Tools for Identifying Climate Vulnerable Communities

ICARP TAC
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Tools for Identifying Climate Vulnerable Communities

• CDPH: Climate Change and Health Vulnerability Indicators for California (CHVI)

• Public Health Alliance of Southern California (PHASC): Health Disadvantage Index (HDI)
A Public Health Framework

Climate & Health Vulnerability
Climate Change and Health Vulnerability Indicators for California

**ENVIRONMENTAL EXPOSURES**
Magnitude, frequency, and duration of environmental or climate-related factors that directly affect human health

**POPULATION SENSITIVITY**
Physiological and socio-economic factors which directly or indirectly affect the degree to which a population is impacted by climate change

**ADAPTIVE CAPACITY**
Responses and adjustments to the impacts of climate change, including the capacity to moderate damages, take advantage of opportunities, and cope with consequences.
Climate Change and Health Vulnerability Indicators for California

**Environmental Exposures:**
- Heat
- Air Quality
- Drought
- Wildfires
- Sea Level Rise

**Population Sensitivity:**
- Children and Elderly
- Poverty
- Education
- Race and Ethnicity
- Outdoor Workers
- Vehicle Ownership
- Disability
- Health Insurance
- Violent Crime Rate

**Adaptive Capacity:**
- Air Conditioning Ownership
- Tree Canopy
- Impervious Surfaces
- Public Transit Access
Development of the Climate Change and Health Vulnerability Indicators for California

1. National guidelines
2. Previously piloted tool
3. Research on climate and health

California Building Resilience Against Climate Effects (CalBRACE) Program, CDC-Funded

- Identify highest priority climate hazards and vulnerabilities
- Compile available data
- Final CHVI
Climate Change and Health Vulnerability Indicators

- 3 Domains, 19 indicators
- Geographic Levels: State, Climate Region, County, Census Tract (for most indicators)
- Data can be ranked (e.g., highest to lowest, decile, ratio compared to state average)
- Some indicators can be stratified by race/ethnicity
- Public data sources
- Accompanying narratives explain data sources, how to use the data, and their relevance to climate and health
Climate Change and Health Vulnerability Indicators

CalBRACE Indicator Maps - Extreme Heat

Projected number of extreme heat days by county in California, 2090

An extreme heat day is defined as a day in April through October when the maximum temperature exceeds the 90th percentile of maximum temperature based on daily temperature data between May 1, 1990.

Source: Data compilation of California State of the Environment report by the California Environmental Protection Agency.

CalBRACE Indicator Maps - Outdoor Workers

Percent of population working outdoors, by county, California, 2006–2010.

Maps population including all civilian noninstitutionalized employed population 16 years and older. Estimates are based on household and some outdoor workers, particularly migrant workers, may travel from their residence for work.

Health Disadvantage Index
http://phasocal.org/ca-hdi/
Development of the Health Disadvantage Index

Social Determinants of Health

- Literature Review
- Domains
  - Indicators/Geographic Unit
  - Data Sources
  - Index Production
    - Communication/Dissemination

User Feedback
## Current HDI Domains and Indicators

### Social Determinants of Health

<table>
<thead>
<tr>
<th>Economic Resources</th>
<th>Social Resources</th>
<th>Educational Opportunity</th>
<th>Health Outcomes</th>
<th>Environmental Hazards</th>
<th>Complete Neighborhoods</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Poverty</td>
<td>High school educational attainment</td>
<td>Residents whose age makes them eligible for, but not enrolled in Preschool</td>
<td>Population disabled</td>
<td>Pedestrian Injuries</td>
<td>Supermarket Access</td>
</tr>
<tr>
<td>Crowding</td>
<td>Linguistic isolation</td>
<td>Low Birth Weight Life Expectancy</td>
<td>Asthma ER Visits</td>
<td>PM 2.5 Concentration</td>
<td>Park Access</td>
</tr>
<tr>
<td>Housing Cost</td>
<td>Renter Occupied</td>
<td>Traffic Density</td>
<td></td>
<td></td>
<td>Retail Density</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>Voting</td>
<td></td>
<td></td>
<td></td>
<td>Tree Canopy</td>
</tr>
<tr>
<td>No Auto Access</td>
<td>Single Parent Households</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uninsured</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Kitchen</td>
<td></td>
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</tr>
</tbody>
</table>
6 domains, 27 indicators

Public data sources

Geographic unit: Census Tract

Standardize and scale each indicator: Z score between 0 (least) and 5 (most disadvantaged)

Compute domain arithmetic means

Total score = weighted average of domain means with weights informed by literature

Provide raw score and percentile among 7,793 eligible Census Tracts
Online Map and Drill Down

http://phasocal.org/HDImap/
Online Map and Drill Down

http://phasocal.org/HDImap/
How Does HDI Compare to CES?

**HDI vs. CES most disadvantaged**

<table>
<thead>
<tr>
<th>HDI1.1 Top 25%</th>
<th>CES 2.0</th>
<th>CES 3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>1319 (6.0)</td>
<td>1376 (6.0)</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>630 (2.8)</td>
<td>573 (2.6)</td>
</tr>
<tr>
<td></td>
<td>637 (3.3)</td>
<td>572 (2.9)</td>
</tr>
<tr>
<td></td>
<td>5207</td>
<td>5267</td>
</tr>
</tbody>
</table>

Millions in parentheses (population)

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**Agree 1319**

- HDI+ 630 CTs
- CES+ 637 CTs
- 2.8 million
- 6.0 million
- 3.3 million

**Agree 1376**

- HDI+ 573 CTs
- CES+ 572 CTs
- 2.6 million
- 6.0 million
- 2.9 million
Life Expectancy at Birth (years) in Most and Least Disadvantaged HDI and CES Census Tracts, 2010

<table>
<thead>
<tr>
<th>HDI</th>
<th>CES2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Top 25%</td>
</tr>
<tr>
<td>Most Disadvantaged: Top 25%</td>
<td>79.1</td>
</tr>
<tr>
<td>Least Disadvantaged: Bottom 75%</td>
<td>80.2</td>
</tr>
</tbody>
</table>
Update to HDI 2.0: Healthy Places Index

• Update data with ACS 2010-2014
• Improve domain weighting and predictive power
• Validate score against health outcomes
• Improved map functionality
• Climate change indicators added as layers (decision support layers)
• Accompanying policy guides
Thank you!

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CalBRACE program website, including links to the indicators:
https://www.cdph.ca.gov/Programs/OHE/Pages/CalBRACE.aspx

Health Disadvantage Index website:
http://phasocal.org/ca-hdi