Heat & Health Index (HHI)
Frequently Asked Questions (FAQs)

General

What data are included in the HHI?

The Heat and Health Index (HHI) currently includes 25 indicators, grouped into four modules:

1. **Historical Heat and Health Burden** module, which includes measures of previous experience with heat at the local level,
2. **Sensitivity** module, which includes pre-existing health conditions that may increase the risk of negative health outcomes when the individual with the condition is exposed to extreme heat,
3. **Sociodemographic** module, which includes social and demographic characteristics that increase exposure or sensitivity to heat or lessen one's ability to cope with extreme heat, and the
4. **Natural and Built Environment** module, which includes characteristics of natural and built environment that increase exposure or sensitivity to heat or lessen one's ability to cope with extreme heat.

The data in the HHI come from the Centers for Disease Control and Prevention (CDC), the National Emergency Medical Services Information System (NEMSIS), the United States Census Bureau, the Multi-Resolution Land Characteristics Consortium (MRLC), and the Environmental Protection Agency (EPA).

How is the HHI different from other heat related tools?

The HHI is the first national tool that incorporates data on heat-related illness, pre-existing health conditions, sociodemographic factors, and natural and built environment factors to assess vulnerability to heat at the ZIP code level. While other tools include heat-related illness data, the HHI provides comprehensive ZIP code level data nationwide. Incorporating heat-related illness data helps communities across the country better understand where heat has been a public health issue in the past and helps inform interventions to decrease negative health impacts from heat.

What geographic level is the HHI available at?

The HHI uses ZIP Code Tabulation Areas (ZCTAs) to aggregate and rank data across U.S. ZIP codes. ZIP codes are created by the U.S. Postal Service to represent postal service delivery routes, meaning that they are not associated with physical boundaries. Therefore, the U.S. Census Bureau created ZCTAs to allow for the mapping and geographical analysis of ZIP codes. While ZCTAs do not precisely match ZIP code service areas, they do provide a reasonable approximation of ZIP code areas, making it easier to analyze and understand data for specific communities or neighborhoods. More information about the creation of ZCTAs can be found on the **U.S. Census Bureau's website**.

How can the HHI be used?

The HHI can be used by public health officials, city planners, decision-makers, and communities to:

- Educate and inform the public about heat risk in their community,
- Identify and prioritize areas that may require special attention or additional action during the heat season to reduce heat-related illness over time, and
- Analyze the unique, local factors driving heat-related illness to inform research and decision-making.

How often will the HHI be updated?
The HHI will be updated every 2-3 years with the most recent data available, to help communities evaluate how heat-health vulnerability is changing over time compared to other communities. The HHI team plans to evaluate additional measures of heat-related illness, pre-existing health conditions, sociodemographic factors, and natural and built environment factors for potential inclusion in the HHI as they become available nationwide at the ZIP Code Tabulation Area (ZCTA) level.

What is the suggested citation for the HHI?
United States Department of Health and Human Services. 2024 Heat and Health Index. Accessed [Date]. https://ephtracking.cdc.gov/HHI

Methodology – Indicators

What indicators are included in the HHI?
The HHI includes 25 indicators grouped into four modules, as follows:

Historical Heat & Health Burden Module

- Number of Extreme Heat Days
- Heat-Related Illness

Sensitivity Module

- Coronary Heart Disease*
- Chronic Obstructive Pulmonary Disease*
- Obesity*
- Asthma*
- Diabetes*
- Poor Mental Health*

Sociodemographic Module

- Lack of Health Insurance
- Poverty
- Unemployement
- No High School Diploma
- Living Alone
- Speaks English "Less than Well"
- Civilian with a Disability
- Outdoor Workers
- Age 65 and Older
- Age 5 and Younger

Natural & Built Environment Module

- Impervious Surfaces
- Lack of Tree Canopy
- No Vehicle
- Mobile Homes
- Renters
- Ozone
- Particulate Matter 2.5 (PM2.5)

*Sensitivity module indicators are marked with asterisks because they are calculated differently than other indicators in the index. While most indicators can have a range of values, the Sensitivity module indicators represent only whether a given ZCTA has a high estimated prevalence of the disease or not. For more information about the indicators, please see the HHI Technical Documentation.

How were the HHI indicators selected?

All indicators included in the HHI were selected based on a review of the current literature, existing indices and databases, and subject matter expertise. Indicators were then reviewed to determine if they were available at the ZIP code level, if they satisfied inclusion and module specific inclusion criteria, and if statistical analysis determined that they provided something unique to the index. Additional information on the inclusion criteria and statistical analysis used to select indicators for the HHI may be found in the **HHI Technical Documentation**.

How does the HHI measure heat?

The HHI measures heat by including a measure of "number of extreme heat days" in the Historical Heat and Health Burden module. Extreme heat days are defined as days where the temperature in a ZCTA exceeded the 95th percentile of all values for that ZCTA, based on historical temperatures for that ZCTA from 1991-2020. This indicator uses the 95th percentile threshold to better account for how individuals may experience heat, based on how they have acclimated to heat and high temperatures in the past. For example, people living in the Southwest, where temperature is regularly over 100°F (38°C), may be more acclimated and prepared for extreme heat compared to people living in areas with typically milder temperatures of 70-80°F (21-27°F), such as in the Pacific Northwest, where many homes do not have air conditioning.

How is the HHI calculated?

The HHI is calculated using a percentile ranking methodology. To learn more about the specific methods used to calculate the HHI, please see the **HHI Technical Documentation**.

Are the HHI indicators weighted? Are some indicators more significant than others?

The indicators in the HHI are not weighted, as the HHI is a national tool and the importance of specific HHI indicators may vary by community. HHI users can weight and customize their data based on community needs.

What other indicators may be included in future iterations of the HHI?

The HHI team evaluated several indicators for inclusion in the HHI. However, not all indicators were available at the ZCTA level nationwide, such as heat-related mortality, heat-related hospitalizations, and heat-related emergency department visits. More information about which indicators were not available nationally at the ZCTA level may be found in the **HHI Technical Documentation**. The HHI team will continue to evaluate additional data sources as new data and information becomes available.

Methodology – Geography

Are Alaska, Hawaii, and U.S. territories included in the HHI?

The HHI currently includes 48 states and the District of Columbia. Due to limited coverage of some of the indicators included in the HHI, the HHI currently does not include data for Alaska, Hawaii, and U.S. territories. Future iterations of the HHI may include Alaska, Hawaii, and U.S. territories as more data for those areas becomes available. The HHI team is exploring opportunities to adapt the HHI for use in these communities.

Why are some ZIP codes not included in the HHI?

Some ZIP codes do not correspond with a ZIP Code Tabulation Area (ZCTA) and are therefore not included in the HHI. This includes ZIP codes that correspond to P.O. boxes, military bases, or organization-specific locations.

There are also some ZCTAs missing from the HHI. ZCTAs may be missing from the HHI if they are uninhabited or if they have a population of less than 50 residents, in which case they were excluded from the HHI to protect the privacy of those residents. This population size exclusion criteria also aligns with the population exclusion criteria used by CDC PLACES for their ZCTA estimates. More information about the population exclusion criteria that CDC PLACES uses can be found on the **CDC PLACES website**.

How are missing data classified in the HHI?

For each ZCTA level observation in the HHI, a value of missing was assigned if one or more of the following circumstances were met:

1. The original data source did not contain that ZCTA,
2. The original data source did contain that ZCTA, but the data for that indicator was missing or blank, and/or
3. The original data source was not at the ZCTA level and did not correspond to a ZCTA after cross-walking the original data to the ZCTA level geography, such as with cross-walking census tract level data to the ZCTA level. (Note: This most often occurred in locations with no permanent residents).

Missing values are coded as "-999" in the dataset.

How can I tell how my community ranks compared to other communities in my state?

The HHI uses a relative ranking system to assign communities a relative percentile rank based on how they compare to all communities nationwide at the ZCTA level. The HHI team is currently exploring options to assign relative ranks for all ZCTAs at the state level as well. This additional functionality would allow users to better understand how their community compares to other communities nationally and within their state.

Are there plans to develop the HHI at additional geographies?

The HHI rankings are currently only available at the ZCTA level, however, the HHI team is exploring the possibility of also including county level rankings in a future release.

Using HHI Data

How can I interpret HHI percentile ranks?

The HHI provides percentile ranks for all indicators, modules, and for the overall HHI. Percentile ranks represent the percentage of ZCTAs that are greater or less than the ZCTA of interest for the selected indicator, module, or overall HHI rank. For example, an overall HHI rank of 0.85 means that 85% of ZCTAs in the nation are likely ***less vulnerable*** to the impacts of heat than the ZCTA of interest and that 15% of ZCTAs in the nation are likely ***more vulnerable*** to the impacts of heat.

What are the limitations of the HHI?

The HHI is intended as a high-level mapping and screening tool to help identify and prioritize areas across the country where people are most likely to feel the effects of heat on their health. The tool relies on historical data, collected by various organizations on different time scales. The HHI does not characterize all heat-related burdens that communities or individuals may face and thus cannot determine an individual or community's risk or level of exposure to all heat-related burdens. Additional information about the limitations of the HHI can be found in the **HHI Technical Documentation**.