health has used data generated by ground-based air-pollution monitors over short periods of time. But in the current study, researchers also calculated long-term exposure levels using satellite-based estimates of ground-level PM$_{2.5}$.

Study subjects consisted of 2.1 million adults who were included in the 1991–2001 Canadian census mortality follow-up study. For residents of cities with ground-based air monitors, the investigators calculated average mean annual concentrations of PM$_{2.5}$ for the period 1987–2001 and assigned exposure levels to individuals based on their residence during that time. They also calculated exposure estimates for the whole cohort for the period 2001–2006 based on satellite remote sensing observations.

The team linked the census and exposure data to national mortality data to estimate increased risk of death from ischemic heart disease, cerebrovascular disease, cardiovascular disease, circulatory disease, and all nonaccidental causes for each 10-µg/m^3 increase in PM$_{2.5}$. The largest estimated increase in mortality was for ischemic heart disease (31%), followed by deaths from nonaccidental causes, circulatory diseases, and cardiovascular disease (each estimated to increase by 15–16%). In contrast, cerebrovascular disease was not clearly associated with PM$_{2.5}$ exposure.

Strengths of the study include the large sample size and the use of remote sensing satellite data, which allowed exposure estimates to be calculated for subjects living in areas without air-pollution monitors. Limitations include a lack of information on smoking and obesity—two of the primary risk factors for cardiovascular disease—and the inability to account for address changes during the follow-up period. However, with a mean estimated exposure of 8.7 µg/m^3 (range 1.9–19.2 µg/m^3), the findings suggest that exposure even to very low amounts of PM$_{2.5}$ over long periods may pose a greater risk to human health than originally assumed.

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Migration Associated with Climate Change
Modern Face of an Ancient Phenomenon

Climate-related human migration has a long history, with droughts, floods, food shortages, and other climate-related changes forcing the resettlement of populations since early hominids first spread out from Africa nearly 2 million years ago. Human-induced climate change is expected to contribute to even greater population movements in the coming decades, with perhaps as many as 250 million people expected to become "environmental refugees" by 2050. A new review emphasizes that health will be a critical concern regarding climate-related migration [*EHP* 120(5):646–654; McMichael et al.].

Migrations are expected to occur primarily within countries or regions, although some will cross international boundaries; whether they are permanent or short term will depend on the events that prompt them. Extreme weather events such as floods, hurricanes, and heat waves typically lead to short-term internal movement, but slow-onset changes such as land degradation or rising sea levels in coastal areas may force populations to make permanent moves.

As in ages past, migrants seek to survive the consequences of an altered environment. But migration often brings with it new challenges such as food shortages, lack of drinking water, and increased incidence and altered patterns of infectious disease. Developing countries will be particularly affected for two reasons: they lack the infrastructure and resources to cope with climate-related changes, and they often are already contending with pre-existing public health challenges such as malnutrition, lack of medical care, and inadequate infrastructure for water and sanitation.

In this review, migration is classified into three types: forced displacement, planned resettlement, and migration to cities. Each poses a unique but not mutually exclusive set of health risks. For example, populations involved in large-scale forced displacement are at increased risk of infectious disease outbreaks and food shortages. Planned resettlement schemes are typically associated with adverse social outcomes (e.g., land-, job-, and homelessness) that can lead to food insecurity and poor mental health. And poor communities in and around cities—frequently a destination for migrants—are themselves often sited in locations at high risk of climate change impacts, such as low-lying plains and coastal zones. So people migrating into these settings may face continued environmental health threats related not only to poverty but also to climate change.

Migration's long history means a wealth of experience and knowledge has accumulated in relation to planned resettlement schemes, predisaster planning, and response to humanitarian and environmental disasters. By drawing on this knowledge, as well as undertaking additional research, policy interventions to minimize the adverse health effects of climate change–related migration can be developed. These responses will require coordination, cooperation, and preplanning on multiple levels from local, national, and international agencies and organizations.

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Nearly a year after the 2004 Asian tsunami, displaced Indians still lived in this camp outside Chennai, where they faced fresh environmental health challenges.

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