Draft
California Communities Environmental Health Screening Tool (CalEnviroScreen)

Proposed Method & Indicators

July 30, 2012

CIPA WORK GROUP &

PUBLIC REVIEW DRAFT

California Environmental Protection Agency

Office of Environmental Health Hazard Assessment

PREFACE

Recognizing that many Californians are burdened by multiple sources of pollution and that some people are more vulnerable to the effects of pollution than others, the California Environmental Protection Agency (Cal/EPA) has developed a method for evaluating the cumulative impacts of pollution on communities. This document is a working draft that describes the proposed California Communities Environmental Health Screening Tool (CalEnviroScreen). It builds upon a general methodology that was discussed in the 2010 document, *Cumulative Impacts: Building A Scientific Foundation*. This draft is the next step in the implementation of the Agency's 2004 Environmental Justice Action Plan and serves as a tool for the Agency to use in achieving its environmental justice goals. One of the plan's key conclusions is that development of guidance to analyze, prevent and reduce the cumulative impacts of multiple pollution sources in communities throughout California is necessary for the Agency to comply with statutory mandates to conduct its activities in a manner that ensures the fair treatment of all Californians, including minority and low-income populations.

The draft California Communities Environmental Health Screening Tool uses existing environmental, health and socioeconomic data to create a cumulative impacts score for communities across the state. The tool compares areas of the state against other areas, creating a relative ranking. An area with a high score would be expected to experience greater cumulative impacts, as compared to areas with low scores. This draft document serves as the basis for discussions of the proposed tool and its potential uses with the public and a wide range of stakeholder, community and government groups. Another objective of this draft is to encourage comparisons of the proposed tool with other related cumulative impacts methodologies that are under development.

The information from the tool will enable state and local decision makers to focus their time, resources and programs on those portions of the state that have higher vulnerabilities and burdens as compared to other areas, and therefore are most in need of assistance. In a time of limited resources, this tool will provide significant insight into how available resources can be prioritized to improve the environmental health of Californians. Potential uses of the proposed tool include administering environmental justice grants, prioritizing enforcement and site-cleanup activities, and identifying opportunities for sustainable economic development in heavily impacted neighborhoods. Other government entities and interested parties may identify other uses of this tool. In addition, the screening tool is not intended to create a legal obligation to conduct additional detailed cumulative analyses for the staff reports written for individual rulemaking.

DRAFT FOR PUBLIC REVIEW

The proposed tool is subject to change based on comments received on this draft. For this reason, the preliminary results of the various evaluations presented in this document are intended to enable readers to see the proposed tool in operation, provide informed feedback and suggest improvements. These preliminary results are not complete or final, and are subject to change as the proposed tool is refined and improved. No regulatory or policy decisions should be made based on the preliminary results in this document.

The proposed tool presents a broad picture of the burdens and vulnerabilities different areas face from environmental pollutants. It is not intended to be a substitute for a focused risk assessment for a given community or site, and it cannot precisely predict or quantify specific health risks or effects associated with cumulative exposures identified for a given community or individual. The tool also does not directly correlate the potential impacts of exposure from different types of pollutants, such as particulate exposures from vehicle emissions and exposures from pesticides or hazardous materials. Additionally, it should be noted that the statutory definition of "cumulative impacts" contained in the California Environmental Quality Act (CEQA), is substantially different than the definition of "cumulative impacts" adopted by Cal/EPA and used to guide the development of this tool. Therefore, the data and ranking generated by this tool cannot be used as a substitute for an analysis of the cumulative impact of any specific project for which an environmental review is required by CEQA .

Transparency and public input into government decision making and policy development are the cornerstones of environmental justice. In that spirit, the framework for the draft California Communities Environmental Health Screening Tool was developed with the assistance of the Cumulative Impacts and Precautionary Approaches (CIPA) Work Group, consisting of representatives of business and non-governmental organizations, academia and government. The CIPA Work Group will also review this report and provide critical feedback and input that will continue to guide the development of this tool. We appreciate the considerable time and effort that the Work Group has devoted to this project since 2008, and we look forward to a productive dialogue with the Work Group and all interested parties.

Cal/EPA also expects to receive input on this draft document at an upcoming series of regional public workshops. (Additional information on these workshops as well as the CIPA Work Group meetings and the development of the proposed tool are available at www.oehha.ca.gov/ej/index.html.) Input from California communities, businesses and other stakeholders are critical to the success of this project. Cal/EPA is committed to an open and public process for the development of the California Communities Environmental Health Screening Tool.

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Introduction

Different places in California are burdened by environmental problems and sources of pollution in ways that vary across the state. Some Californians are also more vulnerable to the effects of pollution than others. Cumulative impacts evaluations can be used to identify the places and people in the state that bear a higher cumulative burden of pollution and are most vulnerable to its effects.

This document describes a proposed method for evaluating the cumulative impacts of multiple pollution sources in a community, while accounting for a community's vulnerability to pollution's adverse effects. The method can be used to provide relative rankings of California communities based on cumulative impacts. This represents a follow-up to Cal/EPA and OEHHA's 2010 report, *Cumulative Impacts: Building A Scientific Foundation.* The relative rankings can help inform decisions at Cal/EPA's boards and departments by identifying the most significantly impacted places in California.

Purpose of the Statewide Evaluation

A preliminary statewide analysis is being conducted:

- To demonstrate the application of a practicable and scientifically justified methodology for evaluating cumulative impacts.
- To provide a baseline assessment and methodology which can be expanded upon and updated periodically as important additional information becomes available.
- To identify communities in California that are most burdened by pollution from multiple sources and are most vulnerable to its effects, taking into account their socioeconomic characteristics.
- To provide as final output a *relative*, rather than absolute, measure of cumulative impacts as reflected in the statewide ranking of communities.

Cumulative impact assessment is a complex problem that is difficult to approach with traditional risk assessment practices. Chemical-by-chemical, source-by-source, route-by-route risk assessment approaches are not best suited to the assessment of community-scale impacts, especially for identifying the most cumulatively impacted places across all of California. Also, while traditional risk assessment may account for the heightened sensitivities of some groups, such as children and the elderly, it has not considered other community characteristics that have been shown to affect vulnerability to pollution, such as socioeconomic factors.

Given the limits of traditional risk assessment, OEHHA developed a workable approach to conduct the statewide evaluation for cumulative impacts. The method emerges from basic risk assessment concepts and is sufficiently expansive to incorporate the multiple factors that reflect community impacts that have not been included in traditional risk assessments. The proposed tool presents a broad picture of the burdens and vulnerabilities different areas face from environmental pollutants. It is not intended to be a substitute for a focused risk assessment for a given community or site, and it cannot precisely predict or quantify specific health risks or effects associated with cumulative

exposures identified for a given community or individual. The tool also does not directly correlate the potential impacts of exposure from different types of pollutants, such as particulate exposures from vehicle emissions and exposures from pesticides or hazardous materials. Additionally, it should be noted that the statutory definition of "cumulative impacts" contained in the California Environmental Quality Act (CEQA), is substantially different than the definition of "cumulative impacts" adopted by Cal/EPA and used to guide the development of this tool. Therefore, the data and ranking generated by this tool cannot be used as a substitute for an analysis of the cumulative impact of any specific project for which an environmental review is required by CEQA.

This report provides an overall description of the methodological approach originally outlined in OEHHA's 2010 report. It also describes the criteria for the selections of scale of analysis and the selection of indicators. Specific indicators are described briefly and preliminary analytical results are presented as maps.

Method

Definition of Cumulative Impacts

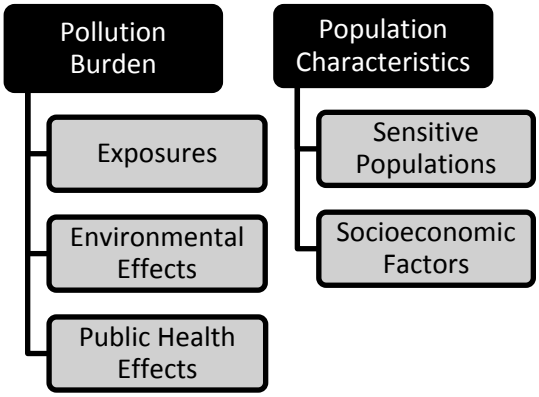
Cal/EPA has a working definition of cumulative impacts as follows:

> *"Cumulative impacts means exposures, public health or environmental effects from the combined emissions and discharges, in a geographic area, including environmental pollution from all sources, whether single or multi-media, routinely, accidentally, or otherwise released. Impacts will take into account sensitive populations and socioeconomic factors, where applicable and to the extent data are available."*[1]

Cumulative Impact Model

The model for cumulative impacts analysis is based on the cumulative impacts definition:

- The model is place-based and provides cumulative impact information on a geographic basis. The geographic scale selected is intended to be useful for a wide range of decisions.
- The model is made up of five components identified from the definition, which are recognized as contributors to impact. The model includes three components representing pollution burden – exposures, public health effects, and environmental effects – and two components representing population characteristics – sensitive populations and socioeconomic factors.



[1] This definition differs from the statutory definition of "cumulative impacts" contained in the California Environmental Quality Act (CEQA). Accordingly, although the term is the same, they cannot be used interchangeably. For example, the data and ranking generated by this tool cannot be used as a substitute for a cumulative impacts analysis in a CEQA document.

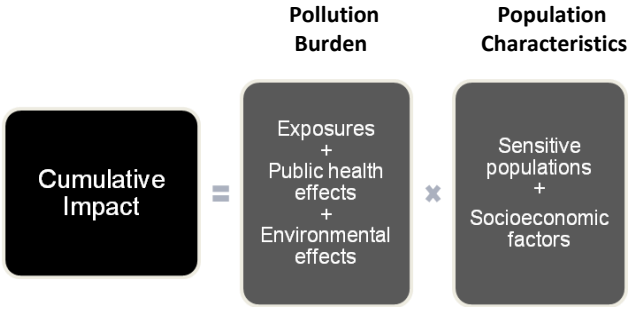
Model Characteristics

The model:

- Combines information on each of the five components in a given geographic area.
- Uses a scoring system to weight each component and derive cumulative impact scores in a given place relative to other places in the state.
- Uses a suite of indicators to characterize each component.
- Uses a limited set of indicators in order to keep the model simple.

Formula for Calculating Cumulative Impact

After the five components are scored, the scores are combined as follows to calculate overall cumulative impact:



Range of Scores for Each Component

Component	Range of Possible Scores
Pollution Burden	
Exposures	1-10
Environmental effects	1-5
Public health effects	1-5
Population Characteristics	
Sensitive populations	1-3
Socioeconomic factors	1-3
Cumulative impact	**6-120**

Criteria for Geographic Scale

Conducting a place-based analysis of impacts requires selecting an appropriate geographic scale for analysis, such as ZIP code, census tract, or county. With respect to criteria considered, the geographic unit should be:

- A useful scale for a wide range of decisions.
- Encompass all the people and places of relevance to possible decisions.
- As small as possible, but not so small that it suggests a level of knowledge of local impact greater than can be determined from current statewide data.
- Not so large that the analysis loses power to discern differences due to averaging across the area.
- Publicly established. (Using an existing geographic unit is much easier than creating a new one for the purpose of the project.)
- Familiar scale to the general public.

Indicator Selection and Scoring

The selection of specific indicators to characterize components of cumulative impact requires a consideration of several factors. These include both the type of information that will best represent the three pollution burden components and two population characteristics components, and the availability and quality of such information. Further, since the goal is to characterize the geographical community for relative ranking, it is not necessary to include all available data, but to focus on the data that are most important and meaningful.

Overview of the Process

1. Identify potential indicators for each component.
2. Find sources of data to support indicator development (see Criteria below).
3. Select and develop indicators.
4. Assign a percentile for each indicator for each geographic unit.
5. Generate maps to visualize data.
6. Derive component scores by calculating the average percentile (see below).
7. Derive the overall cumulative impact score by combining the five component scores.
8. Generate maps to visualize overall results.

Criteria for Indicator Selection

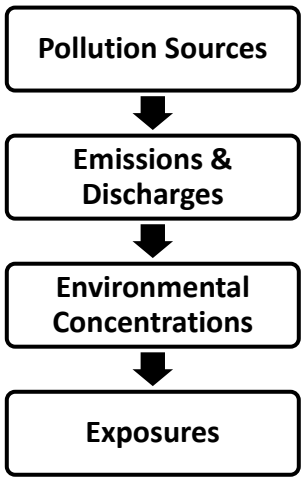
- Indicators should provide a measure that is relevant to the component it represents, in the context of the cumulative impacts definition.
- Indicators should represent widespread concerns related to pollution in California.
- The indicators taken together should provide a good representation of the component.
- Pollution burden indicators should relate to issues that may be potentially actionable by Cal/EPA boards and departments.
- Population characteristics indicators should represent demographic factors known to influence vulnerability to disease.
- Data for the indicator should be available for the entire state and should have location-based information.
- Data should be of sufficient quality, and be:
    - Complete
    - Accurate
    - Current

Exposure Indicators

People are exposed to a pollutant when they come in contact with it, by drinking contaminated water, for example.

Few data are available statewide that provide direct information on exposures. Exposures generally involve transport of chemicals from a source through the environment to an individual or population. Here, data relating to pollution sources, releases, and environmental concentrations were identified and found consistent with criteria for exposure indicator development. They are:

- Ozone & PM2.5 concentrations in ambient air
- Traffic density
- Toxic releases from facilities
- Pesticide use
- *Drinking water quality (under development)*



Public Health Indicators

Public health effects are disease and other health conditions influenced by exposure to pollutants.

With few exceptions, adverse health effects are difficult to attribute solely to exposure to pollutants. However, pollutant exposure is a likely contributor to many observed adverse outcomes at the population level, and has been demonstrated for some outcomes such as asthma and heart disease. Some of these effects increase susceptibility to other health effects of pollution. High quality statewide data related to these and other health outcomes that can be influenced by toxic chemical exposures were identified and found consistent with criteria for development of public health indicators.

- Low birth-weight infants
- Asthma
- Cancer
- Heart disease

Environmental Effect Indicators

Environmental effects are adverse environmental conditions caused by pollutants.

Environmental effects include various aspects of environmental degradation, ecological effects and threats to the environment and communities. The introduction of physical, biological and chemical pollutants into the environment can have harmful effects on different components of the ecosystem. Effects can be immediate or delayed. In addition to direct effects on ecosystem health, the environmental effects of pollution can also affect people by compromising the ability of communities to make use of ecosystem resources. Also, living in an environmentally degraded community

can lead to stress, which may affect human health.

Statewide data on the following topics were identified and found consistent with criteria for indicator development:

- Cleanup sites
- Impaired water bodies
- Leaking underground storage sites and cleanups
- Solid waste sites and facilities, and hazardous waste facilities

Sensitive Population Indicators

Sensitive populations are populations with biological traits that may magnify the effects of pollutant exposures.

Sensitive individuals may include those undergoing rapid rates of physiological change, such as children, pregnant women and their fetuses, and individuals with impaired physiological conditions, such as elderly persons or persons with existing diseases such as heart disease or asthma. Other sensitive individuals include those with lower levels of protective biological mechanisms due to genetic factors.

It is well recognized that children and the elderly are more sensitive to certain pollutants than the general population. Statewide data on the prevalence of children age five or less and elderly age 65 or greater were available and found consistent with criteria for indicator development:

- Prevalence of children
- Prevalence of elderly

Socioeconomic Factor Indicators

Socioeconomic factors are community characteristics that result in increased vulnerability to pollutants.

A growing body of literature provides evidence of the heightened vulnerability of people of color and lower socioeconomic status to environmental pollutants. For example, maternal exposure to particulate pollution is associated with reduced birth weight; this effect is greater among African-American mothers compared to white mothers. Here, socioeconomic factors that have been associated with increased population vulnerability were selected.

Data on the following socioeconomic factors were identified and found consistent with criteria for indicator development:

- Educational attainment
- Income
- Poverty
- Race & ethnicity

Indicator and Component Scoring

- Each indicator has a value for each geographical area. These values for every geographical area are ordered from highest to lowest. A percentile is then calculated from the distribution of indicator values for all areas that have a value. Thus each indicator's percentile in a specific place is relative to the scores for the indicators in the rest of the places in the state. *
- Component scores are calculated as follows:
  - First, the percentiles for all the indicators in a given component are averaged. For example, the percentiles for ozone, PM2.5, pesticide use, toxic releases, and traffic density are averaged for the exposure component.
  - Second, components are assigned scores from their defined ranges (1 to 10, 1 to 5, etc.) based on these averages. For example, if the average of the percentiles for the exposure indicators for an area is 63, the component score is 7, since the score for the exposure component ranges from 1 to 10.

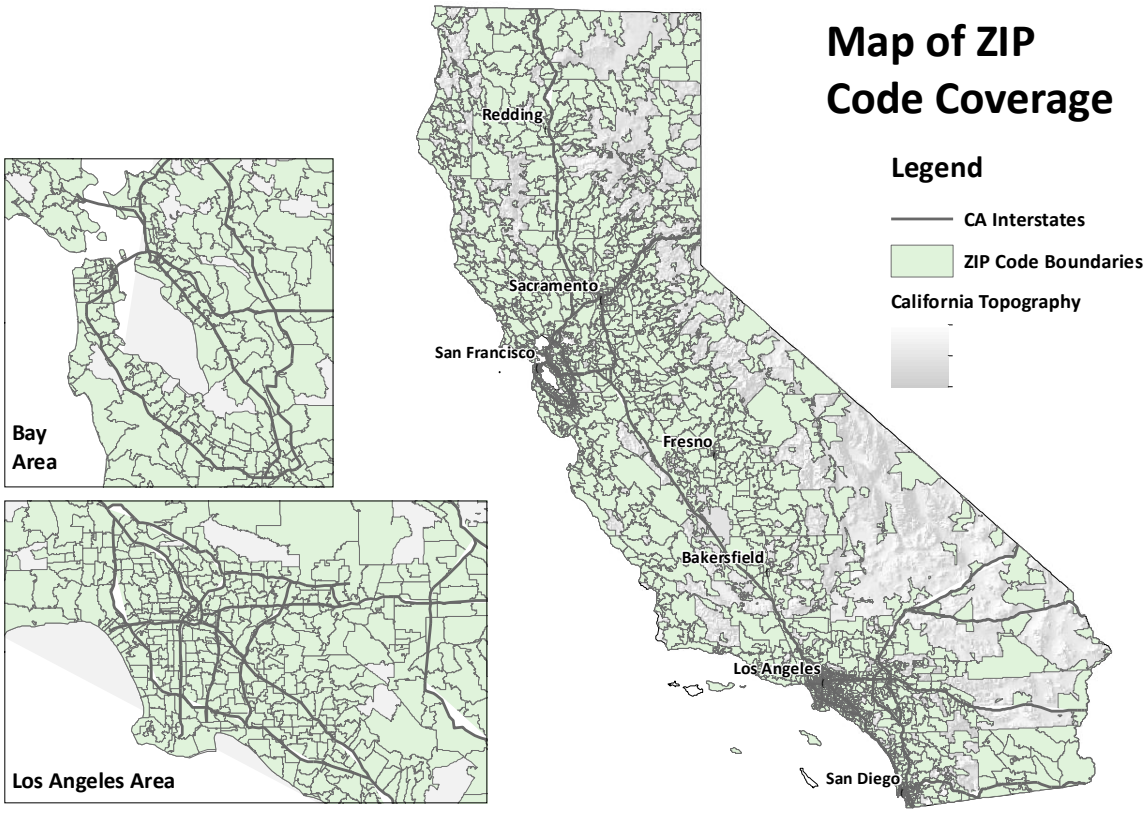
* When a geographic area has no non-zero indicator value (for example, no facilities with toxic releases are present), it is excluded from the percentile calculation and assigned a value of zero. Thus the percentile score can be thought of as a relative ranking of a geographic area relative to the other localities in the state where the hazard effect or population characteristic is present.

Selection of Geographic Scale

For this statewide evaluation, the ZIP code scale is proposed as the unit of analysis:

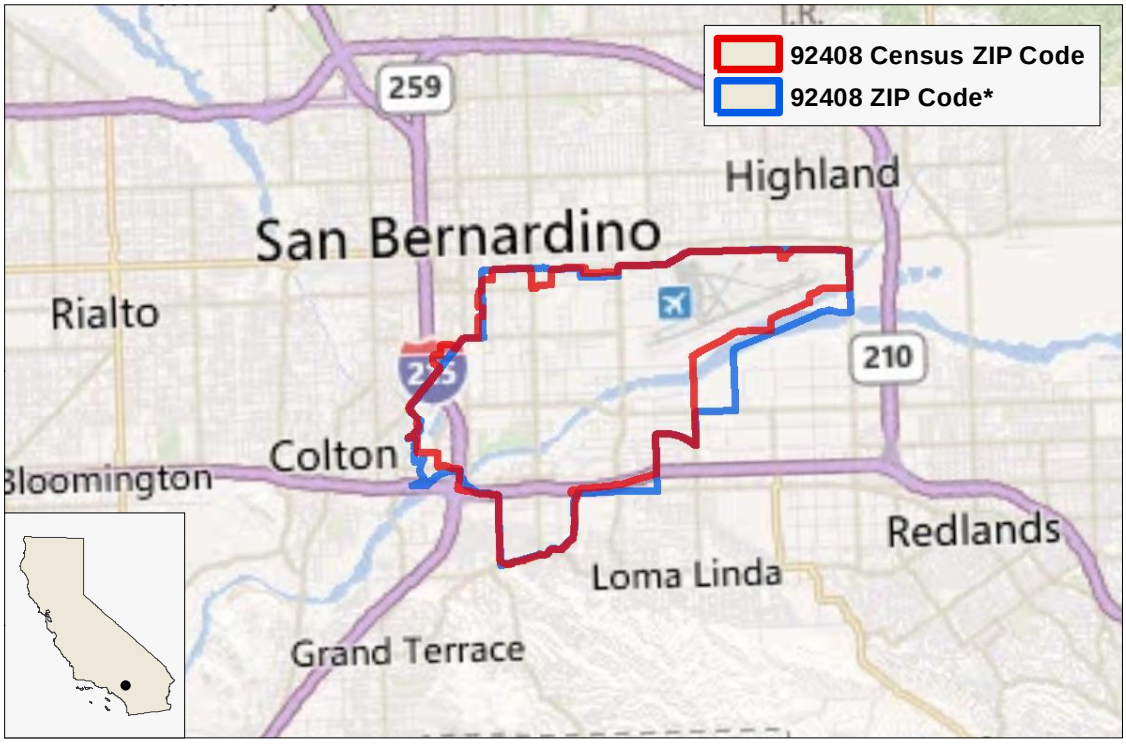
- The ZIP code is a familiar geographic unit.
- Many types of data are available at this scale, such as emissions data, certain health outcome data, and demographic data.
- A representation of ZIP codes, called ZCTAs (ZIP Code Tabulation Areas), is available from the Census Bureau. These were updated in 2010.[2] For simplicity, these areas are referred to as ZIP codes throughout this report.
- The census ZIP codes cover areas that people live, but do not include many sparsely populated places, like national parks.
- There are approximately 1800 census ZIP codes in California, representing a relatively fine scale of analysis

Coverage of California by 2010 Census ZIP Code Boundaries



[2] Additional information on the U.S. Census Bureau's ZIP Code Tabulation Areas may be found on their website: http://www.census.gov/geo/ZCTA/zcta.html.

The following map shows the relationship between census-derived ZIP codes (ZCTAs) and approximate postal service ZIP codes. For many ZIP codes they are similar.



* Postal service ZIP code approximations were obtained from ESRI, Inc.

Individual Indicators:

Description and Preliminary Analysis

Air Quality: Ozone

Exposures

Ozone pollution has been shown to cause numerous adverse health effects, including respiratory irritation and lung disease. The health impacts of ozone and other criteria air pollutants (particulate matter (PM), nitrogen oxides, carbon monoxide, sulfur oxides, and lead) have been considered in the development of health-based standards. Of the six criteria air pollutants, ozone and particle pollution pose the most widespread health threats. The California Air Resources Board (CARB) maintains a wide network of air monitoring stations that provides information that may be used to better understand exposures to ozone and other pollutants across the state.

Data Source

Air Monitoring Network,
Air Resources Board (CARB)

Background

The CARB, local air pollution control districts, tribes and federal land managers maintain a wide network of air monitoring stations in California. These stations record a variety of different measurements including concentrations of the six criteria air pollutants (particulate matter, ozone, lead, sulfur dioxide, nitrogen dioxide and carbon monoxide) and meteorological data. In certain parts of the state, the density of the stations can provide high-resolution data for the city or localized areas around the monitors. However, not all cities have stations.

The information gathered from each air monitoring station audited by the CARB includes maps, geographic coordinates, photos, pollutant concentrations, and surveys.

Ground-level ozone is formed primarily from the reaction of oxygenic compounds and other air pollutants in the presence of sunlight. For this reason, ozone is a bigger problem in the summer and summer-only concentrations were considered.

More Information

http://www.arb.ca.gov/aqmis2/aqmis2.php

Proposed Indicator

Daily maximum 8-hour ozone concentrations, summer season (May-October), averaged over three years (2007-2009).

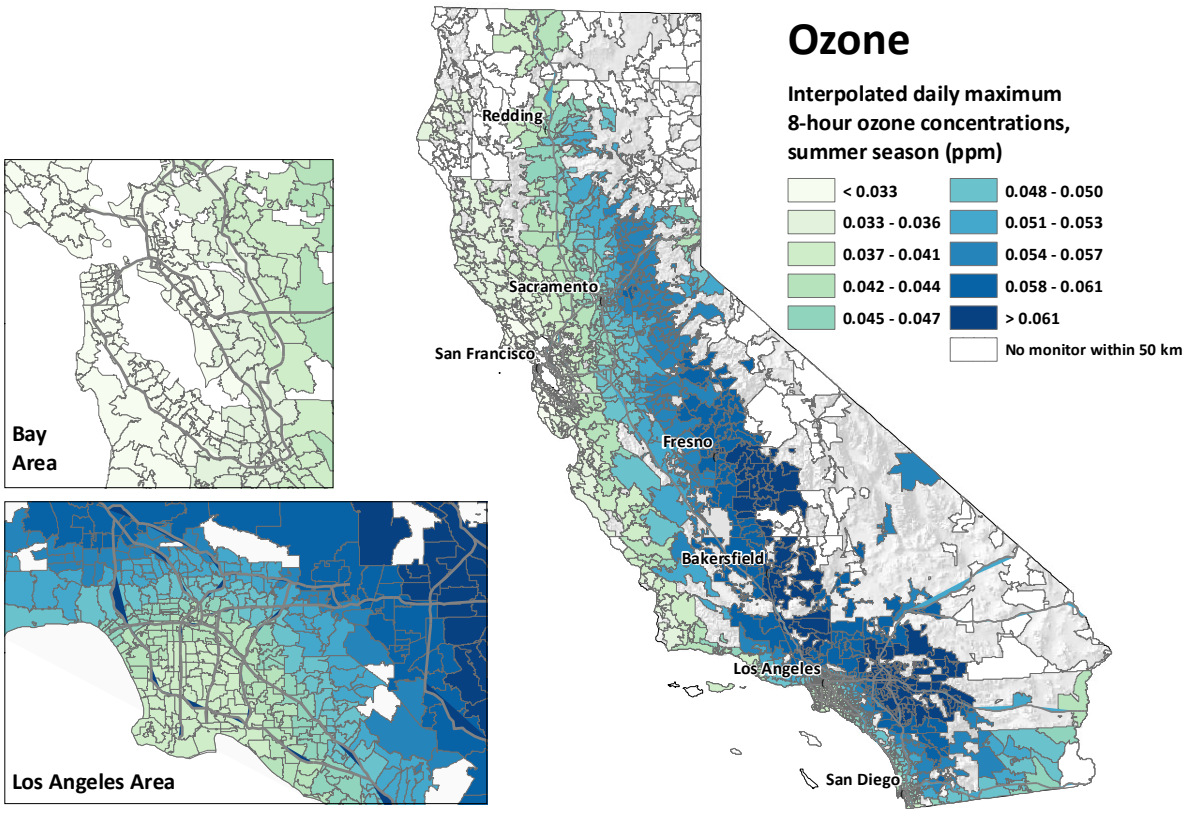
Method

- Daily maximum 8-hour average concentrations for all monitoring sites in California were extracted from CARB's air monitoring network database for the years 2007-2009.
- Monitors which reported fewer than 75% of the expected number of observations, based on scheduled sampling frequency, were dropped from the analysis.
- For each day in the May to October time period, the 8-hour ozone concentrations were estimated at the geographic center of the ZIP code using a geostatistical method (ordinary kriging).

- The estimated daily maxima were then averaged to obtain a single value for each ZIP code.
- ZIP codes were ordered by the ozone concentration values and assigned a percentile based on the statewide distribution of values.

Preliminary Indicator Map

Note: Values at ZIP codes with centers more than 50km from the nearest monitor were not estimated (signified by cross-hatching in the map below).



Air Quality: PM2.5

Exposures

Particulate matter pollution, and small particle (PM2.5) pollution in particular, has been shown to cause numerous adverse health effects, including heart and lung disease. PM2.5 contributes to substantial mortality across California. The health impacts of PM2.5 and other criteria air pollutants (ozone, nitrogen oxides, carbon monoxide, sulfur oxides, and lead) have been considered in the development of health-based standards. Of the six criteria air pollutants, particle pollution and ozone pose the most widespread health threats. The California Air Resources Board (CARB) maintains a wide network of air monitoring stations that provides information that may be used to better understand exposures to PM2.5 and other pollutants across the state.

Data Source

Air Monitoring Network,
Air Resources Board (CARB)

Background

The CARB, local air pollution control districts, tribes and federal land managers maintain a wide network of air monitoring stations in California. These stations record a variety of different measurements including concentrations of the six criteria air pollutants (particulate matter, ozone, lead, sulfur dioxide, nitrogen dioxide and carbon monoxide) and meteorological data. The density of the stations is such that specific city or localized areas around monitors may have high resolution. However, not all cities have stations.

The site information gathered from each air monitoring station audited by CARB includes maps, locations coordinates, photos, pollutant concentrations, and surveys.

More Information

http://www.arb.ca.gov/aqmis2/aqmis2.php

Proposed Indicator

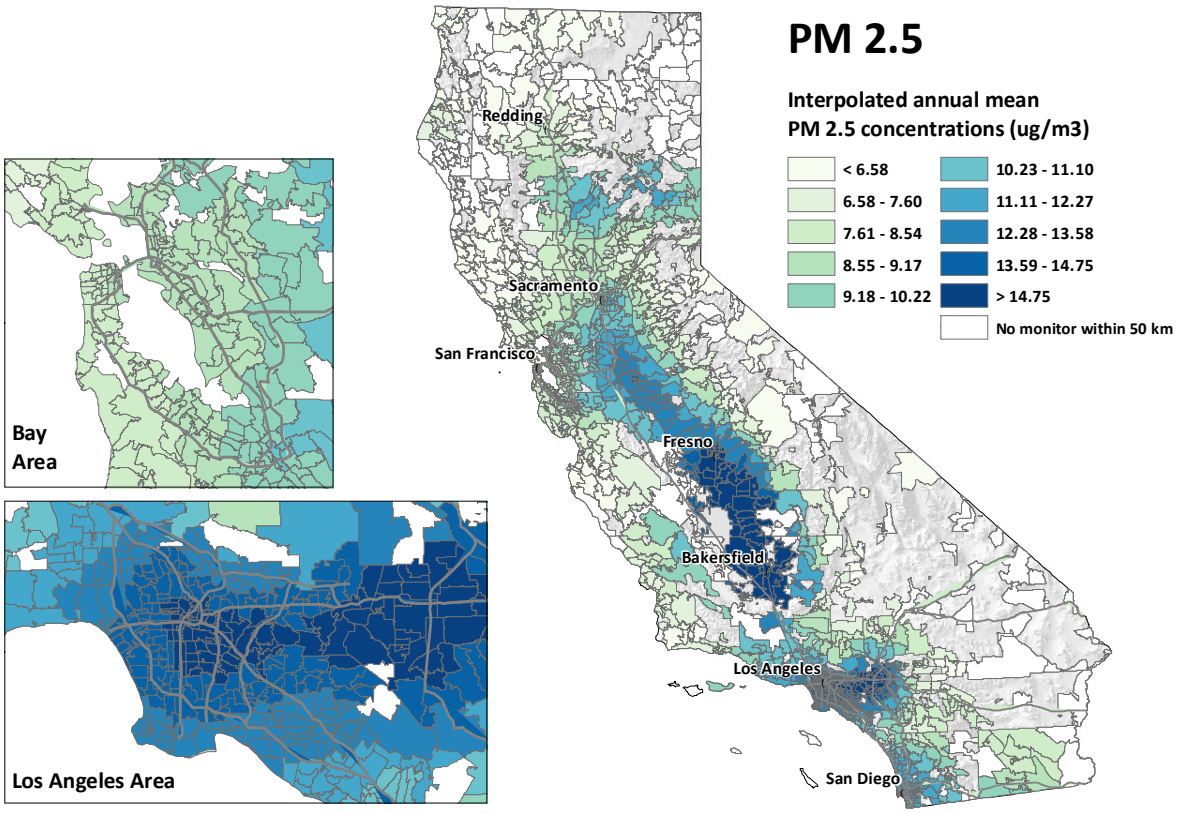
Annual mean concentration of PM 2.5 (average of quarterly means), over three years (2007-2009).

Method

- Monitoring data for the years 2007-2009 was obtained from air monitoring network recordings across the state.
- Monitors which reported fewer than 75% of the expected number of observations, based on scheduled sampling frequency, were dropped from the analysis
- For all measurements in the time period, the quarterly mean concentrations were estimated at the geographic center of the ZIP code using a geostatistical method (ordinary kriging).
- Annual means were then computed for each year by averaging the quarterly estimates and then averaging over the three year period.
- ZIP codes were ordered by the PM 2.5 concentration values and assigned a percentile based on the statewide distribution of values.

Preliminary Indicator Map

Note: Values at ZIP codes with centers more than 50km from the nearest monitor were not estimated (signified by cross-hatching in the map below).



Pesticide Use

Exposures

Pesticide exposure can occur by many different pathways, including drift incidents, worker exposures in the course of application, and consumption of pesticide residues in treated commodities. Complete statewide data on actual pesticide exposures do not exist. The most robust pesticide information available statewide are data maintained by the California Department of Pesticide Regulation showing where and when pesticides are used across the state. While not a true measure of exposure, pesticide use can serve as an indicator of potential burden, as pesticide use represents an environmental release that can potentially result in human exposures. Similarly, unintended environmental effects from the use of pesticides may increase in areas with greater use.

Data Source	California Pesticide Use Reporting (PUR), California Department of Pesticide Regulation (DPR)
Background	In California, all agricultural pesticide use must be reported monthly to county agricultural commissioners, who report the data to DPR. California has a broad legal definition of agricultural use, so in addition to production crop applications, the reporting requirements include pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and along roadside and railroad rights-of-way. In addition, all postharvest pesticide treatments of agricultural commodities must be reported along with all pesticide treatments in poultry and fish production as well as some livestock applications. Production agricultural pesticide use is publicly available for each Meridian-Township-Range-Section (MTRS) in California. Data are available statewide except for some areas that are exempt from reporting, such as some military and tribal lands. Non-production agricultural and non-agricultural pesticide use data is only available at the county scale. Non-agricultural pest control includes home, industrial, institutional, structural, vector control, and veterinary uses. Data are collected annually. The validation and accuracy checking process takes some time, so results are not immediately available. The final version of the annual PUR is usually available in December of the following year.
More Information	http://www.cdpr.ca.gov/docs/pur/purmain.htm
Proposed Indicator	*Total pounds of selected active pesticide ingredient use per square mile, including both agricultural and non-agricultural uses.*

Method

Specific pesticides included in the measure of pesticide use were narrowed from the list of all registered pesticides in use in California with a filter that considered both hazard and the likelihood of exposures (See Appendix A1).

Agricultural production use of pesticides:

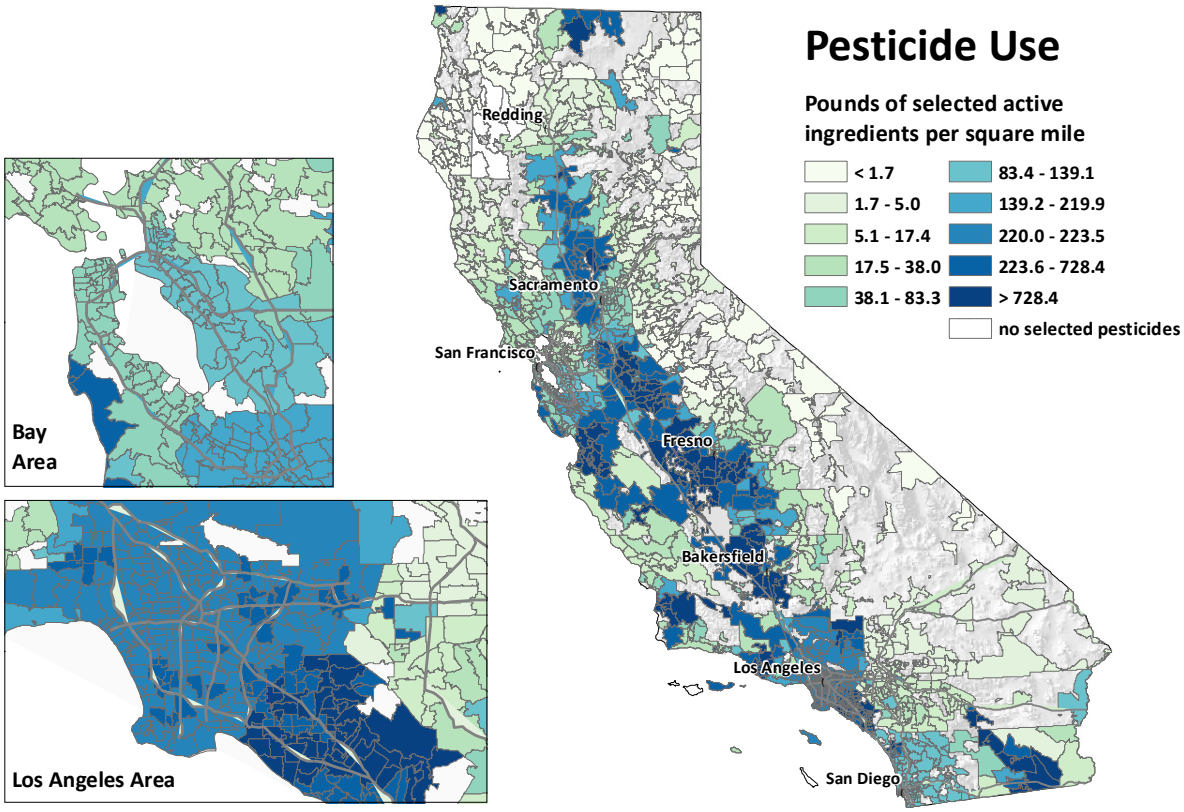
- Production pesticide use records by county were obtained for the entire state for the years 2009 and 2010.
- Production pesticide use (total pounds of selected active ingredient) for MTRS records were matched to ZIP Codes using a match file created in the GIS software ArcMap.
- Production pesticide use for each ZIP code was divided by each ZIP code's area.

Non-agricultural production use of pesticides:

- County non-production pesticide use was obtained for all counties.
- County non-production pesticide use (total pounds of selected active ingredient) was divided by the county's area (square miles).
- Each ZIP code was assigned the county's level of non-production use.

Pesticide use for each ZIP code is the sum of production and non-production pesticide use.

Preliminary Indicator Map



Toxic Releases from Facilities

Exposures

There is widespread concern regarding exposures to chemicals that are released from industrial facilities. Statewide information directly measuring *exposures* has not been identified. However, some data on the *release* of pollutants into the environment is available and may provide some relevant evidence for potential subsequent exposures. The U.S. Environmental Protection Agency (USEPA) maintains a toxic substance inventory of on-site releases to air, water, and land and underground injection of any classified chemical, as well as quantities transferred off-site. The data are reported by each facility.

Data Source

Toxic Release Inventory (TRI) and
Risk Screening Environmental Indicators (RSEI),
U.S. Environmental Protection Agency (USEPA)

Background

TRI is a database of self-reported disposal or other releases and waste management activities for certain listed toxic chemicals. It is updated annually.

The TRI program was created by the Emergency Planning and Community Right-to-Know Act (EPCRA) and Pollution Prevention Act (PPA).

The chemicals included in the database are those on EPCRA:

- Chemicals identified in EPCRA Section 313 (593 individually listed chemicals and 30 chemical categories including 3 delimited categories containing 62 chemicals); and
- Persistent, Bioaccumulative and Toxic (PBT) Chemicals (16 specific chemicals and 4 chemical classes).

Facilities are required to report if they have 10 or more full-time employees, operate within a set of industrial sectors outlined by TRI, and manufacture more than 25,000 pounds or otherwise use more than 10,000 pounds of any listed chemical during the calendar year. Lower reporting thresholds apply for PBT chemicals (10 or 100 pounds) and dioxin-like chemicals (0.1 gram).

RSEI is a computer-based chronic health screening tool developed by USEPA. It applies chemical-specific toxicity weights to TRI emissions data to produce a hazard-weighted result. These weights are drawn from various programs with USEPA, Cal/EPA, and the Agency for Toxic Substances and Disease Registry. Using this metric helps to incorporate toxicity considerations into the emissions data.

More Information

http://www.epa.gov/tri/index.htm
http://www.epa.gov/oppt/rsei/

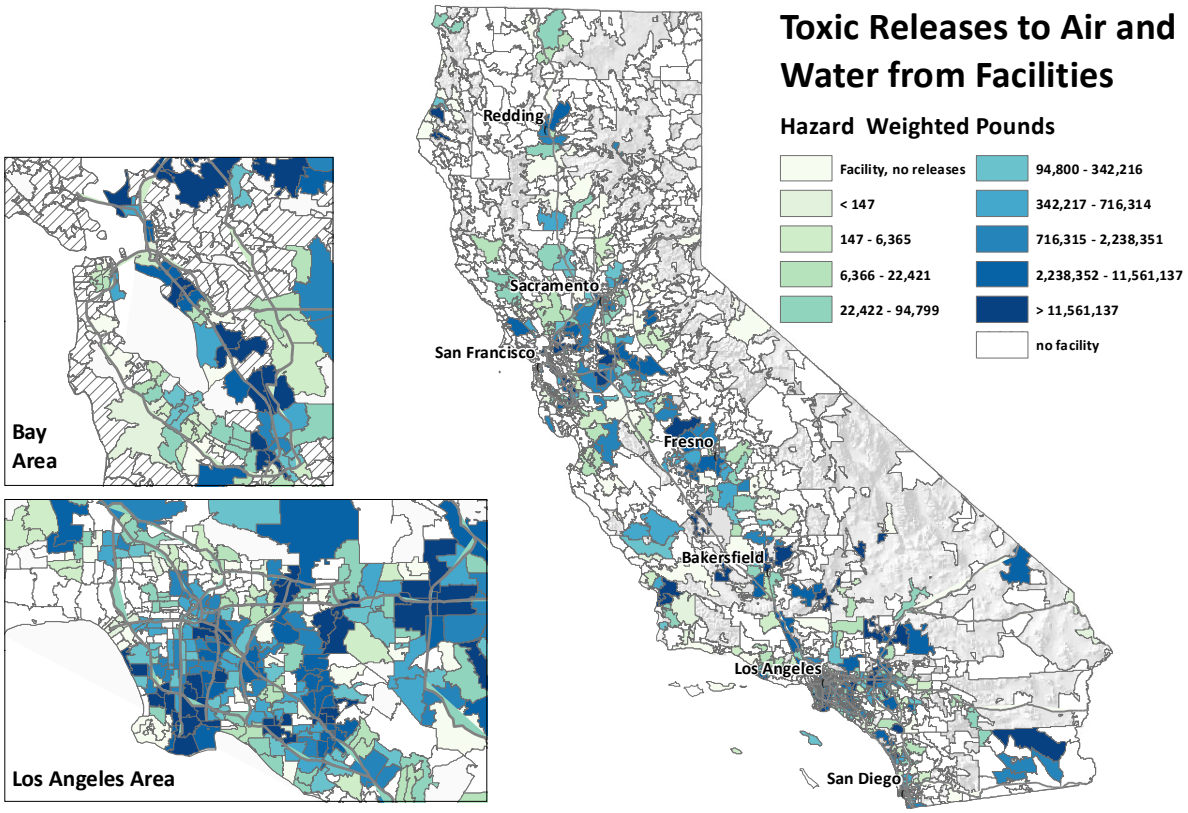
Proposed Indicator

Total hazard-weighted pounds of chemicals released on-site to air or water from all facilities within the ZIP code, or within one kilometer of the ZIP code.

Method

- Data on location and hazard-weighted emissions data for facilities in California, or within one kilometer of California, were downloaded from TRI/RSEI (TRI.NET).
- Facility locations were mapped or geocoded (ArcMap).
- Each ZIP code was scored by adding the hazard-weighted pounds of emissions for all facilities within the ZIP code or within one kilometer of the ZIP code.
- A 3-year average of the hazard-weighted emissions for each ZIP code was calculated for the years 2008-2010.
- Scoring:
  - ZIP codes without a TRI facility were assigned a percentile of zero.
  - All other ZIP codes were assigned a percentile based on their location in the distribution of the remaining ZIP codes.

Preliminary Indicator Map



Traffic Density

Exposures

Exhaust from vehicles contains a large number of toxic chemicals, including nitrogen oxides, carbon monoxide, benzene, and particulate matter. Traffic exhaust also has a role in the formation of photochemical smog. Health effects of concern from these pollutants include heart and lung disease, cancer, and increased mortality. While measurements of exposures to vehicle exhaust are not available statewide, data on the amount of traffic traveling on major roadways statewide are available. Traffic density is used to represent the number of sources releasing exhaust, resulting in human exposures to chemicals in air.

Data Source

Traffic Volume Linkage Tool,
California Environmental Health Tracking Program
Environmental Health Investigations Branch,
California Department of Public Health

Background

Traffic data are compiled under the California Department of Transportation's (CalTrans) Highway Performance Monitoring System. The data consist of traffic volumes along various pre-defined segments of roadways across the state. Locally maintained roads are not included in the data.

Data on traffic counts within specific geographic boundaries across the state (such as traffic within ZIP code boundaries) are not currently readily obtained. However, traffic counts within a defined circular buffer of a point can be calculated using a Traffic Volume Linkage Tool developed under the California Environmental Health Tracking Program. Here, the population-weighted geographic centers of the ZIP codes were used with a buffer of 2.5 kilometers for the calculations of the traffic counts for each ZIP code.

The most recent year for which data are available using this tool is 2004.

More Information

http://www.ehib.org/page.jsp?page_key=136

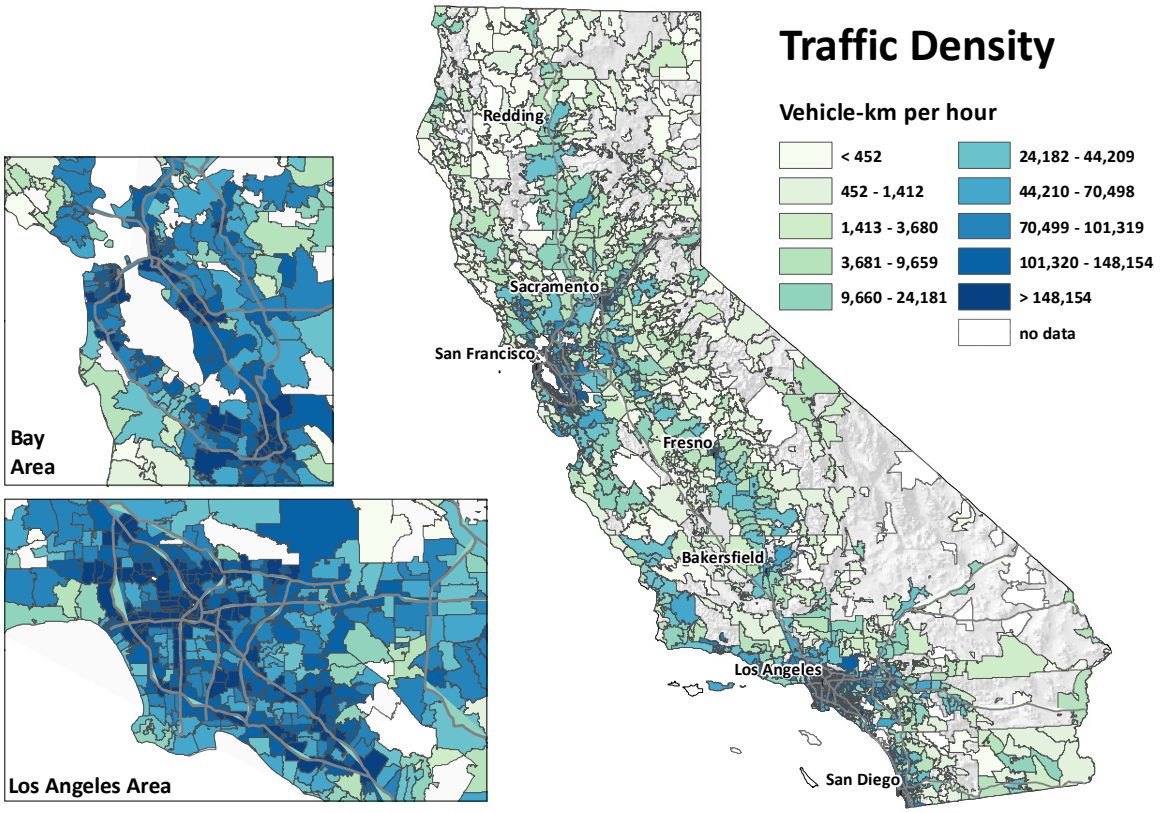
Proposed Indicator

Traffic density within a 2.5 kilometer buffer of the population-weighted centroid of the ZIP code.

Method

- A list of population weighted centroids for each ZIP code in California was inputted into the Traffic Volume Linkage Tool.
- Traffic density estimates (vehicle counts per roadway length) within a 2500-meter buffer around each centroid were obtained.
- ZIP codes were sorted by traffic density and assigned percentiles based on the distribution.

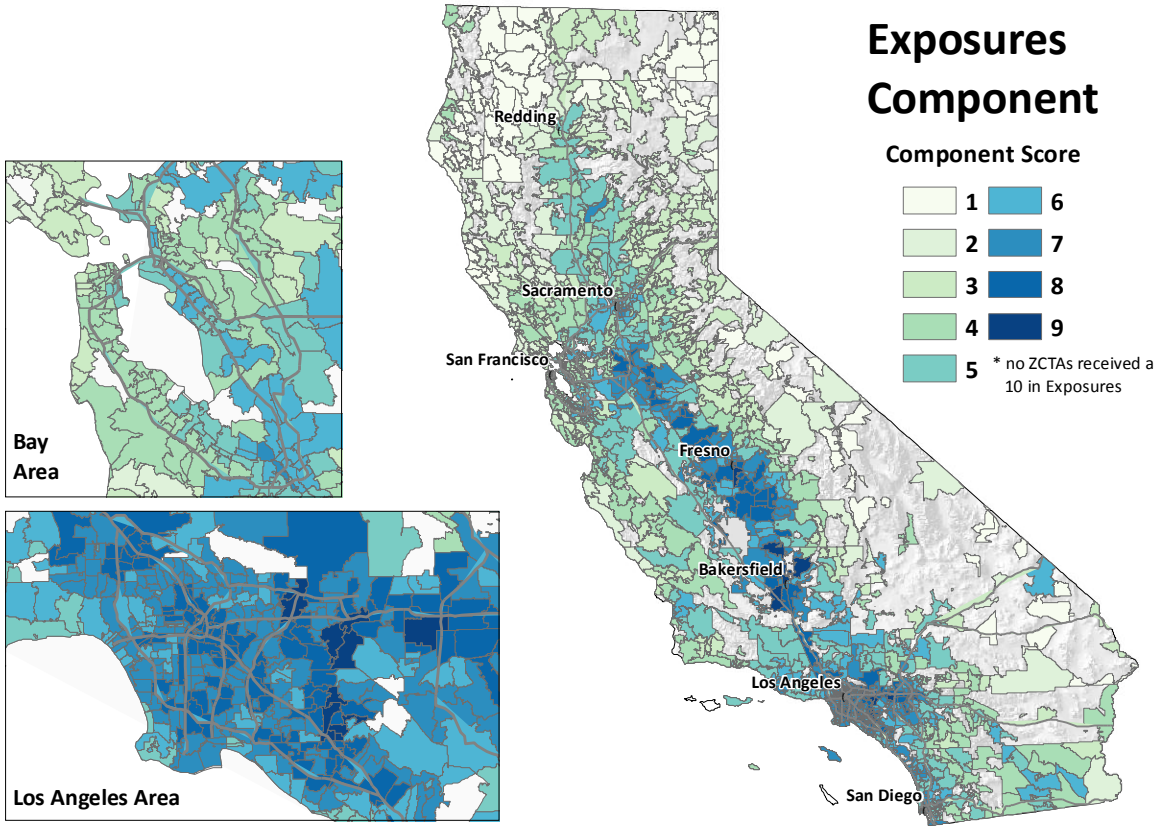
Preliminary Indicator Map



Scores for the Exposures Component (Range of possible scores: 1 to 10)

Scores for the Exposures component for each ZIP code are derived from the average of the percentiles for the five exposure indicators – ozone and PM2.5 concentrations, pesticide use, toxic releases from facilities, and traffic density. The calculated average percentile is then converted to a score based on the range for the component.

Preliminary Component Map



Asthma

Public Health Effects

Asthma is a chronic lung disease characterized by increased breathlessness, wheezing, coughing, or chest tightness. While the causes of asthma are poorly understood, it is well established that exposure to air pollutants, pollen, pet dander, tobacco smoke, mold, and other substances can trigger the onset of asthma symptoms. Nearly three million Californians currently have asthma and about five million have had it at some point in their lives. The California Office of Statewide Health Planning and Development maintains information on asthma emergency department visits and hospitalizations. While patient privacy protects specific information from being made publicly available, certain statistics on this disease across the state by location are available.

Data Source

Office of Statewide Health Planning and Development (OSHPD)
Environmental Health Investigations Branch (EHIB)
California Department of Public Health (CDPH)

Background

EHIB maintains information on asthma – emergency department (ED) visits and hospitalizations. Some ED visits result in hospitalization, but hospitalization is in general a measure of more severe cases. Hospitals are required to report all discharges (since 1986) and all ED visits (since 2005) to the California Office of Statewide Health Planning and Development (COSHPD). Both datasets include information on principal diagnosis, from which asthma visits can be identified, as well as age, gender and race/ethnicity.

Emergency department visits may provide a better measure of asthma burden than hospitalization rates since hospital-specific criteria for admittance may vary.

More Information

http://www.ehib.org/page.jsp?page_key=24

Proposed Indicator

Three-year average, age-adjusted rate of asthma emergency department visits (2007-2009).

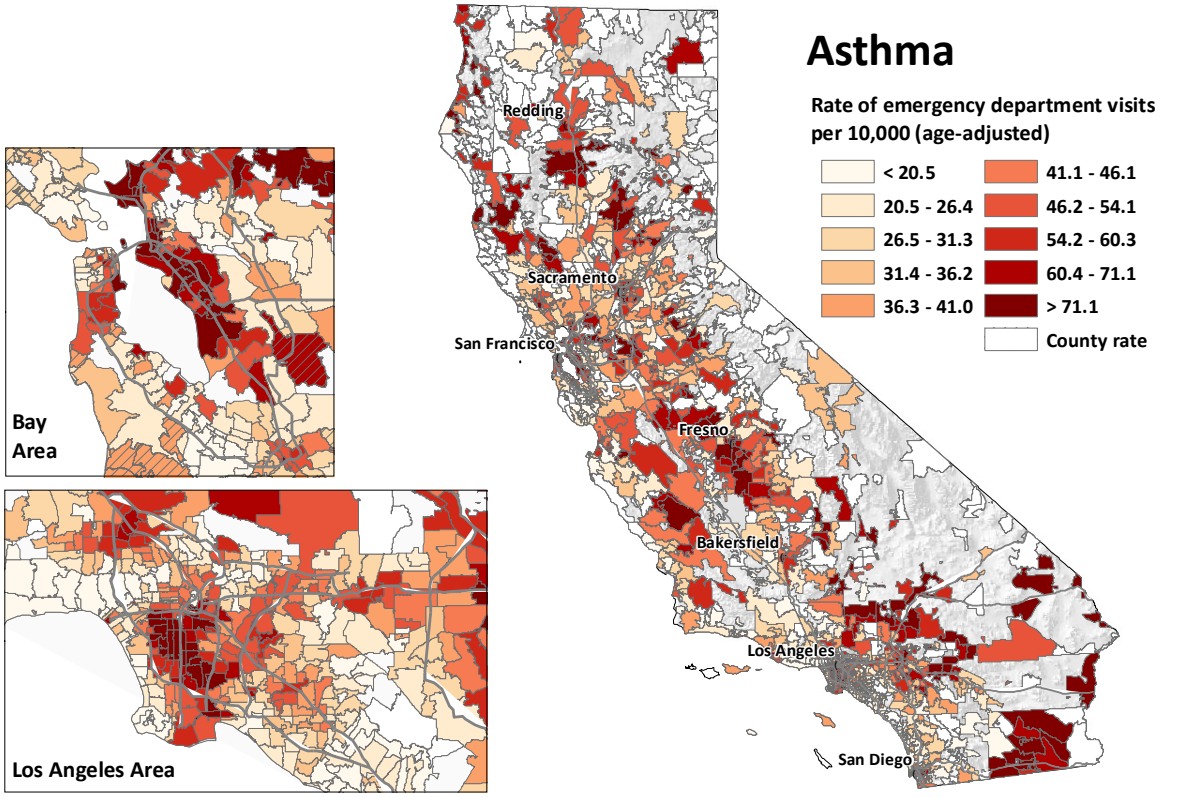
Method

- A three-year (2007-2009), age-adjusted rate of asthma emergency department (ED) visits was obtained for each ZIP code from EHIB.
- Reported ZIP codes were assigned the rate of their corresponding census ZIP code, assuming perfect geographic overlap. Reported ZIP codes that did not correspond to a census ZIP code were excluded from the analysis.
- Census ZIP codes without data were assigned the three year average, age-adjusted rate of their county. For ZIP codes that cross county borders, a weighted sum of the average county rates were calculated based on the proportion of the ZIP code's 2010 population within each county. ZIP codes that cross state boundaries were assigned county averages from their California county only. Alpine county, which did not

have large enough counts to calculate a statistically stable rate, was assigned the average of the five counties which it borders: El Dorado, Amador, Calaveras, Tuolumne, and Mono.

- ZIP codes with no population in the 2010 census were given a percentile score of zero, and excluded from the calculation of percentiles for all other ZIP codes. Thus the percentile score can be interpreted as the relative ranking among ZIP codes with a 2010 population.

Preliminary Indicator Map



Cancer

Public Health Effects

Cancer is not a single disease, but a collection of diseases, characterized by the uncontrolled growth of abnormal cells in the body. Many chemicals are known to cause cancer. Some of these chemicals are known to interact with DNA in the cell, and some may interfere with cell growth or the immune system. There are many chemicals that commonly appear in the environment that cause cancer, including benzene, PCBs, combustion byproducts, certain metals, and DDT. Not all cancers are related to environmental exposures, and the fraction of cancers that is attributable to such exposures is a matter of scientific debate.

Data Source

National Cancer Institute (NCI)
National Vital Statistics System (NVSS)

Background

The NCI provides interactive maps and data downloads of cancer incidence and mortality data that is collected and evaluated by the NVSS. The data from these sources is provided only at the county level. These data can be used to understand trends over time, how cancer risks vary by geographic region, or how they vary by race/ethnicity, age, or by socioeconomic factors.

While cancer incidence rates are commonly used in regional comparisons, cancer mortality rates may capture factors such as differential access to health care in addition to environmental causes. Use of age-adjusted data controls for the effect of age on cancer incidence and mortality. In these data, the 2000 U.S. Standard Million Population was used to perform the age-adjustment.

More Information

http://statecancerprofiles.cancer.gov/map/map.withimage.php?06&001&001&00&0&01&0&1&6&0#map

Proposed Indicator

Age-adjusted cancer mortality rates, all sites, years 2004-2008 (rate per 100,000).

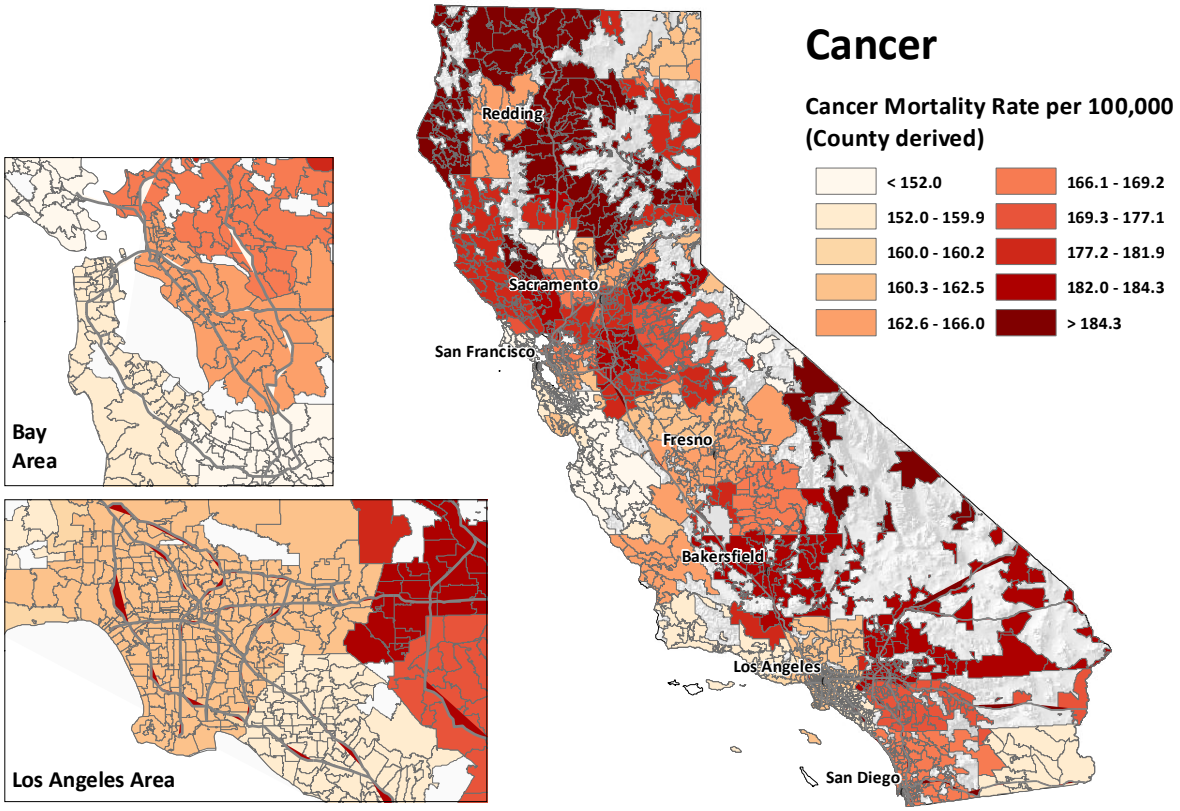
County scale data were included in the current analysis. Cancer mortality rates at the ZIP code scale are being obtained.

Method

- A five-year (2004-2008), age-adjusted rate of all cancer deaths was obtained for each county from NCI's interactive mapping tool.
- ZIP Codes were assigned the rate of their corresponding county, assuming perfect geographic overlap.
- For ZIP codes that cross county borders, a weighted sum of the average county rates were calculated based on the proportion of the ZIP code's 2010 population within each county. ZIP codes that cross state boundaries were assigned county averages from their California county only. Alpine County, which did not have large enough counts to calculate a statistically stable rate, was assigned the average of the five counties which it borders: El Dorado, Amador, Calaveras, Tuolumne, and Mono.

- ZIP codes with no population in the 2010 Census were given a percentile score of zero, and excluded from the calculation of percentiles for all other ZIP codes. Thus the percentile score can be interpreted as the relative ranking among ZIP codes with a 2010 population.

Preliminary Indicator Map



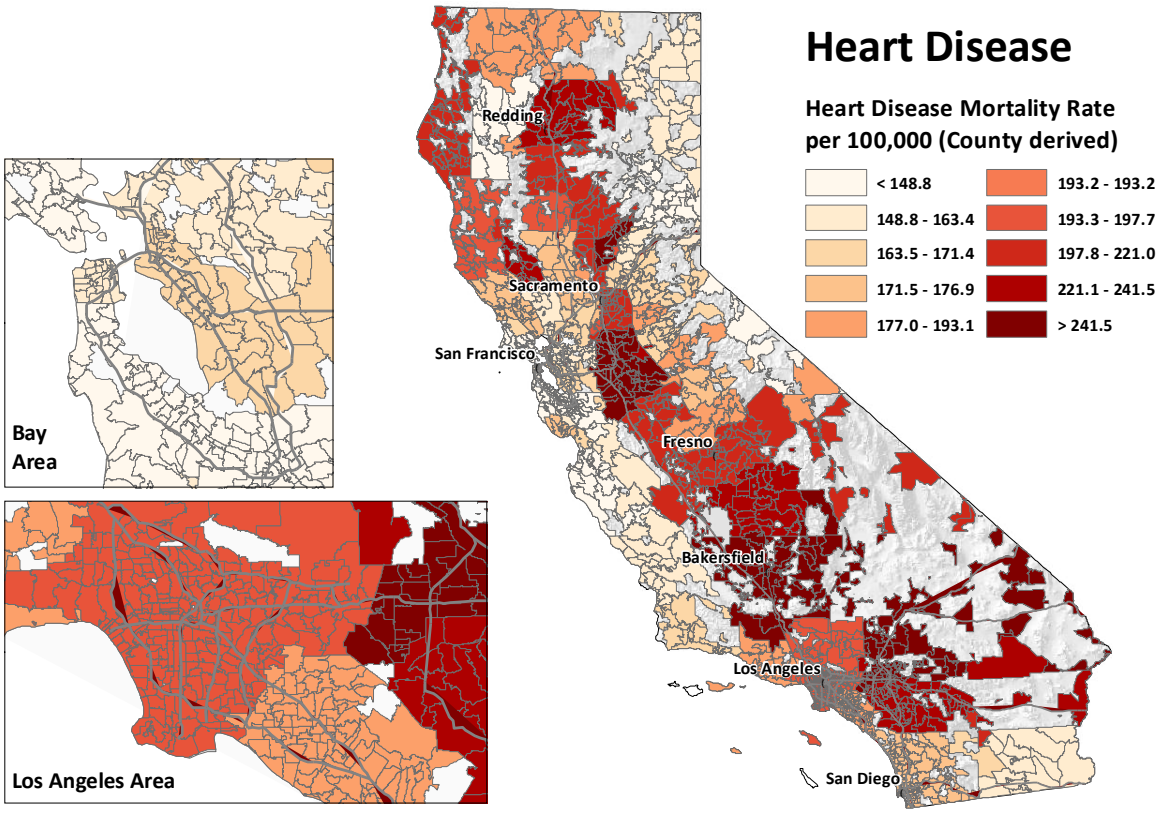
Heart Disease

Public Health Effects

Heart disease is a leading cause of death in California. Risk factors for the development of heart disease include high cholesterol, high blood pressure, diabetes, cigarette smoking, obesity, and physical inactivity. Numerous studies have also shown a relationship between pollution exposure, especially air pollution, and heart disease. There are no statewide data on the prevalence of heart disease. The state maintains data on hospitalizations and emergency department visits due to experiencing a heart attack as well as statistics on deaths due to heart disease.

Data Source	California Department of Public Health (CDPH)
Background	CDPH maintains death records and provides reports pertaining to specific causes of death for the State of California. The report on heart disease mortality includes information for the state as a whole as well as analysis stratified by gender, race, and county. Heart disease mortality rates are provided at the county level for all counties except when a rate was calculated from fewer than 20 deaths (considered unreliable). Use of age-adjusted data controls for the effect of age on heart disease incidence and mortality. In these data, the 2000 U.S. Standard Million Population was used to perform the age-adjustment.
More Information	http://www.cdph.ca.gov/programs/ohir/Pages/Heart2008County.aspx
Proposed Indicator	*Age-adjusted heart disease mortality rates, years 2004-2008 (rate per 100,000).* County scale data were included in the current analysis. Heart disease mortality rates at the ZIP code scale are being obtained.
Method	○ A five-year (2004-2008), age-adjusted rate of all heart disease related deaths was obtained for each county from CDPH. ○ ZIP Codes were assigned the rate of their corresponding county, assuming perfect geographic overlap. ○ For ZIP codes that cross county borders, a weighted sum of the average county rates were calculated based on the proportion of the ZIP code's 2010 population within each county. ZIP codes that cross state boundaries were assigned county averages from their California county only. ○ ZIP codes with no population in the 2010 Census were given a percentile score of zero, and excluded from the calculation of percentiles for all other ZIP codes. Thus the percentile score can be interpreted as the relative ranking among ZIP codes with a 2010 population.

Preliminary Indicator Map



Low Birth Weight Infants

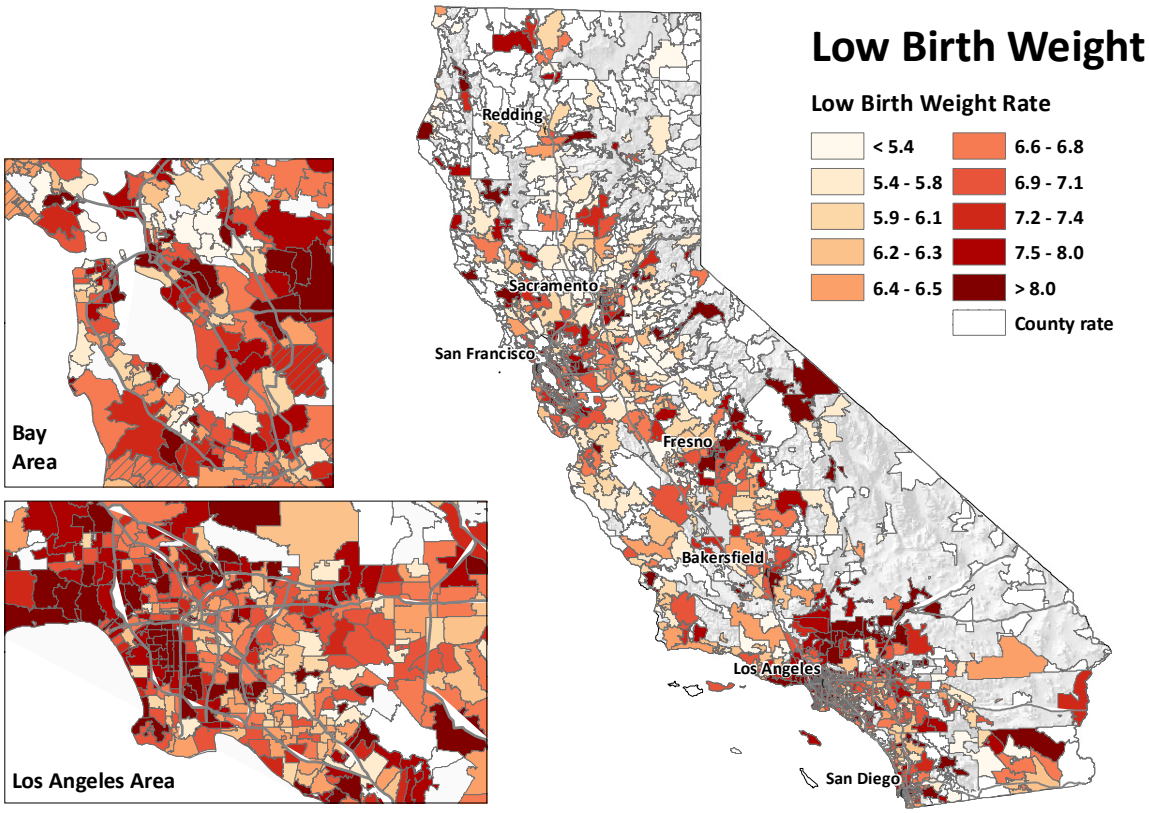
Public Health Effects

Live born infants with a birth weight of less than 2500 grams are classified as having low birth weight, a condition that is associated with increased risk for subsequent health problems and impaired cognitive development. Many studies have shown racial/ethnic and socioeconomic disparities in perinatal outcomes like low birth weight. For example, the incidence of infants with low birth weight is much higher among African-American women as compared to Hispanic and non-Hispanic white women. While risk factors in the mother such as substance abuse and lack of prenatal care can also contribute to birth outcomes, these risks and socioeconomic and racial factors do not wholly explain disparities in perinatal outcomes. Research has shown a link between low birth weight and environmental hazards like air pollution.

Data Source	California Department of Public Health (CDPH), Vital Statistics
Background	CDPH maintains birth records that contain information about birth weight. The associated ZIP codes are based on the mother's self-reported residence at the time of delivery.
More Information	http://www.cdph.ca.gov/data/statistics/Pages/BirthProfilesbyZIPCode.aspx http://www.cdph.ca.gov/data/statistics/Pages/CountyBirthStatisticalDataTables.aspx
Proposed Indicator	*Five-year average low birth weight rate (2005-2009).* Rates derived from small counts are statistically unstable and should be interpreted with caution. A five-year average was used to minimize the occurrence of low counts.
Method	○ The 2005-2009 five-year average low birth weight (LBW) rate was defined as the percent of live births (including multiple births) weighing less than 2500 grams. ZIP code averages were calculated assuming ZIP boundaries did not change during these five years. ○ Reported ZIP codes were assigned the rate of their corresponding census ZIP code, assuming perfect geographic overlap. Reported ZIP codes that did not correspond to a census ZIP code were excluded from the analysis. ○ Census ZIP codes without data were assigned the three year average, age-adjusted rate of their county. For ZIP codes that cross county borders, a weighted sum of the average county rates were calculated based on the proportion of the ZIP code's 2010 population within each county. ZIP codes that cross state boundaries were assigned county averages from their California county only. Alpine County, which did not have enough births to estimate a stable rate, was assigned the average of the five counties which it borders: El Dorado, Amador, Calaveras, Tuolumne and Mono. ○ ZIP codes with no population in the 2010 Census were given a percentile score of zero, and excluded from the calculation of percentiles for all

other ZIP codes. Thus the percentile score can be interpreted as the relative ranking among ZIP codes with a 2010 population.

Preliminary Indicator Map

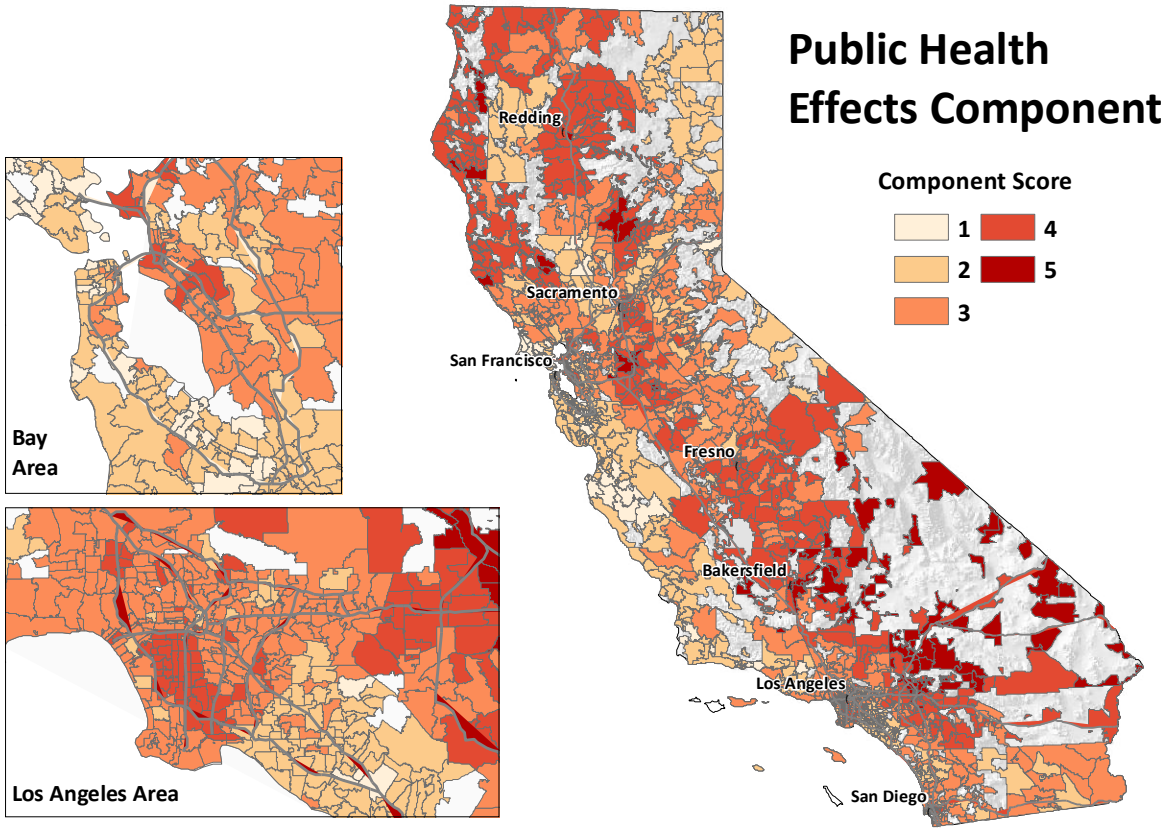


Public Health Effects – Component Scores (Range of possible scores: 1 to 5)

Scores for the Public Health Effects component for each ZIP code are derived from the average of the percentiles for four Public Health Effect indicators – asthma, cancer mortality, heart disease mortality, and low birth weight infants. The calculated average percentile is then converted to a score based on the range for the component.

For two indicators included in this component, heart disease and cancer mortality, county scale data were used. For this reason, the results will change when ZIP code-scale results are available and incorporated.

Preliminary Component Map



Cleanup Sites

Environmental Effects

Contaminated sites are areas that have suffered environmental degradation due to the presence of hazardous substances. Of primary concern is the potential for people to come into contact with these substances. However, some of these "brownfield" sites are also underutilized due to perceived cleanup costs or concerns about liability. The most complete set of information available related to cleanup sites and brownfields in California is maintained by the Department of Toxic Substances Control.

Data Source

EnviroStor Cleanup Sites Database,
Department of Toxic Substances Control (DTSC)

Background

EnviroStor is a public database that provides access to information maintained by DTSC on site cleanup. The database contains information on numerous types of cleanup sites, including Federal Superfund, State Response, Corrective Action, School Cleanup, Voluntary Cleanup, Tiered Permit, Evaluation, Historical, and Military Evaluation sites. The database contains information related to the status of the site such as required cleanup actions, involvement/land use restriction, or "no involvement".

More Information

http://www.envirostor.dtsc.ca.gov/public/

Proposed Indicator

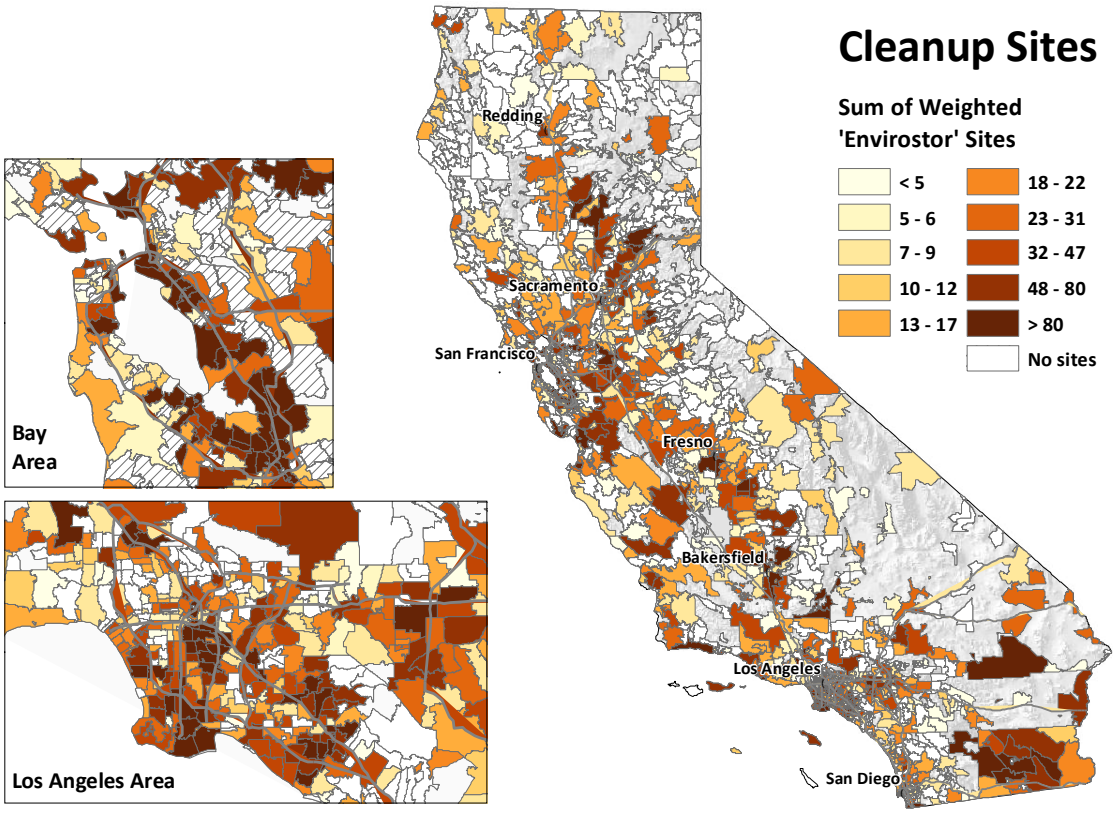
Sum of weighted sites within each ZIP code.

Since the nature and the magnitude of the threat and burden posed by hazardous substances vary among the different types of sites as well as the site status, the proposed indicator takes both into account.

Method

- Data on cleanup site type, status, and location (coordinate or address) for the entire state were downloaded from EnviroStor Cleanup Sites database.
- Several types of sites were excluded from the analysis (school investigations and border zone/hazardous waste evaluations).
- Each remaining site was scored on a weighted scale of 2 to 12 in consideration of both the site type and status (See Appendix A2). Higher weights were applied to Superfund, State Response sites, and cleanups compared to evaluations, for example (site type). Similarly, higher weights were applied to sites that are undergoing active remediation and oversight by DTSC, relative to those with little or no involvement.
- Site locations were mapped or geocoded (ArcMap).
- Each ZIP code was scored based on the sum of the weighted sites it contains.
- Summed ZIP code ranks were assigned percentile scores.

Preliminary Indicator Map



Impaired Water Bodies

Environmental Effects

Contamination of California streams, rivers, and lakes by pollutants can compromise the use of the water body for drinking, swimming, fishing, aquatic life protection, and other beneficial uses. When this occurs, such bodies are considered "impaired." The State Water Resources Control Board provides information relevant to the condition of water bodies throughout the state as part of its responsibilities under the Clean Water Act. Information on impairments to these water bodies can help determine the extent of environmental degradation within an area.

Data Source

303(d) List of Impaired Water Bodies,
State Water Resources Control Board (SWRCB)

Background

Section 303(d) of the Federal Clean Water Act requires State and Regional Water Boards to assess water quality data for California water bodies every two years to determine if they contain pollutants at levels that exceed protective water quality criteria and standards. Lakes, streams and river segments which do not meet water quality standards or are not expected to meet water quality standards are listed as impaired water bodies. Listing a water body as impaired in California is governed by the California's Clean Water Act Section 303(d) Listing Policy.

Information contained within the SWRCB's databases includes shape files showing spatially where water bodes exist in the state, information on which of the segments or areas of water bodies are impaired, and the type of determination that lead to its designation as impaired.

More Information

http://www.swrcb.ca.gov/water_issues/programs/#wqassessment

Proposed Indicator

Summed number of pollutants across all water bodies designated as impaired within the area.

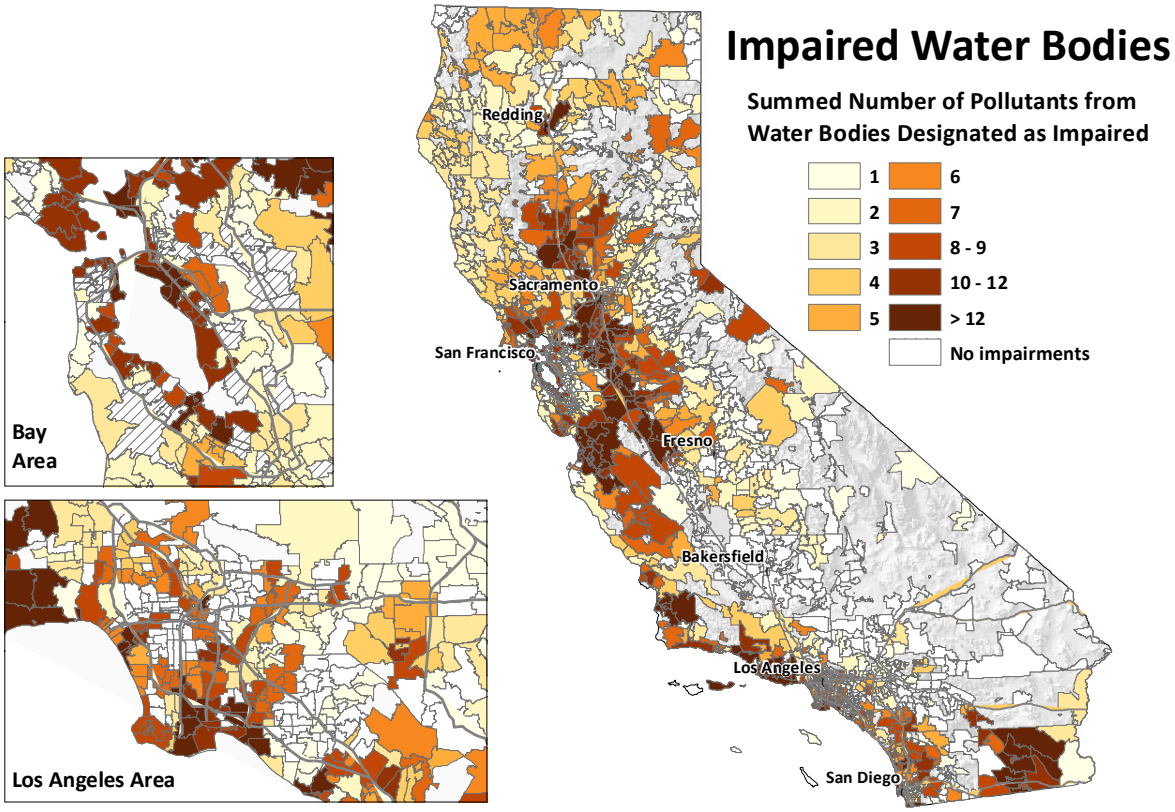
Method

- Data on water body type, water body ID, and pollutant type were downloaded in Excel format, and GIS data showing the visual representation of all water bodies was downloaded from the SWRCB website.
- All water bodies were identified in all ZIP codes in the GIS software ArcMap.
- The number of pollutants listed in streams and/or rivers that intersected a ZIP code were counted.
- The number of pollutants listed in lakes, bays, estuaries and/or shoreline that intersected or bordered a ZIP code were counted.
- The two pollutant counts were summed for every ZIP code.
- Each ZIP code was scored based on the sum of the number of individual

pollutants found within and/or bordering it.

- Summed ZIP code scores were assigned percentile scores.

Preliminary Indicator Map



Leaking Underground Storage Tanks and Cleanups

Environmental Effects

Thousands of underground storage tanks in California have leaked petroleum or other hazardous substances, degrading soil and groundwater. Underground storage tanks are of particular concern when water supplies are affected or threatened. A potential for exposure to hazardous substances through the inhalation of vapors also exists. In addition, the land surrounding these sites may be taken out of service and compromised due to perceived cleanup costs or concerns about liability. The most complete set of information available related to sites that may impact groundwater and require cleanup is maintained by the State Water Resources Control Board.

Data Source

GeoTracker Database,
State Water Resources Control Board (SWRCB)

Background

GeoTracker is a public web site where the SWRCB, regional boards and local agencies can oversee and track projects on cleanup sites impacting groundwater.

The database contains information on leaking underground storage tanks (LUSTs), cleanup program sites, land disposal sites, military LUSTs and military cleanup sites. For each site, there is additional information on the status of cleanup activities. The database is constantly updated and sites never leave the database, where sites may ultimately be designated 'clean closed.'

More Information

http://geotracker.waterboards.ca.gov/

Proposed Indicator

Sum of weighted sites within each ZIP code.

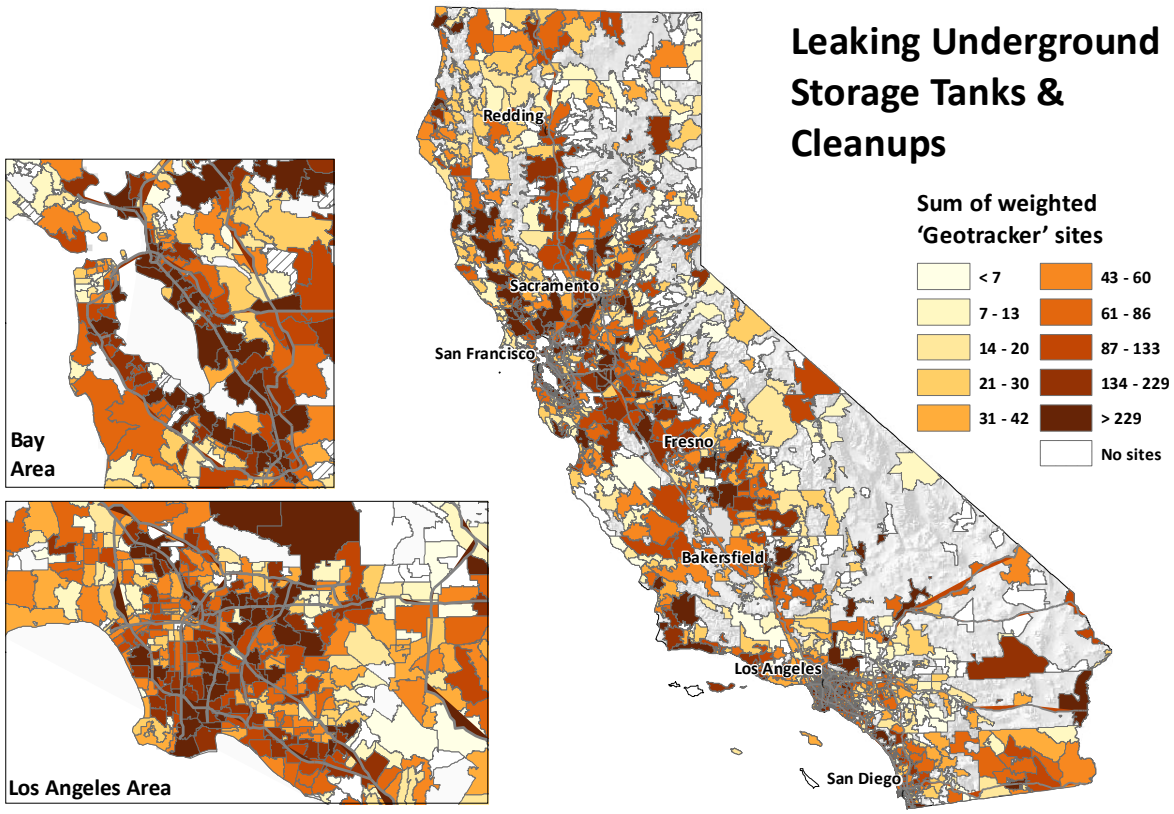
The nature and the magnitude of the threat and burden posed by sites maintained in GeoTracker vary significantly by site type (e.g., LUST or cleanup site) and status (e.g., Completed Case Closed or Active Clean up). Thus, the proposed indicator takes into account information about both the type of site and its status (See Appendix A3).

Method

- Data on cleanup site type, status, and location (coordinate or address) for the entire state were downloaded from GeoTracker.
- Certain types of sites were not included in the analysis (e.g., referred sites).
- Each remaining site was scored on a weighted scale of 3 to 15 in consideration of both the site type and status.
- Sites locations were mapped or geocoded (ArcMap).
- Each ZIP code was scored based on the sum of the weighted sites it contains.

- Summed ZIP code scores were assigned percentiles.

Preliminary Indicator Map



Solid Waste Sites and Facilities, and Hazardous Waste Facilities

Environmental Effects

There are widespread concerns for both human health and the environment from sites that serve for the processing or disposal of solid and hazardous waste. Many newer landfills are designed to prevent the contamination of air, water, and soil with hazardous materials. However, older sites and sites that are out of compliance with current standards may degrade environmental conditions in the surrounding area and pose a risk of exposure. Other types of facilities, such as composting, treatment and recycling facilities raise concerns about odors, vermin, and increased truck traffic, among others. While data are not available that describe environmental effects from the siting and operation of all types of solid waste facilities, the California Department of Resources Recycling and Recovery maintains data on facilities that operate within the state, as well as sites that are no longer in operation, abandoned, or otherwise illegal. The Department of Toxic Substances Control maintains data on permitted facilities that are involved in the treatment, storage, or disposal of hazardous waste,

Data Source

Solid Waste Information System (SWIS),
California Department of Resources Recycling and Recovery (CalRecycle)

EnviroStor Hazardous Waste Facilities Database
Department of Toxic Substances Control

Background

CalRecycle's SWIS database contains information on solid waste facilities, operations, and disposal sites throughout the state. Facility types include landfills, transfer stations, material recovery facilities, composting sites, transformation facilities, waste tire sites, and closed disposal sites.

Records within the database contain information about the location, owner, operator, facility type, regulatory and operational status, authorized waste types, local enforcement agency and inspection and enforcement records.

CalRecycle's Closed, Illegal, and Abandoned (CIA) Disposal Sites Program assists local enforcement agencies in investigating and enforcing State minimum standards at CIA sites in California. There are about 2500 CIA sites the SWIS databases. Priority CIA sites referred or projected for solid waste cleanup in the near future are also identified.

DTSC's EnviroStor Hazardous Waste Facilities database contains data on about 120 permitted hazardous waste facilities across the state. Data maintained includes the type of facility and its cleanup status.

More Information

http://calrecycle.ca.gov/SWFacilities/Directory/

http://www.envirostor.dtsc.ca.gov/public/data_download.asp

Proposed Indicator

Sum of weighted solid waste sites and facilities and permitted hazardous waste facilities within each ZIP code.

Method:

CIA sites:

- CIA data were obtained from staff at CalRecycle.
- Unconfirmed and non-solid waste sites were not included in the analysis.
- Each remaining site was scored on a weighted scaled in consideration of CalRecycle's prioritization categories (See Appendix A4).
- Site locations were mapped or geocoded (in ArcMap).

Active SWIS sites:

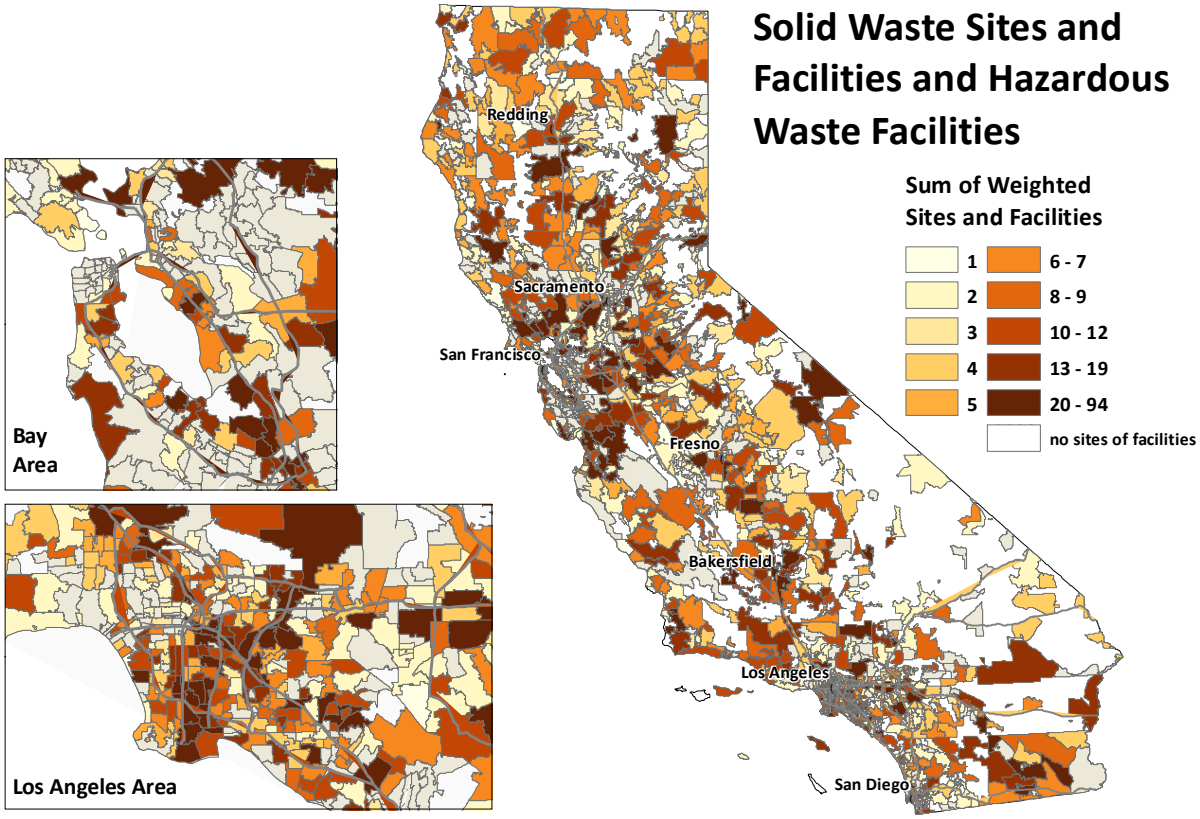
- SWIS data was obtained from the CalRecycle website.
- CIA records were filtered from the database because SWIS contains an inventory of both active and CIA sites.
- Of the non-CIA sites, Clean Closed, Absorbed, Inactive and Planned sites were not included.
- Each remaining site was scored on a weighted scale in consideration of the category type of solid waste operation (See Appendix A4).
- Site locations were mapped or geocoded (in ArcMap).

Permitted facilities:

- Permitted facility data were obtained from the DTSC website.
- Facilities were scored on a weighted scale in consideration of the type and permit status for the facility (See Appendix A4).
- Site locations were mapped or geocoded (in ArcMap).

From CIA, SWIS, and EnvirStor analyses, ZIP codes were scored based on the sum of weighted sites contained in its boundaries (in ArcMap). Summed scores were assigned percentiles.

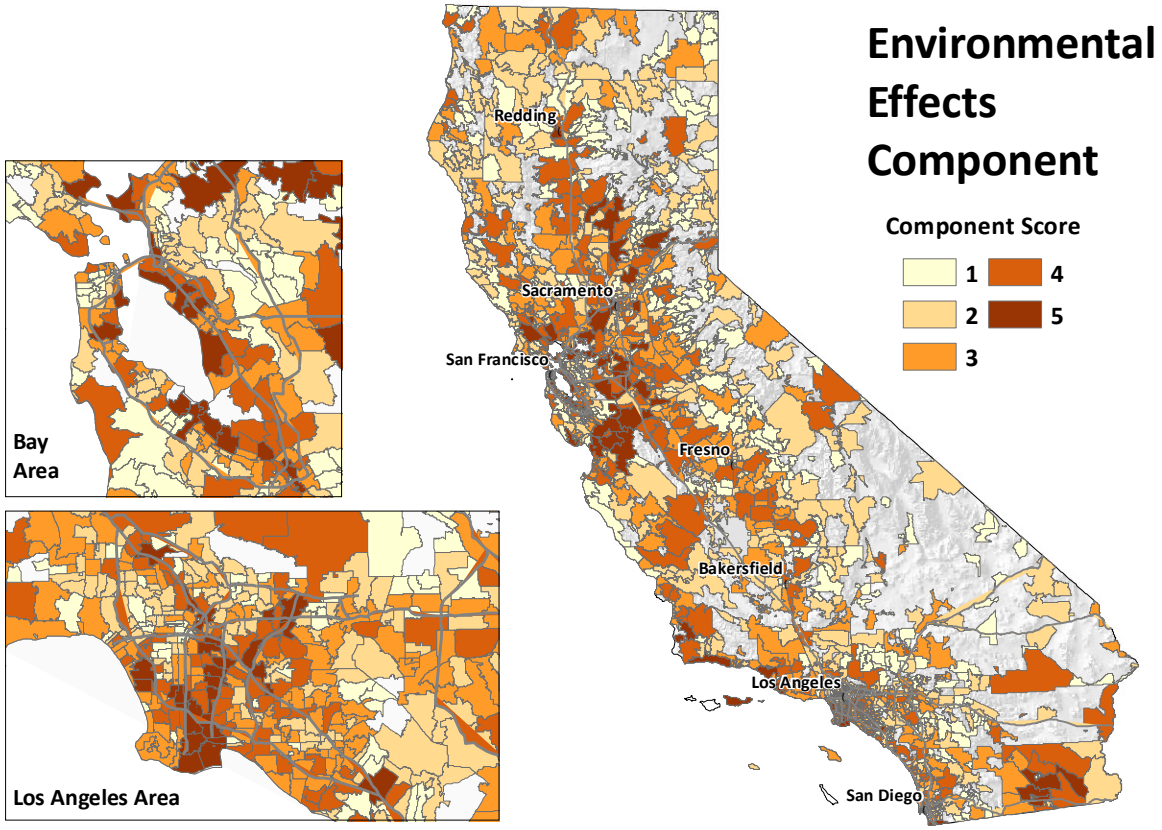
Preliminary Indicator Map



Environmental Effects – Component Scores (Range of possible scores: 1 to 5)

Scores for the Environmental Effects component for each ZIP code are derived from the average of the percentiles for the five Environmental Effects indicators – cleanup sites, impaired water bodies, leaking underground storage tanks and cleanups, and solid waste sites and facilities and hazardous waste facilities. The calculated average percentile is then converted to a score based on the range for the component.

Preliminary Component Map



Age: Children

Sensitive Populations

Children may be especially sensitive to the adverse effects of pollutants for many reasons. Children are often more susceptible to the health effects of air pollution because their immune systems and developing organs are still immature. Irritation or inflammation caused by air pollution is more likely to obstruct their narrower airways. Children may have higher background exposures to multiple contaminants from contact with the ground, from breathing through their mouths, and from spending a significant amount of time outdoors. Further, exposure to toxic contaminants in air or other sources during infancy or childhood could affect the development of the respiratory, nervous, endocrine and immune systems, and could increase the risk of cancer later in life.

Data Source

American FactFinder
U.S. Census Bureau

Background

As part of the 2010 decennial census, the U.S. Census Bureau questionnaire asked all census respondents for the age and date of birth of all members of the household. Other questions asked of all respondents pertain to whether they are of Hispanic or Latino origin, their household relationship, race, sex, and home ownership.

Datasets describing the number of individuals in different age categories are available for California at different geographic scales. The data are made available using the American FactFinder website.

More Information

http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

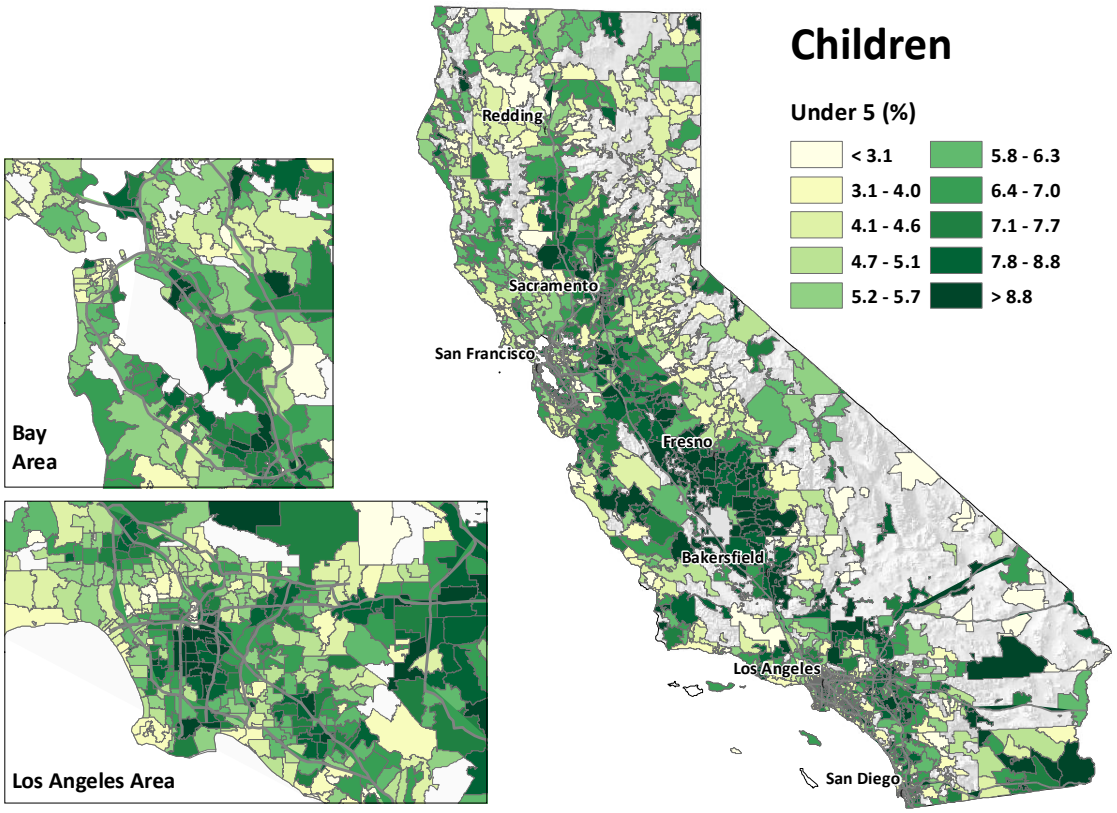
Proposed Indicator

Percent of population under age 5.

Method

- A dataset containing the number of people in different age groups was downloaded by census ZIP codes for the State of California.
- The percent of children in each ZIP code was calculated as the total number of children less than 5 years of age in the ZIP code divided by the total population of the ZIP code.
- ZIP codes were ordered by the percentage of children. A percentile score for a ZIP code was determined by its place in the distribution of all ZIP codes.

Preliminary Indicator Map



Age: Elderly

Sensitive Populations

Elderly populations may be more vulnerable to adverse health effects from exposures to pollutants. This population is more likely to have health conditions that may worsen responses, such as weakened immune systems, and existing cardiovascular and respiratory disease. A history of exposure to the same or other pollutants, or combinations with concurrent pharmaceutical use may influence the response.

Data Source

American FactFinder
U.S. Census Bureau

Background

As part of the 2010 decennial census, the U.S. Census Bureau questionnaire asked all census respondents for the age and date of birth of all members of the household. Other questions asked of all respondent pertain to whether they are of Hispanic or Latino origin, their household relationship, race, sex, and home ownership.

Datasets describing the number of individuals in different age categories are available for California at different geographic scales. The data are made available using the American FactFinder website.

More Information

http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

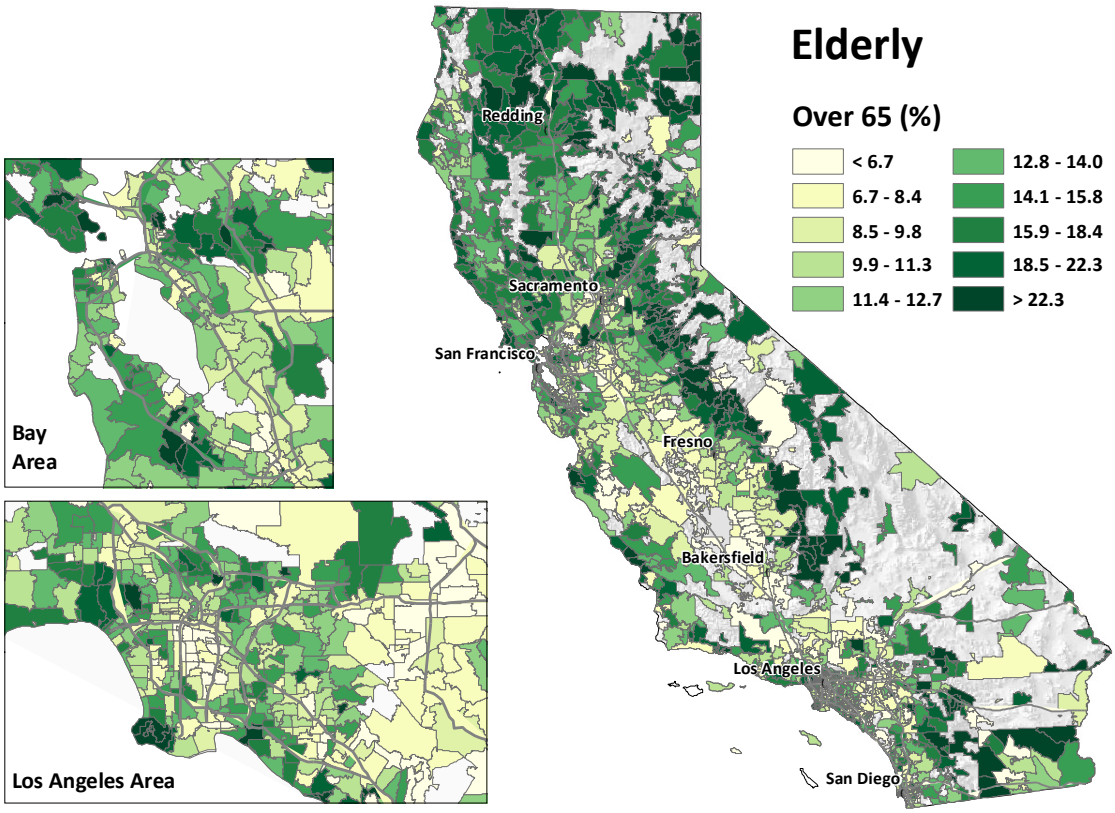
Proposed Indicator

Percent of population over age 65.

Method

- A dataset containing the number of people in different age groups was downloaded by census ZIP codes for the State of California.
- The percent of elderly in each ZIP code was calculated as the sum of all age groups greater than age 65 divided by the total population of the ZIP code.
- ZIP codes were ordered by the percentage of elderly. A percentile score for a ZIP code was determined by its place in the distribution of all ZIP codes.

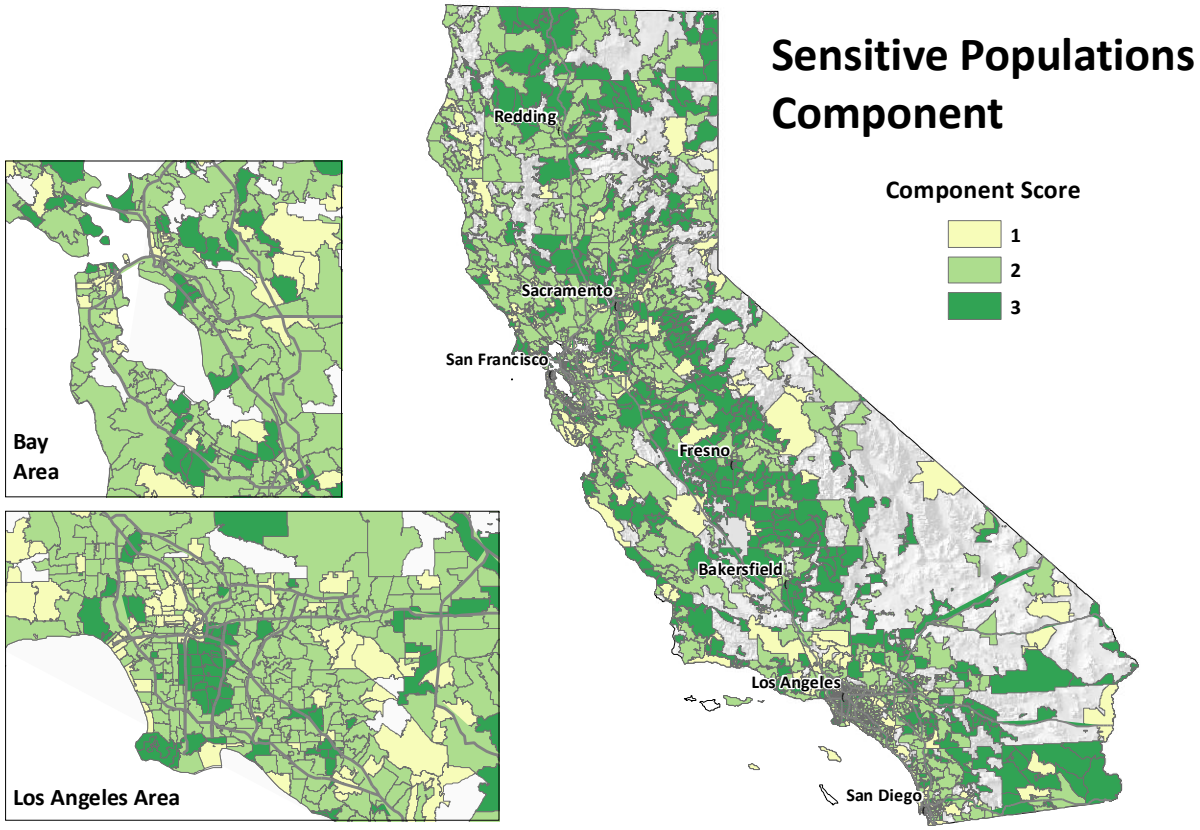
Preliminary Indicator Map



Sensitive Populations – Component Scores (Range of possible scores: 1 to 3)

Scores for the Sensitive Populations component for each ZIP code are derived from the percentiles for the prevalence of children and elderly populations. Since these two populations tend to be inversely correlated, ZIP codes were scored high, if either the children and elderly percentiles were high or if both were high (See Appendix A5 for details).

Preliminary Component Map



Educational Attainment

Socioeconomic Factors

Studies have shown that disadvantaged populations have increased vulnerability to the health impacts of pollution. An important social determinant of health is educational attainment. For example, greater lung cancer mortality has been shown among people with less than high school education who were exposed to particulate pollution compared to those with education beyond high school. Greater infant mortality has also been observed among mothers with lower educational attainment exposed to similar levels. Information on educational attainment is available through the U.S. Census Bureau's American Community Survey (ACS). Unlike the decennial census, the ACS represents a sample of the U.S. population. ACS data provide an estimate for the whole population.

Data Source

U.S. Census American Community Surveys, Five-year estimates
U.S. Census Bureau

Background

Beginning in 2010, the annual ACS became the primary mechanism for collecting data regarding many socioeconomic factors including educational attainment, while the decennial Census was limited to collecting data on housing type, age, and race. The ACS is conducted every year but results were not immediately available for census ZIP codes. These results will be available in late 2012 and will be reported as a five year estimate (2007-2011).

In the meantime, the Missouri Census Data Center, part of the Census Bureau's State Data Center Program, provides 5 year ZIP code estimates on information collected from the ACS. ZIP code estimates are created by using a formula to convert 2010 census tract results to ZIP code estimates for the years 2006-2010.

More Information

http://www.census.gov/acs/www/

http://mcdc.missouri.edu/

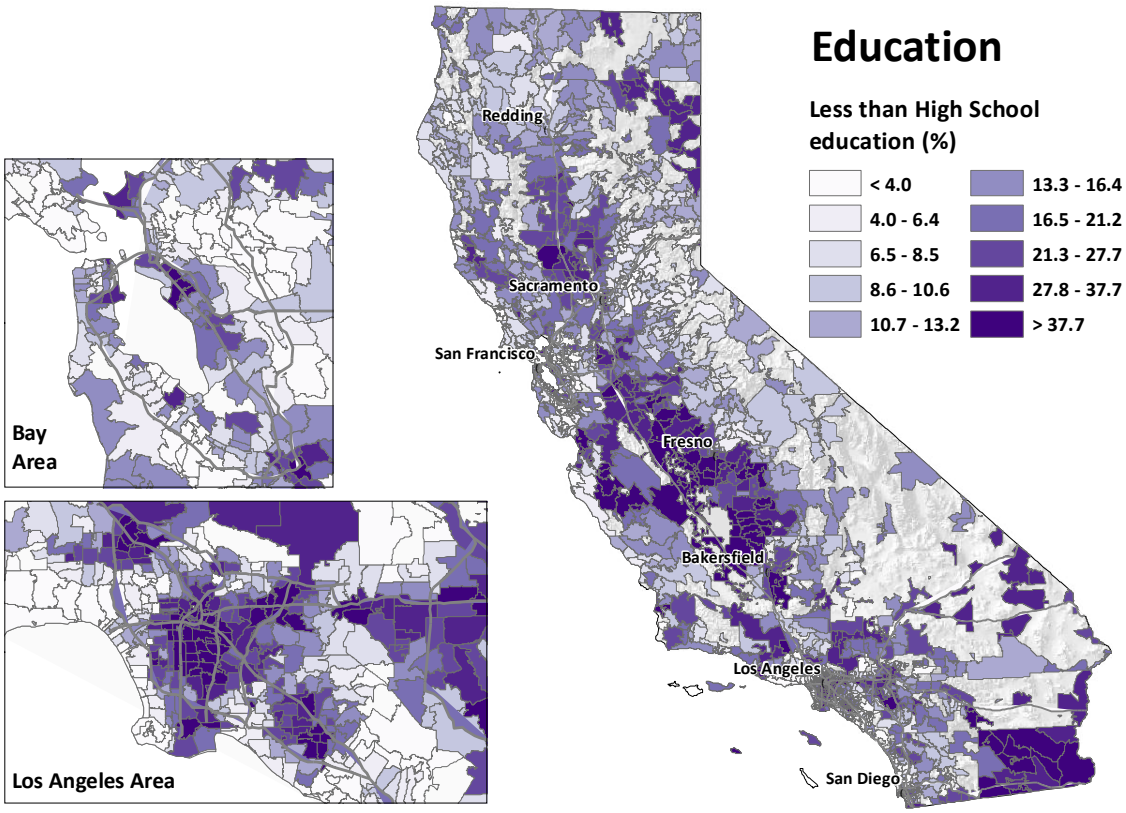
Proposed Indicator

Percent of population over age 25 with less than a high school education.

Method

- Averages of the percent of population over 25 with less than high school education were calculated for each census tract for the most recent five year estimates (2006-2010).
- Using a formula to convert census tract result to ZIP codes provided by the U.S. Census and a population-weighted scaling method, the tract averages were allocated to the corresponding ZIP codes.
- ZIP codes were ordered by the proposed indicator's value and percentiles were assigned to each based on the distribution across all ZIP codes.

Preliminary Indicator Map



Income

Socioeconomic Factors

Studies have shown that disadvantaged populations have increased vulnerability to the health impacts of pollution. An important social determinant of health is income level. Various studies have shown that lower income populations show greater effects, such as higher mortality, from exposure to certain air pollutants compared to higher income populations. Information on income is available through the U.S. Census Bureau's American Community Survey (ACS). Unlike the decennial census, the ACS represents a sample of the U.S. population. ACS data provide an estimate for the whole population.

Data Source

U.S. Census American Community Surveys, Five-year estimates
U.S. Census Bureau

Background

Beginning in 2010, the annual ACS became the primary mechanism for collecting data regarding many socioeconomic factors including income, while the decennial Census was limited to collecting data on housing type, age, and race. The ACS is conducted every year but results were not immediately available for census ZIP codes. These results will be available in late 2012 and will be reported as a five year estimate (2007-2011).

In the meantime, the Missouri Census Data Center, part of the Census Bureau's State Data Center Program, provides 5 year ZIP code estimates on information collected from the ACS. ZIP code estimates are created by using a formula to convert 2010 census tract results to ZIP code estimates for the years 2006-2010.

More Information

http://www.census.gov/acs/www/

http://mcdc.missouri.edu/

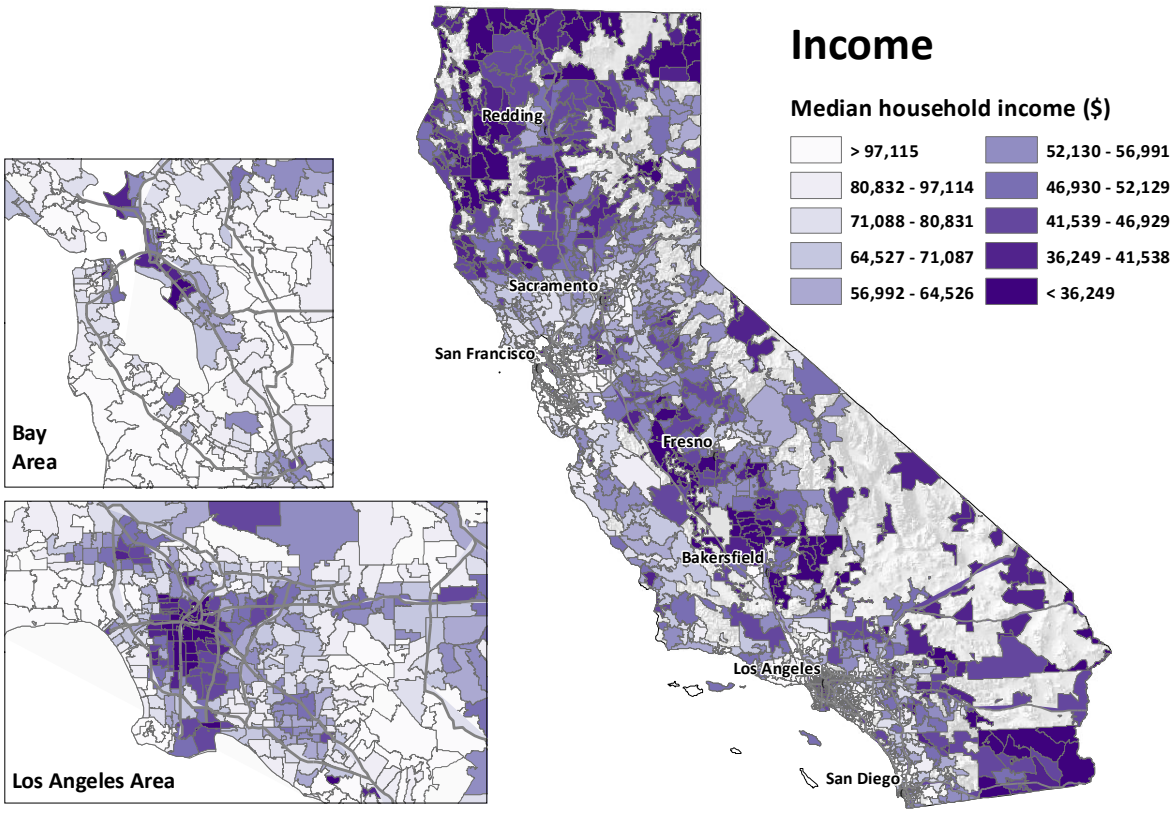
Proposed Indicator

Median household income.

Method

- Averages of the median household income were calculated for each census tract for the most recent five year estimates (2006-2010).
- Using a formula to convert census tract result to ZIP codes provided by the U.S. Census and a population-weighted scaling method, the tract averages were allocated to the corresponding ZIP codes.
- ZIP codes were ordered by the proposed indicator's value and percentiles were assigned to each based on the distribution across all ZIP codes.
- For this indicator, increasing percentiles indicate decreasing median income.

Preliminary Indicator Map



Poverty

Socioeconomic Factors

Studies have shown that disadvantaged populations have increased vulnerability to the health impacts of pollution. An important social determinant of health is poverty. Various studies have shown that impoverished populations show greater effects, such as more frequent asthma symptoms in high traffic areas compared to less impoverished populations. Information on poverty is available through the U.S. Census Bureau's American Community Survey (ACS). Unlike the decennial census, the ACS represents a sample of the U.S. population. ACS data provide the basis for estimating poverty levels for the whole population on a geographic basis.

Data Source

U.S. Census American Community Surveys, Five-year estimates
U.S. Census Bureau

Background

Beginning in 2010, the annual ACS became the primary mechanism for collecting data regarding many socioeconomic factors including poverty, while the decennial Census was limited to collecting data on housing type, age, and race. The ACS is conducted every year but results were not immediately available for census ZIP codes. These results will be available in late 2012 and will be reported as a five year estimate (2007-2011).

In the meantime, the Missouri Census Data Center, part of the Census Bureau's State Data Center Program, provides 5 year ZIP code estimates on information collected from the ACS. ZIP code estimates are created by using a formula to convert 2010 census tract results to ZIP code estimates for the years 2006-2010.

More Information

http://www.census.gov/acs/www/

http://mcdc.missouri.edu/

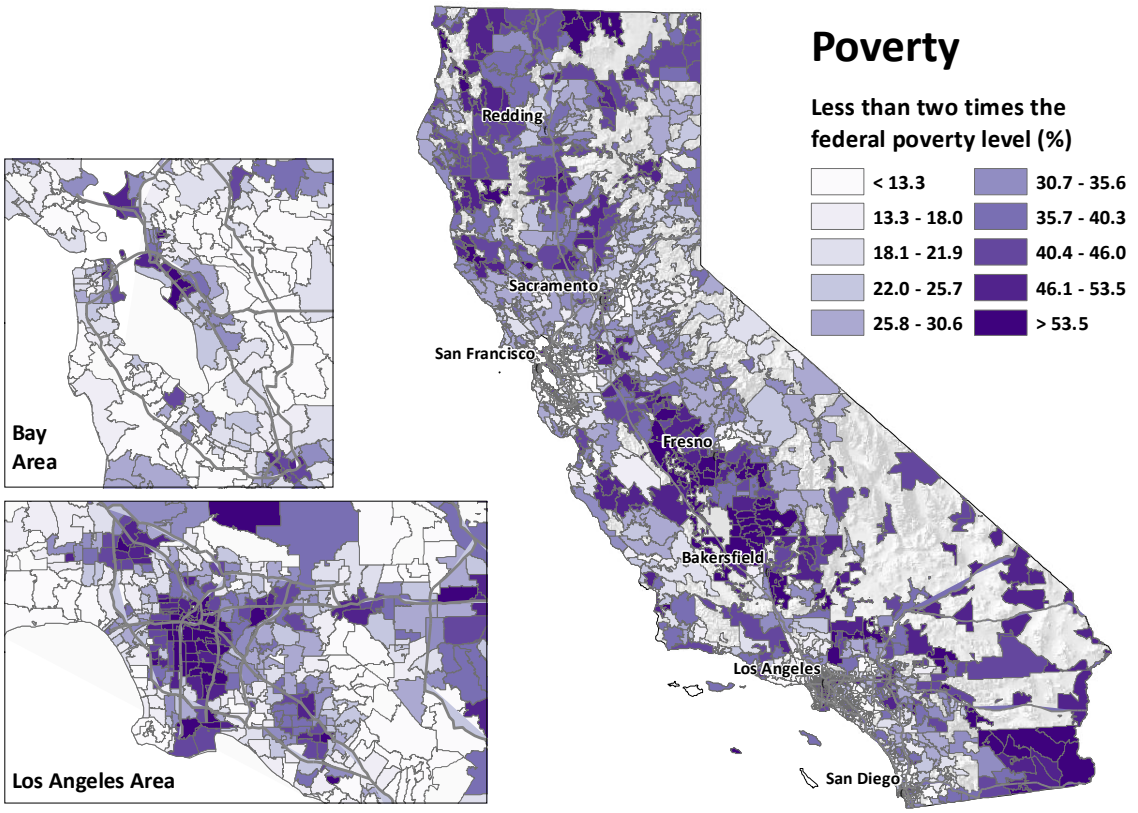
Proposed Indicator

Percent of the population living below two times the national poverty level.

Method

- Averages of the percent of population living below two times the national poverty level were calculated for each census tract for the most recent five year estimate (2006-2010).
- Using a formula to convert census tract result to ZIP codes provided by the U.S. Census and a population-weighted scaling method, the tract averages were allocated to the corresponding ZIP codes.
- ZIP codes were ordered by the proposed indicator's value and percentiles were assigned to each based on the distribution across all ZIP codes.

Preliminary Indicator Map



Race/Ethnicity

Socioeconomic Factors

Emerging scientific research is showing the relationship between pollutant exposure and health outcomes can vary based on the race and ethnicity of the population. For example, studies have shown that maternal exposure to particulate pollution results in a greater effect in reducing infant birth weight among African-American mothers compared to white mothers. Similarly, higher mortality has been observed among African-American populations exposed to ozone than other populations exposed to the same amount. The U.S. Census Bureau collects information on race and ethnicity as part of the decennial census and makes this information publicly available.

Data Source

American FactFinder
U.S. Census Bureau

Background

As part of the 2010 decennial census, the U.S. Census Bureau questionnaire asked all census respondents to identify their race and ethnicity (Hispanic or Latino origin) of all members of the household. Other questions asked of all respondents are age and date of birth, household relationship, sex, and home ownership.

Datasets describing the number of individuals in different race and ethnicity categories are available for California at different geographic scales. The data are made available using the American FactFinder website.

More Information

http://factfinder2.census.gov/

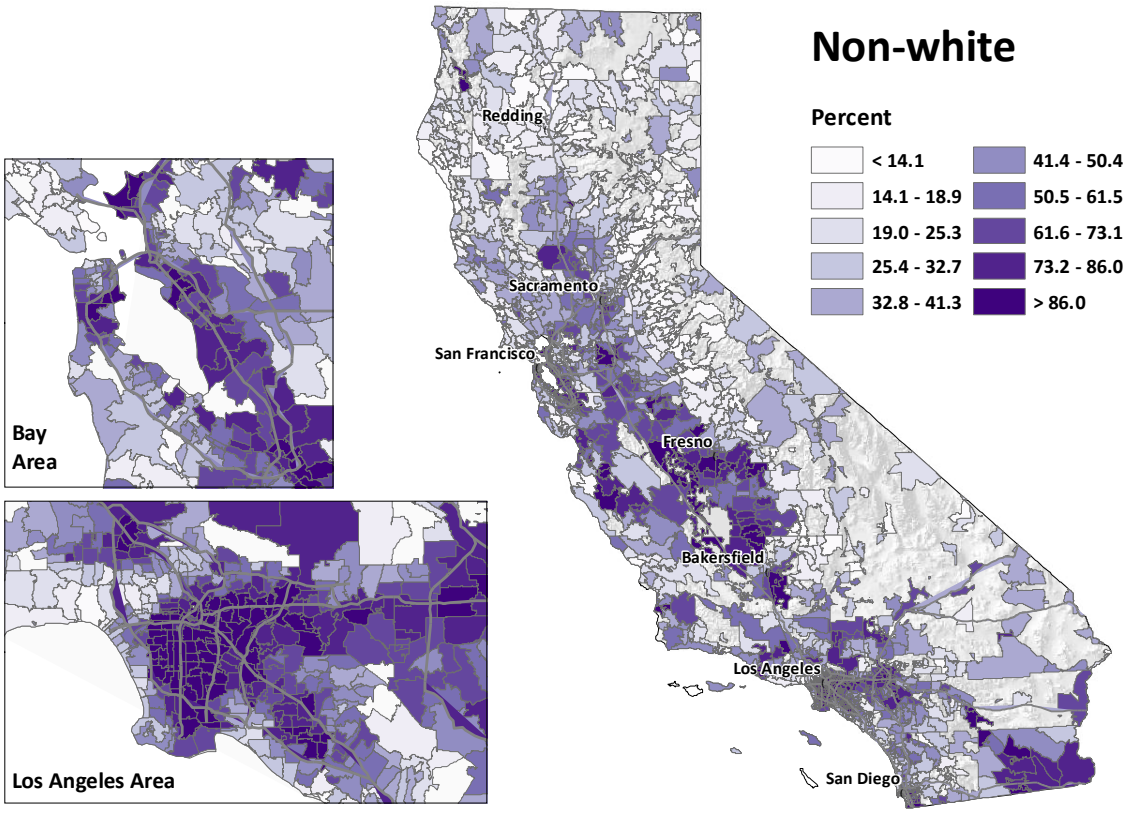
Proposed Indicator

Percent of the population non-white and non-Hispanic/Latino.

Method

- A dataset containing the number of people by race/ethnicity was downloaded by census ZIP codes for the state of California.
- The percent of the population in each ZIP code was calculated as the total number of people identified as non-white and non-Hispanic/Latino in the ZIP code divided by the total population of the ZIP code.
- ZIP codes were ordered by the percentage of the population that is non-white and non-Hispanic/ Latino). A percentile score for a ZIP code was determined by its place in the distribution of all ZIP codes.

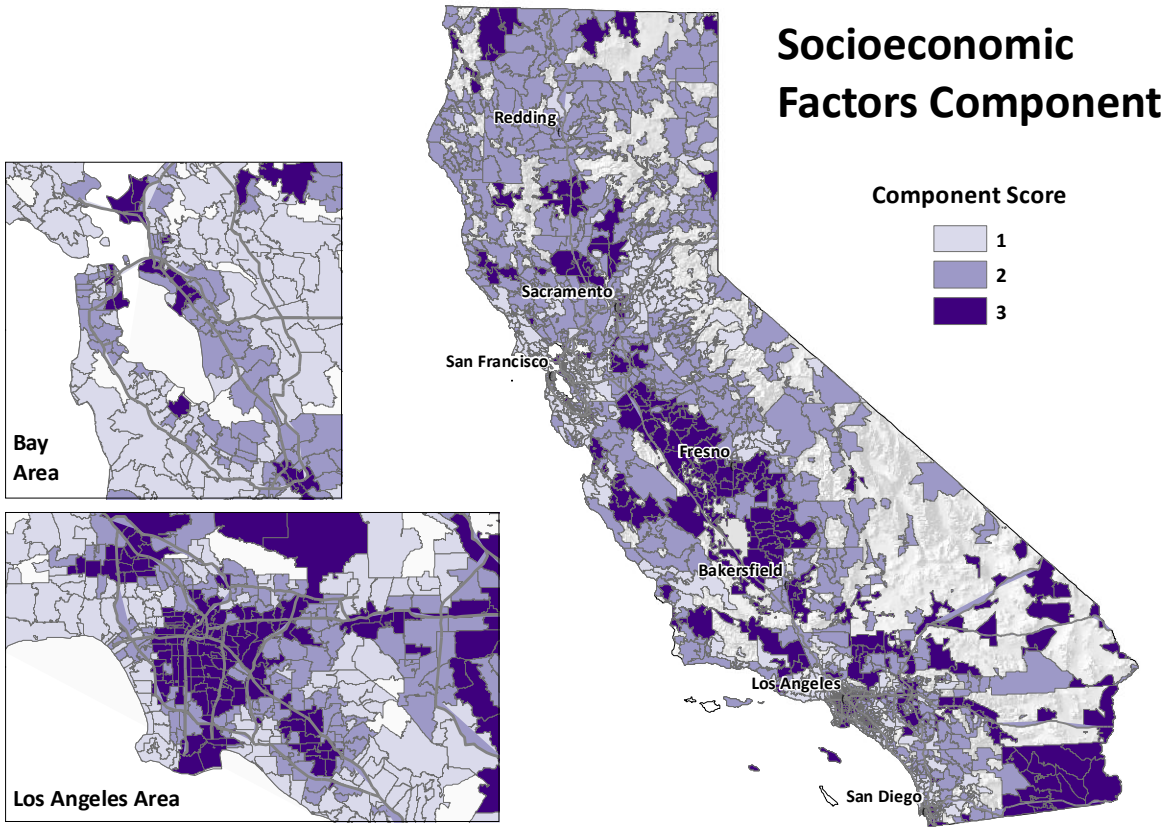
Preliminary Indicator Map



Socioeconomic Factors – Component Scores (Range of possible scores: 1 to 3)

Scores for the Socioeconomic Factors component for each ZIP code are derived from the average of the percentiles for the four proposed Socioeconomic Factor indicators – educational attainment, income, poverty, and race/ethnicity. The calculated average percentile is then converted to a score based on the range for the component.

Preliminary Component Map



Example ZIP Code

Preliminary Indicator Results and Cumulative Impact Score

Example: 92408, San Bernardino
Population 15,271

One example ZIP code was selected to illustrate how an overall cumulative impact score is calculated using the California Communities Environmental Health Screening Tool. Shown below are:

- An area map for the ZIP code and surrounding ZIP codes.
- Tables for each cumulative impact component with percentile scores for each of the indicators that make it up.
- A table showing how a cumulative impact score would be calculated for the example area, based on the preliminary data.

Exposures Indicators					
Indicator	Ozone (concentration)	PM2.5 (concentration)	Traffic (density)	Toxic Releases (weighted lbs)	Pesticide Use (lbs/sq. mi.)
Raw Value	0.0667	14.0	92,800	577,000	3.36
Percentile	97	84	76	68	17
Average Percentile			69		
Component Score			**7 of 10**		

Public Health Indicators				
Indicator	Asthma (rate)	Cancer* (rate)	Heart Disease* (rate)	Low Birth Weight (rate)
Raw Value	69.6	184	242	8.53
Percentile	89	90	93	94
Average Percentile		92		
Component Score		**5 of 5**		

***Currently based on county-scale data. Analysis will change when ZIP code-scale data are obtained.**

Environmental Effects Indicators				
Indicator	Cleanup Sites (weighted sites)	Impaired Water Bodies (number of pollutants)	LUFTs and Cleanups (weighted sites)	Solid Waste Sites and Facilities (weighted sites and facilities)
Raw Value	82	1	110	27
Percentile	91	15	75	95
Average Percentile		69		
Component Score		**4 of 5**		

Sensitive Population Indicators		
Indicator	Prevalence of Children (<5) (percent)	Prevalence of Elderly (>65) (percent)
Raw Value	8.5	6.8
Percentile	86	11
Average Percentile	NA	
Component Score	**3 of 3**	

Socioeconomic Factor Indicators				
Indicator	Educational Attainment (percent)	Household Income ($)	Poverty (percent)	Race and Ethnicity (percent)
Raw Value	32.4	39,100	54.1	83.6
Percentile	85	85	91	88
Average Percentile	87			
Component Score	**3 of 3**			

Calculation of Preliminary Cumulative Impact Score

	Exposures	Public Health Effects	Environmental Effects	Sensitive Populations	Socioeconomic Factors
Component Score	**7**	**5**	**4**	**3**	**3**
Subtotal	**7 + 5 + 4 = 16**			**3 + 3 = 6**	
Cumulative Impact Score	**16 × 6 = 96**				

APPENDICES

Appendix A1: Pesticide Use – Filter for Hazard and Volatility

Total pesticide use for each ZIP code is the sum of production agricultural-, non-production agricultural-, and non-agricultural pesticide use. Specific pesticides included in the measure of pesticide use were identified from the list of all registered pesticides in use through a filter that considered both hazard *and* likelihood of exposure.

More hazardous pesticides were identified using a list generated under the Birth Defect Prevention Act of 1984 (SB 950) and the Proposition 65 list (Safe Drinking Water and Toxic Enforcement Act of 1986). As part of a review process of active ingredients under the SB 950 program, pesticides are classified as "High", "Moderate", or "Low," priority for potential adverse health effects using studies of sufficient quality to characterize risk. The prioritization of each pesticide is a subjective process based upon the nature of potential adverse effects, the number of potential adverse effects, the number of species affected, the no observable effect level (NOEL), potential human exposure, use patterns, quantity used, and US EPA evaluations and actions, among others. Proposition 65 requires the state to maintain a list of chemicals that cause cancer or reproductive toxicity. For the purpose of developing an exposure indicator, pesticides that were prioritized as "Low," not prioritized under SB 950, and not on the Proposition 65 list were removed from the analysis.

The analysis was further limited to pesticides of high or moderate volatility. Higher volatility was considered to increase the likelihood of exposures. A list of pesticide volatilities was obtained from the Department of Pesticide Regulation. Pesticides not appearing on this list were researched for chemical properties in the open literature. Pesticides with volatility less than 10^{-6} mm Hg were removed from the indicator analysis.

The filtering of pesticides for both hazard and volatility resulted in a list of 65 pesticides that were included in the analysis here. These are identified in the table below.

PESTICIDES INCLUDED IN INDICATOR CALCULATION

- 1,3-DICHLOROPROPENE
- 2,2-DIBROMO-3-NITRILO-PROPIONAMIDE
- ACEPHATE
- ACROLEIN
- ALDICARB
- AZINPHOS-METHYL
- BROMOXYNIL HEPTANOATE
- BROMOXYNIL OCTANOATE
- BUPROFEZIN
- CARBARYL
- CARBOFURAN
- CHLOROPICRIN
- CHLOROTHALONIL
- CHLORPYRIFOS
- CHLORTHAL-DIMETHYL
- CLOMAZONE
- CYCLOATE
- CYPRODINIL
- DAZOMET
- DDVP
- DIAZINON
- DICLORAN
- DIMETHOATE
- ENDOSULFAN*
- EPTC
- ETHALFLURALIN
- ETHOPROP
- FENAMIPHOS
- FENPROPATHRIN
- FENTHION
- FLUDIOXONIL
- FLUMIOXAZIN
- HYDROGEN CYANAMIDE
- IMAZALIL
- LINURON
- MALATHION
- METALAXYL
- METAM-SODIUM
- METHAMIDOPHOS
- METHIDATHION
- METHOMYL
- METHYL BROMIDE
- METHYL ISOTHIOCYANATE
- METHYL PARATHION
- MOLINATE
- MYCLOBUTANIL
- NALED
- OXYDEMETON-METHYL
- PCNB
- PHOSPHINE
- POTASSIUM N-METHYL-DITHIOCARBAMATE (METAM-POTASSIUM)
- PROPETAMPHOS
- PROPOXUR
- PROPYLENE OXIDE
- PYRIMETHANIL
- S,S,S-TRIBUTYL PHOSPHORO-TRITHIOATE (DEF)
- SODIUM CYANIDE
- SODIUM TETRATHIOCARBONATE
- SULFUR DIOXIDE
- SULFURYL FLUORIDE
- THIRAM
- TRICLOPYR, BUTOXYETHYL ESTER
- TRICLOPYR, TRIETHYLAMINE SALT
- TRIFLUMIZOLE
- TRIFLURALIN
- ZIRAM

* Added based on its designation as a Toxic Air Contaminant (AB 1807 Program).

Appendix A2: Cleanup Sites – Weighting Matrix

Cleanup Sites from the EnviroStor Cleanup Sites database were weighted on a scale of 2 to 12 in consideration of both the site type and status. The following table shows the weights applied for each site type and status. For a given ZIP code, the weighted scores of all facilities in the area were summed. Terms used in the table are defined below.

Site Type	Status		
	Low • Certified • Completed • No Further Action	**Medium** • Inactive-Needs Eval. • Certified O&M	**High** • Active • Backlog • Inactive- Action Required
Low • Evaluation	2	4	6
Medium • Corrective Action • School Cleanup • Voluntary Cleanup	5	7	9
High • State Response • Superfund	8	10	12

Terms*

- *Active*: Identifies that an investigation and/or remediation is currently in progress and that DTSC is actively involved, either in a lead or support capacity.
- *Inactive*- Needs Evaluation: Identifies non-active sites where DTSC has determined a Preliminary Endangerment Assessment or other evaluation is required.
- *Certified O&M*: Identifies sites that have certified cleanups in place but require ongoing Operation and Maintenance (O&M) activities.
- *Certified*: Identifies completed sites with previously confirmed release that are subsequently certified by DTSC as having been remediated satisfactorily under DTSC oversight.
- *Corrective Action*: Identifies sites undergoing "corrective action", defined as investigation and cleanup activities at hazardous waste facilities (either Resource Conservation and Recovery Act (RCRA) or State-only) that either were eligible for a permit or received a permit. These facilities treat, store, dispose and/or transfer hazardous waste.
- *Evaluation*: Identifies suspected, but unconfirmed, contaminated sites that need or have gone through a limited investigation and assessment process.

- *Inactive – Action Required*: Identifies non-active sites where, through a Preliminary Endangerment Assessment (PEA) or other evaluation, DTSC has determined that a removal or remedial action or further extensive investigation is required.
- *No Further Actio*n: Identifies completed sites where DTSC determined after investigation, generally a PEA (an initial assessment), that the property does not pose a problem to public health or the environment.
- *School Cleanup*: Identifies proposed and existing school sites that are being evaluated by DTSC for possible hazardous materials contamination at which remedial action occurred.
- *State Response*: Identifies confirmed release sites where DTSC is involved in remediation, either in a lead or oversight capacity. These confirmed release sites are generally high-priority and high potential risk.
- *Superfund*: Identifies sites where the U.S. EPA proposed, listed, or delisted a site on the National Priorities List (NPL).
- *Voluntary Cleanup*: Identifies sites with either confirmed or unconfirmed releases, and the project proponents have requested that DTSC oversee evaluation, investigation, and/or cleanup activities and have agreed to provide coverage for DTSC's costs.

* EnviroStor Glossary of Terms (http://www.envirostor.dtsc.ca.gov/public/EnviroStor%20Glossary.pdf)

Appendix A3: Leaking Underground Storage Tanks and Cleanups — Weighting Matrix

Leaking Underground Storage Tanks (LUSTs) and Cleanups from the GeoTracker database were weighted on a scale of 3 to 15 in consideration of both the site type and status. The following table shows the weights applied for each site type and status. For a given ZIP code, the weighted scores of all facilities in the area were summed.

	Status	
	Low • **Inactive Open** • **Verification Monitoring**	**High** • **Remediation** • **Reopen** • **Site Assessment** • **Site Assessment & Remedial Action**
Low • **LUST Cleanup Program** • **Military UST**	**3**	**5**
Medium • **Land Disposal Site**	**6**	**10**
High • **Cleanup Program Site** • **Military Privatized Site** • **Military Cleanup Site**	**9**	**15**

Appendix A4: Solid Waste Sites and Facilities, and Permitted Hazardous Waste Facilities — Weighting Matrix

Solid Waste Sites and Facilities from the Solid Waste Information System and Permitted Hazardous Waste Facilities from DTSC's permitted facilities databases were weighted on a scale of 1 to 13 in consideration of both the site type, regulatory tier or permit type, and violation history. The following tables show the weights applied to the facilities and sites. The score for any given Solid Waste Site or Facility represents the sum of its Site or Facility Type and Violations. The score for any given Permitted Hazardous Waste Facility represents the sum of its Site Type and Permit Type. For all ZIP codes, the weighted scores of all facilities in the area were summed.

Solid Waste Sites and Facilities

Category	Criteria	Site or Facility Type	Violations (any in previous 12 months) [1]
Solid Waste Landfill *or* Construction, Demolition and Inert (CDI) Debris Waste Disposal (active) [2]	Tonnage	**8** (> 10,000 tpd) **7** (> 3,000 to < 10,000 tpd) **6** (> 1,000 to < 3,000 tpd) **5** (> 100 to < 1,000 tpd) **4** (< 100 tpd)	**3** (gas) **1** (each for litter, dust, noise, vectors, and site security)
Solid Waste Disposal Site (closed, closing, inactive) [3]	Tonnage	**1** (All)	**3** (gas) **1** (each for litter, vector, site security)
Inert Debris: Engineered Fill	Regulatory Tier [4]	**2** (Notification)	**1** (each for dust, noise, vectors, site security)
Inert Debris: Type A Disposal	Regulatory Tier [4]	**3** (Permitted)	**1** (each for dust, noise, vectors, site security)
Composting	Regulatory Tier [4]	**5** (Permitted) **3** (Permitted: Chipping & Grinding, 200 to ≤500 tpd) **2** (Notification)	**1** (each for vector, odor, litter, hazard, nuisance, noise, dust, site security) **1** (fire)
Transfer/Processing	Regulatory Tier [4]	**5** (Permitted: large vol.) **3** (Permitted: medium vol.; direct transfer) **2** (Notification)	**1** (each for dust, litter, vector/bird/animal, fire, site security)
Closed, Illegal, or Abandoned Site [5]	Priority Code [5]	**6** (Priority Code A) **4** (Priority Code B) **2** (Priority Code C) **1** (Priority Code D)	NA
Waste Tire	Regulatory Tier [4]	**4** (Major) **2** (Minor)	**2** (each for storage, fire) **1** (each for vectors, site security)

[1] Violations: Recurring requirement ensures only facilities that exhibit a pattern and practice of non-compliance receive a higher impact score and reduces point-in-time fluctuations. Explosive gas violations have a greater potential environmental impact than dust, noise, and vectors (from SWIS and WTMS).

[2] Active landfills (other than Contaminated Soil Disposal Sites and Nonhazardous Ash Disposal/Monofill Facilities) are all in the Full Permit tier, so permitted tonnage (from SWIS) is used to scale impact score.

[3] Solid Waste Disposal Site (closed) means the site was closed pursuant to state closure standards that became operative in 1989. Closed sites associated with the CIA Site database were closed prior to 1989 in accordance with standards applicable at the time of closure.

[4] Regulatory Tier used to weight the site or facility. Placement within a regulatory tier accounts for the type of waste and amount of waste processed per day or onsite at any one time. See Solid Waste Information System (SWIS) for compost and transfer/processing; Waste Tire Management System (WTMS) for waste tire sites.

[5] CIA Sites weighted per established CIA Site Priority Code scoring methodology (A through D; additional information available at http://www.calrecycle.ca.gov/SWFacilities/CIA/forms/prioritize.htm).

Permitted Hazardous Waste Facilities

[The weights assigned below should be considered interim. Improvements to the proposed weights for permitted facilities are still under discussion with DTSC staff]

Category	Criteria	Facility Type	Permit Type
Permitted Hazardous Waste Facilities	Status	**10** (Offsite commercial) **8** (Offsite non-commercial) **6** (Onsite) **2** (Post-closure)	**1** (non-RCRA facilities) **2** (RCRA facilities)

Appendix A5: Component Score for Population Sensitivity Due to Age

Scores for the Sensitive Populations component for each ZIP code are derived from the percentiles for the prevalence of children and elderly populations. Since these two populations tend to be inversely correlated, ZIP codes were scored high if either the children or elderly percentiles were high or if both were high. The following table was used to assign a score to the Sensitive Population component:

Percentile Elderly	Percentile Children			
	Less than 33	33 to 66	66 to 85	Greater than 85
Less than 33	1	1	2	3
33 to 66	1	2	2	3
66 to 85	2	3	3	3
Greater than 85	3	3	3	3