

## California Building Resilience Against Climate Effects (CalBRACE) Project

**Short Title:** Children < 5 years

**Full Title:** Percent of population aged less than 5 years

**CalBRACE Domain:** Population Sensitivity

### Why is this important to health?

Children under 5 years old are especially vulnerable to the health impacts of climate change because they are rapidly growing, both physically and mentally: their lungs are developing, they breathe at a higher rate than adults, and they spend more time outdoors.<sup>1</sup> Due to physiological and developmental factors, children are disproportionately impacted from the effects of heat waves, air pollution, infectious illnesses, and trauma resulting from climate change.<sup>2-5</sup> Children are dependent on their caregivers for response to extreme weather events such as hurricanes and floods. Conditions like injury, death, infectious diseases, malnourishment, and posttraumatic stress are more common in children than adults after extreme weather events. Furthermore, early childhood conditions can impact children's health in the long-term. For instance, early exposure to air pollution increases the risk for allergen sensitization in children under 5 years old. The majority of the existing burden of disease due to climate change occurs in children under 5 years old. Children, infants, and pregnant women are vulnerable to increased heat exposure because they may not be able to efficiently thermoregulate.<sup>2, 6-8</sup> Infants in particular, have a greater risk for mortality and heat-related illnesses, as intensely stressful exposures may lead to adverse birth outcomes including pre-term birth, low birth weight, stillbirth, and maternal complications.<sup>6, 7, 9</sup> Children in low-income, rural, immigrant, or linguistically isolated households may be at increased risk of climate change impacts.<sup>10</sup>

### Summary of Evidence for Climate and Health

Systematic review shows growing evidence that climate change affects the health of children under 5 years old. Two studies done in Southern California found that fine particulate matter (PM2.5) increased the risk of hospitalization for bronchiolitis and death among infants.<sup>1</sup> A study done in Orange County showed increased asthma-related ER visits and hospitalizations with increased levels of O3 and PM2.5 in warm seasons and CO, NOx and PM2.5 in cool seasons.<sup>9</sup> During the wildfires in Southern California in 2003, respiratory hospital admissions related to wildfires increased 8.3% among children under 5 years old.<sup>11</sup> Knowlton et al. demonstrated that emergency department visits for electrolyte imbalances increased among children under 5 years old during the 2006 heat wave in California compared to periods without heat waves.<sup>3</sup>

### Key References:

1. Ritz B, Wilhelm M, Zhao Y. Air Pollution and Infant Death in Southern California, 198-2000. *Pediatrics*. 2006; 118(2): 493-502.

2. Luber G, Knowlton K, Balbus J, et al. Ch. 9: Human Health. *Climate Change Impacts in the United States: The Third National Climate Assessment: U.S. Global Change Research Program*; 2014.
3. Knowlton K, Rotkin-Ellman M, King G, et al. The 2006 California heat wave: impacts on hospitalizations and emergency department visits. *Environmental Health Perspectives*. 2009; 117(1): 61-7.
4. Ghosh JK, Wilhelm M, Su J, et al. Assessing the influence of traffic-related air pollution on risk of term low birth weight on the basis of land-use-based regression models and measures of air toxics. *American Journal of Epidemiology*. 2012; 175(12): 1262-74.
5. Karr C, Lumley T, Schreuder A, et al. Effects of Subchronic and Chronic Exposure to Ambient Air Pollutants on Infant Bronchiolitis. *American Journal of Epidemiology*. 2007; 65(5): 553-60.
6. Basu R. High ambient temperature and mortality: a review of epidemiologic studies from 2001 to 2008. *Environmental Health*. 2009; 8(40).
7. Kovats RS, Hajat S. Heat Stress and Public Health: A Critical Review. *Annual Review of Public Health*. 2008; 29: 41-55.
8. Particulate Matter Integrated Science Assessment Project Team. Integrated Science Assessment for Particulate Matter. Research Triangle Park, NC: U.S. Environmental Protection Agency; 2009.
9. Delfino RJ, Wu J, Tjoa T, et al. Asthma morbidity and ambient air pollution: effect modification by residential traffic-related air pollution. *Epidemiology*. 2014; 25(1): 48-57.
10. Huang ZJ, Yu SM, Ledsky R. Health Status and Health Service Access and Use Among Children in U.S. Immigrant Families. *American Journal of Public Health*. 2006; 96(4): 634-640.
11. Delfino RJ, Brummel S, Wu J, et al. The relationship of respiratory and cardiovascular hospital admissions to the southern California wildfires of 2003. *Occupational and Environmental Medicine*. 2009; 66(3).

## What is the indicator?

### Detailed Definition:

- Indicator (percent) =  $\frac{\text{Total Population } <5 \text{ years of age}}{\text{Total Population}}$
- Stratification: 8 race/ethnicity strata (African American, American Indian Alaska Native, Asian, Hispanic or Latino, Native Hawaiian and Other Pacific Islander, White, Two or more races, Total)
- Interpretation: Children under five years of age are more sensitive to health impacts of climate change

### Data Description and Methodology

#### For 2011-2015

- American Community Survey (ACS) (<http://factfinder.census.gov>)
  - Years available: 2011-2015
  - Geographies available: census tract, city, county, county division, region (derived), state

#### For 2010

- U.S. Decennial Census 2010 (<http://factfinder.census.gov>)
  - Years available: 2010
  - Geographies available: census tract, city, county, county division, region (derived), state

Data were downloaded from 2010 decennial census (SF2DP1 Table) and the 2011-2015 American Community Survey (DP05 and B01001 Tables). Population-weighted

regional estimates were calculated. Regions in the BRACE project are based on county aggregations in the [\*Adaptation Planning Guide Understanding Regional Characteristics\*](#).

### **Limitations:**

There is a tendency for respondents to provide their age as of the date they completed the survey questionnaire, rather than their age as of the survey reference date. Respondents may round up a person's age if they were close to having a birthday; this problem is most pronounced among children less than 1 year old. A common misreporting error is age heaping which is the tendency for people to over report ages that end in certain digits (commonly digits "0" or "5") and under report ages ending in other digits.