PROPOSED CHANGES IN CALENVIROSCREEN VERSION 4.0

Draft CalEnviroScreen version 4.0 updates version 3.0 in a variety of ways. It incorporates:

- The most recent data available for all indicators.
- Improved calculations of some indicators, incorporating new data to better reflect environmental conditions and population vulnerability to pollution. These include:
    - Improved methods to select contaminants evaluated from data on water quality and improvements to water system service areas used in calculating the Drinking Water Contaminants indicator.
    - The incorporation of data on additional pesticides to the Pesticide Use indicator.
    - The addition of data on dairies and feedlots to the Groundwater Threats indicator.
    - The addition of data on chrome metal plating facilities to the Hazardous Waste indicator.
    - Improvements in the methodology used to create the Particulate Matter (PM) 2.5 and Diesel PM air quality indicators.
- One new indicator to reflect children's risk of lead exposure to lead-based paint in low-income communities with older housing stock.

With these changes, draft CalEnviroScreen 4.0 uses 21 indicators covering pollution sources and drivers of vulnerability within California's approximately 8,000 census tracts, to measure overall cumulative burdens affecting California communities.

The model and method used to calculate CalEnviroScreen scores remain the same as those used in the previous version, and are described in the report, *Draft CalEnviroScreen 4.0: Update to the California Communities Environmental Health Screening Tool*.

The pages below summarize changes between the tool's 4.0 and prior 3.0 versions. More detailed information on the proposed changes and a full description of each indicator are provided in the draft report.

Exposure Indicators

Indicator	Improvements
Air Quality: Ozone	The air monitoring data used in this indicator have been updated to reflect ozone measurements for the years 2016–2018. The measure for draft CalEnviroScreen 4.0 is the average daily maximum ozone concentration. This is the same method used for version 3.0. Ozone concentrations for census tracts with centers more than 50 kilometers from an air monitor were assigned the value of the nearest air monitor.
Air Quality: PM2.5	The air monitoring data used in this indicator have been updated to reflect PM2.5 measurements for the years 2015–2017. For the monitoring site near San Ysidro, data were available only for 2015 and part of 2016. Data from nearby sites were used to estimate missing values. Satellite data were used in combination with land use, meteorology data, and ground-level-monitor data to generate data about PM2.5 concentrations. Previously, satellite data at a 10-km square grid resolution were used to estimate PM2.5 concentrations for census tracts with centers more than 50 kilometers from the nearest PM2.5 air monitor. The PM2.5 estimates for draft CalEnviroScreen 4.0 were generated from a 1-km square grid layer, blending measured monitor concentration data with 1-km square satellite grid cell data. Grid cells closer to monitors received a higher weight from measured monitor concentrations, while grid cells further away received higher weight from satellite estimates. PM2.5 concentration data for census tract centers more than 50 kilometers from the nearest PM2.5 monitor were based solely on satellite data.
Diesel Particulate Matter	Diesel PM emissions data were updated to reflect measurements for the year 2016. Emissions data from sources of diesel PM in Mexico near the US are also included in this update. Diesel PM emissions estimates are for 1-km square grid cells that account for most of the state. In the previous version of CalEnviroScreen, these grid estimates were for 4-km square grid cells. As was done in Version 3.0, draft CalEnviroScreen 4.0 grid estimates were calculated using only the populated areas of each census tract (populated census blocks). While CalEnviroScreen 3.0 represented diesel PM emissions in kilograms per day for a 2012 summer day in July, draft CalEnviroScreen 4.0 estimates emissions for the entirety of 2016. Estimates are modeled from on-road emissions for a typical summer week in July, and from non-road emissions modeled for the year 2016. Results are reported in US tons per year.

To account for additional diesel PM emissions from sources on the Mexico side of the US-Mexico border, in San Diego and Imperial Counties, modeled diesel PM emissions data were compared with data from air monitoring of nitrogen oxides (NO_x), a proxy for diesel PM. Based on a comparison of data for modeled diesel PM emissions to measured concentrations of NO_x, modeled diesel PM data were adjusted upward at the border area near Calexico. Data for modeled diesel PM in San Diego County did not need to be adjusted.

Statewide, there have been decreases in diesel PM emissions from both on-road and area-based sources between 2012 (the base year for CalEnviroScreen 3.0) and 2016. In addition to decreases in actual emissions, there have been improvements in California Air Resources Board's (CARB) modeling approach, which include changes in certain spatial surrogates used to allocate area-based sources. Statewide, estimates of area-based emissions have decreased by approximately 50%, with sources from certain vehicle types undergoing even greater reductions.

Drinking Water Contaminants

The Drinking Water Contaminants indicator uses information on the quality of drinking water that is delivered by community water systems, as well as the boundaries of the geographic areas served by the systems. Along with community water systems and state small water systems, draft CalEnviroScreen 4.0 now incorporates data about water quality for 12 tribal areas.

Of the approximately 2,945 community and state small water systems, 2,933 had service area boundaries. This area represents all community water systems statewide and includes about 90 state small water systems reported in the California Safe Drinking Water Information Systems database. The drinking water indicator for draft CalEnviroScreen 4.0 incorporates 438 additional community water system service area boundaries. These boundaries were downloaded from the Water Boundary Tool from Tracking California (formerly the California Environmental Health Tracking Program). The boundaries in the tool were either obtained from water providers, or researched and drawn by OEHHA or Tracking California staff, using maps or other information about the people served by the system.

The methodology used to reflect the quality of delivered water was also improved for draft CalEnviroScreen 4.0 by selecting sample locations to represent delivered water and by collecting updated information on how much water wholesale water suppliers provide to their customers.

Water contaminant data from 2011–2019 were collected, representing the most recent compliance period (3 years of monitoring) and cycle (9 years of monitoring). A systematic approach was used to select regulated contaminants based on detections in drinking water, toxicity

concerns and frequency of systems with tests for the contaminants, with the result that data for haloacetic acids and ethylene dibromide were added to the indicator. Independent uranium and radium 226/228 measures were replaced with measures of gross alpha particle activity, which indicate total radioactivity in water (from uranium, radium 226, and other alpha-emitting radionuclides), for better data coverage across the state. Lead concentration data from monitoring were replaced with the 90th percentile lead concentration data submitted to the State Water Resources Control Board (SWRCB) under the Lead and Copper Rule for Drinking Water. Values below detection limits for all contaminants were treated as zero results.

Lastly, in this next draft version of CalEnviroScreen, the drinking water indicator will include more data on the ambient groundwater layer from the Groundwater Ambient Monitoring and Assessment (GAMA) Program. The chart below indicates the GAMA projects used in CalEnviroScreen 3.0, and those proposed for use in version 4.0.

GAMA Program	CalEnviroScreen 3.0	CalEnviroScreen 4.0
Monitoring Wells (Water Board Regulated Sites)	No	Yes
Local Groundwater Projects	No	Yes
Public Water System Wells	Yes	Yes
California Department of Water Resources	No	Yes
GAMA - Domestic Wells	Yes	Yes
National Water Information System (NWIS)	No	Yes
GAMA - Priority Basin Project	Yes	Yes

Children's Lead Risk from Housing

For draft CalEnviroScreen 4.0, OEHHA proposes adding an indicator to identify areas where children may be exposed to lead through lead-based paint used in older homes. The proposed indicator of children's lead risk from housing was calculated using the percentage of households within a census tract with a likelihood of lead-based paint (LBP) hazards due to housing age, combined with the percentage of low-income households with children.

To determine whether households have a likelihood of containing LBP, weighted age categories were developed using the construction period

for each housing unit (HU) in the census tract (see table below). Parcel data from Digital Map Product's SmartParcels were used to determine the age of construction of HUs, and American Community Survey (ACS) data for census tract estimates were used when parcel data were unavailable.

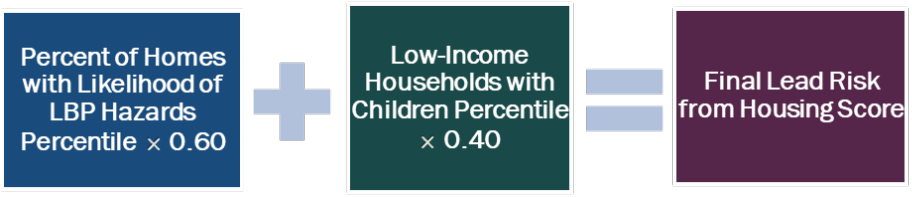
Age of HUs, using parcel data (year built)	Age of HUs, using ACS data** (year built)	HUs with LBP hazards *(%)
after 1998	after 1999	0
1978-1998	1980-1999	4
1960-1977	1960-1979	22
1940-1959	1940-1959	69
before 1940	before 1940	71

*The age of housing categories and LBP hazard weights come from the HUD 2001 and Jacobs et al., 2002 studies.
**ACS estimates were matched as closely as possible to the parcel data categories.

The indicator of children's lead risk from housing is similar to the indicator used by the Washington Tracking Network's Lead Exposure Risk map, which factors in age of housing and poverty level to estimate lead exposure. Poverty is a known modifier of old housing-related lead exposure risk; it is also reasonable to assume that HUs in lower-income neighborhoods are less likely to have undergone renovations and abatements to reduce LBP than those in higher-income neighborhoods. OEHHA used the prevalence of low-income households in the proposed indicator instead of a direct measure of poverty to account for some of the geographical differences in living costs in California. This was further restricted to include only low-income households with children to examine the most vulnerable communities to lead exposure across California.

The low-income estimates for the children's lead exposure risk indicator are from the 2012–2016 Comprehensive Housing Affordability Strategy (CHAS) data available from the U.S. Department of Housing and Urban Development (HUD). This dataset contains information at the census tract scale that enables the calculation of the percentage of low-income households (those with household income lower than 80% of the county median household income) with one or more children under 6 years of age.

The percentage of HUs with a likelihood of LBP hazards and the percentage of low-income households with children were individually ranked and assigned percentile scores. The two measures were then combined as a weighted sum, with a weight of 0.6 assigned to old homes and 0.4 assigned to low income households with children. The sum is the final score for lead risk from housing.



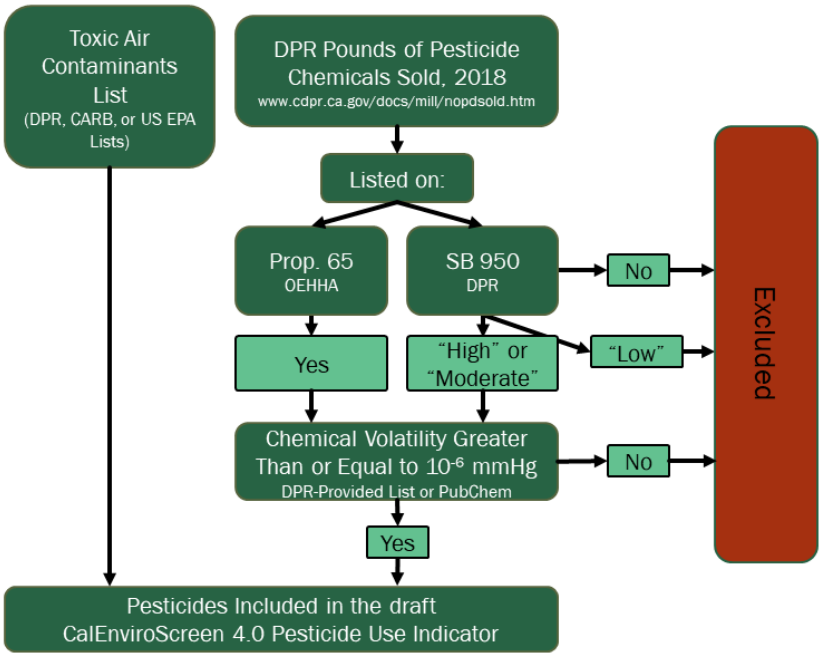
Certain assumptions, data gaps, and limitations within the data sets and indicator scoring methodology may affect the calculation of scores. For example, renovating an older home can abate lead exposure, but can also cause lead compounds to be dispersed into the air and soil around the home, potentially increasing lead exposure. Data on the effective year built, which is the building's age adjusted for significant renovations or neglect, were missing for most residential parcels statewide, and were not used in the analysis.

The focus for this particular indicator is exposure through lead paint used in the construction of older homes, and it does not attempt to capture other sources of lead exposure. Results of blood lead level testing released by California Department of Public Health (CDPH) in 2012 indicate that children have concerning levels of lead exposure across California. Data on children with elevated blood lead levels (EBLLs) are limited because universal testing of children for lead is not required in California and reporting of test results is constrained by health privacy laws. EBLLs have been found to be significantly associated with age of housing, income, race, and enrollment in public assistance programs. These factors have been used to screen for places that may be associated with children at high risk for significant lead exposure. Other indicators in CalEnviroScreen account for other possible sources of potential lead exposure such as the indicators for drinking water contaminants, toxic releases from facilities, and hazardous waste.

Pesticide Use

The Pesticide Use indicator was updated with reported pesticide use data for the years 2016–2018. OEHHA revisited the hazard and volatility-based pesticide selection criteria from CalEnviroScreen 3.0 to account for more recent data and updated information around hazard and volatility (see figure below). This indicator in CalEnviroScreen 3.0 and earlier CalEnviroScreen versions was based on the top 100 most used pesticide active ingredients (measured in pounds). For the proposed draft CalEnviroScreen 4.0 update, OEHHA evaluated the California Department of Pesticide Regulation's (DPR) list containing the

pounds used in 2018 for each active pesticide ingredient. The same hazard criteria from DPR's California Senate Bill (SB) 950 risk assessment prioritization of pesticides from 2011 were applied, along with an evaluation of pesticides on the Proposition 65 list as of March 2020. Pesticides meeting these hazard criteria were then evaluated based on their volatility. When available, data from DPR on volatility for each chemical were evaluated, along with data from PubChem and other scientific literature, when DPR data were not available. Several additional pesticides were included that were designated in California as Toxic Air Contaminants.



The draft CalEnviroScreen 4.0 includes 83 pesticide chemicals, compared to 70 pesticide chemicals in CalEnviroScreen 3.0. Of the 83 pesticide chemicals currently included in the analysis, 51 were included in the previous version and 32 are new. The data show increases in the total pounds used for 44 of the 51 pesticide chemicals previously included, while only six of the previously included chemicals saw a decrease in total pounds used. The top three pesticide active ingredients used in production agriculture accounted for in both CalEnviroScreen 3.0 and the draft CalEnviroScreen 4.0 remain the same: 1,3-Dichloropropene ("Telone"), metam potassium, and chloropicrin made up over 65% of the pounds accounted for in both versions.

OEHHA has explored the possibility of including data about non-agricultural pesticide use in CalEnviroScreen, where it has so far not

been addressed. OEHHA evaluated the DPR database on Pesticide Use Reporting (PUR) and examined the data on non-agricultural pesticide use (e.g., structural, applied by professional services, and used for vector control) as well as non-production agricultural use (e.g., on parks and recreational lands, rights-of-way, golf courses, water bodies, and cemeteries). Unlike production agricultural use data, which is available at the section (one -square mile) scale across California, data for these two categories (non-agricultural pesticide use, and non-production agricultural use) are only available at the county scale. Applying countywide data to census tracts is problematic, especially in larger counties or counties with both urban and rural areas and varied land uses. OEHHA investigated methods of using parcel data to assign application types to different census tracts (e.g., landscape maintenance, or structural pest control), but found data quality issues with both the PUR and parcel datasets. These factors prevented the inclusion of data on non-agricultural and non-production agricultural pesticide use in the indicator at this time.

OEHHA also investigated data from DPR on pesticide use at schools. This database had inconsistent reporting of pesticide volumes, as well as only partial coverage of data across public schools, and no coverage at private schools. For these reasons, OEHHA did not incorporate the schools data into the indicator at this time, although OEHHA will continue to work with DPR and local and county partners to better capture pesticide use near all sensitive receptors, including schools.

Toxic Releases from Facilities

Data from the Risk Screening Environmental Indicators (RSEI) of the U.S. Environmental Protection Agency (U.S. EPA) on toxicity-weighted concentrations of modeled chemicals that are released into the air were updated to incorporate an average of the emission data for the years 2014–2016.

As with CalEnviroScreen 3.0, data on toxic release emissions from Mexico were incorporated to address the data gap for cross-border pollution. Data from Mexico's Registry of Emissions and Pollutant Transfer (RETC, for its initials in Spanish) from the years 2014–2016 were incorporated into the RSEI model by Abt Associates, U.S. EPA contractors for the RSEI program. The locations of facilities reporting emissions to RETC were independently validated by San Diego State University researchers as part of a CARB contract to improve the quality of emissions data collected at the California-Mexico border.

Traffic Impacts

The draft Traffic Impacts indicator, previously known as the Traffic Density indicator, was updated with traffic volume estimates for 2017, and incorporates data from an updated roadway network. CalEnviroScreen 3.0 used 2013 traffic volume estimates. The traffic volume data for draft CalEnviroScreen 4.0 were acquired from TrafficMetrix®, a database of traffic volumes that includes estimates for

2017. Data about the updated roadway network was purchased from the location technology company TomTom. Modeling of traffic data on road segments without traffic counts was used to provide statewide coverage, following the same approach used in CalEnviroScreen 3.0.

To account for the impact of traffic at the California-Mexico border, 2017 data on traffic volume for trucks, buses and personal vehicles at six ports of entry were downloaded from the U.S. Customs and Border Protection website. The previous version of CalEnviroScreen used 2013 data. In addition, data about traffic impacts from parallel roads in Mexico that are within 150 meters of the California-Mexico border were included for the two major parallel roads in Tijuana (Via Internacional and Blvd. Aeropuerto), using the same data from the San Diego Association of Governments (SANDAG) that was used for CalEnviroScreen versions 2.0 and 3.0. Updated data for these roads were not located, and data for traffic volumes on parallel roads in Mexicali were also not located.

Environmental Effect Indicators

Indicator	Improvements
Cleanup Sites	The indicator has been updated with information on the location and status of cleanup sites from the EnviroStor database of the Department of Toxic Substances Control (DTSC), downloaded in March 2020.
Groundwater Threats	Updated information on the location and status of groundwater cleanup sites was downloaded from the State Water Resources Control Board's (SWRCB) GeoTracker database in March 2020. Data on one additional type of groundwater threat are proposed for inclusion in CalEnviroScreen 4.0. Data on dairies and feedlots classified as confined animal facilities and regulated by SWRCB have been added to the indicator. This is a response to concerns about potential impacts to groundwater and soil from nitrogen and other waste products from animal operations. Data for dairies and feedlots data were downloaded from the California Integrated Water Quality System Project database in March 2020. Data from sites were weighted based on animal population at the facility as a proxy for magnitude of the operation. Data about sites that were inactive or pasture-based were not included in the analysis, leaving data on approximately 1,500 dairies and feedlots to be included in the indicator. These data were analyzed based on facilities' distance to populated areas, as was done for data about other types of sites in the indicator. The proposed weighting of the data from these sites in relation to data from the other types of sites in this indicator can be

found in in the draft report, in the appendix of the chapter on Groundwater Threats.

Hazardous Waste Generators and Facilities

Data from hazardous waste generators were updated for the years 2017–2019 with information provided by DTSC. Updated information on the location and status of permitted hazardous waste facilities was also acquired from DTSC in April 2020. Numerous adjustments to data about permitted facility locations were made in this version, and more information about facility boundaries were also incorporated. Reported locations for the facilities were checked, and the information adjusted, by Dr. James Sadd and his research team at Occidental College, who provided it to OEHHA.

A minor change to the scoring matrix for hazardous waste facilities was also made. Compliance history data are now a component of permitted facility scoring. OEHHA worked with DTSC during its California SB 673 (Permitting Criteria) process, and used data from the Violations Scoring Procedure (VSP) to assign scores to facilities with a high number of violations in a rolling 10-year period. OEHHA assigned additional weights to data from facilities that fell within VSP Compliance Tiers of "Conditionally Acceptable" or "Unacceptable." The new facility scoring weights can be found in the appendix of the Hazardous Waste Generators and Facilities section in the report.

One additional type of hazardous waste site has been included in this update. Data from chrome plating facilities were added, as these facilities are generators of hazardous waste, and have discharges of concern due to their impact on both air and water. CARB maintains a list of about 150 chrome plating facilities for monitoring purposes, and OEHHA has used facility-level data on annual permitted amperage-hours as a proxy for size. Facilities were classified as small, medium, or large based on permitted amperage-hours. Data from chrome plating facilities were analyzed based on the facilities' distance from populated areas, as was done for data from other types of sites in this indicator. The new facility scoring weights can be found in the appendix of the Hazardous Waste Generators and Facilities section in the report.

To account for cross-border pollution, OEHHA identified one brick kiln in Mexico within 1 kilometer of a community in California. Due to pollution concerns, but without data on the volume of waste generated, this brick kiln was classified as a large hazardous waste generator. The location of this site was independently validated by San Diego State University researchers as part of a California Air Resources Board contract to improve the quality of emissions data collected for the California-Mexico border area (Contract number 16RD010).

Impaired Waters

SWRCB released its Final 2014/2016 California Integrated Report (Clean Water Act Section 303(d) List /305(b) Report) on impaired water bodies in 2018. This 2014/2016 version updates data from Regions 2

(San Francisco), 3 (Central Coast), 4 (Los Angeles), 5 (Central Valley), 8 (Santa Ana), and 9 (San Diego). This Impaired Waters indicator update includes new information from the SWRCB 2014/2016 report for these regions. Data for Regions 1, 6, and 7 remain the same as in CalEnviroScreen 3.0.

OEHHA evaluated the indicator scoring, and investigated alternative methods of characterizing data from the SWRCB Integrated Report. Data on combinations of beneficial-use-impaired per water body and pollutant were researched, but OEHHA found that inconsistent reporting of these data across regions led to unreliable results. For draft CalEnviroScreen 4.0, OEHHA used the same method for counting unique pollutants per census tract used in CalEnviroScreen Version 3.0.

Solid Waste Sites and Facilities

Updated information on (1) active solid waste sites, (2) closed, illegal, or abandoned waste sites, (3) waste tires and (4) violations at solid waste facilities was obtained from California's Department of Resources Recycling and Recovery (CalRecycle) in March 2020. Data about scrap metal recyclers that were active from 2017–2019 were obtained from DTSC. These data were all incorporated into draft CalEnviroScreen 4.0.

To account for cross-border pollution, OEHHA identified one closed solid waste site in Mexico within 1 kilometer of a community in California. This site was classified the same way as a closed solid waste site in CalRecycle's database and was assigned the same weighted score. The location of this site was independently validated by San Diego State University researchers as part of a CARB contract to improve the quality of emissions data collected for the California-Mexico border area (Contract number 16RD010).

In response to California SB 1383, CalRecycle will regulate anaerobic digestion facilities that help to divert food waste from landfills, and reduce emissions from short-lived climate pollutants such as methane. Data from these facilities were scored in the draft version of CalEnviroScreen 4.0 based on regulatory tier, volume of waste accepted per day, and violation history. The new scoring weights for data from these facilities can be found in the appendix of the Solid Waste Sites and Facilities section in the report.

Sensitive Population Indicators

Indicator — Improvements

Asthma

The Asthma indicator has been updated with data for the years 2015–2017, and represents the age-adjusted and spatially modeled rates of emergency department (ED) visits for asthma, as calculated by Tracking California. These rates were modeled using frequencies of ED visits for

asthma as identified by International Classification of Diseases (ICD) codes. Since the previous version of CalEnviroScreen was issued, the ICD has been updated from version 9 to 10. Because ICD-10 was fully implemented in 2015, this indicator uses ICD-9 for part of 2015, and ICD-10 for the remainder of 2015, and for the following two years. ICD-10 is a significant improvement on ICD-9, largely in its greater specificity, expandability, and reflection of current diagnostic practice. It has been suggested that this change could contribute to a disagreement between classifications under ICD-9 and ICD-10, but it does not appear to have affected draft CalEnviroScreen 4.0 results. Indeed, the correlation between scores for the asthma indicator for CalEnviroScreen 3.0 and draft 4.0 is very high.

Cardiovascular Disease: Heart Attack Rate

The Cardiovascular Disease (CVD) indicator has been updated with data for the years 2015–2017 for rates of ED visits for heart attacks. The Office of Statewide Planning and Research supplied data on the frequency of ED visits for acute myocardial infarction by ZIP code. ZIP codes are the smallest geographic unit available for ED data. Tracking California first calculated rates at the ZIP code scale. These rates were then age-adjusted and spatially modeled to the census tract scale to produce a three-year average.

Because these data were modeled from ED visit frequencies identified from ICD codes for CVD, like asthma ED data, they may have been affected by the 2015 change from ICD version 9 to ICD-10. This indicator uses ICD-9 codes for the beginning of 2015, and ICD-10 codes for the remainder of 2015, as well as 2016 and 2017. This change, while an improvement in methods, could result in less agreement between classifications under ICD-9 and ICD-10. However, the correlation between scores for the CVD indicator for CalEnviroScreen 3.0 and 4.0 is very high.

Low Birth Weight Infants

The draft CalEnviroScreen 4.0 indicator for the percentage of low birth weight (LBW) infants uses data from more recent years (2009–2015). As in CalEnviroScreen 3.0, the indicator relies on calculated (not modeled) rates over 7 years of birth data, and excludes tracts with fewer than 50 births over the 7 years. Estimates derived from places with few births are considered unreliable because they often produce extreme values, and can vary greatly by year. The use of 7 years of birth data allows for larger sample sizes per tract, which offer more stable and accurate estimates than if fewer years of data are used.

Socioeconomic Factor Indicators

Indicator	Improvements
Educational Attainment	The indicator has been updated with 2014–2018 estimates from the American Community Survey (ACS) for the percentage of the population that had not attained a high school degree. The methods for analyzing the data and excluding unreliable estimates are the same as those used for CalEnviroScreen 3.0.
Linguistic Isolation	The indicator has been updated with 2014–2018 estimates from the ACS for the percentage of limited English-speaking households. The methods for analyzing the data and excluding census tracts with unreliable estimates are the same as those used for CalEnviroScreen 3.0.
Poverty	The indicator has been updated with 2014–2018 estimates from the ACS for the percentage of the population living below half the federal poverty level. The methods for analyzing the data and excluding census tracts with unreliable estimates are the same as those used for CalEnviroScreen 3.0.
Unemployment	The indicator has been updated with 2014–2018 estimates from the ACS for the percentage of the population over age 16 that is unemployed and eligible for the labor force. The methods for analyzing the data and excluding census tracts with unreliable estimates are the same as those used for CalEnviroScreen 3.0.
Housing-Burdened Low-Income Households	The indicator has been updated with 2012–2016 estimates from HUD's CHAS data. The measure is the percentage of households in a census tract that are both low income, and severely burdened by housing costs. The methods for analyzing the data and excluding census tracts with unreliable estimates are the same as those used for CalEnviroScreen 3.0.