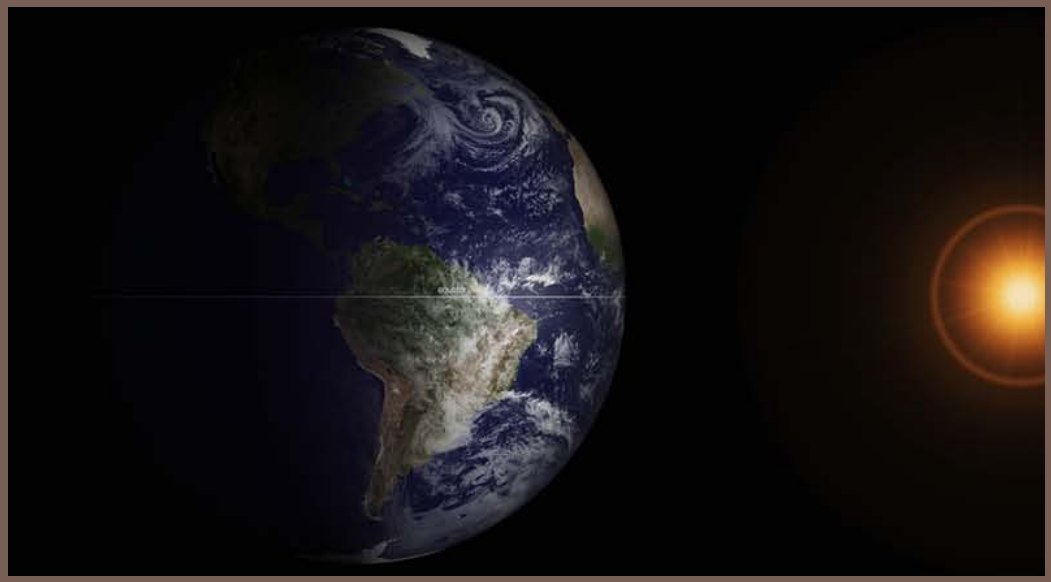
Improvements in Surveillance and Public Health from the California Environmental Health Tracking Program



Jan 23, 2014

Paul English, PhD, MPH

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

California Department of Public Health CDPH

PUBLIC HEALTH INSTITUTE

Overview

- Background
- Components of California's tracking program
- Examples and success stories

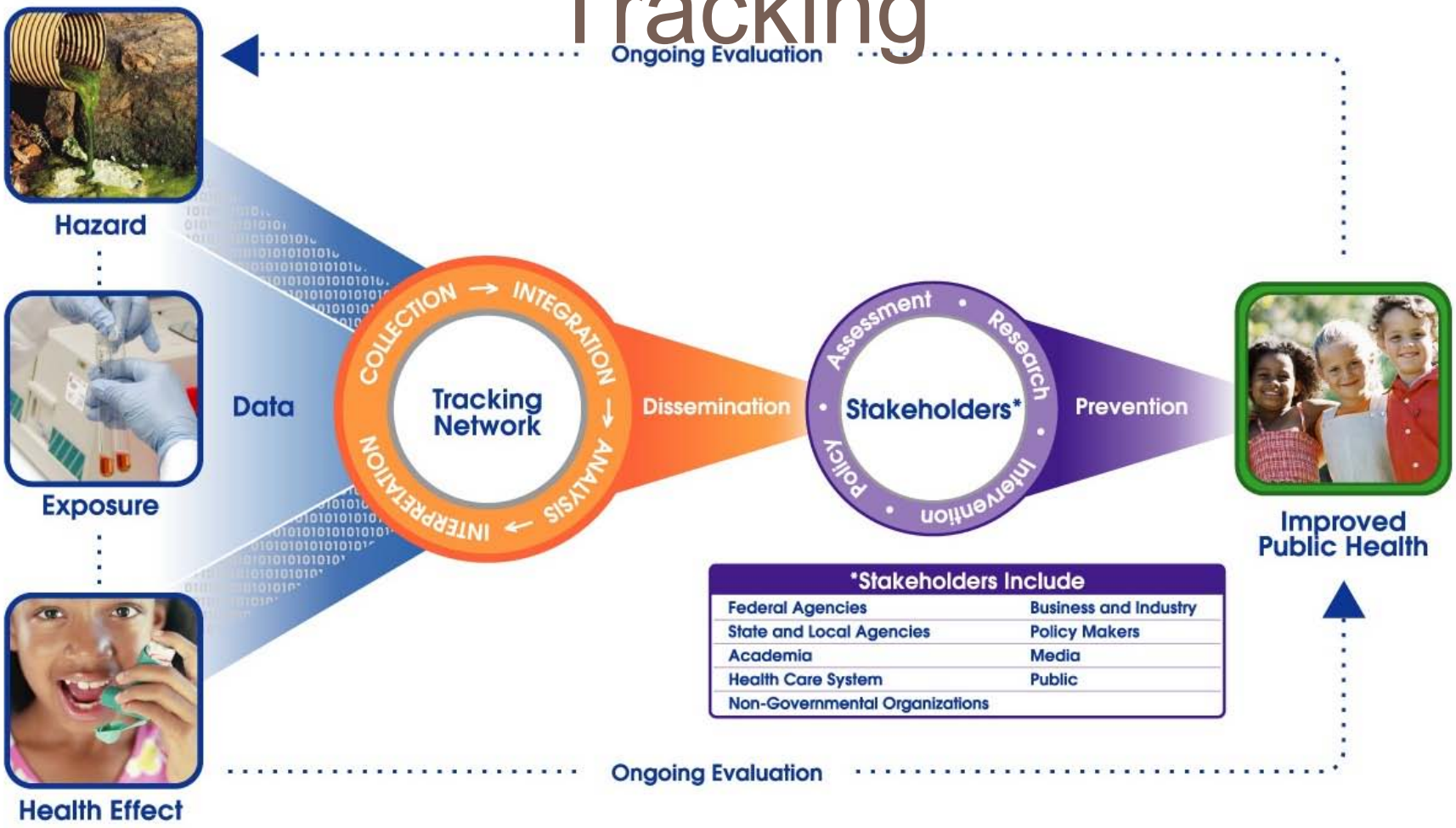
3 Background

California's environmental health gap : Why we need environmental health surveillance

- 2000-2001-- Nationally and state recognized:
  - Rise in chronic diseases, such as asthma, learning disabilities, and autism
  - Exposure to environmental hazards accounted for a significant proportion of many chronic diseases
  - Gap in basic information on the relationship between the environment and health
  - $100 billion a year in California—fiscal toll from nine environmentally-related chronic diseases, due to related health care costs and lost productivity

- An effective surveillance system was needed to document and explore links between hazards, exposures, and health

Environmental Public Health Tracking



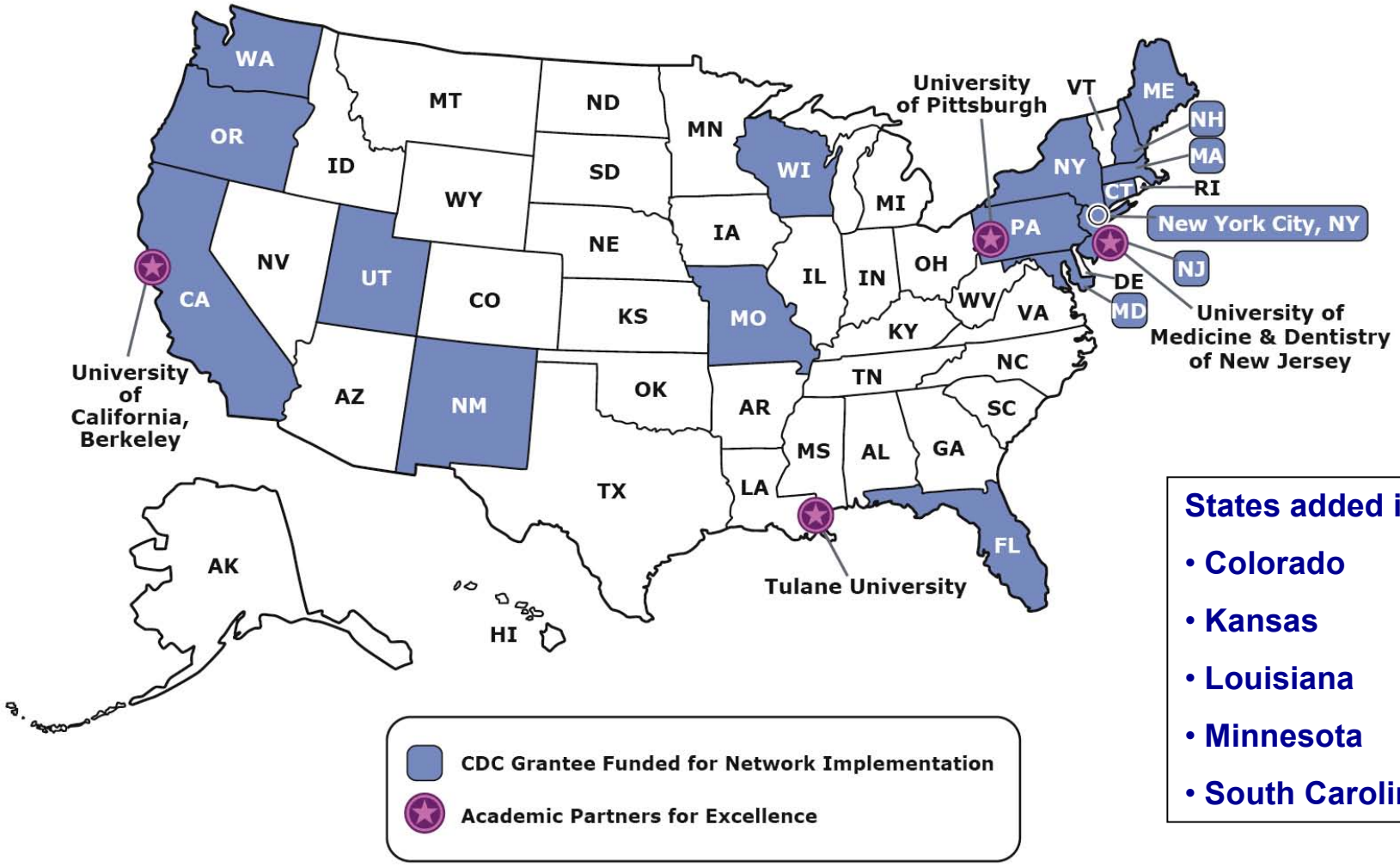
("Tracking" = "Surveillance")

Environmental Public Health Tracking Network (EPHTN)

A secure, web-based network that will provide access to environmental and health data that are collected by a wide variety of agencies.

- Compile and provide access to a core set of nationally consistent data and measures
- Exchange data
- Inform and interact with the public
- Enable the systematic linking of health effects, exposures, and/or hazard datasets on an ad-hoc or ongoing basis
- Provide a toolset for data analysis, visualization, reporting, and monitoring
- Provide security and protection to sensitive or critical data

CDC's Environmental Public Health Tracking Program Grantees FY 2006



States added in 2009:

- **Colorado**
- **Kansas**
- **Louisiana**
- **Minnesota**
- **South Carolina**

About us

- Within the California Dept of Public Health
- Mostly funded by the Centers for Disease Control and Prevention
  - 1 of 23 grantees
- Current staffing and expertise
  - 7 (CDC-funded), 3 (other grant funded), 1 state staff
  - Multidisciplinary project teams: Epidemiology, environmental science, GIS, software development, health education, program management, policy
- Mission: to provide data and information for public health action

CEHTP Program Values

Guided by the principles of environmental justice and precaution

- **Participatory process**
  Facilitate and support the involvement of our stakeholders, including the community, throughout our program process.

- **Relevancy of actions**
  Produce meaningful tools, data, and information that is relevant to our stakeholders and useful for informing public health actions.

- **Scientific integrity and innovation**
  Analyze, interpret, and present data and information to our best understanding and ability, using the latest and most appropriate methods.

- **Transparency in decision making**
  Make the rationale for program activities and decisions available in a manner that is transparent and intelligible.

What should California's Tracking Program do?

- Improve:
  - surveillance
  - value of existing data
  - access to data
- Inform:
  - policy and decision-making
  - program planning and resource allocation
  - land use and planning decisions
- Support community action/advocacy
- Identify communities at risk
- Support advancement of knowledge
  - Generate hypotheses
  - Develop methods
  - Facilitate research through data and tools

Make data more useful, understandable, and accessible for public health action by stakeholders at the community, local, and state level

11

Main Tracking Program Activities

Main program activities/components

- Web portal, tools, and services
- Research and special projects
- Data requests and collaborations
- Needs assessment, outreach, and capacity building
- Advisory group

Web Portal, Tools, and Services

- Provides public access
  - Data queries and downloadable datasets
  - General information about topic areas
  - Mapping tools
- Restricted access to some tools and services

- **Examples of topic areas/data**
  - **Air**
  - **Agricultural pesticide use**
  - **Asthma**
  - **Birth defects**
  - **Biomonitoring**
  - **Cancer**
  - **Carbon monoxide poisoning**
  - **Childhood lead poisoning**
  - **Drinking water**
  - **Heart attacks**
  - **Heat-related vulnerability**
  - **Housing**
  - **Maternal and Infant Health**
  - **Poverty**
  - **Traffic**

CALIFORNIA **ENVIRONMENTAL HEALTH TRACKING** PROGRAM

Improving Public Health With Better Information

Welcome to the California Environmental Health Tracking Program (CEHTP) web portal.
We are working to improve public health by delivering science-based information on the trends and distributions of diseases and environmental threats, as well as the often complex relationships between them.

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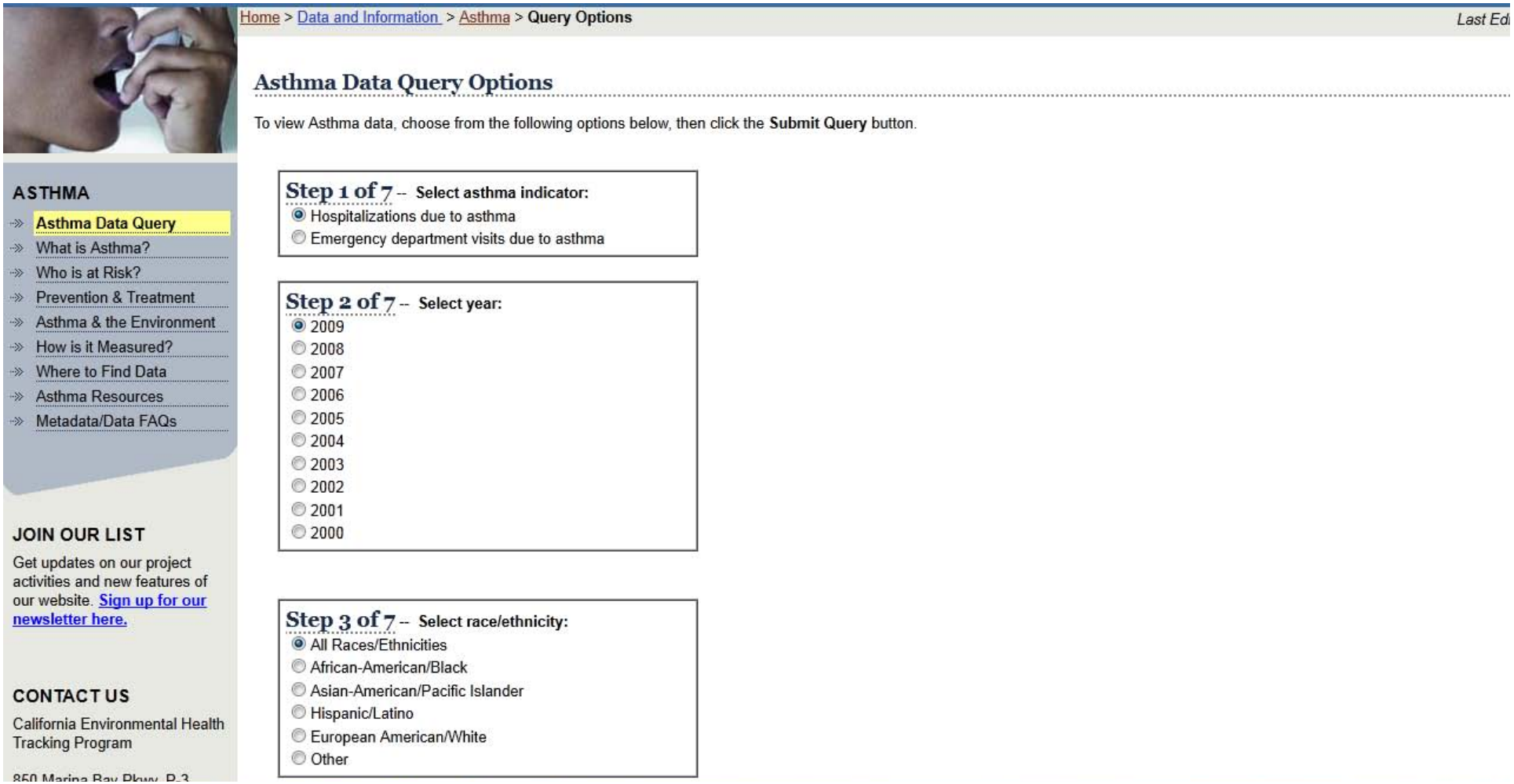

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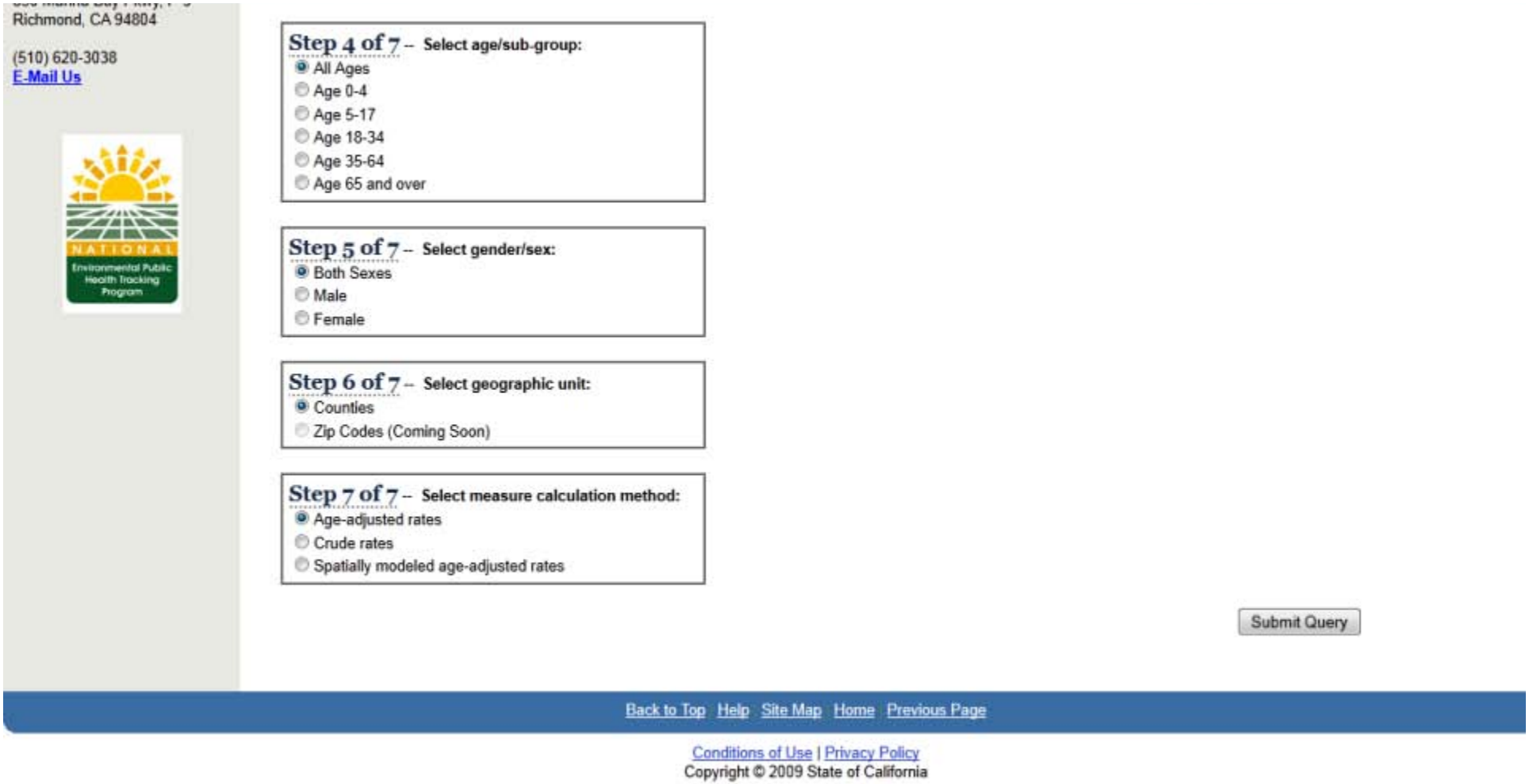

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ASTHMA

- Asthma Data Query
- What is Asthma?
- Who is at Risk?
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- How is it Measured?
- Where to Find Data
- Asthma Resources
- Metadata/Data FAQs

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CONTACT US

California Environmental Health Tracking Program

850 Marina Bay Pkwy, P-3
Richmond, CA 94804

(510) 620-3038

Asthma Hospitalization and Emergency Department Visits Query Results

This query system automatically generates a **table, map, and chart** using the criteria you have chosen. To see the data in your desired format, click on the corresponding tabs below. View **Info** tab to learn about the data and how they can be used. View the **Sources** tab for information about the underlying data sources.

To **modify your query**, click on the yellow box to the right. Options for **other ways to visualize the data** are listed on the right side bar.

Table | Map | Chart | Info | Sources

Modify Your Query

Hospitalizations due to asthma in California by County, All Races/Ethnicities, All Ages, Both Sexes, 2009 [Notes]

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Alpine	NA	NA	NA	NA
Amador	4.34	2.42	7.14	18
Butte	9.61	8.32	11.04	210
Calaveras	5.33	3.23	8.22	26
Colusa	6.99	3.87	11.57	15
Contra Costa	11.08	10.45	11.74	1186
Del Norte	6.53	3.93	10.19	20
El Dorado	5.34	4.30	6.55	101
Fresno	12.50	11.80	13.24	1224
Glenn	4.78	2.66	7.93	15
Humboldt	8.83	7.27	10.61	119
Imperial	15.02	13.26	16.94	270
Inyo	6.72	3.43	11.82	13
Kern	10.66	9.93	11.42	847
Kings	10.78	9.05	12.74	153
Lake	13.73	10.86	17.12	90
Lassen	7.63	5.02	11.13	28
Los Angeles	11.53	11.32	11.74	11782

* To see more-detail county-spe data, click county nam the Table ta

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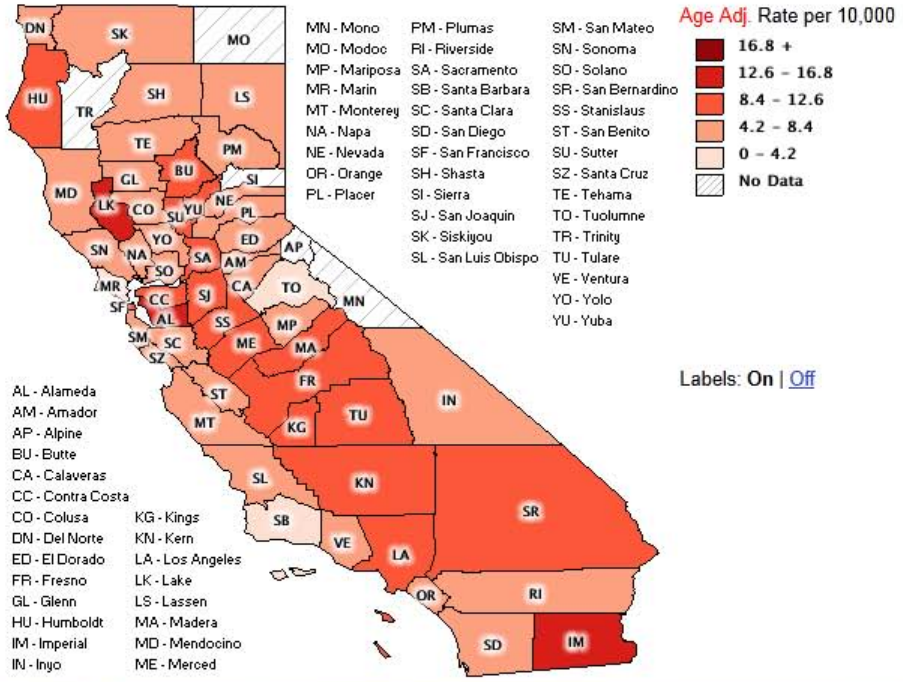

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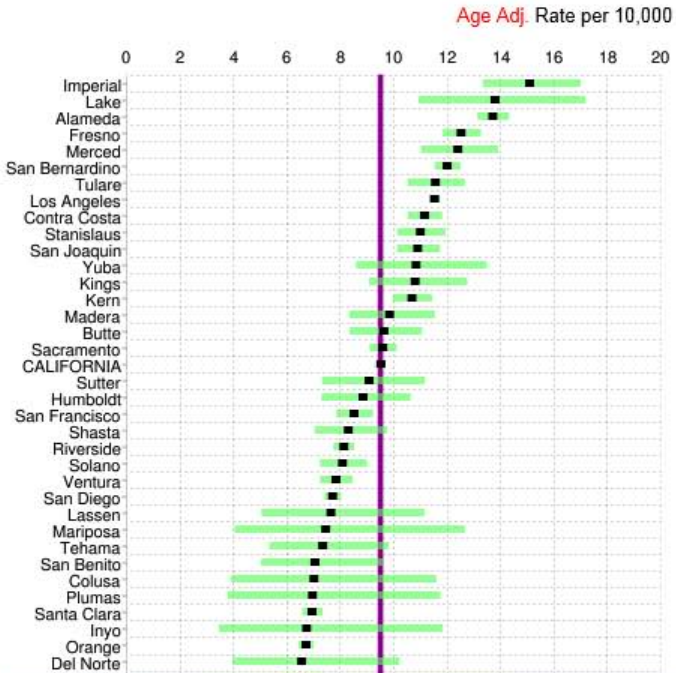

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Tulare	11.56	10.52	12.66	489
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Contra Costa	11.08	10.45	11.74	1186
Stanislaus	11.01	10.13	11.95	593
San Joaquin	10.91	10.13	11.74	766
Yuba	10.82	8.57	13.47	82
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Kern	10.66	9.93	11.42	847
Madera	9.82	8.31	11.52	152
Butte	9.61	8.32	11.04	210
Sacramento	9.57	9.06	10.09	1367
Sutter	9.06	7.29	11.15	92

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Table | Map | Chart

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Time Series Table/Chart for Fresno County

Chart | Table | Print... | Export...

Hospitalizations due to asthma in Fresno County by Year, All Races/Ethnicities, All Ages, Both Sexes

Close

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2001	11.60	10.89	12.36	1010.00
2002	11.78	11.06	12.54	1030.00
2003	12.49	11.75	13.26	1095.00
2004	10.91	10.23	11.63	983.00
2005	10.23	9.56	10.92	912.00
2006	10.31	9.65	11.00	945.00
2007	11.22	10.54	11.93	1067.00
2008	11.75	11.05	12.48	1106.00
2009	12.50	11.80	13.24	1224.00

Close

Research/Special Projects

- Projects may utilize CEHTP
  - Data
  - Technical infrastructure, such as linkage tools
  - Other expertise
- Another way to provide data and information that is useful for public health action
- Opportunity to focus on issues of importance to Californians

- **Project lead / co-lead**
  - **Perchlorate and pesticide biomonitoring**
  - **Breast cancer mapping**
  - **HIA on cap-and-trade**
  - **Climate change commu nity vulnerability mapping**
  - **Agricultural pesticides and autism study**
  - **Heat-related illness and mortality report**
  - **Pesticides and schools study**
  - **Cost of children's**

Data Requests and Collaborations

- Data requests
  - For data not available on web portal, including data generated using CEHTP linkage services
- Provide technical assistance
  - Epidemiology and statistics
  - Communication and facilitation
  - Software development
  - GIS

- **Contributed to other projects**
  - **Heat wave magnitudes & PH impacts (Margolis)**
  - **Hypospadias, genes & environment (Stanford)**
  - **Community vulnerability analysis (Pastor, Morello-Frosch)**
  - **Occupational fatality mapping (Occ. Health Branch, CDPH)**
  - **Heat vulnerability index validation (UC Berkeley)**
  - **710 Freeway Expansion Project (Human Impact Partners)**

Needs Assessment, Outreach, and Capacity Building

- Assess stakeholder needs to inform program activities
- Ensure stakeholders are aware of our resources
- Enhance users' ability to understand and use our resources
- Collaboration with "data intermediaries"

- **Activities include**
  - **Needs assessments like focus groups, surveys, usability testing**
  - **Evaluation**
  - **Ongoing communications, such as newsletter**
  - **Project-specific outreach**
  - **In-person and web-based presentations, demonstrations, and trainings**

Advisory Group

- Provide guidance and feedback on program activities
- 27 members
- Meet in person 2-3 times a year
- Representing
  - Local, state, fed govt
  - CBOs and NGOs
  - Academia
  - Healthcare

- **Roles include**
  - **Assist in data access as data stewards and user groups**
  - **Provide guidance on data analysis, interpretation and visualization**
  - **Collaborate on dissemination strategies and activities**
  - **Use data, tools, and services for public health action**
  - **Engage in program**

29

Examples and Success Stories

Enhancing Existing Data

- Geocoding
- Sub-county mapping and spatial modeling

Geocoding Service

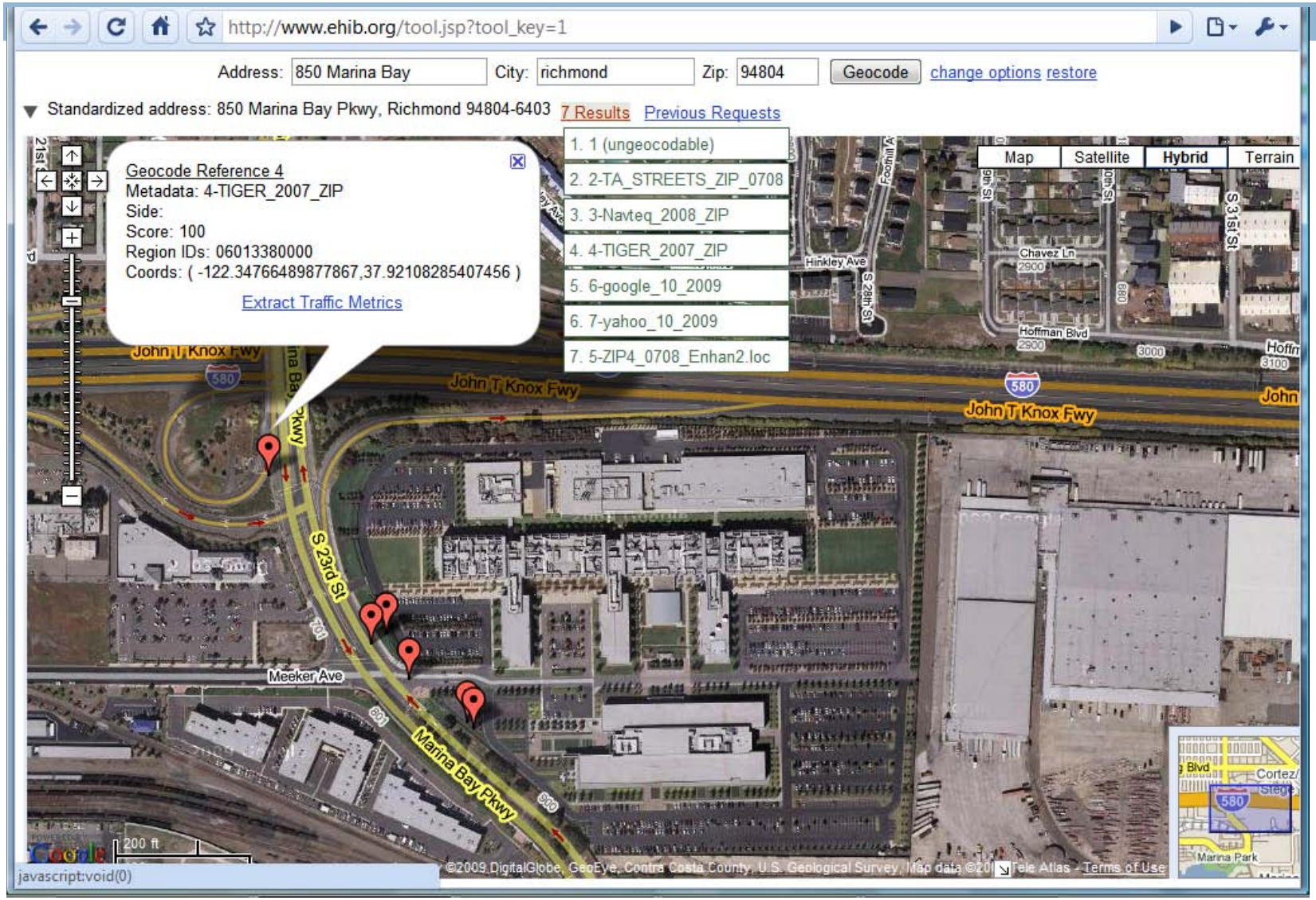
Problem

- Geocoding is essential to public health
  - Accurately mapping disease or other information
- Without our service, government programs:
  - Paid for commercial geocoding services
  - Used free services that were less accurate
  - Spent resources and time creating their own in-house geocoding capabilities
  - Did not geocode their data

What We Did

- Created geocoding tool
  - Free for users (CDPH and program partners)
  - Highly accurate
  - Secure
  - High throughput (up to 1 million records per table; can geocode 300,000 records/hr)
  - Offered as web-based tool, desktop application, and API
- Developed tutorial and conducted trainings

Geocoding Service



Geocoding Service: Successes

- Used over 63,000 times to geocode over 42 million addresses

- Used by over 50 programs for wide variety of public health purposes
  - Vital Statistics- real-time geocoding of death records
  - Cancer Detection- map provider locations, inform service delivery
  - Monitoring outbreaks- TB, STDs, vectors and vectorborne diseases
  - Emergency preparedness- mapping of sensitive sites, essential services

"The Geocoding Service is the best in California [state government]"

Sub-County Data

Problem

- County-level data are of limited utility for local-level action
- Data often displayed at county level
  - Concerns about confidentiality
  - Higher resolution data may be of limited utility when rates are suppressed

What We Did

- Explored display of community-level data through use of spatial statistics
  - Census tract maps offer higher resolution of patterns
  - Smoothed surface maps are not limited by political boundaries
- Verified utility of data with stakeholder advisory group

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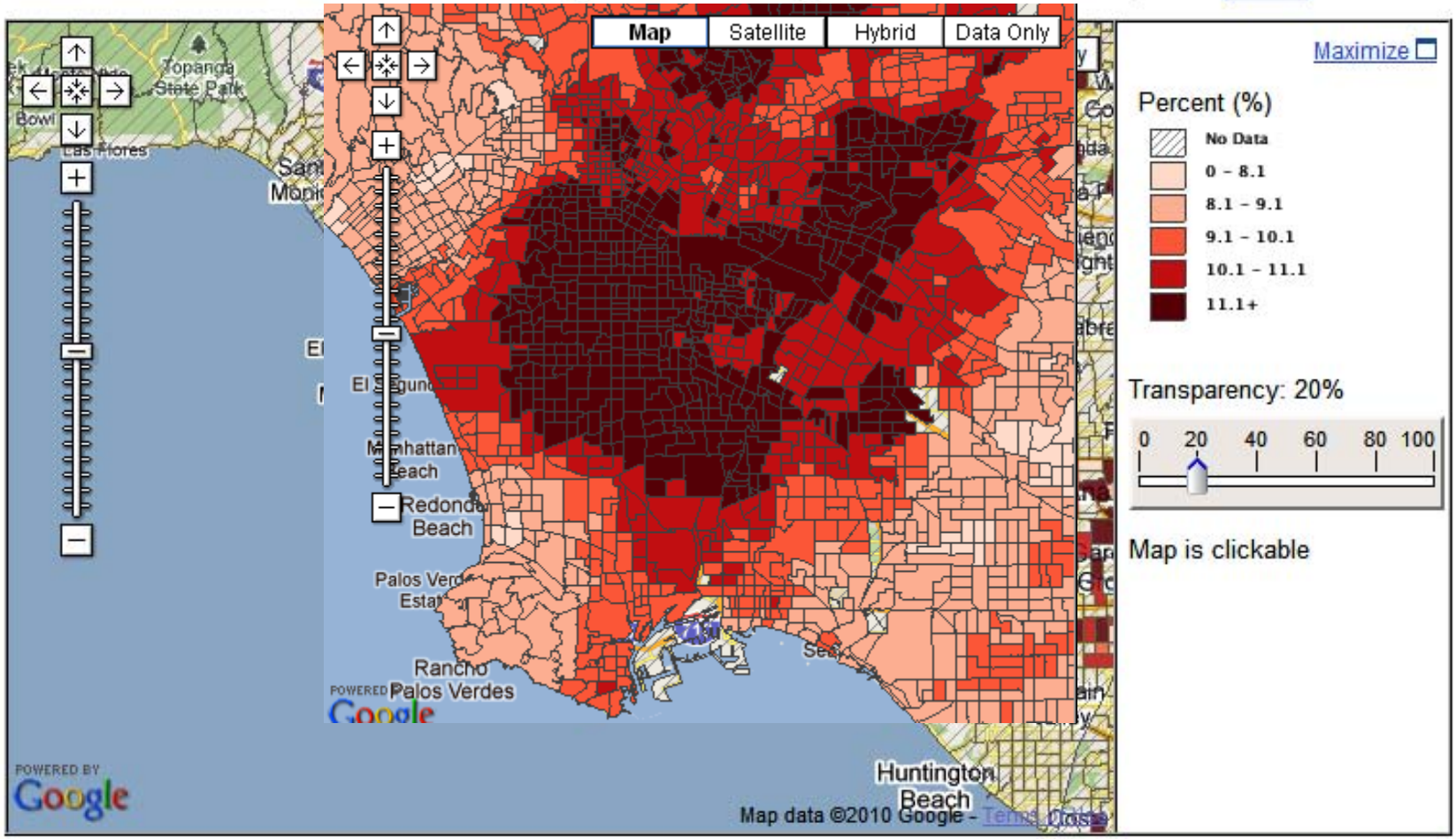
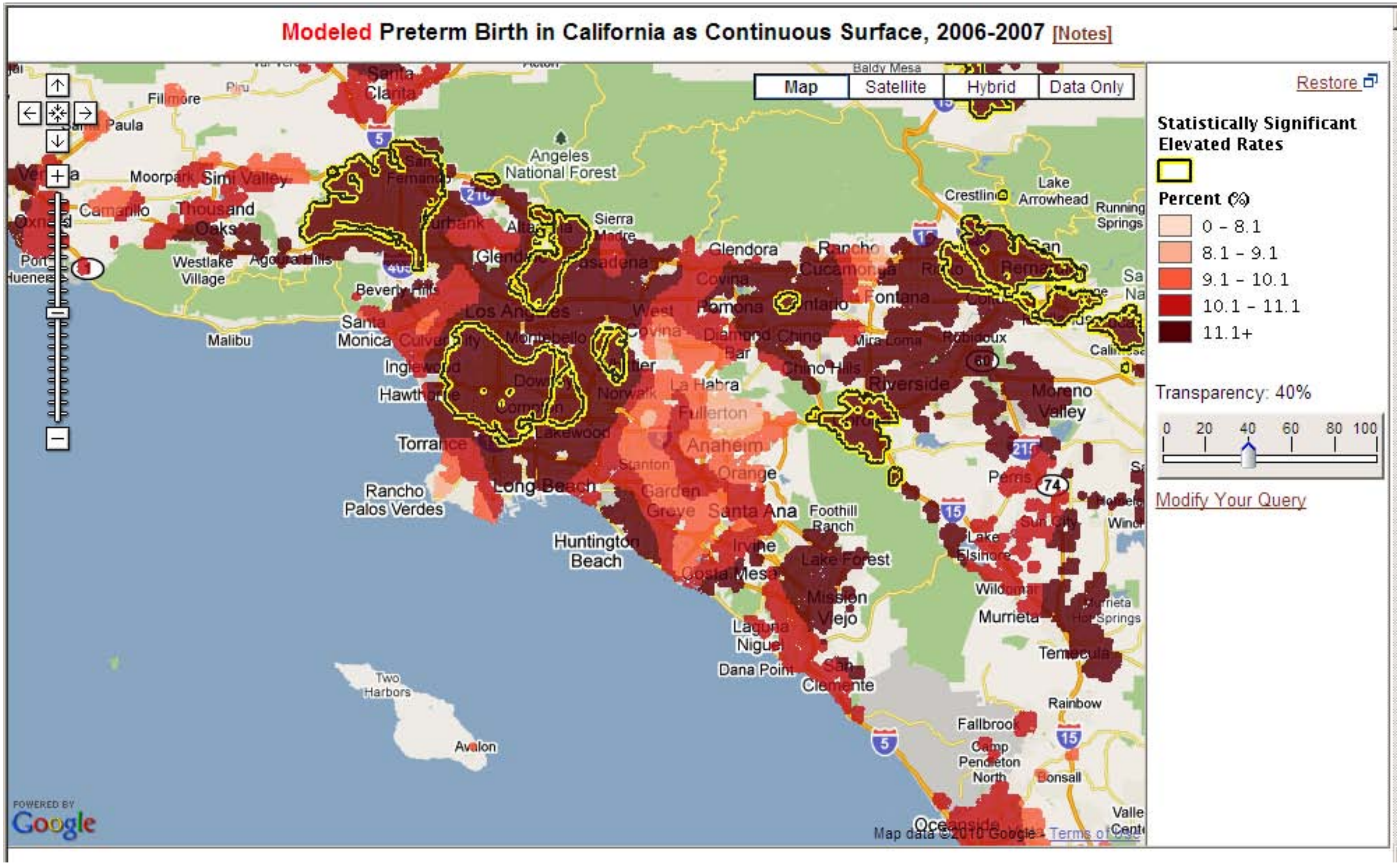
Preterm Birth in California by Census Tract, All Races/Ethnicities, 2006 [Notes]



NOTES ABOUT THE DATA

- Preterm birth is a singleton birth prior to 37 weeks of gestation (about 8.5 months). Very preterm birth is a singleton birth prior to 32 weeks of gestation. Smoking cessation and reduced access to nutritious foods and medical services can lead to



Modeled Preterm Birth in California as Continuous Surface, 2006-2007 [Notes]
Map
Satellite
Hybrid
Data Only
Restore
Statistically Significant Elevated Rates
Percent (%)
0 - 8.1
8.1 - 9.1
9.1 - 10.1
10.1 - 11.1
11.1+
Transparency: 40%
0 20 40 60 80 100
Modify Your Query
Angeles National Forest
Moorpark
Simi Valley
Thousand Oaks
Westlake Village
Malibu
Santa Monica
Inglewood
Hawthorne
Torrance
Rancho Palos Verdes
Long Beach
Huntington Beach
Glendora
Pomona
Fontana
Riverside
Moreno Valley
Perris
Anaheim
Orange
Santa Ana
Irvine
Costa Mesa
Lake Forest
Mission Viejo
Laguna Niguel
Dana Point
San Clemente
Murrieta
Temecula
Rainbow
Fallbrook
Camp Pendleton North
Bonsall
Two Harbors
Avalon
Lake Arrowhead
Crestline
Running Springs
Foothill Ranch
Map data ©2010 Google - Terms of Use
POWERED BY Google

Sub-County Data: Successes

- Identified communities at risk and target activities
  - Fresno County MCH, childhood lead poisoning prevention activities
  - Informed asthma, air quality programs
- Assessed other possible risks
  - Fresno used data to examine MIH outcomes and lead
- Informed program planning
  - Fresno's MCH 5-year needs assessment and planning document

"You have helped us in a huge way."

- Fresno County Director of Public Health Nursing

Making Data More Useful and Accessible

- Childhood lead poisoning
- Mapping and linkage tools

Childhood Lead Poisoning

Problem

- Childhood lead poisoning still a problem in CA
- Blood lead screening data collected by CLPPB
- County-level data was not publicly available

What We Did

- Worked with CLPPB to get permission to display data
- Developed text and data query system to display data on
  - Blood lead levels
  - Age of housing
  - Poverty

Childhood Lead Poisoning: Successes

- Data on childhood lead poisoning now available publicly for the first time
- Used for program planning in Nevada County
  - To identify data discrepancies
  - To assess trends and gaps to inform 3-year planning process
- Used to advocate for more funding for childhood lead poisoning prevention programs

Mapping and Linkage Tools

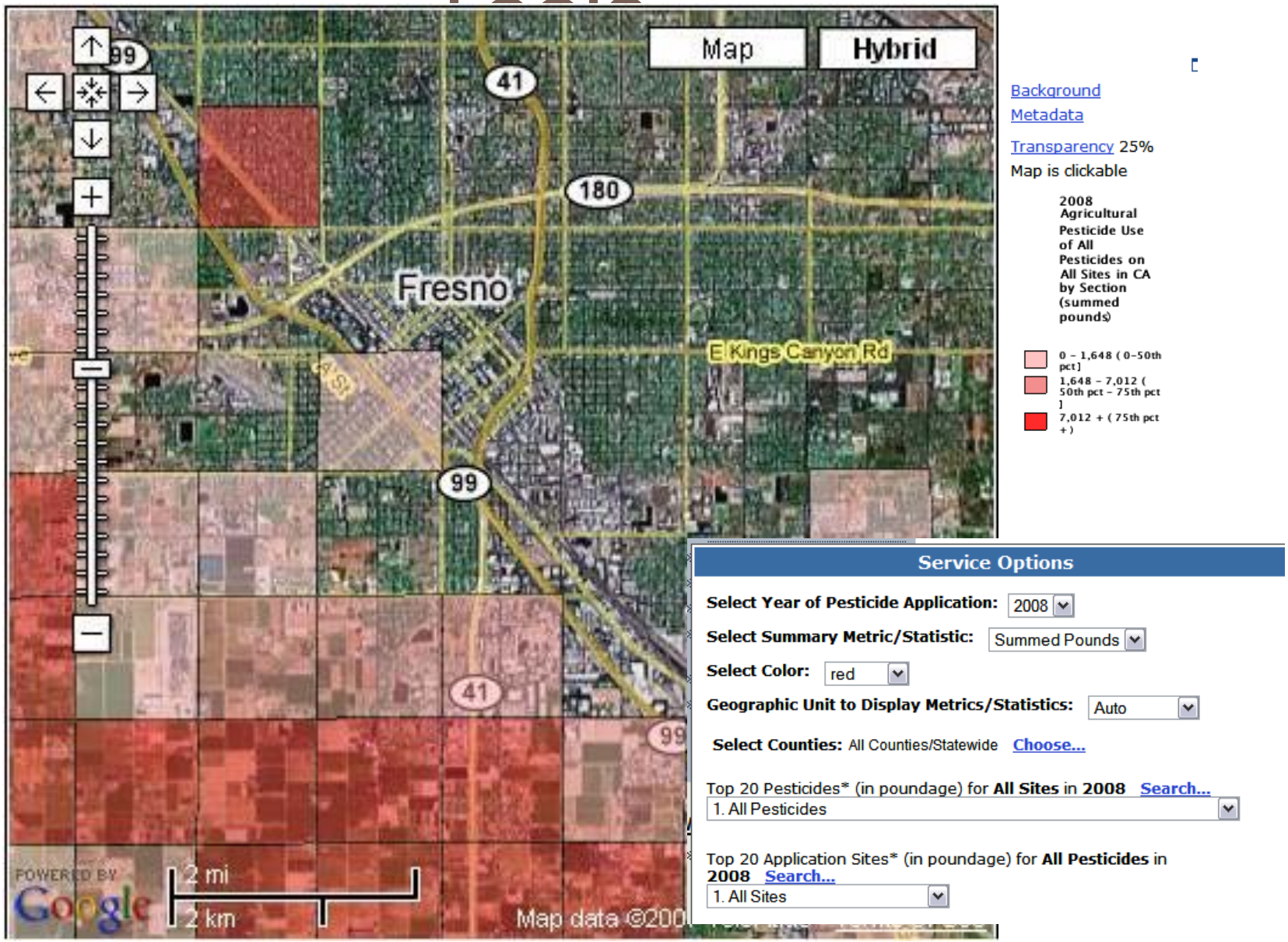
Problem

- Data for environmental hazards often not available in useful or accessible formats
- Pesticide use data in datasets containing millions of records
- Traffic data not easily accessed or interpreted for public health use

What We Did

- Developed mapping tools that enable users to visualize pesticide and traffic data for their community
- Developed linkage tools that enable users to link their data with pesticide or traffic data by geography and time

Pesticide Mapping and Linkage Tools



Traffic volume linkage tool

CEHTP Spatial Linkage Demonstration

Background | Enter Buffer Parameters | Spatial Linkage Results

Enter coordinates in Alameda County:

Longitude -122.2737 Latitude 37.8066

Coordinate system: NAD83 UTM Zone 10 NAD83 Decimal Degrees

Radius (in meters) 350

Submit Query

geocode an address

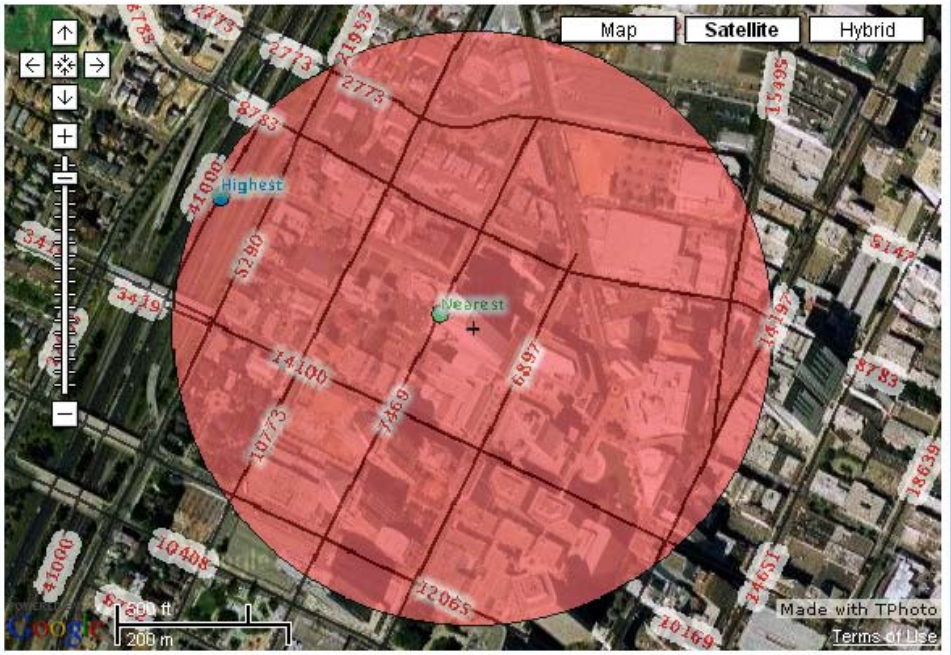
CEHTP Spatial Linkage Demonstration

Background | Enter Buffer Parameters | Spatial Linkage Results

Metric	Value
1. (hg) Highest Gauss-adjusted traffic volume segment within buffer (vehicles/day*)	5,833
2. (hu) Unadjusted traffic volume of highest segment within buffer (vehicles/day*)	41,000
3. (hdir) Direction to highest segment within buffer (degrees ccw** from east)	152
4. (hdist) Distance to highest segment within buffer (meters)	334
5. (ng) Gauss-adjusted traffic volume of nearest segment within buffer (vehicles/day*)	5,833
6. (nu) Unadjusted traffic volume of nearest segment within buffer (vehicles/day*)	7,469
7. (ndir) Direction to nearest segment within buffer (degrees ccw** from east)	155
8. (ndist) Distance to nearest segment within buffer (meters)	43
9. (sg) Sum of all Gauss-adjusted traffic volumes within buffer (vehicles/day*)	13,294
10. (su) Sum of all unadjusted traffic volumes within buffer (vehicles/day*)	184,336

*average annual daily traffic

**ccw=counter clockwise



Mapping and Linkage Tools: Successes

- Public data now more accessible to the public and more useful for public health purposes

- Uses of pesticide mapping and linkage tools
  - Identify site for pesticide biomonitoring project
  - Conduct studies on pesticides and autism; pesticides and birth defects

- Uses of traffic linkage tool
  - Screen proposed development projects for possible health impacts
  - Conduct study on traffic and asthma

Conducting Surveillance and Collecting Data

- Breast cancer mapping project
- Water system boundary tool

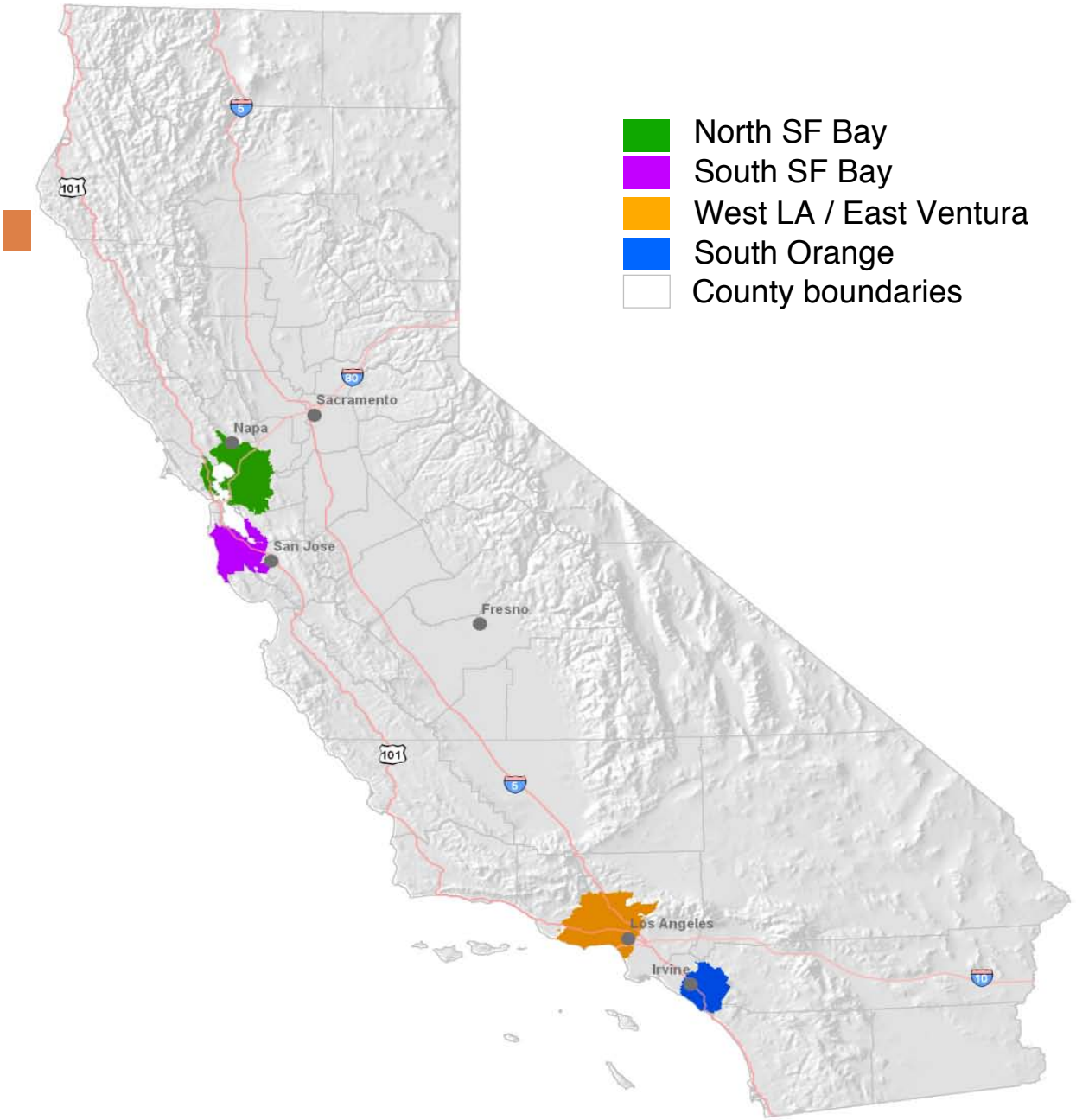
Breast Cancer Mapping Project

Problem

- No proactive breast cancer “cluster” detection
- Breast cancer information not provided at community level
- Scientific experts unsure about selecting a method for sub-county mapping
  - Concern about utility and

What We Did

- Convened advisory group of breast cancer advocates
  - Guided the development of breast cancer mapping protocol, results dissemination
- Created mapping protocol
  - Use Scan Statistic at census tract level
  - Exclude results arising from population shifts or temporary changes in detection rates

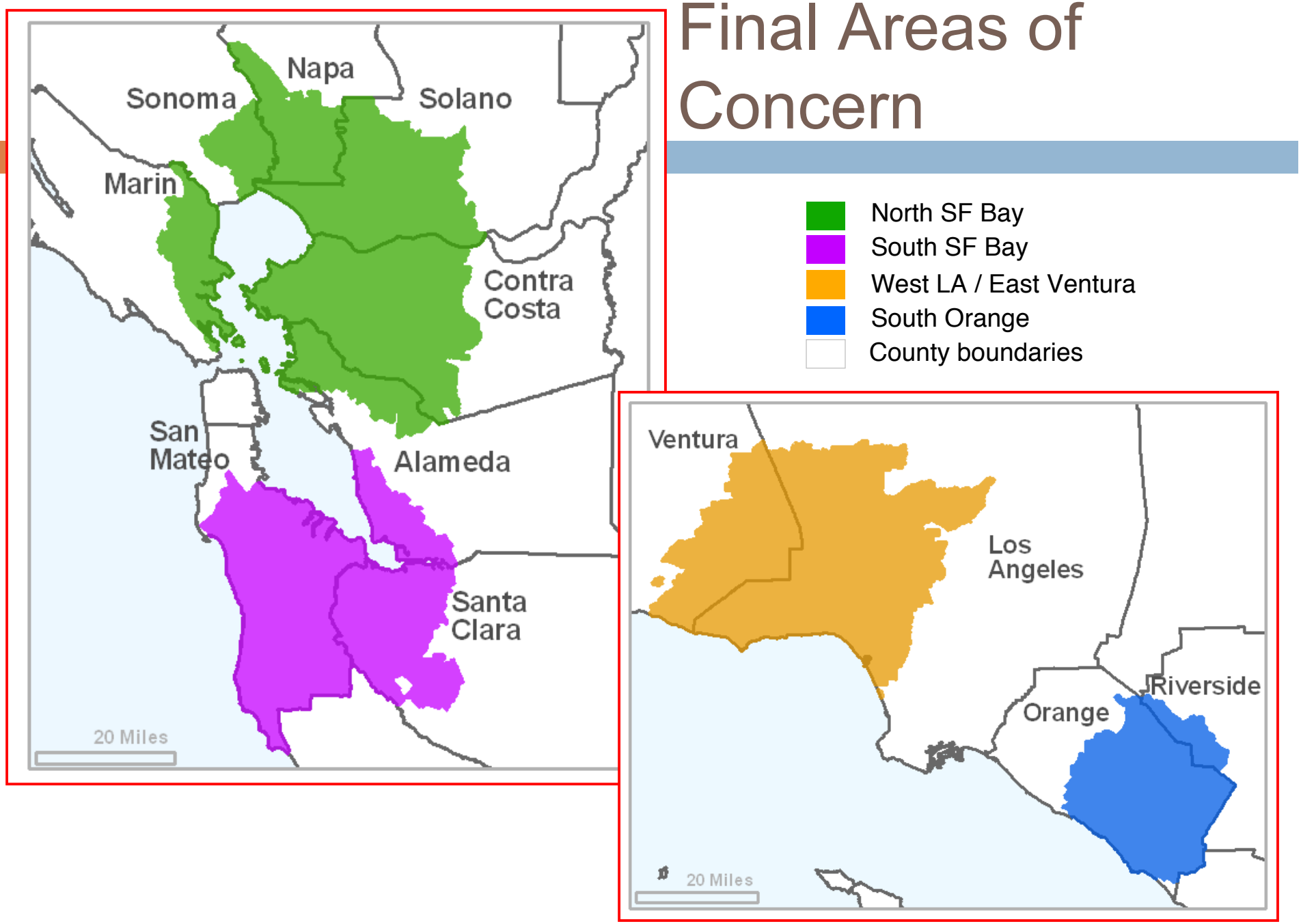


Final Areas of Concern

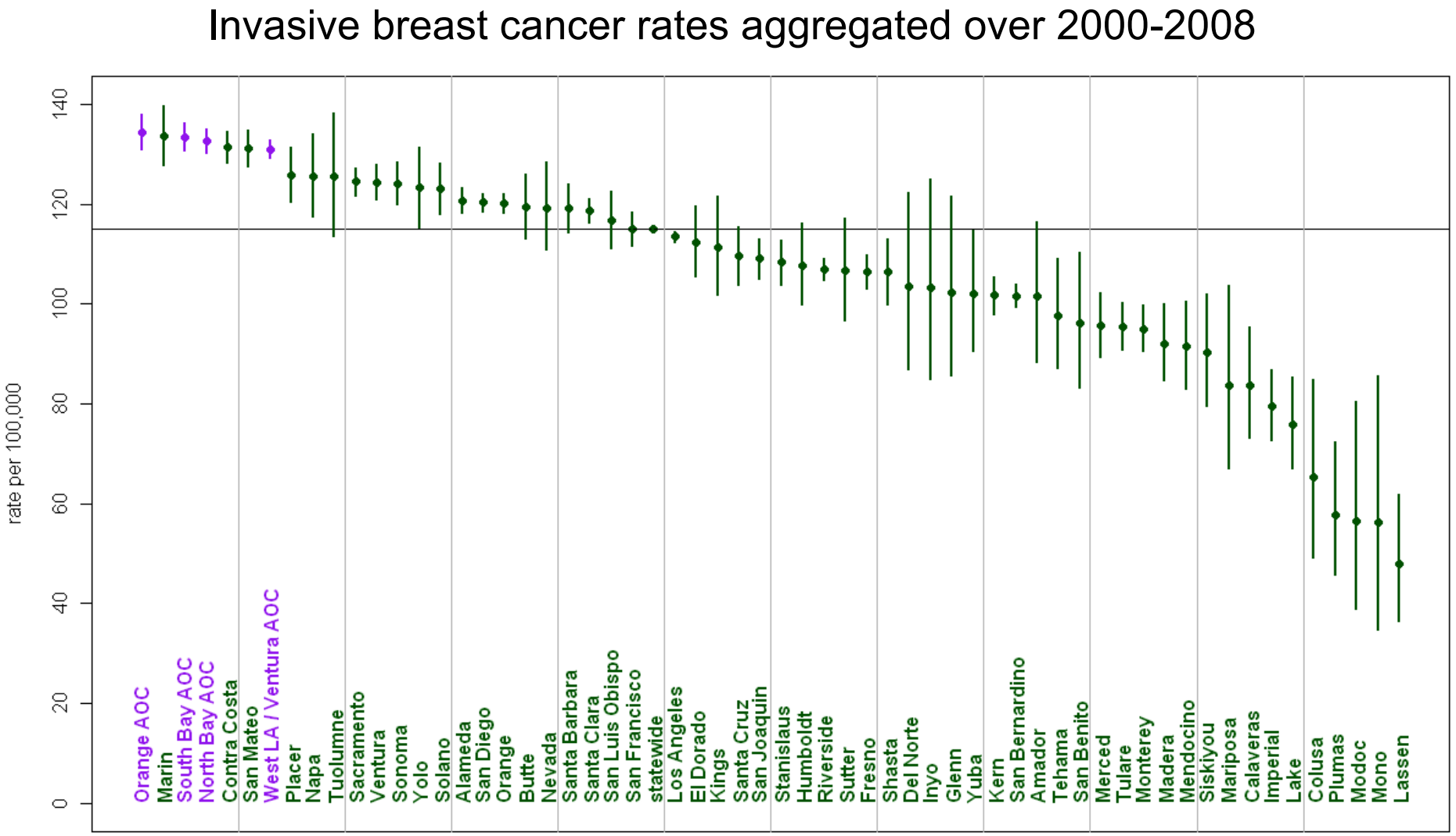
Many areas are located within counties that do not, as a whole, have rates much higher than the state rate

Data Source: California Cancer Registry, 2000-2008
Prepared by the California Breast Cancer Mapping Project

Final Areas of Concern



Comparing areas of concern with counties



Breast Cancer Mapping Project: Successes

- Established community-led proactive breast cancer mapping protocol using established statistical methods
- Identified areas of concern in counties previously unknown to have elevated rates
- Ventura County hospital used results to educate providers and target outreach activities to populations at risk as identified in report

Water System Boundary Tool

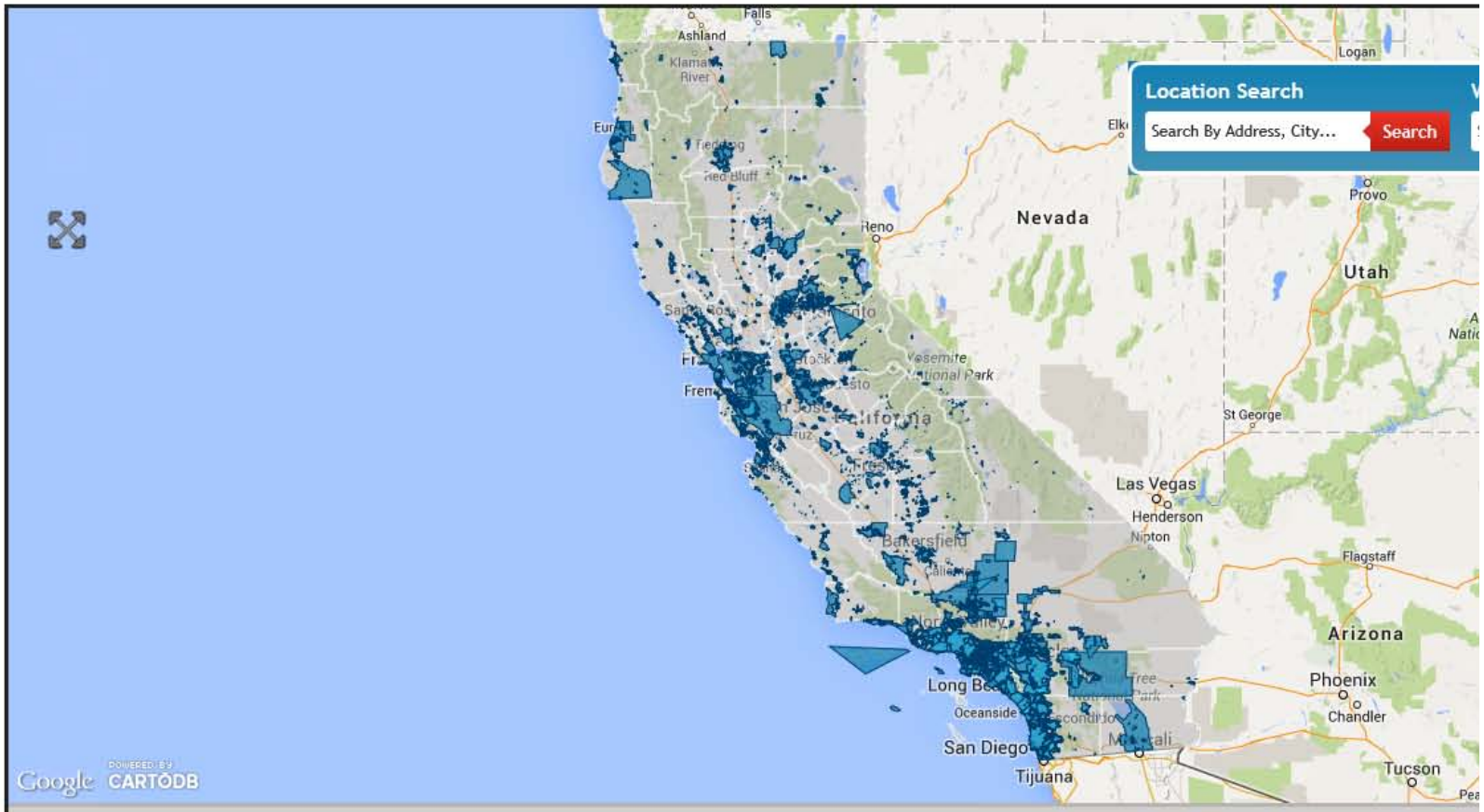
Problem

- 8000+ public water systems
  - No requirement for reporting of customer service areas
  - Many water systems lack the capacity to digitize their maps
- System boundary information needed
  - Emergency preparedness
  - Outbreak investigations
  - Epidemiology

What We Did

- Developed web-based tool to crowd-source boundary data collection
  - Secure access by public water system and state personnel
  - Can upload, draw, edit, and download boundaries
  - Can input multiple boundaries per system to track changes over time
  - Boundaries available to the public as a single statewide map as well as for individual systems

Explore your Water System



DRINKING WATER

- **Drinking Water Quality Data**
- What are Drinking Water Contaminants?
- Arsenic
- Disinfection Byproducts
- Nitrate
- Drinking Water Monitoring
- Measures & Limitations
- Where to Find Data
- Drinking Water Resources
- Metadata/Data FAQs

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CONTACT US

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(510) 620-3038
E-Mail Us

Current Map Settings

County:
All Counties

Water System Type:
All Types

Population Served:
All Populations

# of Connections:
All Connections

Filtering Options

Filter by County: All Counties

Filter by Type of Water System: All Types

Filter by Population: Min value: 0 to

Filter by Water System Connections: to

Water System Boundary Tool: Successes

- Collected data for water systems serving 90% of state population
- Enabled or enhanced research studies
  - Water costs; nitrate pollution in agricultural communities; cumulative impacts
- Support drinking water management activities
  - Water supply permits, sample siting plans, reporting requirements
  - Identify locations of private well users
  - Create plans to improve drinking water quality and waste water management

Conducting Research

- Pesticides use near schools
- Cost of environmental disease in children

Pesticides and Schools Study

Problem

- Agricultural pesticides widely used in CA
- Childhood exposure to pesticides raises special concerns, because children
- Proximity to fields increases probability of exposure

What We Did

- Assess amount and types of ag pesticides used near public schools
  - For top 15 ag counties
  - Public schools: 2,511
  - Students enrolled: 1,457,230
  - 2.3 million pesticide records
- Enhanced data
  - Digitized school boundaries
  - Linked pesticide use data, field location data, and

Pesticides and Schools Study

- Undergoing final approval
- Created list of “pesticides of public health concern”
- Improved geographic data on schools
- Identified pesticides with highest use near schools
- Identified counties/schools with highest pesticide use nearby
- Characterized populations attending schools near the most pesticide use

Cost of Environmental Disease in Children

Problem

- Growing concern about the environment and the relationship with health
- Costs drive many policy decisions
- Economic analysis useful for setting priorities, resource allocation, and considering pollution prevention

What We Did

- Currently conducting study
  1) Select significant childhood diseases known to be impacted by the environment
  2) Calculate the disease burden
  3) Determine the costs (direct, indirect, lost potential earnings, annual &/or lifetime)
  4) Estimate the environmental contribution to the

Informing Policy and Planning

- Validation of heat alerts
- Climate change vulnerability assessment

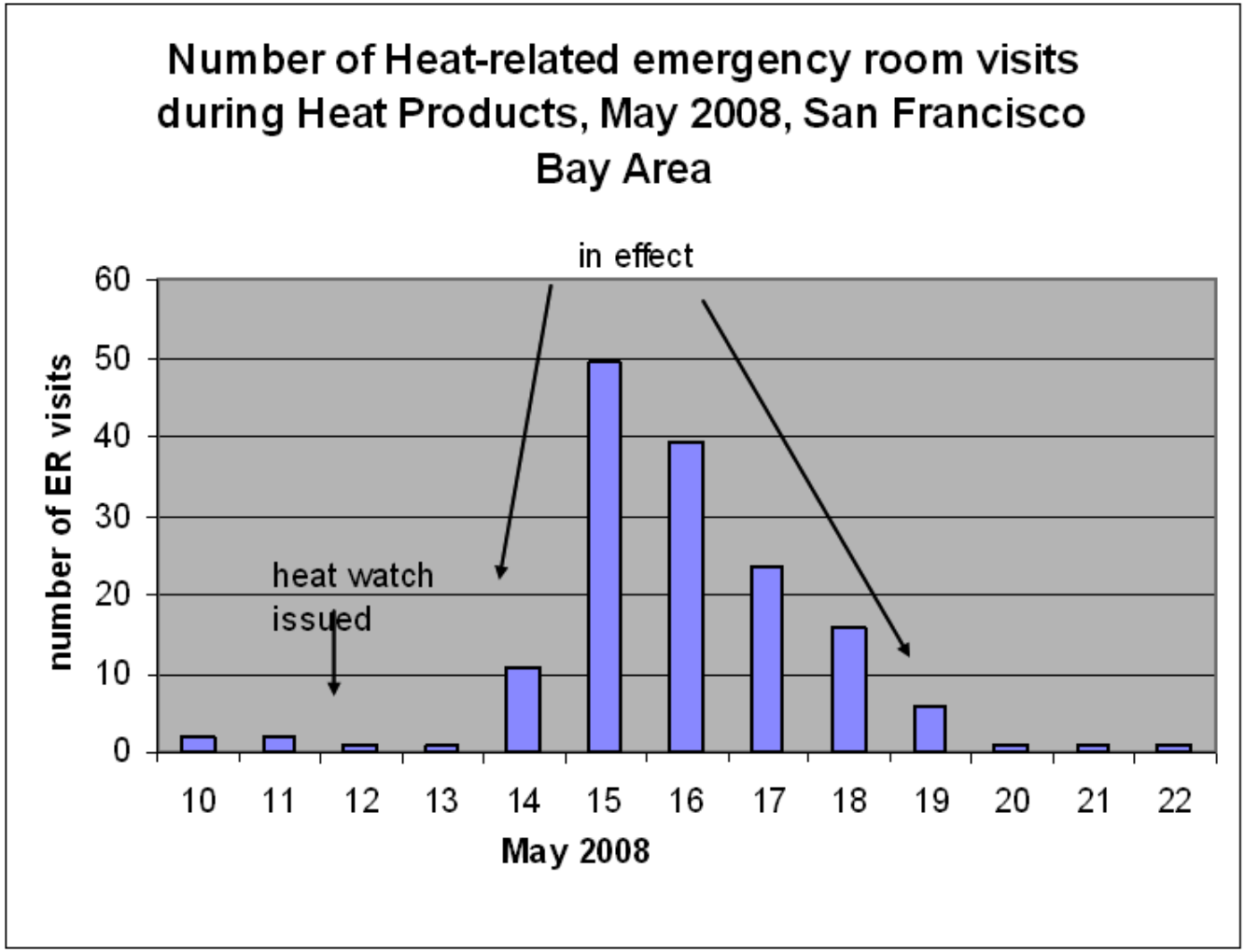
Heat Alert Sensitivity Study

Problem

- Due to budget cuts, the City of San Jose wanted evidence for maintaining for cooling centers
- Heat alert systems are a first line of defense, trigger preventative action
- No overall consistent criteria to define thresholds for heat alerts
- No systematic

What We Did

- Used CEHTP data to confirmed accuracy of heat alerts
  - Assessed if heat alerts predicted times when people suffered the most heat illness
  - In San Jose area, heat-related emergency room visits peaked following heat alerts
  - Visit subsided when the heat alerts stopped


Number of Heat-related emergency room visits during Heat Products, May 2008, San Francisco Bay Area
in effect
heat watch issued
number of ER visits
60
50
40
30
20
10
0
10
11
12
13
14
15
16
17
18
19
20
21
22
May 2008

Heat Alert Sensitivity Study: Successes

- Results informed budget, policy decisions
  - City of San Jose decided to allow cooling centers to open as part of the city's heat alert response
- Conducted similar analysis in Los Angeles

Climate Change Vulnerability Assessment

Problem

- Multiple factors affect a community's vulnerability to climate change
  - Risk of exposure to environmental impacts of climate change
  - Capacity to adapt to changing environment
  - Sensitivity to climate change events

What We Did

- Developed methodology to screen for areas of greatest concern
- Piloted in two counties: Fresno and Los Angeles

Climate Change Vulnerability Assessment*

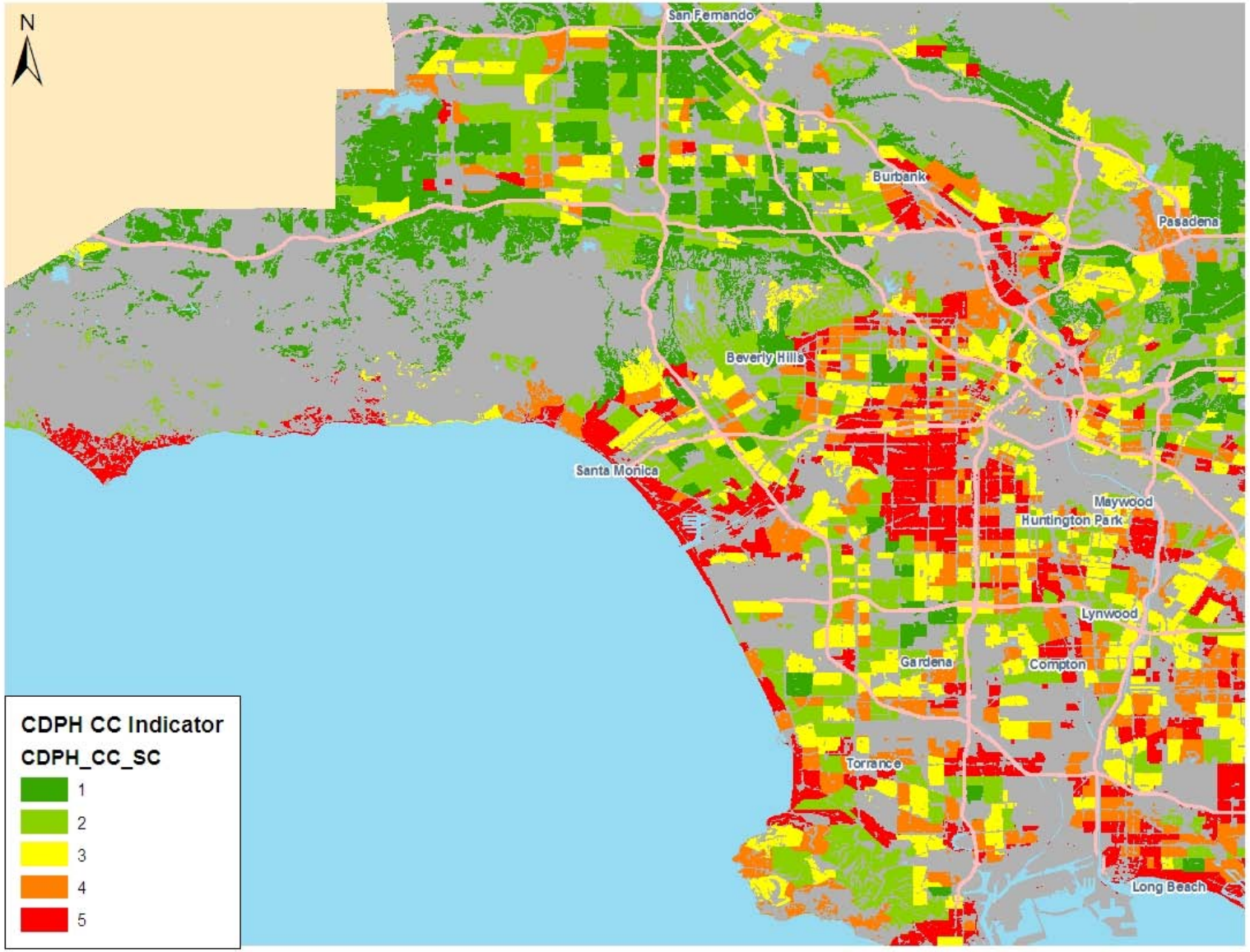
Metric	Source
Central air conditioning	CA Energy Commission (2009)
Tree canopy	National Land Cover Database (2001)
Impervious surface	National Land Cover Database (2001)
Public transit routes	SCAG 2011; Fresno COG 2011
Elderly living alone	Census 2000
Household car access	Census 2000
Wildfire risk	CAL FIRE 2003
Flood risk	FEMA (Fresno 2009; LA 2008)
Sea rise inundation	Pacific Institute 2009 (LA only)

- Data were ranked by quintiles and mapped for census tracts; Final vulnerability score a sum & re-ranking across all metric ranks

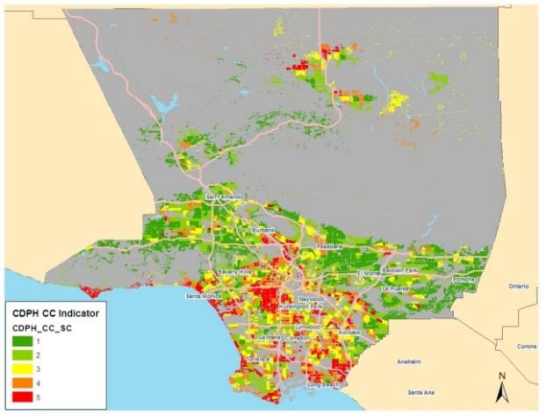
* English et al, Intl J Climate Change, 2013

Final CDPH Climate Scores

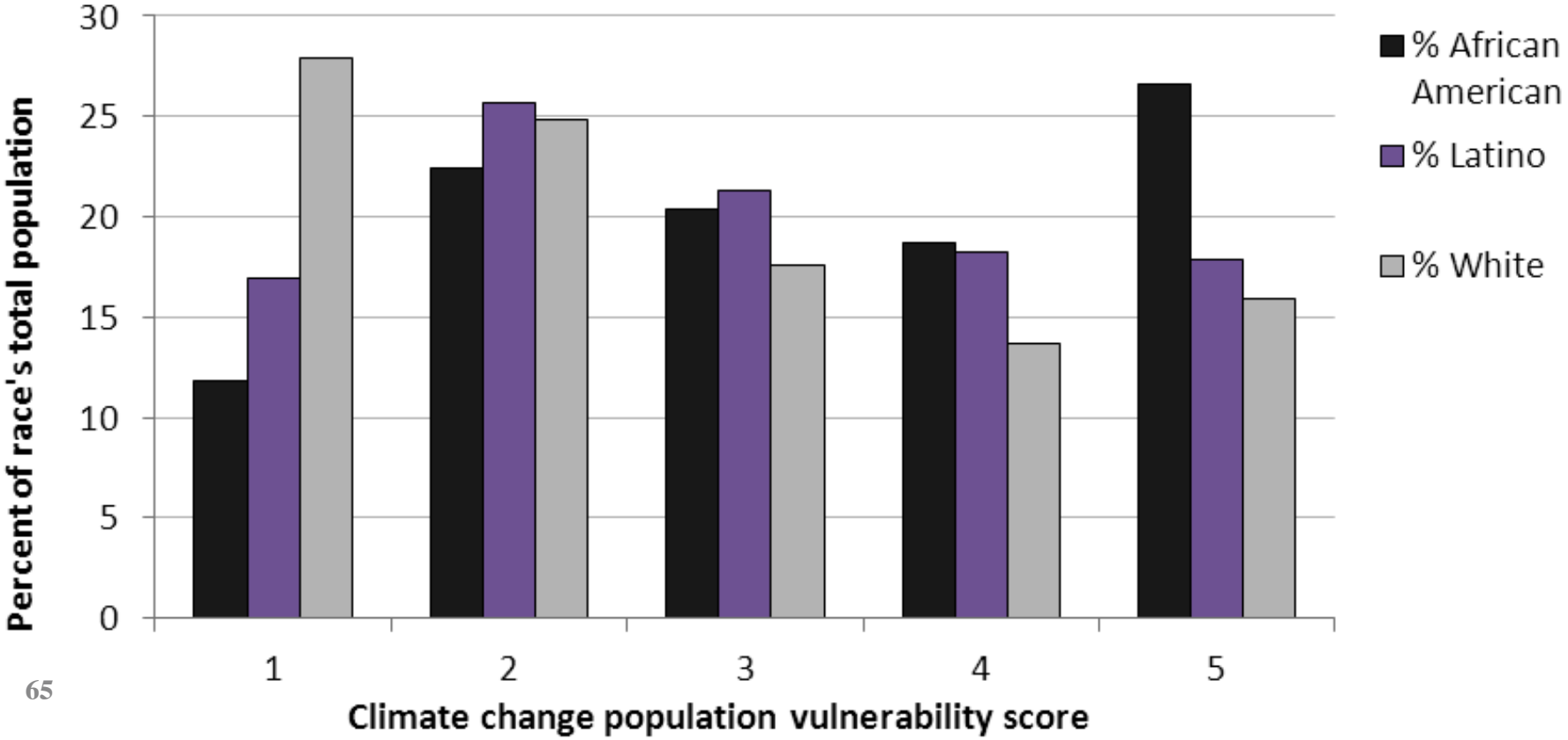
LA County (including residential & sensitive populations land use mask)



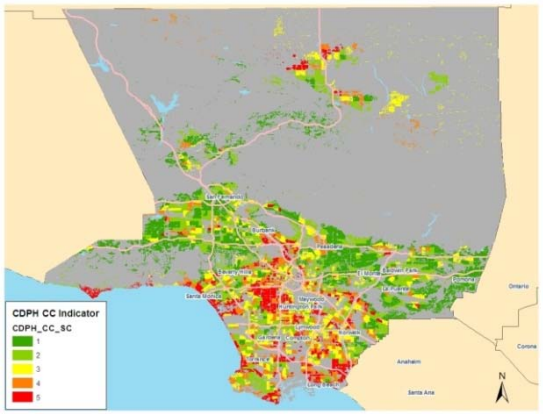
46% of African Americans and 36% of Latinos reside in the two highest risk categories compared to 30% of whites



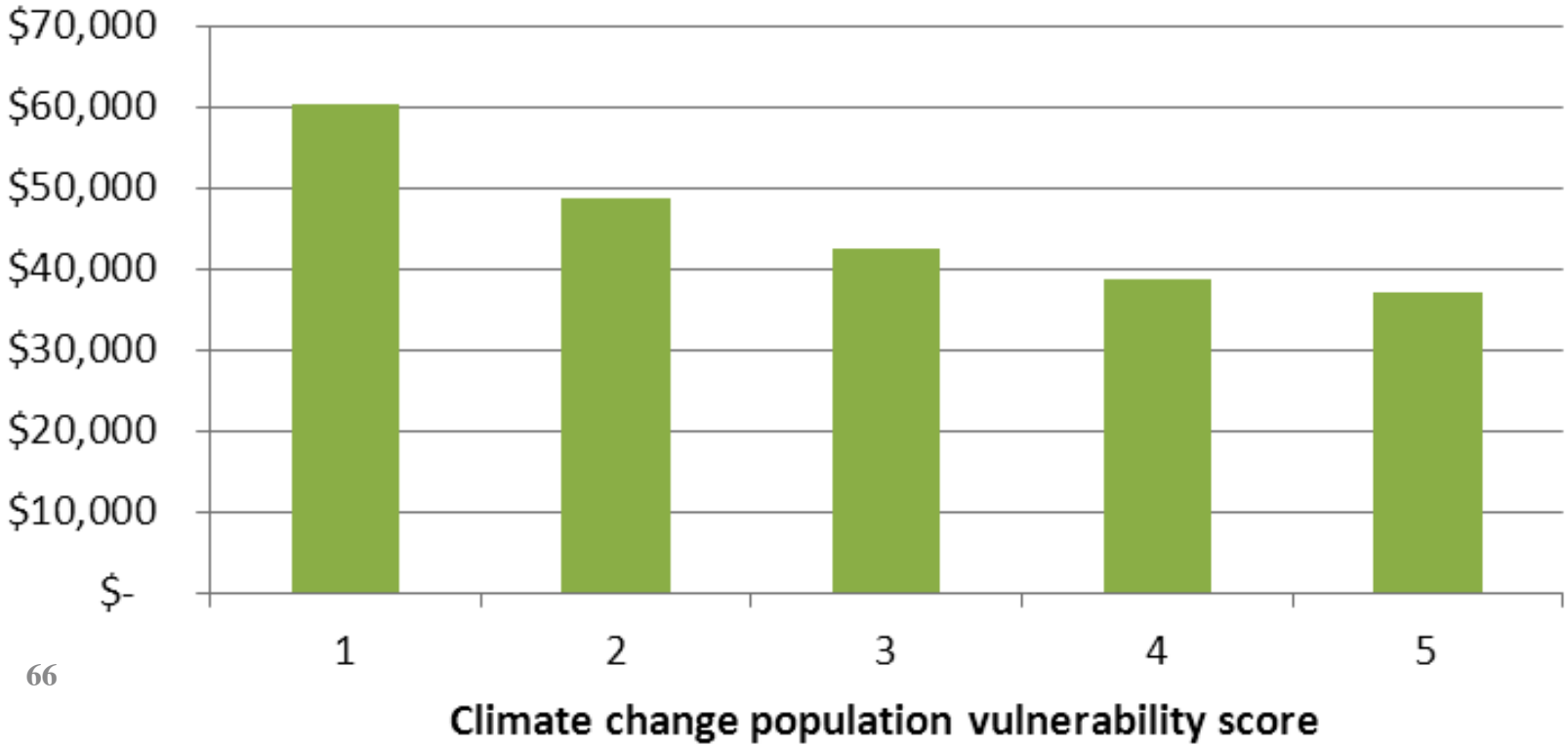
Los Angeles County



In LA County, median income in the highest risk area is 40% lower than the lowest risk area



LA County average median household income, 1999($), by climate change population vulnerability score



Climate Change Vulnerability Assessment: Successes

- Developed screening methodology that can be used and adapted locally

- Los Angeles Department of Public Health used results to:
  - Plan for service deliveries during climate related emergencies (such as extended heat events and power outages)
  - Coordinate with Community Emergency Response Teams to assist the vulnerable populations in their cities when impacted

Acknowledgements

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  - Alexa Wilkie
  - Michelle Wong
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- Environmental Health Investigations Branch, California Department of Public Health
- National Environmental Health Tracking Program, Centers for Disease Control and Prevention

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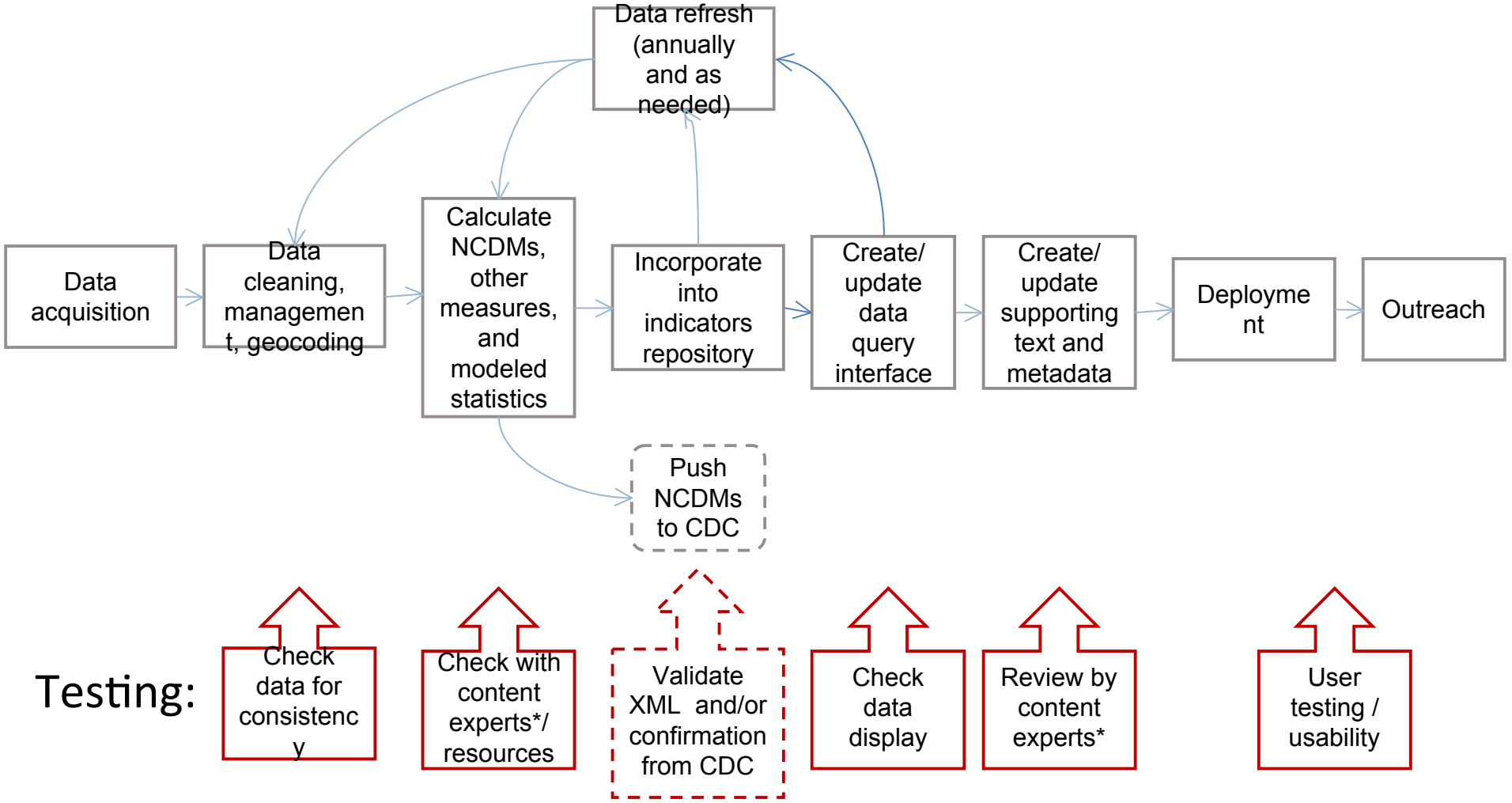
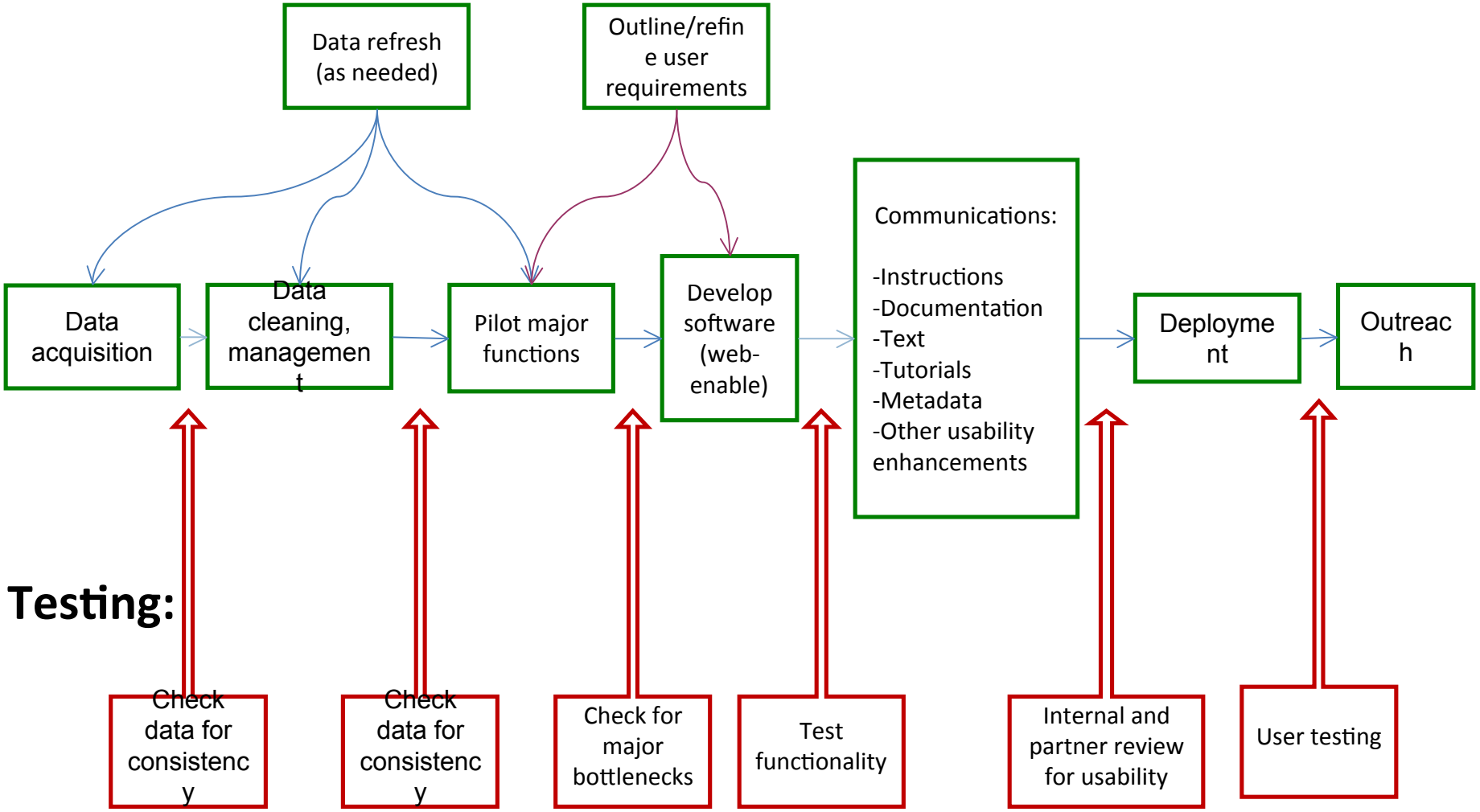
- Roberts E, English P, Wong M, Wolff C, Valdez S, Van den Eeden S, Ray G. 2006
- Progress in Pediatric Asthma Surveillance II: Geospatial Patterns of Asthma in Alameda County, California. *Prev Chronic Dis Jul. http: www.cdc.gov/pcd/issues/2006/jul/05_0186.htm*.

Flowchart for Content Areas:



*Content experts include data stewards and staff from content specific programs and organizations. Background text will be developed in a parallel process, and will also be reviewed by content experts when appropriate.

Flowchart for Tools:



What we track/data we use

- Health
- Environmental
- Demographic
- Geographic

Data collection and access

Hazards:

- Air quality
- Pesticides
- Drinking water quality
- Traffic

Exposures:

- Childhood lead poisoning
- Carbon Monoxide poisoning
- Biomonitoring

Health:

- Maternal and Infant Health
- Birth defects
- Heart Attacks
- Cancer
- Asthma

Differ by:

- ✓ Data steward
- ✓ Purpose for collection
- ✓ Data quality, format
- ✓ Data availability
- ✓ Funding