

## Chapter 3

# Identifying and Mapping Vulnerable Populations

### ABSTRACT

*Climate change does not affect all populations uniformly; there are disproportionate impacts on certain populations who are more vulnerable to displacement, injury or death due to risk factors such as poverty, race, age, and medical conditions. The social determinants of health interact with climate change to determine a population's risk of adverse health impacts from changing precipitation patterns, rising temperatures, rising sea levels, and extreme weather events. Emergency preparedness planning must take into account the special concerns of vulnerable populations in order to ensure that they have food, water, and a temperature-safe shelter during climate change events such as heat waves, floods, and hurricanes. In addition, they may require assistance in evacuating their residences. This chapter addresses the use of technologies to identify and map these vulnerable populations.*

### INTRODUCTION: DEFINING VULNERABLE POPULATIONS

The first step in identifying populations of concern is to define “vulnerability” and how it applies to public health impacts in the context of global warming.

Merriam Webster's Dictionary defines “vulnerability” as “the quality or state of having little resistance to some outside agent (vulnerability to infection)” (Merriam Webster, 2017). In the context of climate change threats to health, vulnerability is the tendency or predisposition to be adversely affected

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by these threats. Vulnerability to climate-related health effects comprises three elements: exposure, susceptibility to harm, and adaptive capacity. In the Introduction to *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*, Balbus et al. (2016) define the three elements as follows:

- Exposure is contact between a person and one or more biological, psychosocial, chemical, or physical stressors, including stressors affected by climate change. Contact may occur in a single instance or repeatedly over time, and may occur in one location or over a wider geographic area.
- Susceptibility to harm (or sensitivity) is the degree to which people or communities are affected, either adversely or beneficially, by climate variability or change.
- Adaptive capacity is the ability of communities, institutions, or people to adjust to potential hazards, to take advantage of opportunities, or to respond to consequences. A related term, resilience, is the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events (Balbus et al., 2016, adapted from IPCC, 2014 and NRC, 2012).

Vulnerability occurs on an individual level, affected by the person's health status (e.g., presence of underlying medical condition such as asthma), age, gender, educational level, income, family support, and access to healthcare. It also occurs at the societal level, where adaptive capacity is influenced strongly by the natural and built environments (for example, the infrastructure), governance and management (health-protective surveillance programs, regulations and enforcement, or community health programs), and institutions. Exposure to extreme weather events is in part a function of geography, (e.g., coastal areas and islands are especially at risk of storms and flooding). Exposure to pathogens is a function of location (near vector habitats) but can be greatly reduced through integrated pest management. Susceptibility to harm, or sensitivity, may be increased by a pre-existing condition (e.g., asthma or other lung disease), age (i.e., very young or elderly), pregnancy, occupation. The greatest predisposing factor for vulnerability is poverty. Racial, religious, ethnic, or gender discrimination is another risk factor for vulnerability.

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