



Predicting and Preparing for the Public Health Impacts of Climate Change in California

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Outline

- Climate Change, Health and Health Equity
- California Use Cases of Climate Data in Public Health
- Public Health Programs
- Relevance/Barriers



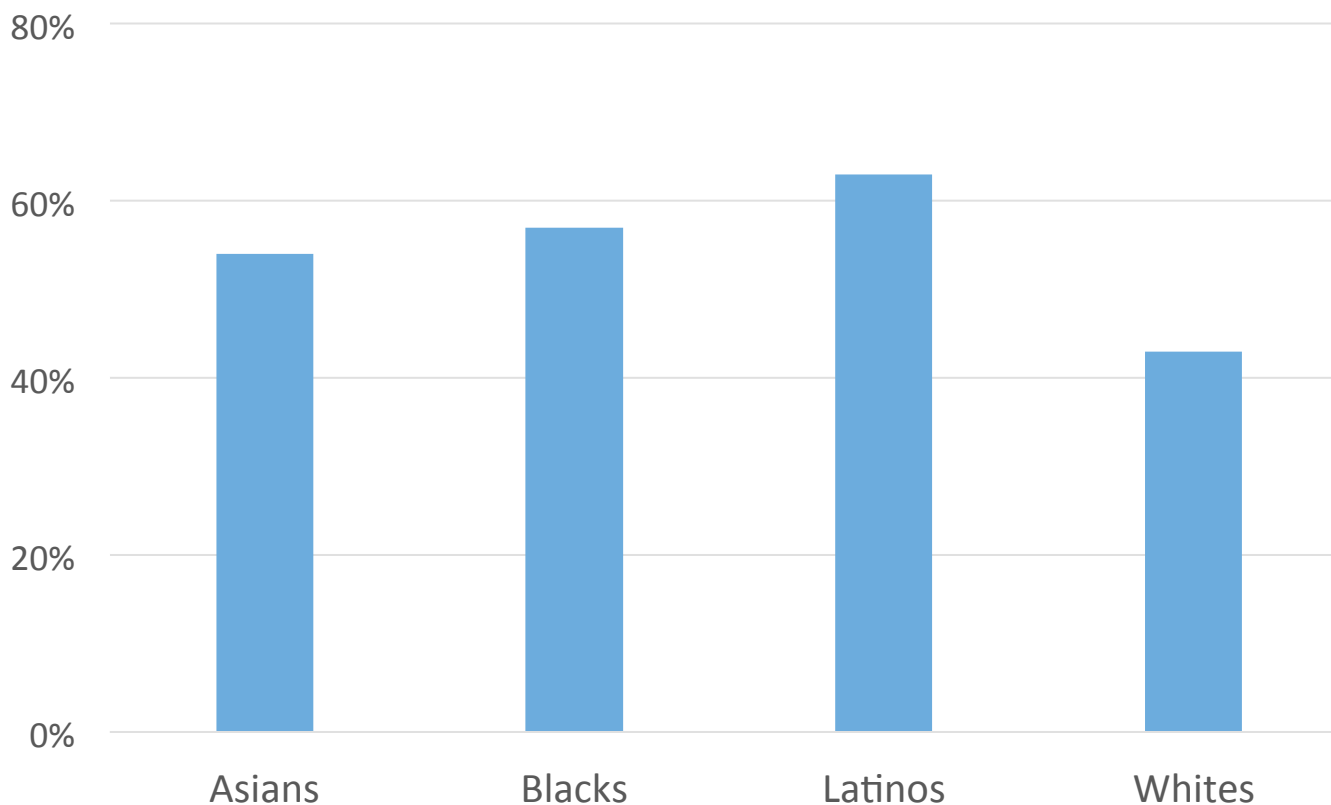
Climate Change, Health and Health Equity

- What is the existing burden of disease?
- What are the existing inequities in health outcomes?
- What is producing population vulnerabilities and inequities in the health outcomes?
- How will climate change impact health outcomes and the factors producing health inequities?

“Climate change will, absent other changes, amplify some of the existing health threats the nation now faces. Certain people and communities are especially vulnerable, including children, the elderly, the sick, the poor, and some communities of color.” - *3rd National Assessment of Climate Change, 2014*

“How serious of a threat is global warming to the economy and quality of life for California’?”

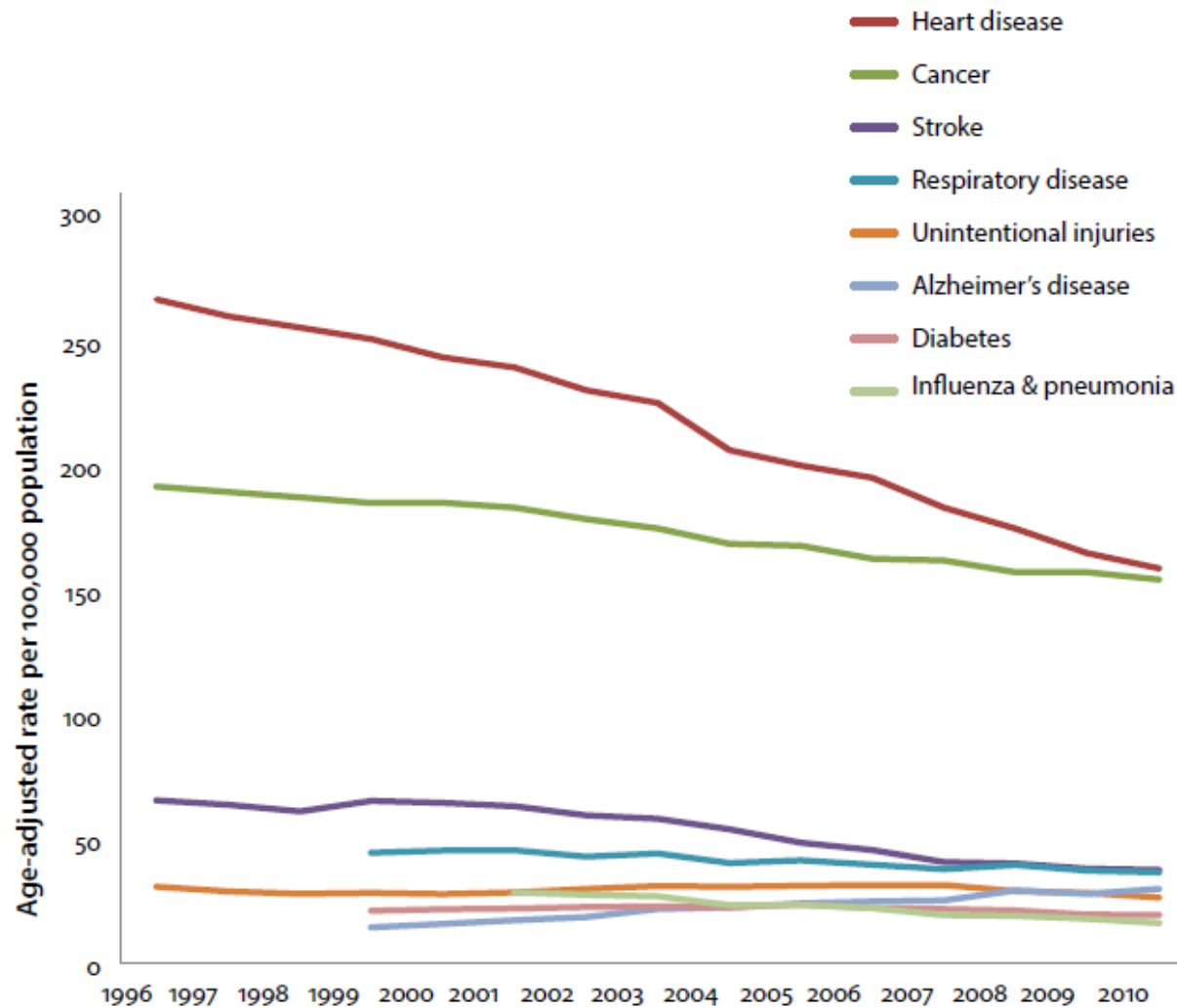
Percent Responding Very Serious



Source: Public Policy Institute of California. Californians & the Environment: Statewide Survey. July 2015



Burden of Disease and Injuries: Leading Causes of Death, California



Source: California Department of Public Health, Vital Records, 2012

Health disparities are pervasive and occur between and within communities

A White child from the Oakland Hills can expect to live to 85 years old, whereas an African-American child living in West Oakland—just a few miles away—can expect to live only to 70.

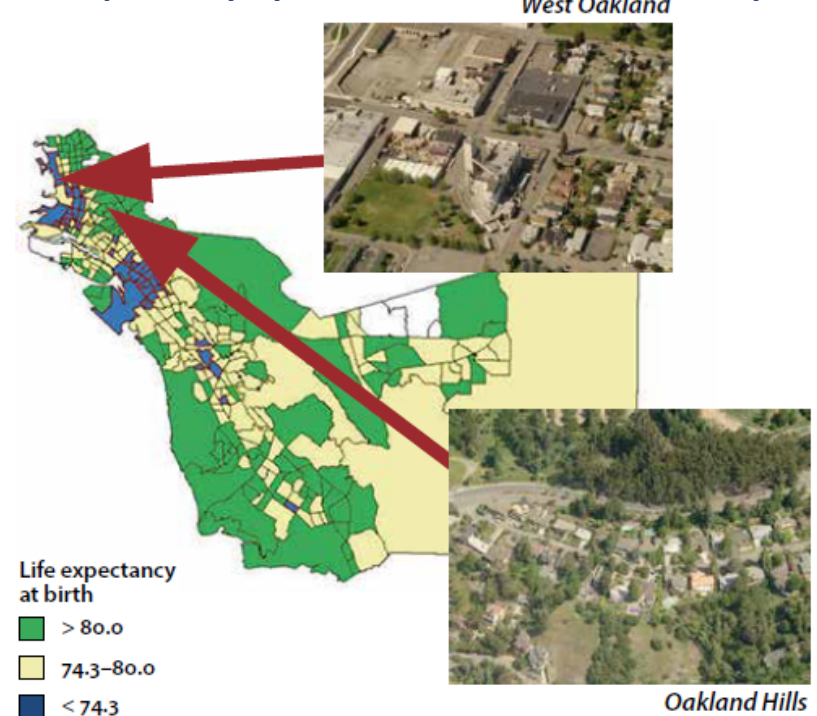
The child from West Oakland is:

- 1.5 times more likely to be born prematurely
- 7 times more likely to be born into poverty
- 2 times as likely to live in a home that is rented
- 4 times more likely to have parents with only a high-school education
- 2.5 times more likely to be behind in childhood vaccinations
- 4 times less likely to read at grade level by fourth grade
- 4 times as likely to live in a neighborhood with double the density of liquor stores and fast food outlets
- 5.6 times more likely to drop out of school

As an adult, he or she is:

- 5 times more likely to be hospitalized for diabetes
- 2 times more likely to be hospitalized for heart disease
- 2 times more likely to die of heart disease
- 3 times more likely to die of stroke
- 2 times as likely to die of cancer

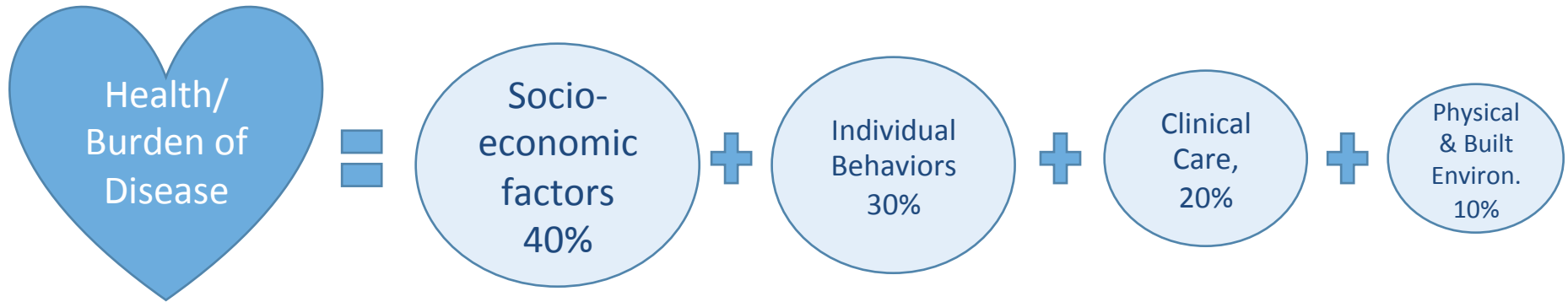
Life Expectancy by Census Tract, Alameda County, 2000



		West Oakland	Oakland Hills
Percent	High school grads	65%	90%
	Unemployment	12	4
	Poverty	25	7
	Home ownership	38	64
	Non-White	89	49

Sources: Alameda County Public Health Department, 2008, 2012

What is producing population vulnerabilities and inequities in the health outcomes?



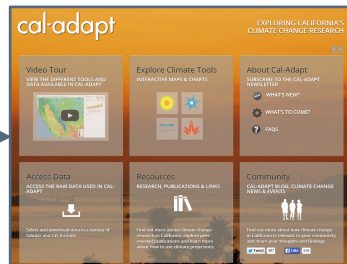
Source: Robert Wood Johnson/University of Wisconsin, Commission for a Healthier America, County Health Rankings, 2012

- Disparities in health determinants mirror health disparities
- Climate change will impact along this continuum
- Indirect impacts on health through human systems and ecosystem perturbations may eclipse direct impacts of environmental exposures (via food/economic insecurity)
- A population that has a high burden of chronic disease (heart disease, obesity, diabetes, asthma, mental health, etc.) is not as climate-resilient as a population with a low burden

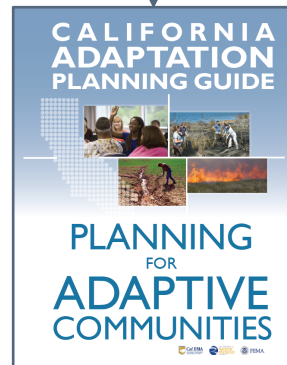
California Use Case: State Agency Response

Downscaled data

- 4 models
- A2/B1 SRES
- Climate risks: temperature, sea level, precipitation, snowpack, wildfire



Statewide Adaptation Strategy and Guidance



4 Volumes, 285 p

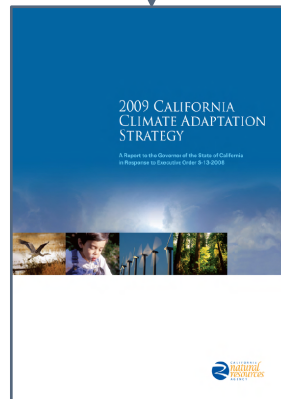


BRACE funding

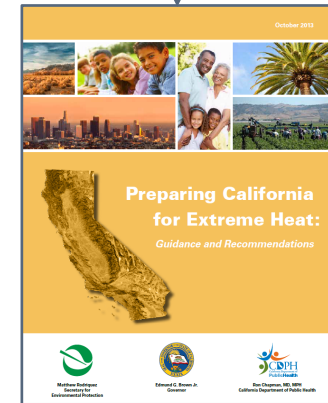
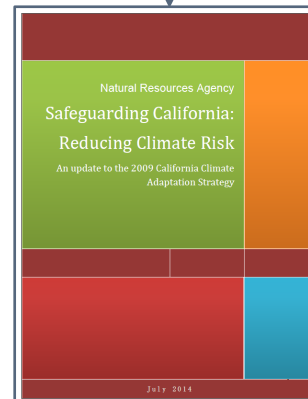


Priorities

- Sea Level Rise
- Heat
- Wildfire



2 Volumes, 540 p
Catalogue of public health impacts



24 p



- 58 County Climate & Health Profiles, 16p
- Census tract vulnerability assessment
- Burden of disease projections

Cal-Adapt Content in California County Health and Climate Profile Reports

■ Heat

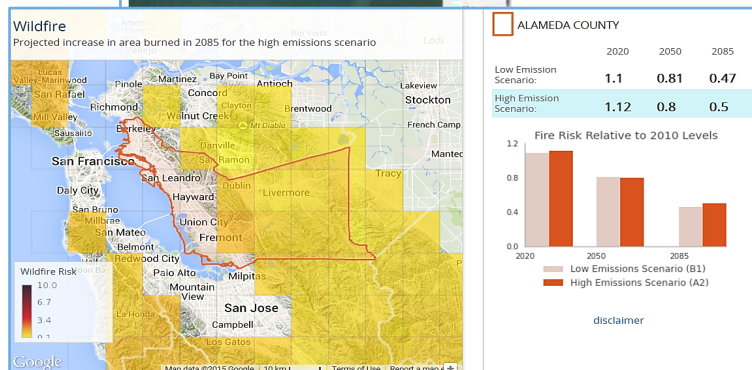
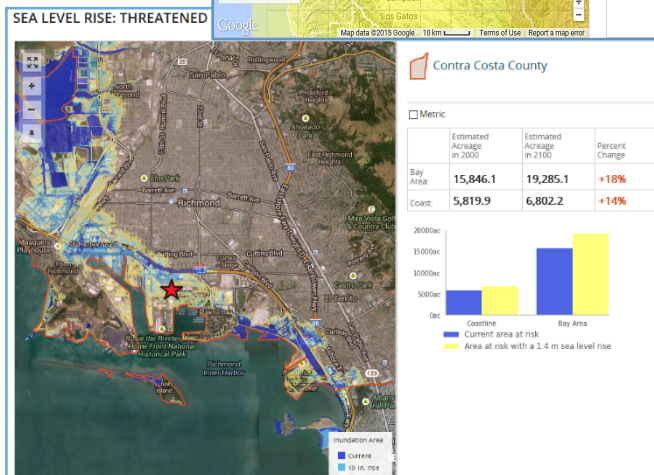
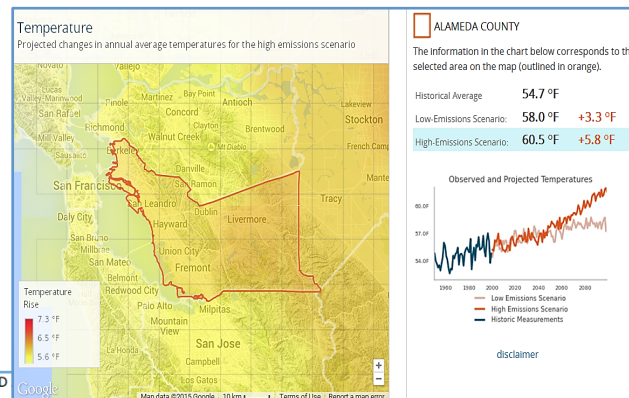
- Ave, Min, Max (mo., annual, decadal)
- Extreme Heat Days
- Heat waves

■ Sea Level Rise

- 100 year flood + 50, 100, 140 cm rise

■ Wild Fires

- Relative change from baseline



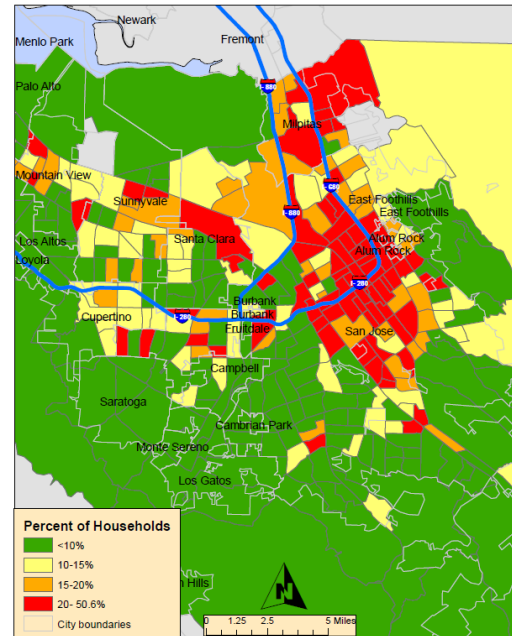
Vulnerable/Disadvantaged Populations and Spatial Resolution of Statewide Data Sources

Climate Change Vulnerability Indicators, CalBRACE CDPH		Resolution
Exposure and Environment Domain (current & projected)		
Heat (mean, min, max, extreme heat days, heat waves) - projected		7.5 mi grid
Risk of wildfire >200 hectares (projected risk)		7.5 mi grid
Percent of the population living in 100-year flood zone		Census block
Percent of population currently living in high risk wildfire zone		Census block
Annual average PM2.5 concentration ($\mu\text{g}/\text{m}^3$)		Census tract
Unhealthy days of ozone exposure		Census tract
Population Sensitivities Domain (current)		
Children aged < 5 years		CT
Adults aged ≥ 65 years		CT
Educational attainment		CT
Population living below federal poverty level		CT
Race/ethnicity		Census block
Households paying >30% (or 50%) of income for housing costs		CT
Jobs working outdoors		CT
Car ownership		CT
Linguistic isolation		CT
Comorbidities		County
Population living with a disability		CT
Health care access		CT/Zip code
Adaptive Capacity Domain (current)		
Air conditioning ownership		Zip code
Impervious surfaces		30 m
Tree canopy		30 m
Population residing <1/2 miles of transit stop with headway <15 min.		Census block

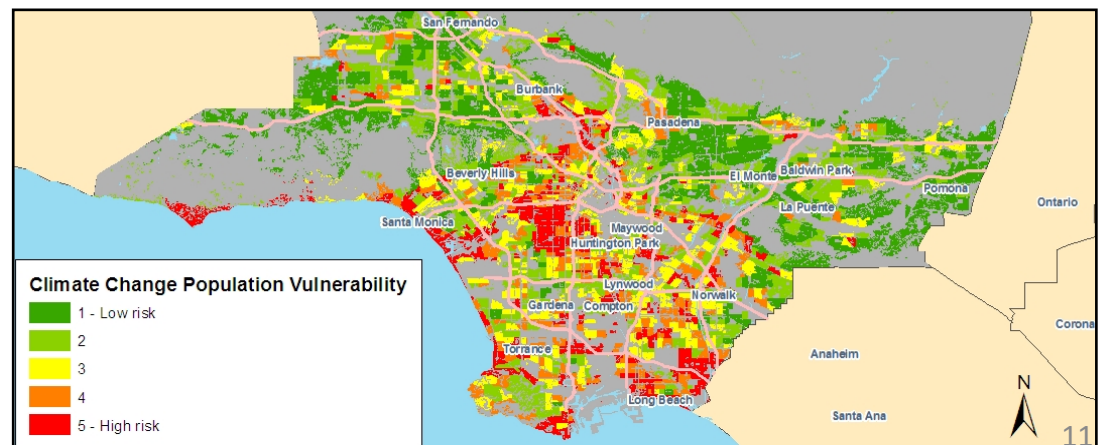
Overlay of Climate Risks and Vulnerable/Disadvantaged Populations (Census tract)

- Single Factor

Percent of Linguistically Isolated Households by Census Tract, Santa Clara County, 2006-2010

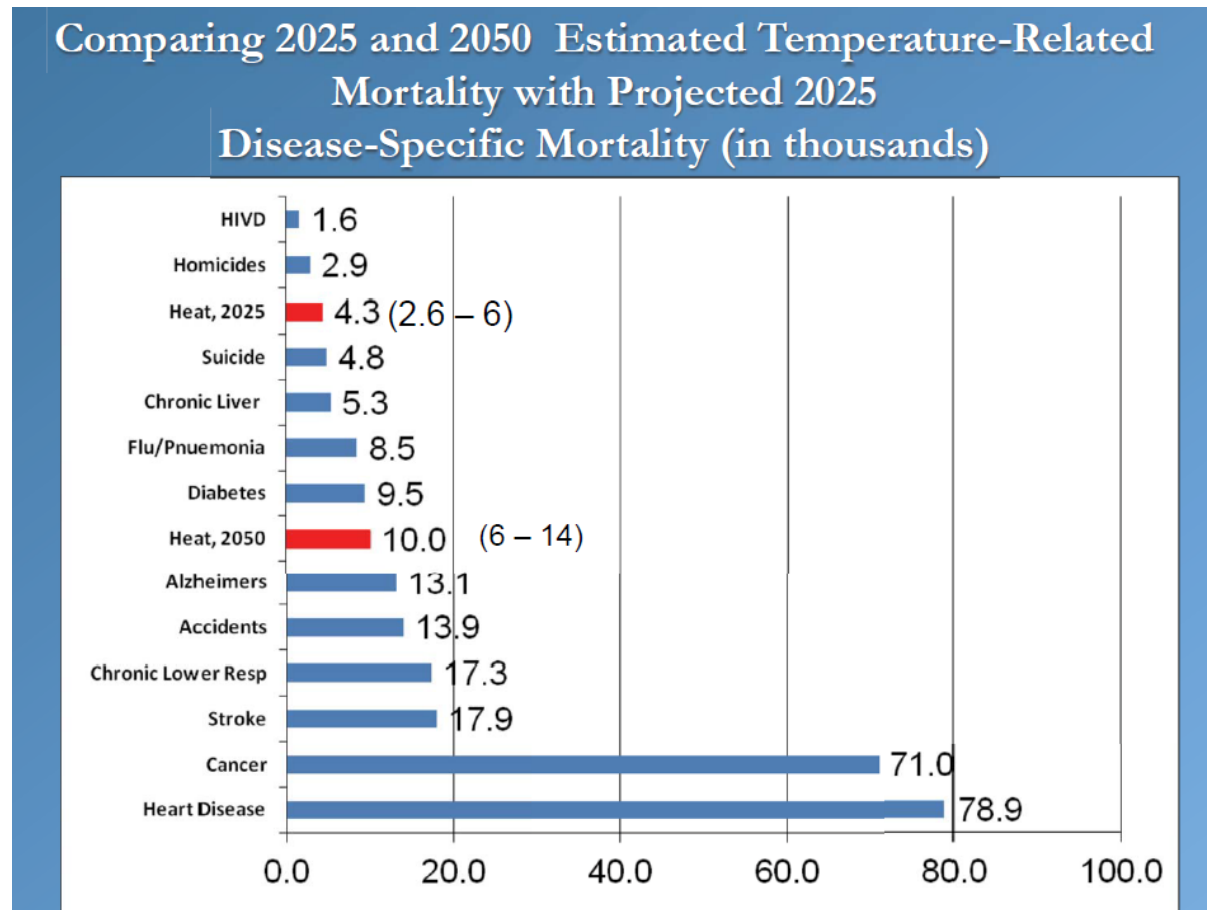


- Cumulative Index



Predictive Modeling of Health Outcomes and Climate Change Scenarios (county level)

- Comparative Risk Assessment models

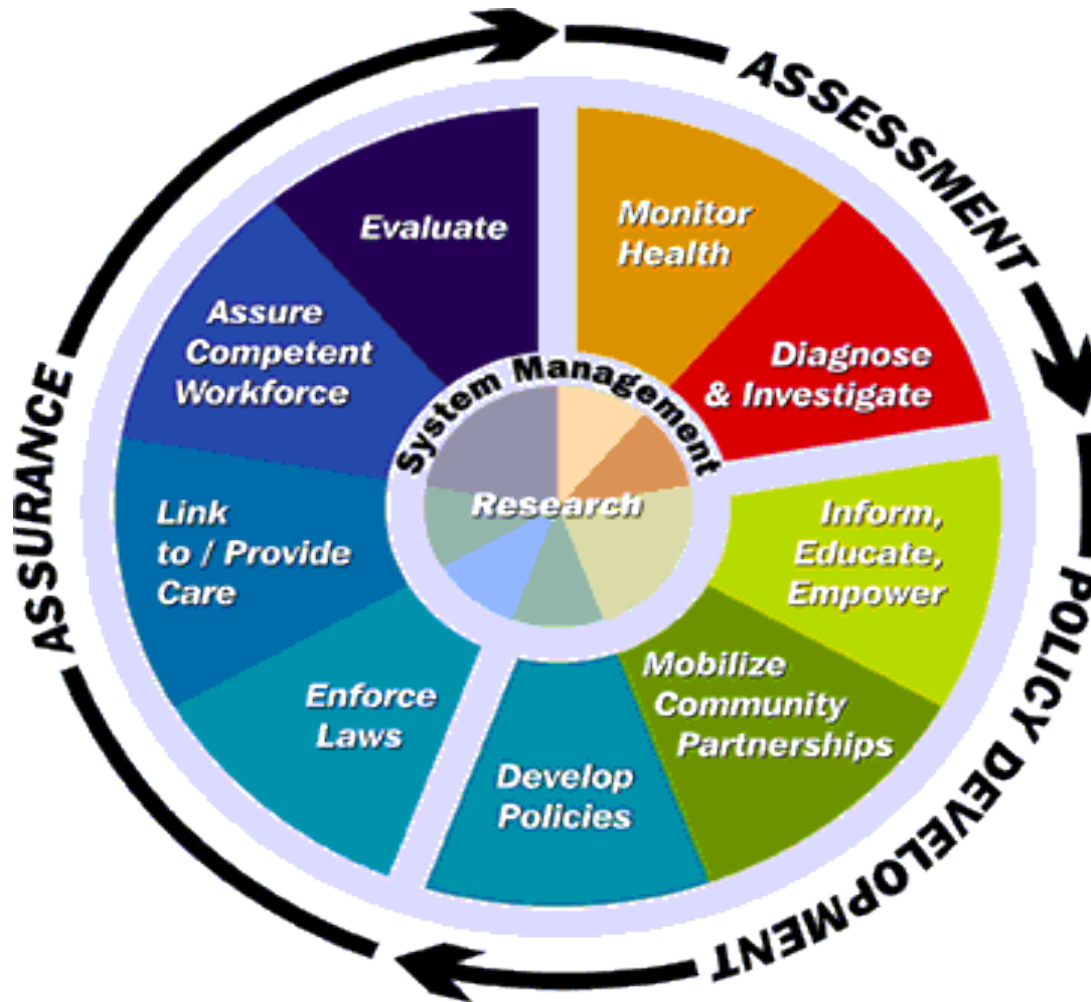


Source: Ostro B, Rauch S, Green S. Environmental Research 111 (2011) 1258–1264

Technical/Methodologic Issues in Using Climate Projections and Health Data

- Geospatial resolution and limits of statistical reliability of many health data sets are between census tract and county in California
- To maintain a consistent resolution, health and population data may require statistical downscaling - not common in PH practice or research
- Linking health (models) to other sectors' models
 - Air shed models of PM_{2.5} linked to models of regional transport of wildfire emissions
 - Land use and travel demand models used in urban and regional transportation planning (MPOs)
 - ✓ Creation/exacerbation of urban heat islands from smart growth strategies to reduce GHG emissions in housing-transportation
 - ✓ Coordination of adaptation and mitigation strategies
- Vulnerable populations in specific geo-spatial settings
 - E.g., residents in an urban heat island or micro-environment (top floor of heat absorbing building)
- Complexity/Uncertainty/Transparency – black box syndrome

Public Health Core Functions and 10 Essential Services



Source of [Ten Essential Public Health Services](#): [Core Public Health Functions Steering Committee](#), 1994

Where Does Climate Change Fit in Public Health Practice?

- Emergency preparedness
- Built environment/healthy planning
- Health equity/vulnerable populations
- Environmental health
- Epidemiology/health policy
- Health promotion/chronic disease
- Nutrition, local food security, urban agriculture, farmer's markets
- Health education, community education/engagement
- Infectious disease/vector borne disease
- Public Health Nursing
- All programs are touched!



Strengths of Local Health Departments

- Know and work with disadvantaged communities
- Communications expertise on health issues
- Role of downscaled climate data
 - Creates engagement by localizing/personalizing impacts
 - Inputs to adaptation planning/public health preparedness
 - Communications
 - ✓ Localizing impacts
 - ✓ Needs to be tied to relevant and meaningful action (“So, what am I supposed to do?”)

Barriers Faced by Local Health Departments for Engagement on Climate Change

- Inadequate funding and categorical constraints in programs
 - “Climate specialists” vs. building capacity into existing programs
 - California AB32/Cap & Trade funding for mitigation, not adaptation
- Start-up: health departments struggle with where to start
 - No single entry-point or model of engagement
- Framed as an environmental, rather than health issue
- Lack of internal education on climate and health, and tools
- Existing climate projections and data are highly technical and often not accessible and underutilized
- Challenged and/or unengaged leadership
- Political: in some locales, climate change cannot be openly discussed

Summary and Conclusion

- Data are sufficient to take immediate actions on mitigation and adaptation
- In general, public health does not suffer a “science deficit disorder” with downscaled climate projections at 1/8°. For some jurisdictions, additional downscaling would be welcome.
- Data are often:
 - Not accessible to many public health staff
 - Not linked to programmatic activities
- Existing data are underutilized
- Data translation into useful information is needed for a range of internal and external public health audiences
- Public health departments are:
 - interested in climate change
 - few are actively engaged, but momentum is building
 - impacted by resource and political constraints