Assessment of Environmental Health Data in the California – Baja California Border Region

California Environmental Health Tracking Program

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Solicitation No. SOLTA14-008

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Executive Summary

The California-Baja California border region is connected by a common cultural history, family ties, ecological resources, and economy. The region is characterized by its rapid population growth, the movement of people and goods across the border and throughout the region, and industrial activities, all of which present environmental challenges unique to this region.

These environmental challenges, coupled with underlying population vulnerabilities in the region, greatly impact public health. In order to improve overall health of the region, more efforts are needed to collect and report environmental health data, develop interventions to improve the environment and community health, and evaluate these interventions over time to most positively impact health. Specifically, we found that:

Many sources of environmental hazards uniquely impact the California border region
- Air pollution continues to be a pervasive hazard in the border region with myriad sources, such as traffic, industrial pollutants, unpaved roads, and drying seabeds
- Climate change may seriously impact health, given the border region's hot and dry climate, existing environmental hazards, and community vulnerabilities
- Many areas in the border region, particularly in rural communities, continue to experience high levels of drinking water contamination
- Traffic is an important pollution source in the border region and is very concentrated at border crossings and in urban areas of San Diego County

Because of these environmental hazards and underlying population vulnerabilities, many residents continue to experience poorer than average health outcomes
- Asthma continues to severely impact residents of Imperial County
- Imperial County has very high rates of heat-related illness, likely a result of the combination of high heat, limited infrastructure to deal with extreme heat, and population vulnerabilities (such as a high proportion of outdoor laborers or low income)
- Lead exposures continue to decrease, though compared to the California average, the prevalence of young children with elevated blood lead levels is nearly two-fold in Imperial County and slightly elevated in San Diego County

Better data will be imperative in the future to track, intervene upon, and monitor ongoing environmental health conditions in the California-Baja California border region
- Better data are needed to track, predict, and assess the impacts of climate change on health, likely one of the greatest public health challenges in the coming decades
- There is a need to collect data on the location of and contamination in water sources, public drinking water systems, and well water, especially in rural communities
- Valley fever is likely underreported, but will continue to pose a serious health risk into the future
- Birth defects data are not systematically reported in Imperial and San Diego County
- Pesticide illness and exposure data are likely underreported, and not currently amenable to assessing long term health effects
- Broadly speaking, environmental health data from Baja California were commonly limited or not readily accessible, making it difficult to draw broad conclusions

Ongoing and systematic environmental health surveillance networks are fundamental to assessing health status over time, conducting research, developing health programs and targeted interventions, evaluating those programs, and ultimately improving public health. Although environmental health data are collected on both sides of the border, data are often collected by different agencies, at varying geographic resolutions, and reported with diverse metrics that may not be comparable across time or geographic borders. Though environmental health data collection and reporting requires better coordination across jurisdictions, the data should also remain responsive to community health needs. In our assessment of available data resources, we found that:

- **Data metrics were often inconsistent, making data comparisons difficult throughout the border region.** Establishing consistent data standards for the region would allow for more meaningful data comparisons and consistency in data metrics over time. These data standards should reflect regional data needs, and be responsive to local community priorities as well.
- **Data were often not accessible to users.** For maximum data accessibility, it is essential that data are publicly available to users with varying levels of technical expertise, and in a machine-readable format that is easy to extract, transform, and process.
- **Data documentation was often limited or non-existent.** Standardized codebooks, data dictionaries, and metadata are essential for increasing data accessibility.
- **Data from sub-state and sub-county/municipality geographies had limited availability**. Greater efforts should be made to collect and report data at geographies that are relevant to local communities, while ensuring that data privacy is protected in these communities.
- **Greater coordination among agencies would allow for datasets to be accessed from a centralized hub.** Environmental health surveillance programs and open data portals can better serve users from a single centralized data system.

Environmental Health in the California-Baja California Border Region

Overview

Data are essential for describing the state of environmental health in the California-Baja California Border region and understanding how it compares to the surrounding region. Although environmental health data are collected on both sides of the border, data are often collected by different agencies, at varying geographic resolutions, and reported with diverse metrics that may not be comparable across time or geographic borders. Coordinated binational environmental health surveillance will better capture the region's environmental health status, inform public health interventions, and allow the evaluation of border health initiatives. Though environmental health data collection and reporting would benefit from better coordination across jurisdictions, the data should also remain responsive to community needs.

The purpose of this report is to:
1. Present an assessment of environmental health data and trends that have been highlighted as priority needs along the California-Baja California border region
2. Identify data gaps and needs in existing environmental health datasets
3. Provide recommendations to more systematically share environmental health data along the U.S.-Mexico border region

California-Baja California Border Region

The California-Baja California border region is connected by a common cultural history, family ties, ecological resources, and economy. The region has experienced rapid population growth, the frequent movement of people and goods across the border and throughout the region, and industrial activity, all of which present small and large-scale environmental issues unique to the area, such as the shrinking of the Salton Sea and pollution in the New River. In addition, communities along the entire border region face consistently higher rates of unemployment, poverty, chronic disease, and percent uninsured.[1] These challenges will have the greatest impact on disadvantaged, underserved, and vulnerable communities, such as children, the poor, women, and the elderly living in the Border Region. Impacted communities will likely continue to face many of these challenges into the future, and grapple with important emerging hazards, such as climate change. Building coordinated and systematic environmental health surveillance networks will be fundamental for assessing these changes over time and positively impacting public health.

Population Growth

Across the entire U.S.-Mexico border from 2000 to 2010, the population increased 12% on the U.S. side of the border, and by 18% on the Mexico side of the border (rates higher than each country's respective national increase).[2,3] Within the California-Baja California border region, there are over 6 million residents, accounting for over 40% of the entire U.S.-Mexico border's population.[4] The population of the California-Baja California region is expected to increase to over 9 million individuals by 2030.[5] Population growth will continue to put pressure on the environment and environmental health, impacting air quality, water services and wastewater treatment, and natural habitats.

Economic Growth and Environmental Hazards

The border region has been marked by large increases in economic integration and cross-border trading over the past several decades, especially with the onset of the North American Free Trade Agreement (NAFTA) in 1994. The growth has been so rapid that by 2006 the number of maquiladoras—industrial facilities along the border region operating within a free-trade zone—more than doubled compared to

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pre-NAFTA, with the majority operating in Mexico. Major industries in the area, such as agriculture, generate environmental hazards like pesticides, dust, particulate matter from agricultural burning, and water pollutants from livestock operations. The rapid economic growth has contributed greatly to myriad sources of pollution in the region, including facility emissions, shipping, and diesel truck traffic and idling.[6]

Overall, trade has increased over 266% between Mexico and the U.S. since 1994, furthering economic opportunity and population growth along the border region.[4] However, this growth has also led to increases in truck shipments across the border, higher demand on limited natural resources, and hasty development to support rapidly growing communities. These challenges impact traffic, air quality, waste production and disposal, and water quality.[6]

*Emerging Environmental Health Challenges*
In addition to the challenges represented by the region's rapid growth, the California-Baja California region will continue to face unique environmental health challenges in the near and distant future. Climate change will have a variety of impacts that will affect communities, the environment, and the economy. The border region is most starkly defined by its arid landscape, and limited water resources will continue to drive demographic, economic, and political processes. Rising seas, warming temperatures, and changes in precipitation and upstream snowpack will all impact water scarcity, and significant hydrologic stress has been predicted by the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT).[4] Some of the challenges related to climate change will directly impact health (such as heat illness), while others may result in socioeconomic shifts that drive overall health vulnerability and resilience (such as changes in industry, employment, and migration patterns). These challenges will disproportionately impact the most vulnerable and disadvantaged communities throughout the border region.

This report assesses demographic, health, and environmental data sources for the California-Baja California region. For each content area discussed in this report, its relevance to environmental health is explained, various available indicator data are presented, and data gaps are highlighted. Indicators were chosen based on their overall relevance to environmental health surveillance, data availability, and feedback from border health experts from governmental, academic, and non-governmental organizations (NGOs) in the U.S. and Mexico. Recommendations are then given on how to better integrate environmental health surveillance across the U.S.-Mexico border.

Geographic and Demographic Overview
The California-Baja California border is, at 150 miles, the shortest section of the nearly 2,000 mile U.S.-Mexico border. It is also the most densely populated border region, with over 6 million residents. In 2010, over 25 million vehicles and nearly 15 million pedestrians crossed a port of entry (POE) in California-Baja California, and over $41 billion USD worth of goods were shipped through the region.[7]

The California-Baja California border region is defined as jurisdictions in California and Baja California within 100 kilometers of the border. This includes San Diego and Imperial Counties in California (note: we have excluded for purposes of data collection very small portions of Orange and Riverside County that fall within the 100 km region), and includes the municipalities of Playas de Rosarito, Tijuana, Tecate, and portions of Mexicali and Ensenada. A detailed map of the study area is shown below (Map 1).

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Map 1. California-Baja California border region and border crossings
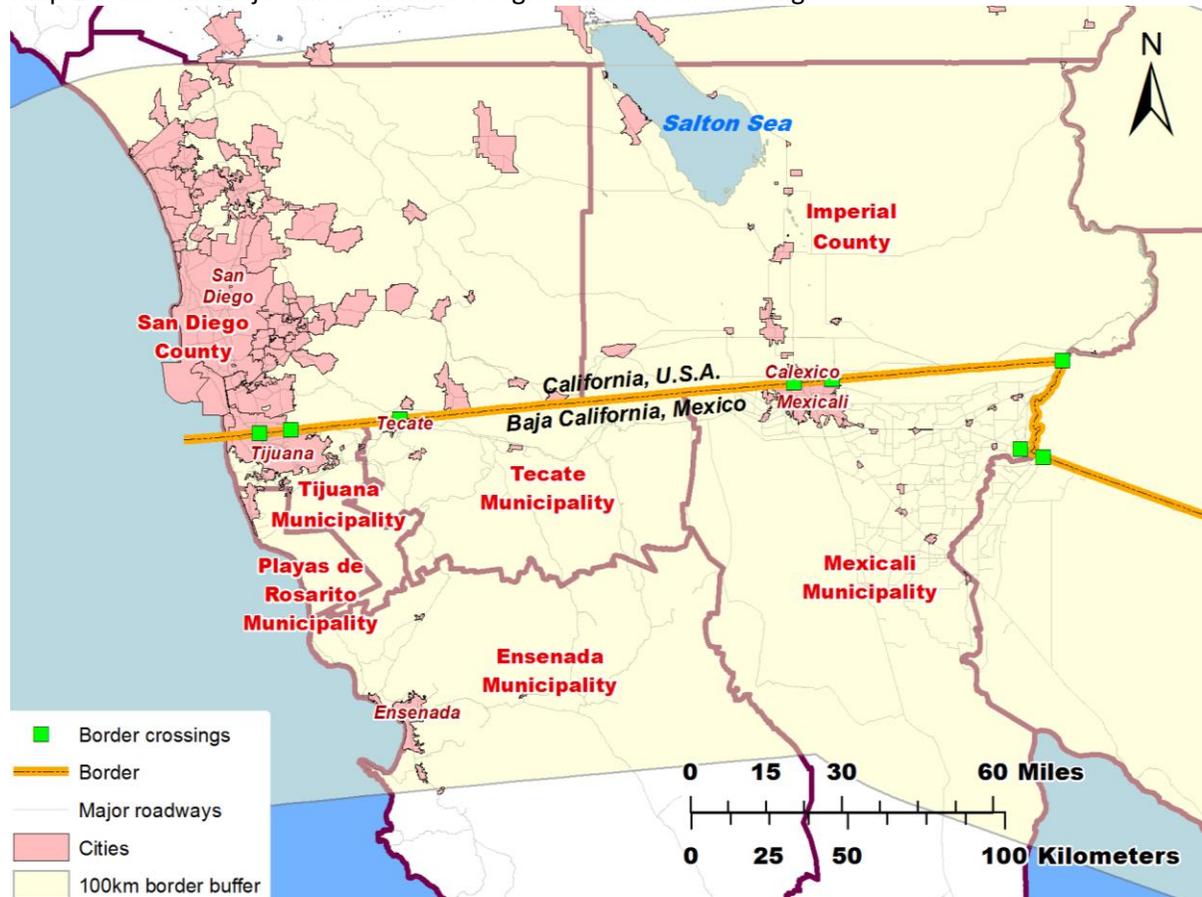
Source: U.S. Census Bureau - https://www.census.gov/geo/maps-data/data/tiger-line.html. Instituto Nacional de Estadística y Geografía (INEGI) - http://www.inegi.org.mx/est/scince/scince2010.aspx.

Social and economic factors greatly impact a community's health and well-being, as well as their preparedness and response to environmental hazards, natural disasters, and climate change. In the U.S., San Diego County has higher median income, higher educational attainment, and lower poverty rates compared to California (Table 1 and Figure 1). Imperial County has much lower median income and lower educational attainment compared to the state and San Diego County (Figure 1 and Figure 2). Over 80% of Imperial County self identifies as Hispanic or Latino, and nearly a third of residents speak English 'less than very well'.[i]

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[i] Speaking English less than "very well" is a metric used by the U.S. Census to describe level of English fluency

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Table 1. Demographic data from the California border region

	Imperial County	San Diego County	California
Total population (2010)	174,528	3,095,313	37,253,956
Hispanic or Latino, any race (2010)	140,271	991,348	14,013,719
Not Hispanic or Latino (2010)	34,527	2,103,965	23,240,237
Income & poverty (2012)			
Median household income (US$)	$41,255	$63,373	$61,400
Persons below poverty	23.0%	13.9%	15.3%
Percent uninsured	21.6%	17.1%	17.8%
Speak English less than 'very well' (2012)	31.6%	16.1%	19.6%

Source: U.S. Census Bureau - http://factfinder.census.gov/.

Figure 1. Percent of population (25+ years) by educational attainment in California border region, 2012

Source: U.S. Census Bureau - http://factfinder.census.gov/.
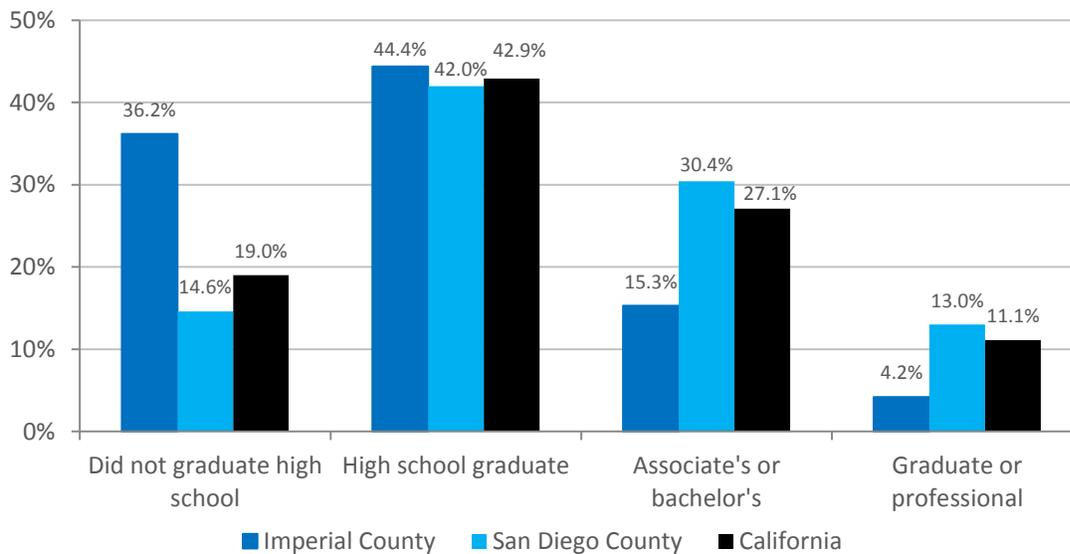
Figure 2. Percent of persons below poverty in the California border region, 2012

Source: U.S. Census Bureau - http://factfinder.census.gov/.
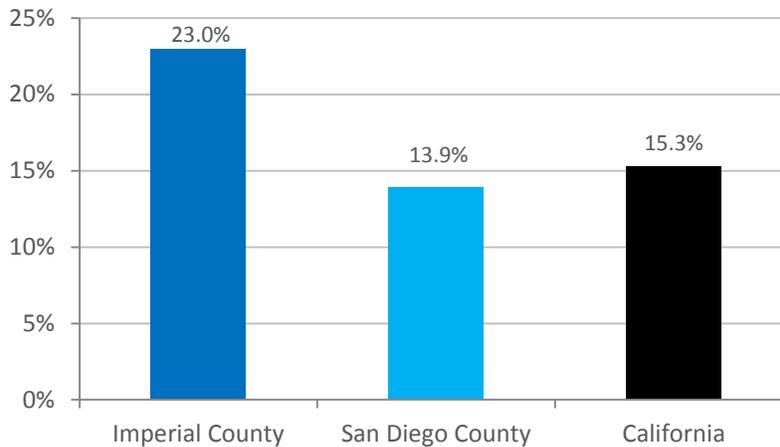
The majority of the Baja California border region population resides in urban areas in Tijuana and Mexicali. Literacy rates in Baja California are much higher compared to Mexico as a whole, and municipalities in Baja California also tend to have higher education rates compared to the rest of Mexico (Table 2). Overall, residents in Baja California tend to have better economic outcomes compared to Mexico as a whole, though rates of income below the minimum well-being line[ii] and access to healthcare services vary by municipality. Though direct comparisons cannot be made between U.S. and Mexico census data, the demographic data are useful to describe underlying community vulnerabilities that may result from income, race, education, poverty, and other social factors that impact health and well-being.

Table 2. Demographic data from the Baja California border region, 2010

	Ensenada	Mexicali	Playas de Rosarito	Tecate	Tijuana	Baja California	Mexico
Total population	466,814	936,826	90,688	101,079	1,559,683	3,155,070	112,336,538
Population 6+ years old that can't read/write	6.1%	3.5%	4.2%	3.8%	3.5%	3.9%	7.8%
Average years in school for population 15+ years	8.9	9.6	8.5	8.9	9.2	9.3	8.6
Population with income below minimum well-being line	12.0%	9.0%	8.5%	4.8%	10.2%	9.8%	19.4%
Population without health services access	27.2%	29.4%	37.9%	27.9%	41.0%	35.1%	31.8%

Source: Instituto Nacional de Estadística y Geografía - http://www3.inegi.org.mx/sistemas/biinegi/. Consejo Nacional de Evaluación de Política de Desarrollo Social - http://www.coneval.gob.mx/Medicion/Medici%C3%B3n/Tablas-dinamicas-municipales.aspx.

[ii] The 'minimum well-being line', or 'Linea de Bienestar Mínimo', is essentially used in the same way as the poverty line in U.S. demographic data.

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Overview of Select Environmental Health Indicators & Data Reporting

The following select environmental health data indicators were chosen to provide an overview of environmental health conditions in the California-Baja California border region based on the authors' experience operating the California Environmental Health Tracking Program (see inset below), as well as from interviews conducted with content area experts with extensive knowledge, experience, and expertise in border health issues.[iii] Some environmental health indicators were given lower reporting priority if they were already included in other Border 2012 and Border 2020 initiatives (such as indicators in the 2010 report "State of the Border Region Indicators Report", though there are some data overlaps). The totality of these initiatives is crucial for gaining a broad understanding of environmental health along the U.S.-Mexico border.

Health Indicators	Environmental Indicators
Asthma	Air Contaminants
Cancer	Climate Change
Coccidioidomycosis – Valley Fever	Drinking Water Quality
Heat-Related Illness	Green Spaces and Parks
Cardiovascular Disease	Pesticide Use
Lead Exposures	Traffic
Maternal and Infant Health	Toxic Emissions
Pesticide Exposure and Illness	

Data and data infrastructure are typically more available along the U.S. side of the border, thus most sub-state/sub-country data reported here are from the U.S. When feasible, efforts were made to collect data from Mexico that were relevant to the prioritized environmental health content areas, as well as to identify data gaps. Data are reported for the most recent year of data available at the time of this assessment. Data comparisons are typically not possible between California and Baja California due to variations in priority health outcomes, data metrics, collection, and reporting. Data indicators presented here are not exhaustive of all data available, but were curated from disparate sources to provide an overview of environmental health in the region.

As noted throughout the report, data are often unavailable at the neighborhood or sub-county/sub-municipality level, a common gap for health and environmental health data, particularly in rural communities. This limits the ability to assess indicators in local communities, or to assess specific population vulnerabilities, in the absence of more robust, systematic, and ongoing data collection and reporting. However, public health research has consistently shown the disproportionate impact of various environmental hazards on low-income communities, communities of color, and specific subpopulations such as children, the elderly, individuals with pre-existing health conditions, and pregnant women. These disproportionate impacts and risks for specific populations are noted throughout the report.

[iii] Interviews were conducted with experts from governmental, academic, and non-governmental organizations to better identify environmental health challenges, data resources available, and data needs along the California-Baja California border. Interviewees included April Fernandez (Chief of the Border Health Office, California Department of Public Health), Dr. Margarito Quintero Núñez (Institute of Engineering - Universidad Autónoma de Baja California), and Joy Williams (Research Director at the Environmental Health Coalition).

How to Find More Detailed Data
Many users will want more detailed data to better fit their needs. Metadata—the more detailed description of data sources, data metrics, and data quality and limitations—are included as an appendix to this report (see *"Appendix: Metadata for Health and Environmental Data Indicators"*). A core component of environmental health surveillance is maintaining and updating detailed and accessible metadata documents. The metadata and this final report can serve as a guiding template in future efforts to update and catalogue available environmental health data along the U.S.-Mexico border region.

In addition, by going to the primary data sources documented in the metadata, data users can collect their own data to make it more useful for their needs. For example, many maps displayed in this document are either available online in a dynamic format, or the data can be downloaded for use in geographic information system (GIS) software. Screenshots displayed in this report are intended to provide the reader with a sample of the data that are available to them. For greater access to these data, the reader is encouraged to access the tools in their dynamic online form.

California Environmental Health Tracking Program

The California Environmental Health Tracking Program (CEHTP) improves public health by providing information on environmental health hazards and outcomes. CEHTP integrates environmental, health, and other data sources to improve the utility of public health data and to inform public health policy and practice.

CEHTP makes data available on a variety of environmental hazards that may impact children's health, including traffic, air pollution, water quality, and pesticides. For more information on CEHTP, visit www.CEHTP.org. Visit www.cdc.gov/ephtracking to learn more about the National Environmental Public Health Tracking Program.

Asthma

SUMMARY FINDINGS
- The border region has many environmental hazards related to asthma, including high traffic and air pollution, dust, and agricultural and industrial activities
- Rates of asthma emergency department visits and hospitalizations continue to severely impact residents of Imperial County

Asthma is a disease that affects the lungs. It is the most common chronic disease among children in the U.S. and impacts over 5 million Californians. Asthma is characterized by ongoing inflammation of the lining of the lung passages. This inflammation can be asymptomatic, or at other times the lung passages may undergo spasms resulting in coughing, chest tightness, and wheezing. The severity of those symptoms can range from mild to life-threatening. The World Health Organization estimates that 44% of asthma may result from environmental exposures.[8] Many hazards in our environment contribute to and can exacerbate asthma, including air pollution, dust, agricultural burning, and various household hazards (such as indoor mold, pests, pet dander, and household chemicals).

Lifetime prevalence of asthma indicates the extent of asthma diagnoses throughout the region (Figure 3), while emergency department (ED) visit rates (Figure 4) and hospitalization rates (Figure 5) are better indicators of active asthma and asthma severity. Asthma ED visits and hospitalization rates are consistently higher in Imperial County compared to both San Diego County and California, and childhood asthma prevalence rates in Imperial County have consistently been among the highest in California. There are starkly higher rates of asthma ED visits for Black and Hispanic children in San Diego compared to White children (Figure 6), and asthma rates remain very high for all ethnicities in Imperial.

Figure 3. Lifetime asthma prevalence in the California border region - children age 0-17 years, 2001-12
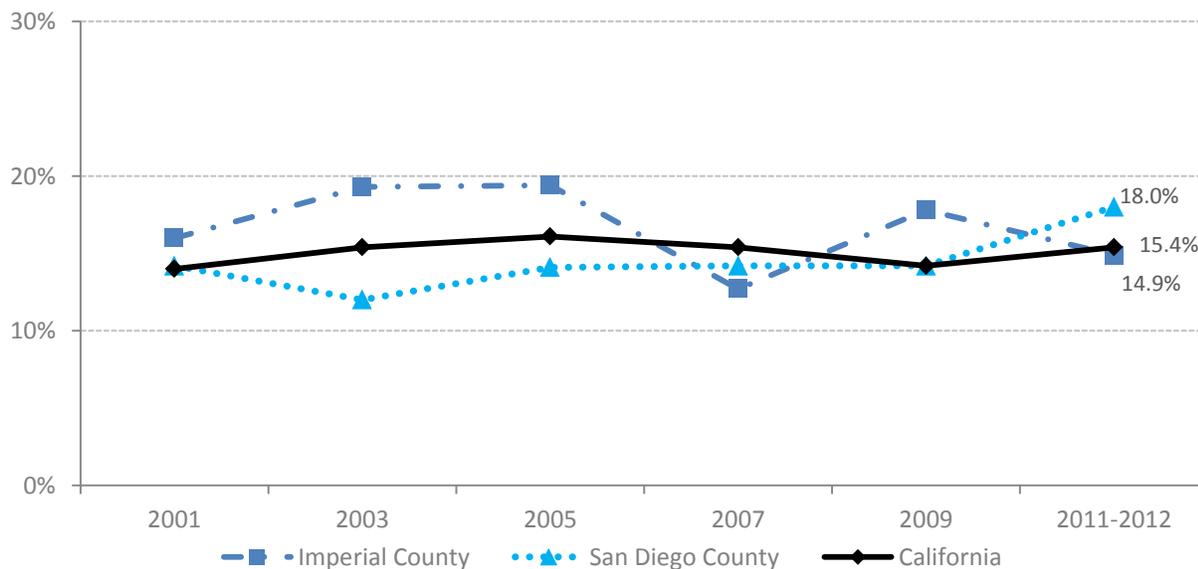
Source: UCLA Center for Health Policy Research, California Health Interview Survey - http://www.chis.ucla.edu.

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Figure 4. Asthma ED visits in the California border region - all ages, 2005-12
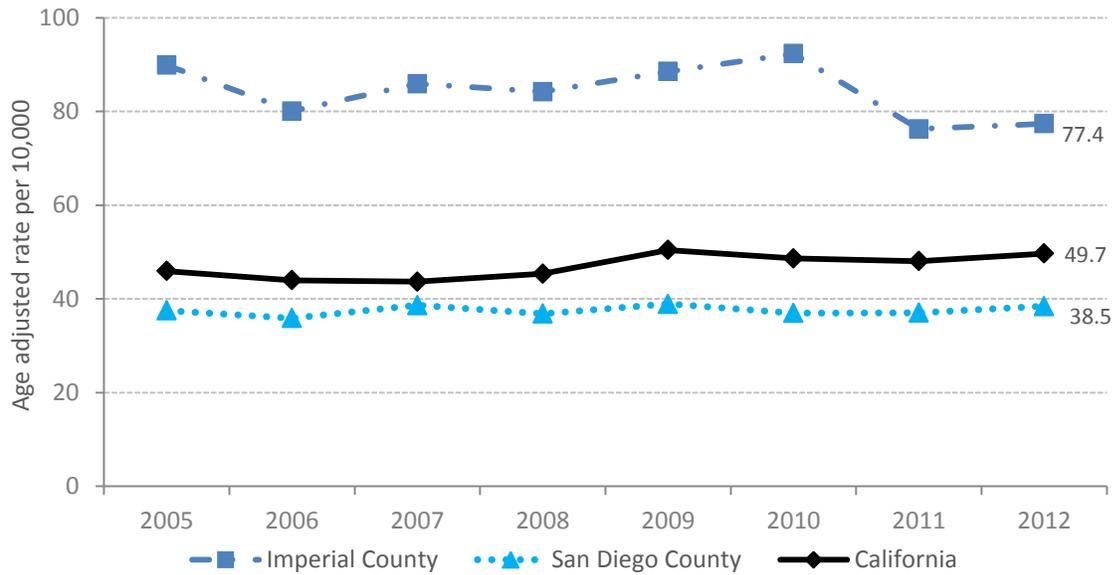
Source: California Office of Statewide Health Planning and Development. Accessed at www.cehtp.org/p/asthma.

Figure 5. Asthma hospitalizations in the California border region - all ages, 2000-12
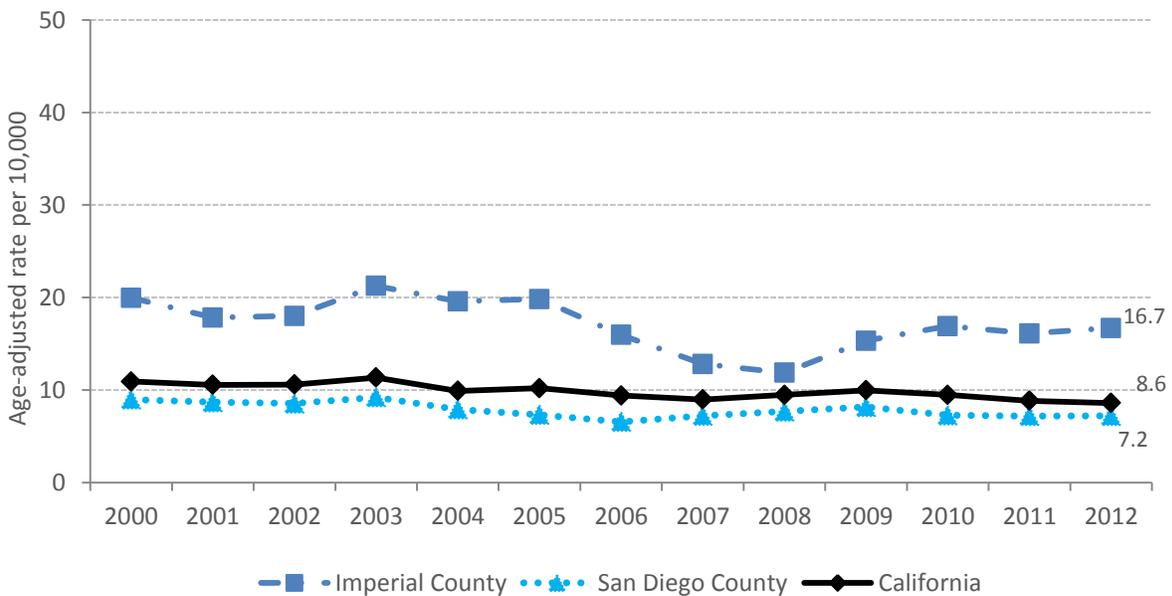
Source: California Office of Statewide Health Planning and Development. Accessed at www.cehtp.org/p/asthma.

Figure 6. Asthma ED visits among children (age 5-17 years old) by race/ethnicity, 2012
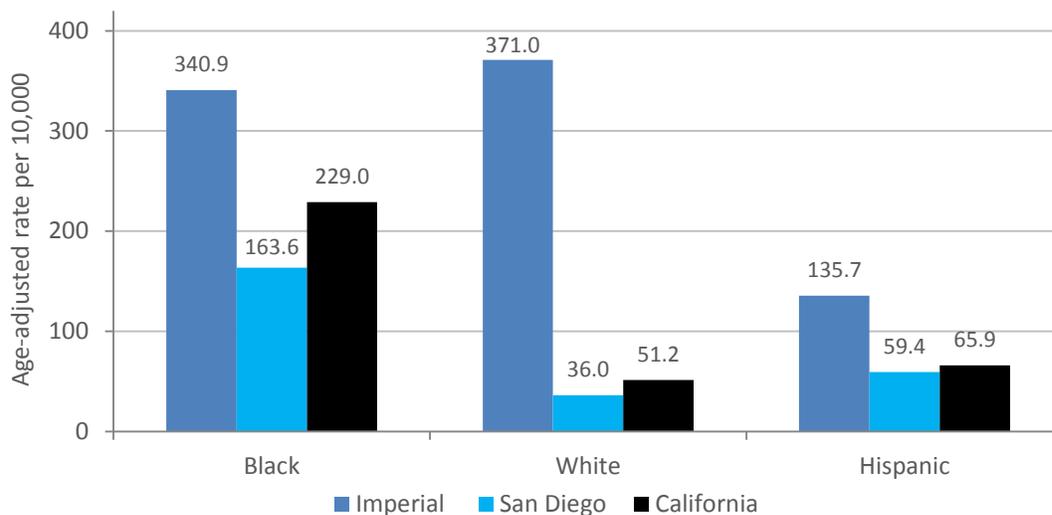
Source: California Office of Statewide Health Planning and Development. Accessed at www.cehtp.org/p/asthma.

Rates of clinical asthma diagnosis have been increasing in Baja California, while rates in Mexico have held fairly steady (Figure 7). These rates are not adjusted by age. Rates of clinical diagnosis are not publicly available at the municipality level. Data from Mexico cannot be compared to U.S. prevalence data, as asthma incidence is only reported by first, second, and third tier health facilities, and there is some uncertainty as to variations in diagnosis and/or case definition.

Figure 7. Asthma incidence rates in Baja California and Mexico - all ages, 2005-12

Source: Sistema Nacional de Vigilancia Epidemiológica - http://www.epidemiologia.salud.gob.mx/anuario/html/anuarios.html.
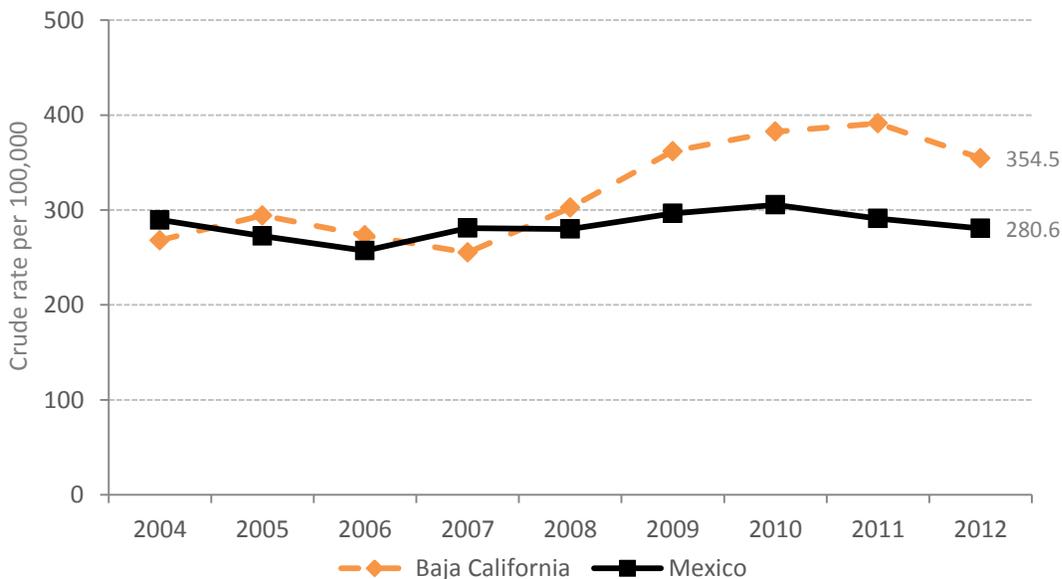
Cancer

SUMMARY FINDINGS
- Incidence rates of cancer are, overall, relatively similar in the border region compared to California, with some small differences both higher and lower for several cancer types
- Variations in cancer rates may result from differences in the demographics (such as age), environmental exposures, genetics, and/or the complex relationship amongst these factors

Cancer is the general name for a large and diverse group of diseases characterized by cells that grow out of control with the potential to spread to other parts of the body. If untreated, cancer may lead to serious illness and death.

A combination of factors may play a role in the development of cancer, including genetics, the environment, and parental exposures. Associations have been observed between various cancers and many environmental factors, including indoor radon; diagnostic x-rays and CT scans; prenatal exposures; house paint, glue, and solvent exposures; high levels of nitrate in drinking water; secondhand smoke; residence on a farm; pesticides; air pollution; and occupational hazards.[9,10,11] Exposure to carcinogenic compounds can occur at many points throughout one's life, from parental exposure at the time of conception, to childhood and adult exposures before the time of diagnosis, and exposures that may occur at home, work, and elsewhere in the community.

The incidence rate of various selected cancers for which research has indicated some relation to environmental hazards are shown in Table 3. Because the incidence of some cancers is relatively rare, data are aggregated into a 5-year period to allow for stable incidence rate estimates. With the exception of kidney cancer, the incidence rate of diagnosed cancers in Imperial County is slightly lower or the same compared to California. It is unknown why there may be a lower incidence rate for some cancers, though there may be some residents who travel to Mexico for cancer diagnoses and/or treatment, or it could be indicative of a generally younger population (for whom cancer is a less frequent health outcome). The incidence rate of breast cancer is slightly elevated in San Diego County compared to California, while others are generally similar to slightly higher.

Table 3. Incidence rate of select cancers (per 100,000 persons), 2007-11

	Imperial County	San Diego County	California
Bladder	13.5	18.5	18.8
Breast, female only	99.7	129.7	122.4
Kidney	19.1	14.9	14.2
Leukemia	11.5	12.7	12.4
Liver & bile duct	9.2	9.1	9.2
Lung & bronchus	45.2	51.4	49.5
Non-Hodgkin lymphoma	15.7	19.2	18.9
Thyroid	9.4	11.8	11.4

Source: California Cancer Registry. Accessed at http://www.cancer-rates.info/ca/index.php.

Incidence rates of these selected cancers were not readily available at the municipality level in Baja California. Data were easily accessible for breast cancer (female only) incidence in Baja California, where the incidence rate was 8.8 cases per 100,000 persons in 2012, lower than national average in Mexico of 17 cases per 100,000 persons (Sistema Nacional de Vigilancia Epidemiológica, http://www.epidemiologia.salud.gob.mx/anuario/html/anuarios.html).

Coccidioidomycosis - Valley Fever

SUMMARY FINDINGS
- Valley fever is a serious illness that may increase in frequency with climate change, and incidence should be tracked into the future, though cases may be underreported
- Though there are fewer cases in the border region compared to some Central Valley counties, valley fever will continue to be a risk throughout the border region

Coccidioidomycosis, also known as valley fever, is an illness caused by the fungus *Coccidioides*. The fungus lives in the soil and is found in parts of the southwestern United States, Mexico, and Central and South America. People can be exposed to valley fever by inhaling fungal spores in the air and may experience flu-like symptoms or pneumonia. Some patients develop a chronic lung infection, an infection that spreads to other tissues, and other complications that can lead to severe disability or death. Some populations – including individuals older than 60 years, those with weakened immune systems, pregnant women, and Black and Filipino populations – are at higher risk for valley fever.[12]

The environment's impact on the distribution and prevalence of valley fever is still under investigation. Data suggest that the spores grow best in soils after a heavy rain and disperse most effectively during hot, dry conditions. Scientists believe that climate change has the potential to increase the prevalence of valley fever, as rainfall is expected to have periods of greater intensity coupled with subsequent heat events. Soil-disturbing construction activities may increase the release of these spores into the air; this may place certain occupations (farmers, construction, outdoor laborers, etc.) at greater risk for exposure.[13,14]

The incidence rate of confirmed valley fever cases in 2013 in California was 8.6 cases per 100,000 persons. The reported incidence in Imperial and San Diego is much lower, at 2.2 and 2.9 cases per 100,000 persons, respectively. Many valley fever experts believe confirmed cases are underreported, potentially due to a lack of symptoms or misdiagnosis.[15] Rates of valley fever diagnoses over time are shown in Figure 8 (note the unreliable estimates in Imperial Valley, a common occurrence in rural areas). Data on the incidence of valley fever in Baja California were not available.

Figure 8. California county-specific coccidioidomycosis rates - all ages, 2009-12

Source: California Department of Public Health - http://www.cdph.ca.gov/healthinfo/discond/Pages/Coccidioidomycosis.aspx.
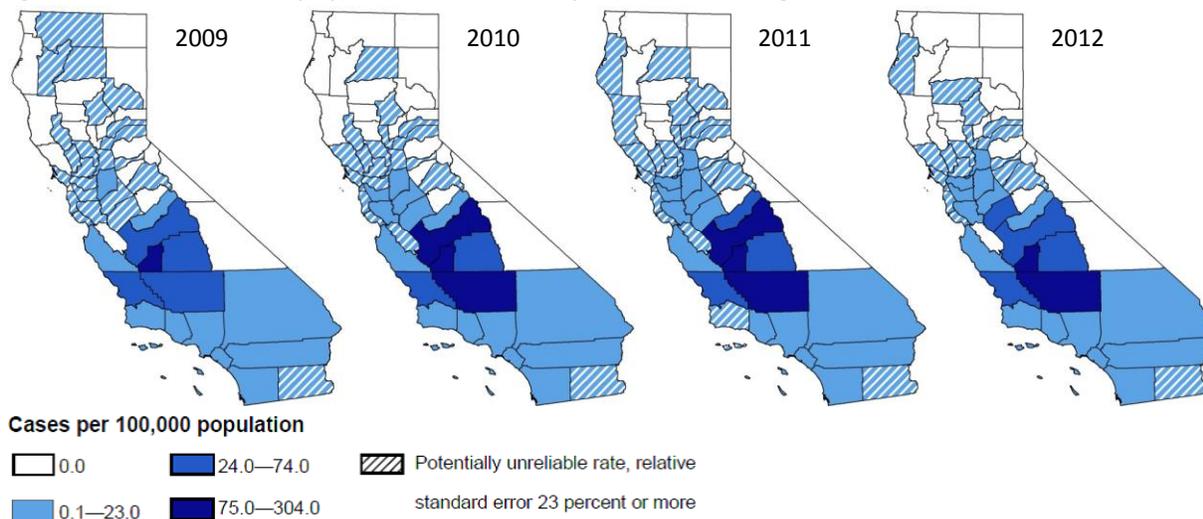
Heat-Related Illness

SUMMARY FINDINGS

- Heat-related illnesses are expected to be an emerging public health priority as climate change continues over the coming decades
- Imperial County has very high rates of heat-related illness, likely a result of the combination of high heat, limited infrastructure to deal with extreme heat, and underlying population vulnerabilities (such as a high proportion of outdoor laborers or low income)

People suffer from heat-related illness when the body's natural temperature controls become overwhelmed. The health impacts of extreme heat events range from mild heat cramps to death, and damage can be done to an individual's brain or other vital organs. Certain populations, such as elderly people living alone, face much greater health risks during heat waves.[16] Climate change and our built environment (defined as the constructed spaces in which people live, work, learn, and play) both contribute to extreme heat. The effects of extreme heat are already being felt and are expected to increase over time. During the 2006 California heat wave, there were 16,166 additional ED visits and 1,182 additional hospitalizations than usual in the state.[17]

Emergency department visits and hospitalizations due to heat are consistently much higher in Imperial County compared to San Diego County and California (Figure 9 and Figure 10), and this pattern is consistent amongst all age groups (Figure 11). This may be due to a combination of factors, such as more intense heat events, less infrastructure to deal with extreme heat (such as shaded areas, air conditioning access, and/or cooling centers), a higher proportion of outdoor laborers, and/or other underlying population vulnerabilities (such as income, age, and/or transportation access).

Figure 9. Heat-related ED visits in the California border region - all ages, 2005-12
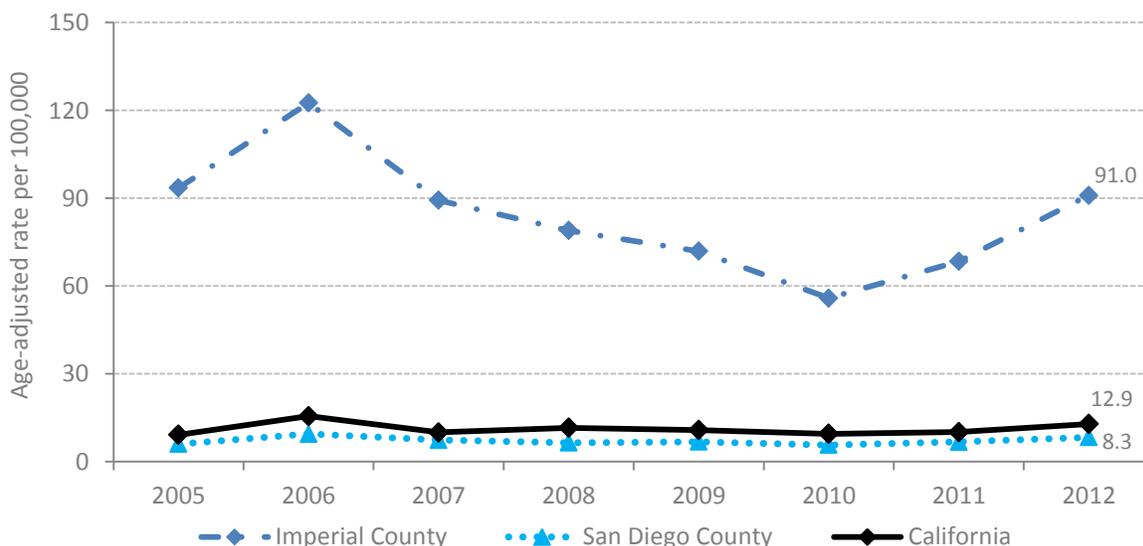
Source: California Office of Statewide Health Planning and Development. Accessed at www.cehtp.org/p/climate_change.

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Figure 10. Heat-related hospitalizations in the California border region - all ages, 2000-12
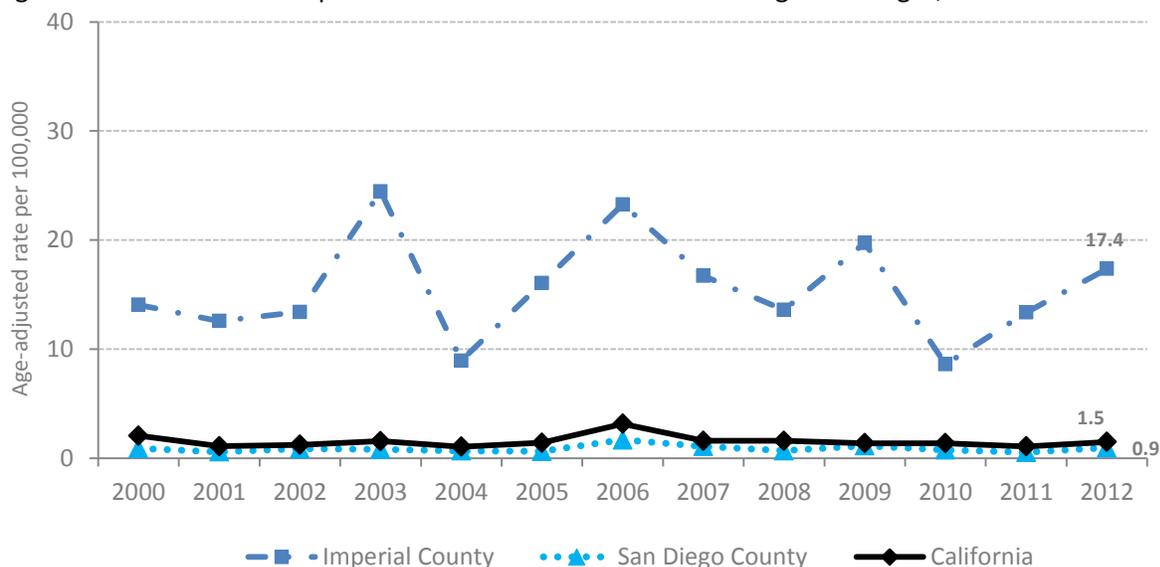
Source: California Office of Statewide Health Planning and Development. Accessed at www.cehtp.org/p/climate_change.

Figure 11. Heat-related ED visits by age group in the California border region, 2005-12
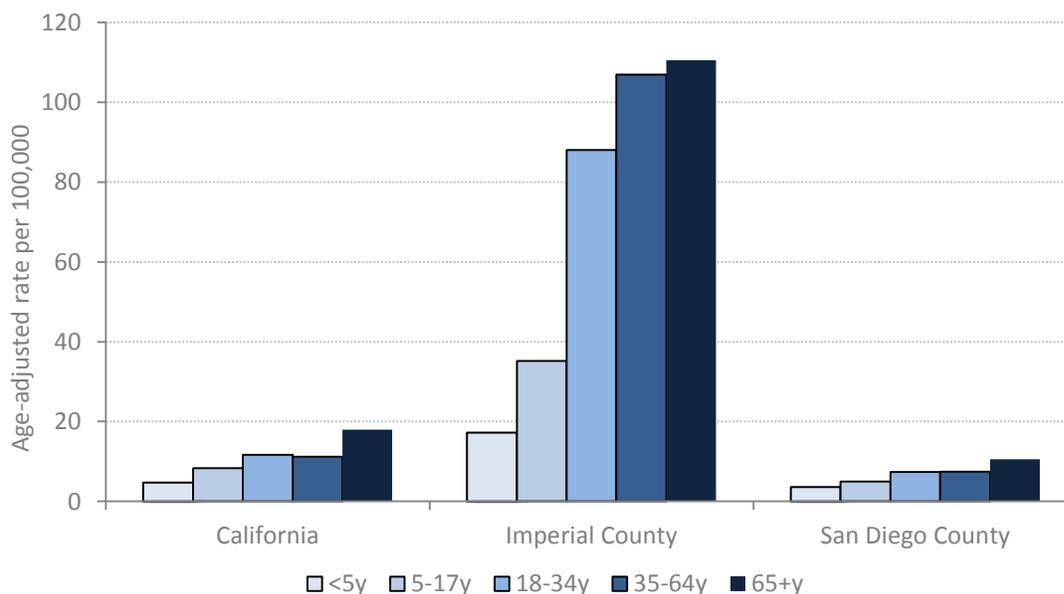
Source: California Office of Statewide Health Planning and Development. Accessed at www.cehtp.org/p/climate_change.

Data specific to heat-related illnesses were not available for Baja California. There are, however, some national measures of heat illness reported in weekly bulletins on extreme temperatures.[iv] Data are not summarized in a format that can be easily queried.

[iv] http://www.epidemiologia.salud.gob.mx/informes/informesh/2014/temperaturas/temperaturas-semanas.html

Cardiovascular Disease

SUMMARY FINDINGS
- Rates of cardiovascular disease have generally been decreasing throughout California
- Cardiovascular disease remains elevated in Imperial County compared to California

Cardiovascular disease (CVD) results from damage to the vessels that supply blood to the heart. If the vessel damage becomes severe enough to cut off blood flow or cause spasms in the arteries, a myocardial infarction (more commonly known as a heart attack) may occur. Cardiovascular disease is the leading cause of death in California and the nation, and the second leading cause of death in Mexico.[18]

CVD is associated with several environmental factors, including air pollution, chemical exposures, and environmental tobacco smoke. Air pollutants associated with CVD include ozone, particulate matter, carbon monoxide, and sulfur dioxide. These hazards result from multiple sources in the border region, including industrial emissions, shipping, traffic, dust, and agricultural practices. The elderly and patients with pre-existing illness will be more susceptible to environmental hazards related to CVD.[19,20]

The rate of hospitalizations from myocardial infarctions (MI) in 2012 is much higher in Imperial County (40.0 cases per 100,000 persons) compared to San Diego County (21.4 cases per 100,000 persons) and California (27.2 cases per 100,000 persons). Since the year 2000, hospitalizations from myocardial infarction have been decreasing across all three areas (Figure 12).

Figure 12. Hospitalizations due to MI in the California border region - adults (age 35+), 2000-12
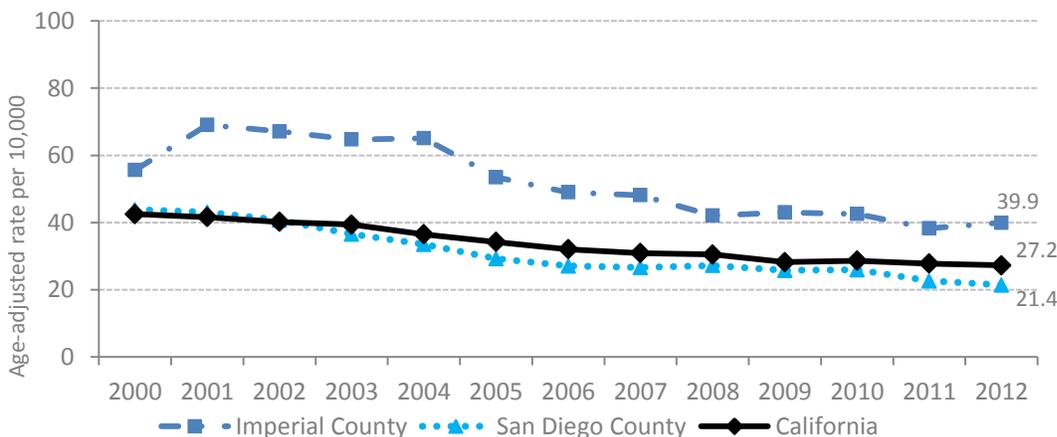
Source: California Office of Statewide Health Planning and Development. Accessed at www.cehtp.org/p/heart_attacks.

Data related to cardiovascular disease were not publicly available at the municipality level in Baja California. Data reported are for new cases of clinically diagnosed ischemic heart disease (because this is a different health indicator than "hospitalizations from MI", data from California and Baja California are not directly comparable). Incidence rates of ischemic heart disease were slightly higher in Baja California in 2013 compared to Mexico, 80.2 and 72.9 cases per 100,000 persons, respectively (Sistema Nacional de Vigilancia Epidemiológica, http://www.epidemiologia.salud.gob.mx/anuario/html/anuarios.html).

Lead Exposures

SUMMARY FINDINGS

- Lead exposures continue to decrease throughout California, though the prevalence of young children with elevated blood lead levels is nearly two-fold in Imperial County, and slightly elevated in San Diego County, compared to the California average

Lead is a natural mineral that has been used in many products and is harmful to humans. Although the United States has taken many steps to remove sources of lead exposure (it was banned from pain in 1977 and from gasoline in 1996), lead is still present in our environment. And there is no known safe level of lead in the blood, as measured by blood lead levels (BLL). Common sources of lead include lead-based paints from pre-1978, lead contaminated soil, lead contaminated dust from paint, take-home occupational exposures, and imported goods (such as cosmetics, household items, and food).[21]

Lead exposures can cause headaches, stomach aches, loss of appetite, and fatigue. Higher amounts of lead exposure can damage the nervous system, kidneys, and other major organs—very high exposures can lead to seizures or death. Lead poisoning is particularly harmful for a child's nervous system and brain, as they are still undergoing complex neurological and physiological development. It can lead to lifelong neurological impairments, learning difficulties, reduced IQ, and behavioral problems.[22,23,24] An assessment by the California Environmental Health Tracking Program found that lifetime costs resulting from lead exposures total $8-11 billion dollars for each annual birth cohort in California.[25]

In Imperial County in 2011, 4.8% of children <6 years old tested for elevated BLL had levels greater than 4.5 micrograms per deciliter of blood (μg/dL). In San Diego County, 3.1% of children <6 years old had elevated BLL; and in California, 2.5% of children below 6 year olds screened had elevated BLL. Tested BLL are generally decreasing, but Imperial County has consistently higher BLL (Figure 13). These data predominantly account for at-risk children who were most likely to be screened for elevated BLL, and the data do not reflect the total average burden of elevated BLL.

Figure 13. Percent of children (<6 years) with elevated blood lead levels above 4.5 μg/dL, 2007-11
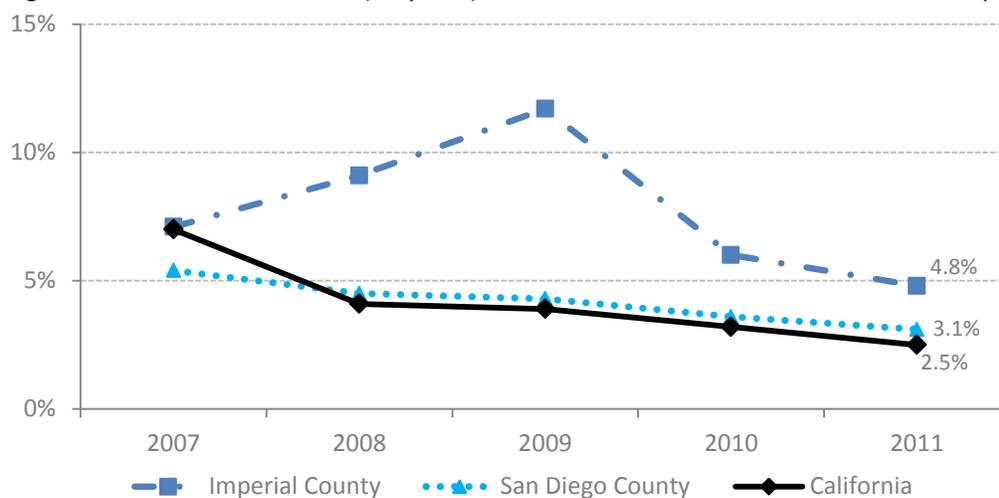
Source: California Lead Poisoning Prevention Program. Accessed at www.cehtp.org/p/lead.

In 1990, Mexico began phasing out leaded gasoline and introduced unleaded fuels.[26] Leaded gasoline was completely phased out in Mexico by 1997, but other means of exposure still exist. Lead paint, lead glazed pottery, and candies with lead are still widely prevalent in Mexico.[27,28] There is no national program that monitors lead exposures, so data are not available for average population BLLs in Mexico. Recent research suggests that lead exposure remains a national public health concern.[29]

Maternal and Infant Health

SUMMARY FINDINGS

- Rates of preterm birth and term low birthweight are similar in the border region compared to California averages
- Data on birth defects are not systematically reported in Imperial and San Diego Counties

Prematurity and growth retardation are commonly used as measures of maternal and infant health. Prematurity occurs when a baby is born too early. Infants are considered preterm when they are born before completing 37 weeks (about 8.5 months) of pregnancy. Growth retardation (or term low birthweight,) occurs when a fetus grows insufficiently while in the womb and is small for the child's gestational age. Infants that are born preterm or with a low birthweight are at higher risk of dying in the first year of life and of having developmental problems throughout life. Preterm birth and term low birthweight have been associated with various environmental hazards, including lead,[30] particulate matter,[31] pollution from diesel combustion,[32,33] and some pesticides.[34,35]

The prevalence of preterm birth is slightly elevated in Imperial County and California in comparison to San Diego County. These trends are consistent over time, with some slight decreases since 2007 (Figure 14). The prevalence of low birthweight is slightly lower in Imperial and San Diego Counties compared to California (Figure 15), and it's consistent over time.

Figure 14. Percent of births that are preterm in the California border region, 1996-2010
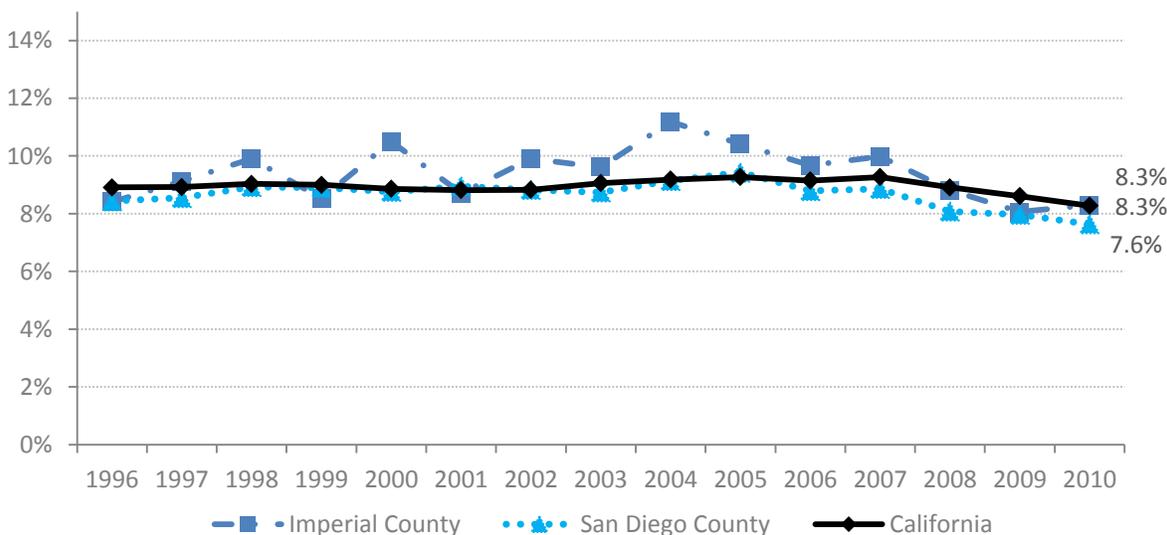
Source: California Department of Public Health, Office of Vital Statistics. Accessed at www.cehtp.org/p/mih.

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Figure 15.Percent of births that are term low birthweight in the California border region, 1996-2010
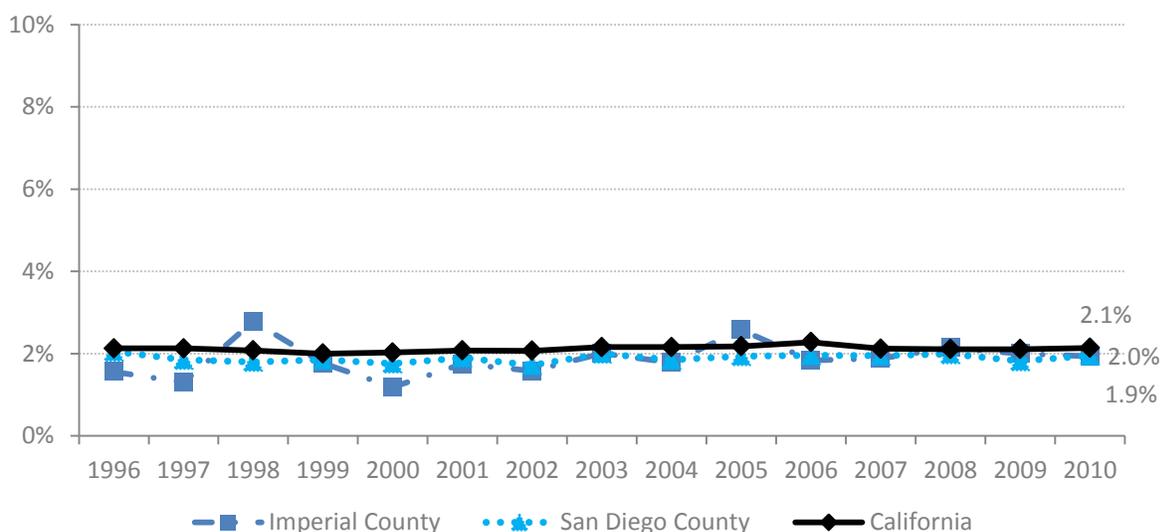
Source: California Department of Public Health, Office of Vital Statistics. Accessed at www.cehtp.org/p/mih.

Birth defects are another key indicator of infant health. Birth defects are one of the leading causes of infant death. Some birth defects, such as Down syndrome, can affect multiple organs. Infants born with birth defects may be at increased risk of premature birth, illness, and long term disability. Many birth defects are believed to have complex multiple causes, including both genetic and environmental factors, and scientists estimate that 60% of birth defects have causes that are unknown. More research is needed to understand the links between the environment and birth defects. Common environmental hazards that may be related to birth defects include air pollution, pesticides, arsenic, disinfection byproducts, plastics, and solvents.[36,37]

Data on birth defects are not systematically collected for San Diego and Imperial Counties (data in California are only available for 8 Central Valley counties).

There are some data available for birth defects and low birthweight in Baja California. Rates of anencephaly and cleft lip are elevated in Baja California compared to Mexico Table 4. In 2009 the proportion of low birthweight in Baja California (4.6%) was slightly lower compared to all of Mexico (5.2%) (data not shown). Data by municipality were not readily accessible.

Table 4. Birth defects in Baja California and Mexico, 2012

Birth defects per 10,000 children under 1yr (2012)	Baja California	Mexico
Anencephaly	4.0	1.1
Spina bifida	2.3	1.3
Cleft lip	5.4	6.3

Source: Sistema Nacional de Vigilancia Epidemiológica - http://www.epidemiologia.salud.gob.mx/anuario/html/anuarios.html.
Sistema Nacional de Información en Salud - http://www.sinais.salud.gob.mx/descargas/zip/anuario2009.zip.

Pesticide Exposures and Illness

SUMMARY FINDINGS
- Pesticide exposures and illness are likely underreported, and data are likely biased towards acute effects
- Pesticide illness data are not currently amenable to assessing long term health effects

Pesticides (including herbicides and insecticides) are a common environmental pollutant in many communities in California, particularly in agricultural areas. Over the past several decades there has been increasing research on the potential health effects associated with pesticide use. Pesticides have been associated with abnormal neurological development in children, attention deficit and hyperactivity disorder, reductions in IQ, and deficits in perceptual reasoning and memory.[38,39,40,41,42,43]

Pesticide exposure is more likely in places where people spend time in or near areas where pesticides are applied. (Exposure to pesticides can also occur through food consumption itself.) The potential for pesticide exposure is of particular public health concern amongst vulnerable groups, including individuals with pre-existing health conditions, such as asthma. The risk for exposure is elevated in many communities and among certain populations. An analysis of pesticide use near schools found that Hispanic children were 91% more likely to attend schools in the top quartile of nearby agricultural pesticide use.[44] Children from lower socioeconomic backgrounds (e.g., low-income children, ethnic minorities, or children subject to multiple environmental exposures) may experience stronger neurological effects from environmental hazards.[45,46]

Possible, probable, and definite cases of pesticide exposure are reported by the California Pesticide Illness Query (CalPIQ), an online database query from the California Department of Pesticide Regulations. In 2012, there were 11 reported cases (possible, probably, or definite) of pesticide illness in Imperial County, 60 in San Diego County, and 981 in California. Reporting is likely to be incomplete since not all pesticide exposures and illnesses will be diagnosed as such, and are likely underreported by those exposed. The reporting systems are biased toward acute effects of pesticide exposures that invoke the most immediate symptoms, rather than delayed acute effects or chronic health effects that may occur long after the pesticide exposures occurred.

In Mexico, pesticide exposures are reported as "pesticide intoxication" and are a reportable condition. Data are not publicly available at the municipality level. In 2012 in Baja California, the incidence rate of diagnosed pesticide intoxication was 0.48 cases per 100,000 persons, compared to 3.5 cases per 100,000 persons in Mexico (Sistema Nacional de Vigilancia Epidemiológica, http://www.epidemiologia.salud.gob.mx/anuario/html/anuarios.html).

Air Contaminants

SUMMARY FINDINGS
- Air pollution continues to be a pervasive hazard in the border region with myriad sources, such as traffic, agricultural and industrial pollutants, unpaved roads, and a drying Salton Sea
- Imperial County has more days each year classified as unhealthy to very unhealthy compared to San Diego County

Air contaminants are air-borne compounds that affect human health in both indoor and outdoor environments. Air pollution can negatively impact human health through both direct exposure of individuals (breathing in the compound) and the myriad health consequences that will result from global climate change. Air pollutants have wide ranging impacts on health, including poor birth outcomes, decreased lung function (including asthma and acute respiratory diseases), cardiovascular disease, and neurological effects.[47,48] The California Air Resources Board (CARB) estimates that air pollution causes around 9,200 premature deaths each year in California.[49] Children, the elderly, those with pre-existing health conditions (asthma, CVD, etc.), and those who are active outdoors are most susceptible to the negative health effects of air pollution.[48] In addition, low-income and communities of color often live closer to sources of air pollution, leading to disproportionate exposure.

Air contaminants can be divided into several broad categories based on their regulatory classification, impact, or source.
- Criteria Air Pollutants include six compounds regulated and monitored in California and by the U.S. EPA under the Clean Air Act. These compounds include ozone, particulate matter ($PM_{2.5}$ and PM_{10}), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and lead.
- Toxic Air Contaminants (TACs) and Hazardous Air Pollutants (HAPs) are compounds considered hazardous to human health and are designated at the state (TACs) and federal (HAPs) level. Together, TACs and HAPs include several hundred compounds, many of which are not regularly monitored and often lack data for ambient air concentrations.
- Greenhouse gases include air emission compounds that contribute to global warming.
- Indoor air contaminants are compounds prevalent in indoor environments, such as mold, volatile organic compounds, radon, environmental tobacco smoke, and others.

Major regional sources of air pollution include:
- Vehicular traffic, particularly near border crossings
- Off-road vehicles, unpaved roads, agricultural, and other dust-generating sources
- Environmental sources, such as the drying of the Salton Sea, which allow seabed dust to be carried into the air and contribute to poor air quality (these dust particles are also contaminated with agricultural and industrial waste products, such as pesticide residues)
- Emissions from agricultural, industrial, and shipping activities

The Air Quality Index is commonly used to convey how clean air is from the perspective of human health. In 2014, in comparison to San Diego County, Imperial County had more days with an AQI defined as unhealthy or very unhealthy.

Breakdown of AQI over total number of days in 2014

Imperial County   *San Diego County*

- **Good** (green)
- **Moderate** (yellow)
- **Unhealthy for Sensitive Groups** (orange)
- **Unhealthy** (red)
- **Very Unhealthy** (dark red)
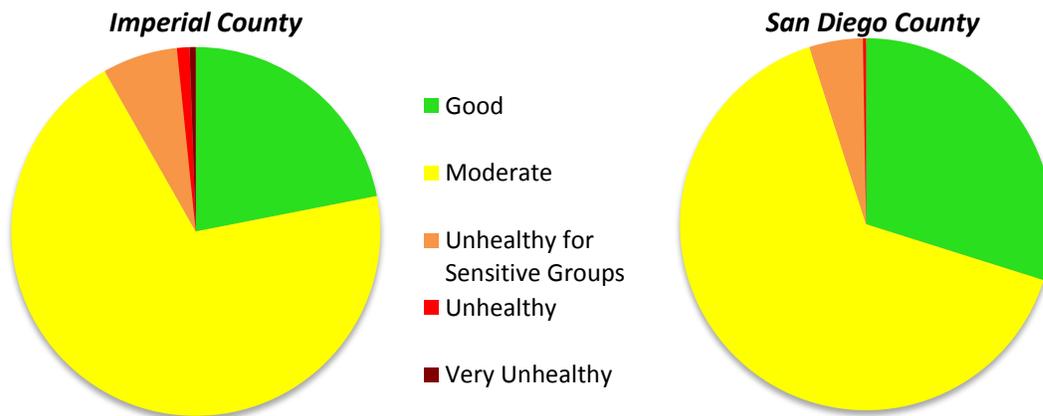
Source: U.S. EPA Air Quality Index Report - www.epa.gov/airdata/ad_rep_aqi.html.

CARB collects and distributes data on ambient air quality for California. In Mexico, analogous data are collected by the Secretaría de Protección al Ambiente de Baja California (SPABC – the State Secretariat of Environmental Protection) and reported to U.S. EPA for distribution.[50] Some concern has been expressed regarding the validity of data from current border area monitors in Baja California.[51] Particulate matter data by census tract and the locations of air monitors documented in U.S. EPA's AirData annual summary files are shown in Map 2.

Map 2. Percentile rank of particulate matter (PM$_{2.5}$) by census tract and location of air monitor sites

Particulate matter percentile by census tract
- < 25
- > 25 to 50
- > 50 to 75
- > 75
- Border
- PM monitors with data reported by EPA
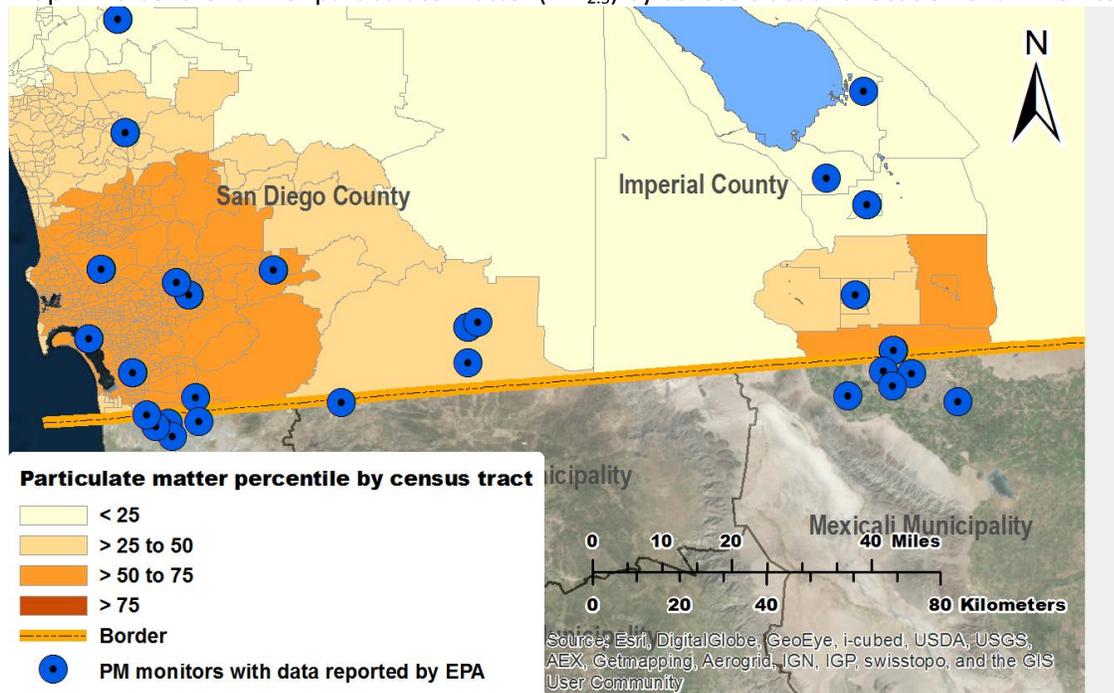
Sources: CalEnviroScreen 2.0 - http://oehha.ca.gov/ej/ces2.html. U.S. EPA AirData - http://aqsdr1.epa.gov/aqsweb/aqstmp/airdata/download_files.html.

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Emission inventories identify and catalogue sources of air pollution and are important for identifying ways to improve air quality. Sources may include stationary, area-wide, and mobile sources. For example, in 2012 in Imperial County, CARB estimated that 0.51 tons of $PM_{2.5}$ and 0.75 tons of PM_{10} were emitted by on-road motor vehicles per day (3.08 tons $PM_{2.5}$ per day and 5.96 tons PM_{10} per day were emitted in San Diego County).[52] CARB point source emissions data showed 41 emitters in Imperial County and 238 emitters in the San Diego County (U.S. EPA 2011 National Emissions Inventory, http://www.epa.gov/ttnchie1/net/2011inventory.html).

The emissions inventory for Baja California is collected by SPABC and made available via their website, which contains documents summarizing greenhouse gas emissions for Baja California[53] and an emissions inventory for the municipality of Mexicali.[54] However, there is no similarly accessible local-level dataset for particulate matter readily available online for Baja California.

Climate Change

SUMMARY FINDINGS
- Climate change may have very serious health impacts in the border region given its hot and dry climate, existing environmental hazards, and community vulnerabilities
- Data are needed to better track, predict, and assess the impacts of climate change on health

Climate change will have myriad health impacts beyond the likely substantial increase in heat-related illnesses and deaths. Other, more indirect health impacts may result from the degradation of drinking water supplies that can result from salt water intrusion from sea level rise. Broader disruptions in health, economic, and social systems may result from changes in ecological patterns and resource scarcity.[55] The migrations of human populations can be a particularly challenging event along any geopolitical boundary, but this movement of populations may also be an effective adaptation strategy to climate change.[56]

Climate change will impact air quality as increased temperatures and sunlight increase levels of dust and ozone. Increased temperatures and carbon dioxide levels may contribute to the increased production of allergenic pollens and mold spores. And intermittent patterns of heavy rain followed by elevated heat may also play a role in exposures to fungal spores that cause valley fever.

High temperatures, strong winds, and dry conditions that result from climate change will increase fire risks for some communities. Wildfires can cause significant declines in air quality and can also have severe impacts related to burns, smoke inhalation, displacement from one's home, and the traumatic stress of experiencing a disaster.

As the climate changes, extreme weather events are expected to occur more frequently. Examples include droughts, caused by a lack of precipitation, and floods, caused by an abundance of precipitation. Changes in water runoff patterns will alter food and water supplies (as witnessed in California's current drought) and may influence the spread of vector-borne diseases (e.g. dengue fever). Flood events can devastate communities and result in drownings, infections, displacement from one's home, and long-lasting health effects related to emotional stress and trauma.

The health effects of climate change are expected to have the greatest impact on children, the elderly, individuals with pre-existing conditions, and low-income communities. These populations may be more susceptible to infectious disease, have the greatest vulnerability during extreme weather events, and possess the fewest resources necessary to recover and adapt to such events.

Prospective data on projected environmental impacts, as well as analyses looking at past heat waves and other similar events, are needed to better understand which populations may be at greatest risk in the future. Though much more research is needed on climate change and health, there have been substantial data improvements in climate change projections.

Cal-Adapt, a site developed by UC Berkeley and California Energy Commission, provides information about how climate change might affect California at the local level by maintaining high resolution geographic data on climate change projections in California. Cal-Adapt predicts monthly and annual changes in temperature, precipitation, snowpack, soil moisture, humidity, wind, and fire risk over time. The models are produced using high and low emissions scenarios. Cal-Adapt includes average annual temperature projections through 2099 (Exhibit 1). As shown in the images below, the changes in

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temperature are expected to be greater in inland communities compared to coastal areas. More detailed data can be downloaded from the tool, and the user can select various options from within the queryable interface.

Exhibit 1. Cal-Adapt projections for change in annual average temperature from baseline to end of century for Imperial and San Diego Counties

San Diego County
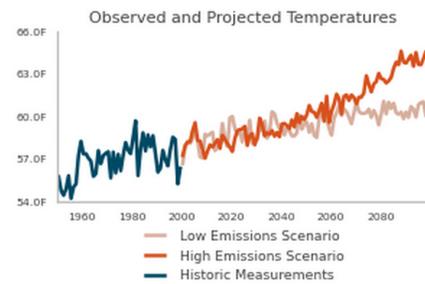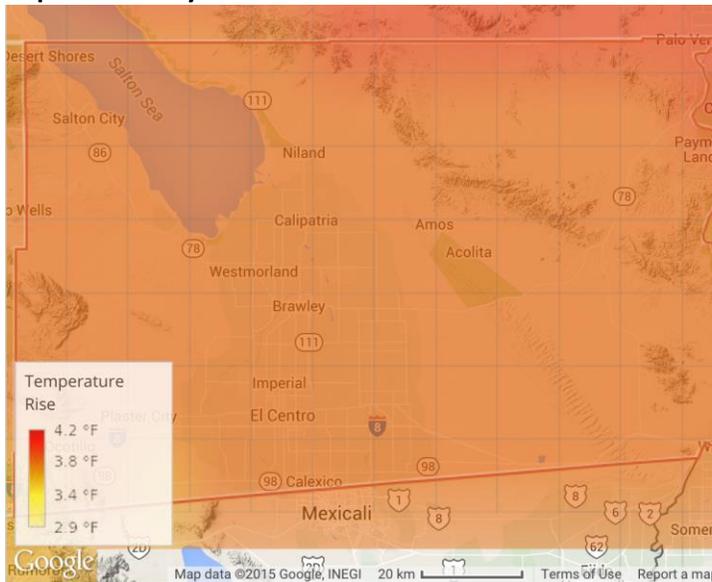
Imperial County

Source: Cal-Adapt, Local Climate Snapshots - http://cal-adapt.org/tools/factsheet/.

The Programa Estatal de Acción Ante el Cambio Climatico de Baja California (PEACC - Baja California's State Program of Action Against Climate Change) produces the Climate Database of Northwestern Mexico, a database for climate change in the region. Figure 16 shows projections for precipitation and

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temperature change for both B1 (low) and A2 (high) emissions scenarios (data shown are not available for download). Data from PEACC and Cal-Adapt are not directly comparable.

Figure 16. Average precipitation change and temperature change for B1 and A2 emissions scenarios

Precipitation projections
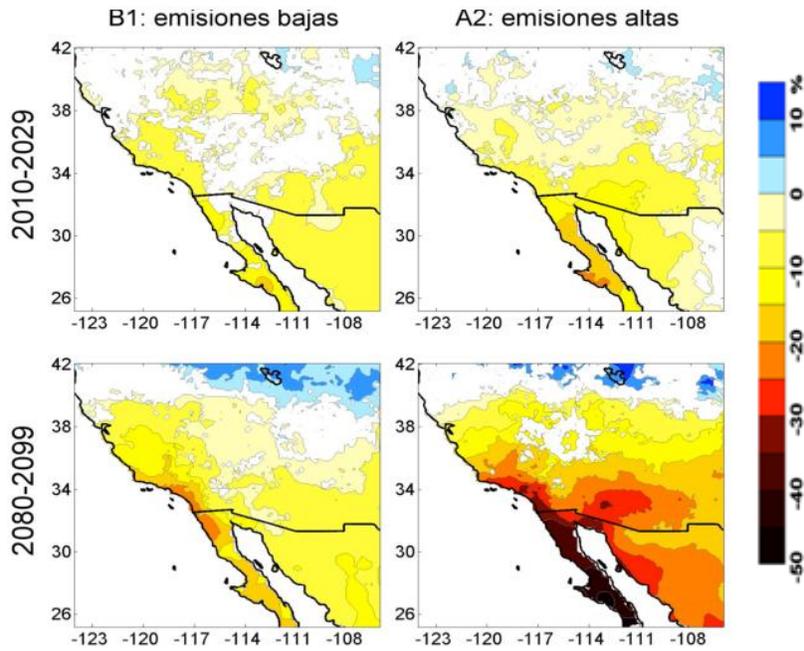
Temperature projections
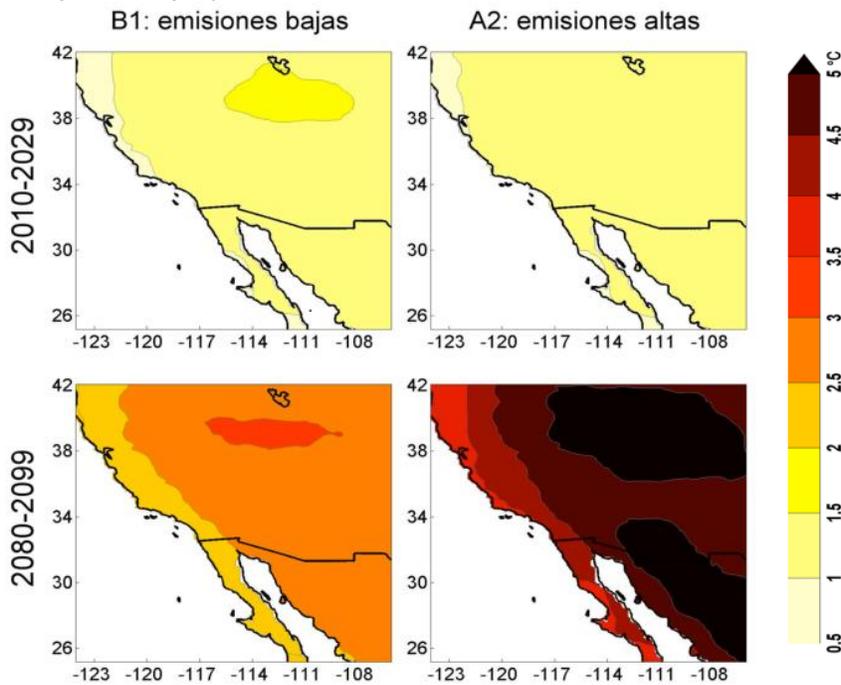
Source: Programa Estatal de Acción ante el Cambio Climático de Baja California - http://peac-bc.cicese.mx/datosclim/dcbc.php.

Drinking Water Quality

SUMMARY FINDINGS
- Many areas in the border region, particularly in rural communities, continue to experience high levels of drinking water contamination
- Maintaining water quality is imperative in the hot and dry border region where water is limited and the population continues to grow
- Better data are needed to track the location of and contamination in water sources, public drinking water systems, and well water

Drinking water may contain natural and man-made contaminants that are a risk to human health. The presence of contaminants in water may contribute to adverse acute or long-term health effects, including gastrointestinal illness, reproductive problems, cancer, and neurological disorders.

Common water contaminants (such as disinfection byproducts, arsenic, nitrate, and lead) can have health effects in children, adults, and in utero. The U.S. EPA sets maximum concentration levels for hazardous compounds. An individual's overall risk of developing a water-related illness will depend on many factors: the specific contaminant, the concentration and potency of that contaminant, how the contaminant enters the body (for example, whether by drinking or showering), and the person's individual susceptibility. Vulnerable populations, such as the elderly, children, and pregnant women, are more likely to suffer ill effects than the rest of the population.

The main strategies for preventing water-related illness are to protect water sources (i.e., water supplies), provide effective and reliable water treatment, and monitor water quality. Federal laws and regulations are in place at the state level to implement these strategies for community water systems. Many small community water supplies and private domestic wells, predominantly in rural areas, are not covered by the Safe Drinking Water Act (SDWA). Therefore, these communities may not have the same level of safety assurance as larger drinking water systems. Monitoring drinking water hazards and exposures in both rural and urban communities remains an important task and considerable challenge for environmental health surveillance.

There is no complete geographic map of public drinking water systems for California. Recently, CEHTP developed a tool to collect public data on the location of drinking water systems. This tool facilitates the creation, collection, and vetting of digital maps for every public water system in California. Over 90% of the population of California is represented by the over 2,500 water system boundaries uploaded or created using the tool. Compiling a complete digitized database of public drinking water systems will allow for better emergency planning and preparedness, spur important research, and improve communication among utilities with respect to water quality and conservation. A sample image of drinking water system boundaries collected by the tool in San Diego and Imperial Counties are shown below (Map 3).

Map 3. Water system boundaries for San Diego and Imperial Counties (only select major water systems are labeled, including the Imperial Irrigation District and City of San Diego)

San Diego County   **Imperial County**
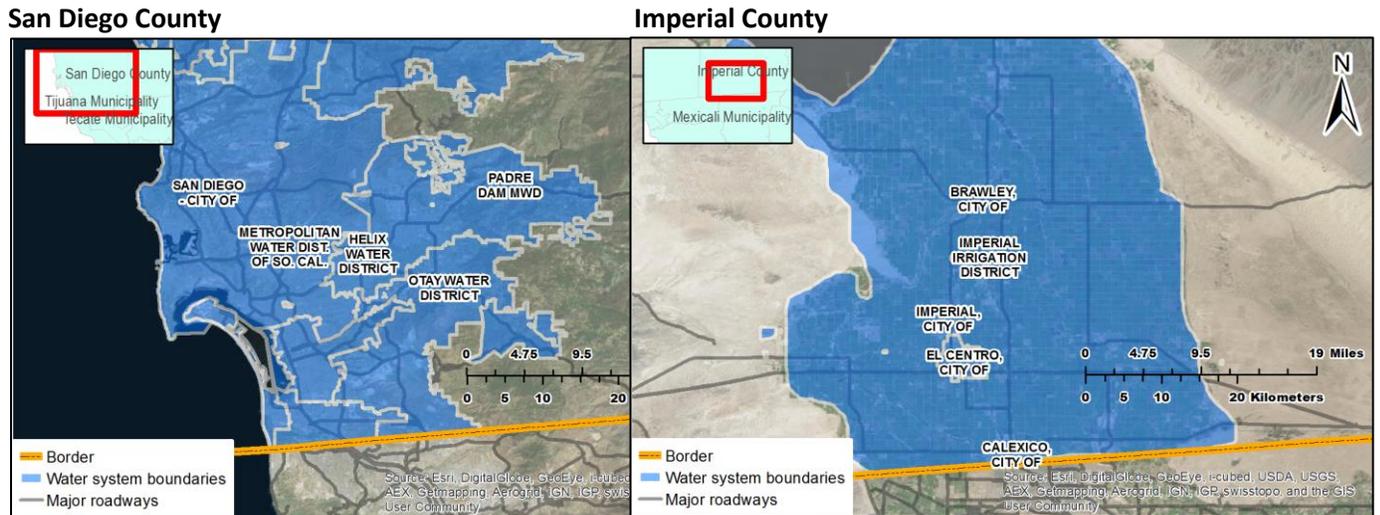
Source: California Environmental Health Tracking Program - http://cehtp.org/page.jsp?page_key=762.

Using data from CEHTP's tool to collect drinking water system boundaries, California EPA's Office of Environmental Health Hazard Assessment (OEHHA) modeled census tract-level summaries of drinking water quality for all of California (Map 4). This indicator takes into account relative concentrations of different contaminants and whether multiple contaminants are present. A higher index number indicates higher contaminant levels. More details are available in CalEnviroScreen documentation.[57]

Map 4. Drinking water contaminant index percentile by census tract in San Diego and Imperial Counties

Source: CalEnviroScreen 2.0 - http://oehha.ca.gov/ej/ces2.html.

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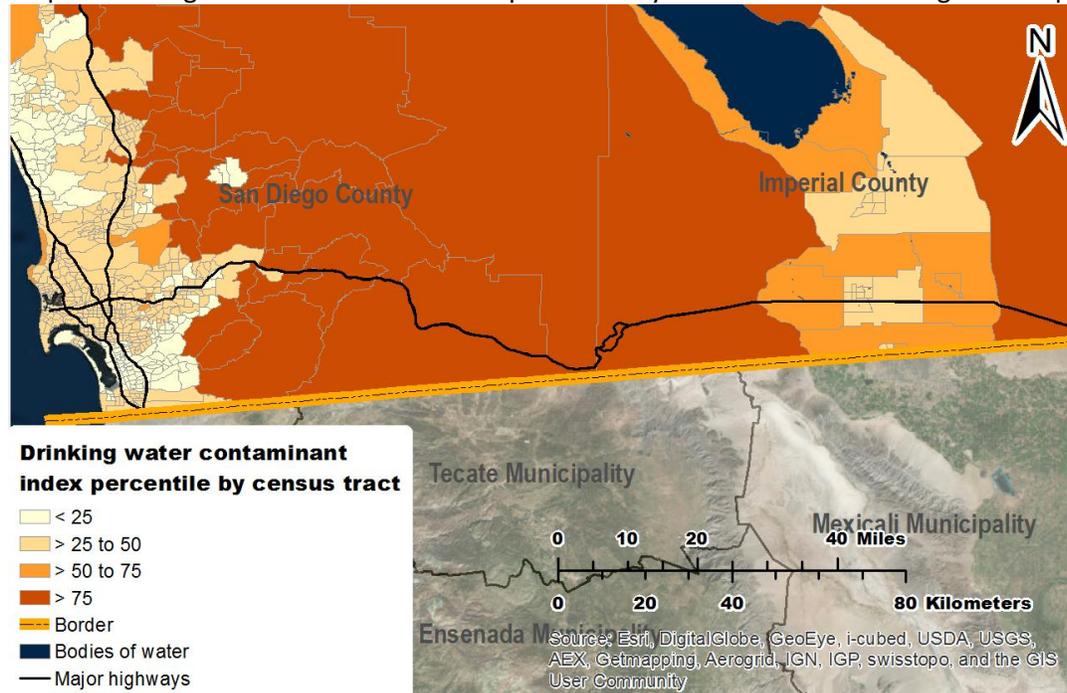
Potable water quality data (water intended for drinking) are not readily available online for Mexico. However, the Comisión Nacional del Agua (CONAGUA – the National Water Commission) prepares and publishes water quality data for several different indicators at select sampling sites. The data provides information on the quality of water supply stored for provision to systems for treatment and distribution, but is not an indicator of endpoint quality of water intended for consumption (purified, bottled, at the tap, etc.).

Map 5 below shows "Biochemical Oxygen Demand" (one measure of water quality) at selected sampling sites across the municipality of Tijuana (total suspended solids, chemical oxygen demand, and a number of other water quality metrics are also available). Data are not directly comparable to water quality data shown by CalEnviroScreen.

Map 5. Biochemical oxygen demand at select sampling sites in Tijuana and surroundings
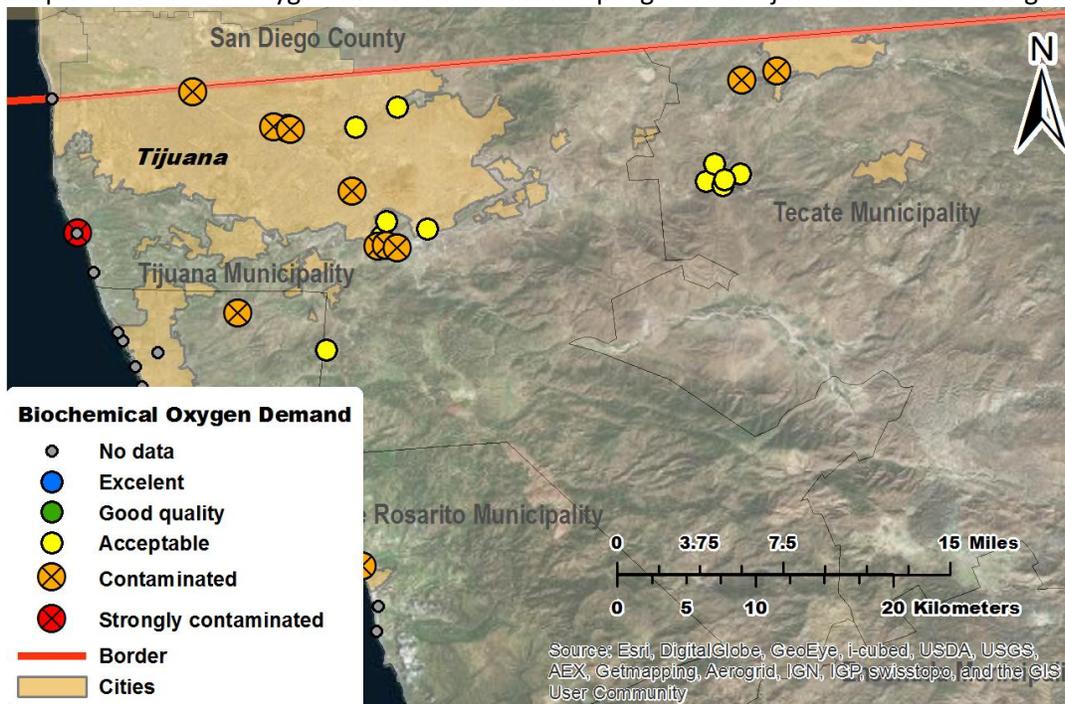
Source: CONAGUA - http://www.conagua.gob.mx/CONAGUA07/Contenido/Documentos/CALIDAD_AGUA_2013.xlsx.

Green Spaces and Parks

SUMMARY FINDINGS

- Green spaces and parks are a valuable community resource that promote physical activity, social well-being, and climate change adaptation
- It will be important to increase public availability of high quality parks and green spaces amidst the pressures of a growing population

Access to green space (defined as an area of grass, trees, or nature for recreational or aesthetic purposes) is an important component for the promotion of community health and well-being.[58,59] Green spaces can be divided into land cover and park areas. Land cover refers to the type of vegetation or environment covering the ground. Parks and recreational areas are places designated by government or other agencies for people to gather for social and recreational activities.

Land cover

Trees and vegetation improve a location's suitability for humans, and positively impact water runoff, flood risks, air quality, and temperature.[60] Vegetative cover is particularly important for climate change mitigation and adaptation, and will change with transformations in local climate. Understanding these changes will be critical to intervening upon health impacts related to climate change. The European Space Agency recently released data considered to be the highest resolution global land cover dataset. Although other land cover datasets are available from both U.S. and Mexican governments,[61,62] the ESA GlobCover 2009 data include both countries in a single uniform dataset at high spatial resolution.

The eastern portion of the California-Baja California border region has very little vegetative coverage apart from agriculture, whereas the western portion (San Diego County, Tijuana, Ensenada) have more abundant vegetative coverage (Map 6). More urbanized areas notably lack vegetative cover.

Map 6. Vegetative land cover along the California-Baja California border region, 2009
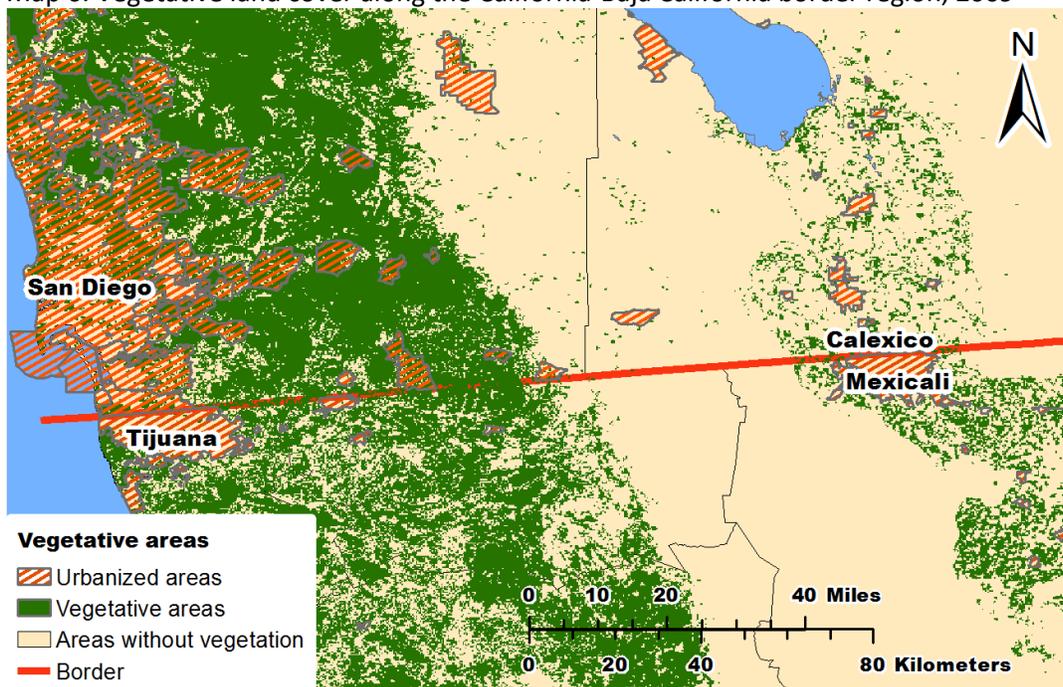
Source: European Space Agency, GlobCover2009. Accessed at http://earthengine.google.org.

Parks and recreational areas

City parks and other public spaces are important for health in ways relating to recreation, physical activity, community social connections, stress reduction, and heat-island mitigation.[63,64] Geographic data for park boundaries and recreational areas are often available from government agencies.

For California, the California Protected Areas Data Portal (CPAD), produced and coordinated by the GreenInfo Network, provides publicly available geographic data on outdoor open spaces that are protected by government agencies for public use. These areas are controlled by a mix of city, county, and state agencies, and include locations such as state parks, beaches, plazas, athletic fields, regional parks, and other open spaces. The dynamic CPAD mapping tool allows for queries narrowed by type of protected area, location, or other keyword and also includes options to display administrative boundaries and school locations. A snapshot of the tool (available at www.calands.org/map) is shown below (Exhibit 2).

Exhibit 2. California Protected Areas Data Portal showing park areas (and their designated jurisdiction) in San Diego and the Imperial Valley

San Diego area   **Calexico**
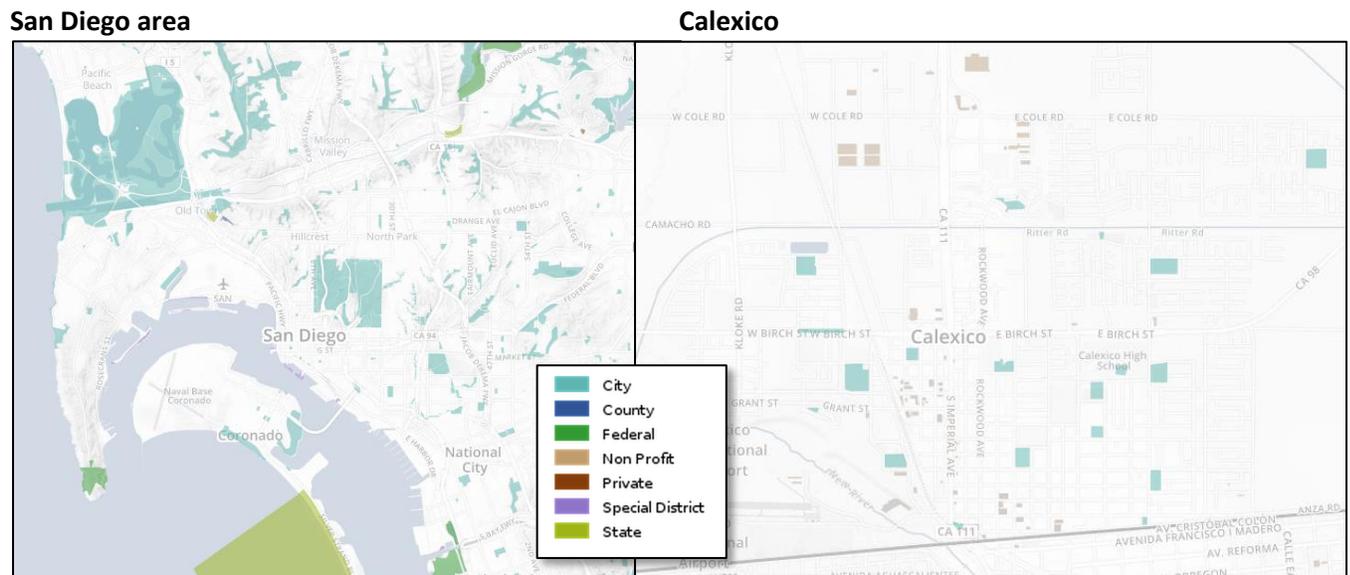
Source: California Protected Areas Database - http://calands.org/data.

In Mexico, geographic data for similar types of spaces are available from the Instituto Nacional de Estadística y Geografía (INEGI - The National Institute of Statistics and Geography) and the Sistema para la Consulta de Información Censal 2010 (SCINCE – the 2010 System for Consultation of Census Information). "Areas verdes" (i.e., "green areas") include parks, playgrounds, sports playing areas, and other recreational areas. A view of Tijuana near the San Ysidro border crossing is shown in Map 6.

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Map 6. "Green areas" near San Ysidro border crossing in Tijuana

Source: Instituto Nacional de Estadística y Geografía - http://www.inegi.org.mx/est/scince/scince2010.aspx.
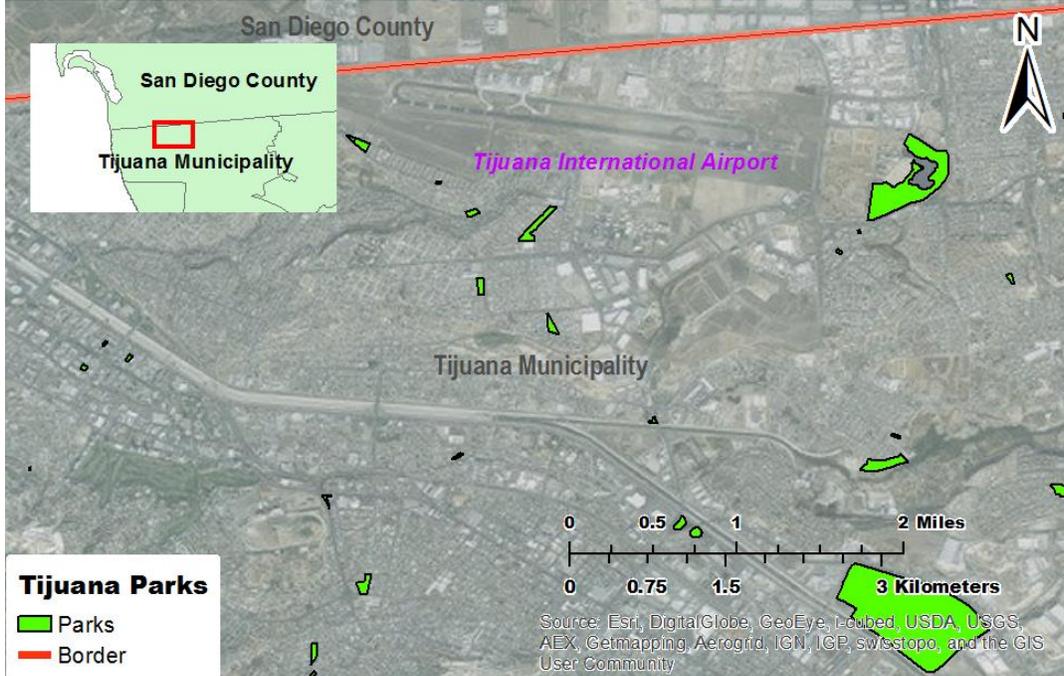
Pesticide Use

SUMMARY FINDINGS

- Pesticides are a common environmental hazard in Imperial County, and can lead to air, soil, and water contamination
- The longer-term health effects of pesticides are widely acknowledged in scientific literature, but poorly tracked in clinical data because of their often long latency and complex etiology

A pesticide is any substance used to kill or repel insects (insecticides), weeds (herbicides), rodents/small mammals (rodenticides), mold (fungicides), bacteria, or viruses. While all individuals should avoid exposure to pesticides to the greatest extent feasible, children are more susceptible to pesticide exposure and the health effects of pesticides compared to adults.[65,66,67] Pesticides can have a variety of health effects depending on their physical properties, including cancer, reproductive and developmental effects, impacts on nerve cell activity, respiratory effects, and eye and skin irritation, among others.

California's Department of Pesticide Regulation (CDPR) maintains the Pesticide Use Reporting (PUR) Database. Data are reported by pesticide and by crop type at 1-square mile sections for pesticide applications to agricultural fields, parks, golf courses, cemeteries, pastures, and along transportation rights-of-way. The image below shows CEHTP's Pesticide Mapping Tool and pesticide use near the San Diego metro area and the Imperial Valley (Exhibit 3). The Imperial Valley is a major agricultural area and has substantial amounts of pesticide applied in the region. The pesticide mapping tool allows the user to interactively browse data by pesticide, crop, year, and unit of measurement.

Data on pesticide use were not available for Baja California.

Exhibit 3. Pesticide use reported in the Imperial Valley, California 2012, summed pounds, 2012
San Diego area   **Imperial Valley**
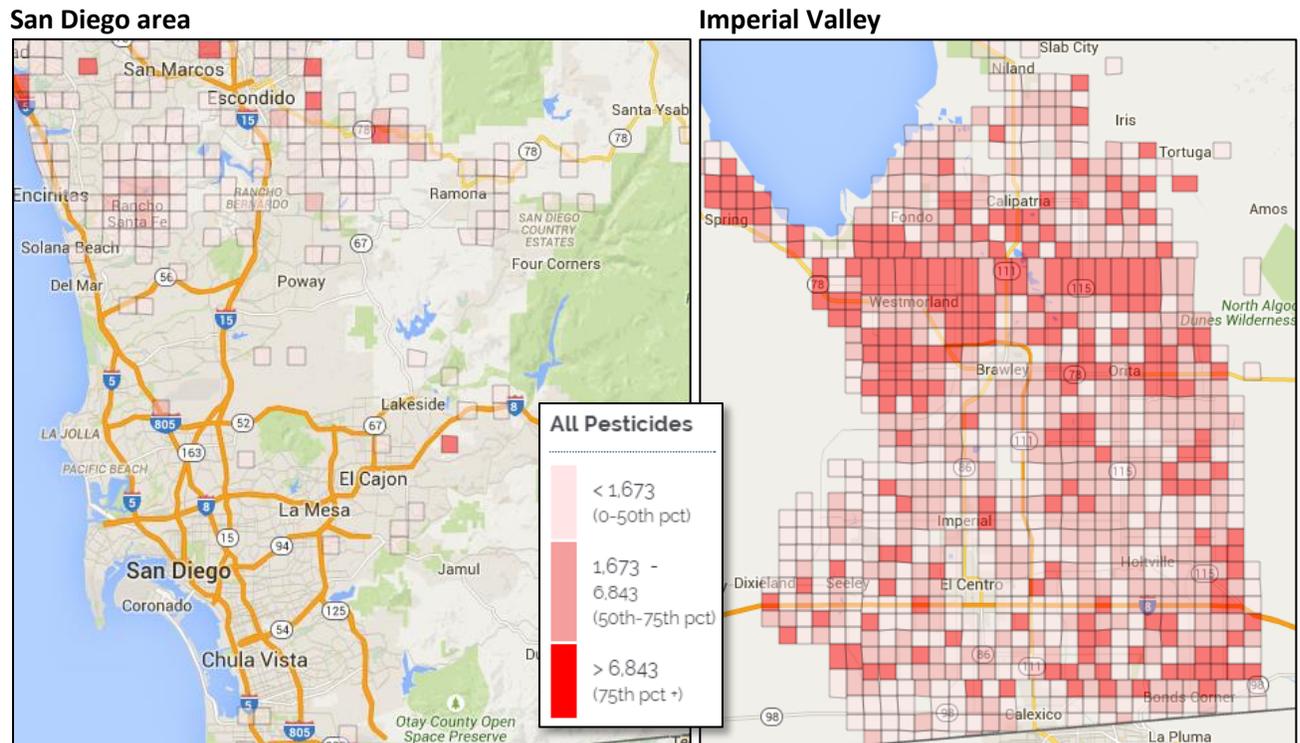
Source: CDPR Pesticide Use Reporting System. Accessed at http://www.ehib.org/tool.jsp?tool_key=18.

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Traffic

SUMMARY FINDINGS

- Traffic is an important pollution source in the border region, with very concentrated traffic near the border crossings and high traffic density in urban areas of San Diego County
- Unpaved roads in Imperial County and other rural areas can allow for increased dispersal of road dust, and greater pollution generated by vehicular traffic

Cars and trucks produce pollutants that are harmful to health, including diesel particulate matter (PM), nitrogen oxides (NOx), carbon monoxide (CO), and volatile organic compounds (VOCs). These pollutants have a wide variety of health effects, including but not limited to asthma, heart disease, cancer, poor birth outcomes, and premature death.[68] Those living closest to busy roadways are likely to have disproportionate exposures and health outcomes from traffic pollutants, as are individuals with pre-existing conditions. Low-income communities and communities of color are often most likely to reside near freeways and other busy roadways.[69,70]

Vehicular traffic is associated with other health outcomes related to noise (such as stress and cardiovascular disease) and injuries from collisions. Indirect health effects may occur as individuals near busy roadways may walk or bike less due to high traffic volumes, leading to consequences of physical inactivity (such as obesity and diabetes).[71]

CEHTP has an online tool that can be used to estimate traffic exposure within a given distance from any geographic, and produces a variety of traffic metrics using different criteria and adjustment techniques. Traffic metrics are calculated within a user-defined radius from a single point (such as a street address). Using the Traffic Tool, analyses can be conducted to estimate the environmental effects of traffic within a given area. Combined with other traffic data models, this can help investigators quickly understand local traffic, its community impact, and future planning efforts.

The most widely used metric, "sum of all length-adjusted traffic segments", is the best generalizable traffic metric for understanding traffic density within a given road segment (Exhibit 4). Other more detailed metrics are also available (Exhibit 5).

Traffic density can also be summarized at the census tract level to better convey its impact across a broader community. Traffic density percentiles by census tract in San Diego are shown together with border crossing locations in Map 7.

Exhibit 4. Traffic volumes for a major intersection in Calexico, Imperial County

Background	Enter Buffer Parameters	**Spatial Linkage Results**	
Metric			**Value**
(sl) Sum of all length-adjusted traffic volumes within buffer (vehicle-km/hr)			2,416
(sg) Sum of all Gauss-adjusted traffic volumes within buffer (vehicles/day*)			118,349
(hl) Length-adjusted traffic volume of highest segment within buffer (vehicle-km/hr)			995

Show more metrics

*average annual daily traffic

♀=nearest segment to buffer center ♀=segment with highest traffic volume in buffer
Hide Buffer

Source: CEHTP Traffic Tool - http://www.ehib.org/traffic_tool.jsp.

Exhibit 5. Detailed traffic metrics for an intersection in downtown San Diego

Metric	Value
(sl) Sum of all length-adjusted traffic volumes within buffer (vehicle-km/hr)	1,519
(nu) Unadjusted traffic volume of nearest segment within buffer (vehicles/day*)	14,610
(ngl) Gauss- and length-adjusted traffic volume of nearest segment within buffer (vehicle-km/hr)	158
(ndist) Distance to nearest segment within buffer (meters)	110
(hgl) Gauss- and length-adjusted traffic volume of highest segment within buffer (vehicle-km/hr)	158
(hu) Unadjusted traffic volume of highest segment within buffer (vehicles/day*)	19,400
(hg) Highest Gauss-adjusted traffic volume segment within buffer (vehicles/day*)	2,881
(sg) Sum of all Gauss-adjusted traffic volumes within buffer (vehicles/day*)	3,477
(hl) Length-adjusted traffic volume of highest segment within buffer (vehicle-km/hr)	802
(ndir) Direction to nearest segment within buffer (degrees ccw** from east)	91
(sgl) Sum of all Gauss- and length-adjusted traffic volumes within buffer (vehicle-km/hr)	164
(su) Sum of all unadjusted traffic volumes within buffer (vehicles/day*)	67,318
(hdir) Direction to highest segment within buffer (degrees ccw** from east)	272
(ng) Gauss-adjusted traffic volume of nearest segment within buffer (vehicles/day*)	2,881
(hdist) Distance to highest segment within buffer (meters)	232
(nl) Length-adjusted traffic volume of nearest segment within buffer (vehicle-km/hr)	802

*average annual daily traffic
**ccw=counter clockwise

Source: CEHTP Traffic Tool.
Accessed at http://www.ehib.org/traffic_tool.jsp.

Map 7. Traffic density for the border region by census tract

San Diego area

Imperial County

Sources: CalEnviroScreen 2.0 - http://oehha.ca.gov/ej/ces2.html.

Border crossings between California and Baja California have very high levels of traffic (Table 5). The pollution and noise from this concentrated traffic can impact nearby communities, border crossing workers, and other border crossers on foot and in vehicles.[72] There are six border crossings along the Baja California border region that generate vehicular traffic, mostly from commercial trucks and personal vehicles. Long wait times at the border crossings can further exacerbate pollution as cars sit idling. Otay Mesa and San Ysidro remain the busiest border crossings for vehicles in the California-Baja California border region (Figure 17).

Table 5. Numbers of border crossings from Baja California into the United States*

| Port name	Andrade	Calexico	Calexico East	Otay Mesa	San Ysidro	Tecate
Trucks	0	0	325,243	810,193	0	52,239
Trains	0	0	252	205	0	0
Buses	0	0	2,785	41,222	57,171	237
Personal vehicles	453,079	4,071,666	3,399,697	6,910,219	11,946,060	812,540
Pedestrians	800,176	4,567,333	310,344	3,415,957	7,925,371	743,666

*Zero values may occur where data cannot be recorded due to a lack of facilities, such as no rail crossing at the port of entry.

Figure 17. Number of personal vehicles and pedestrians crossing at California-Baja California border crossing points, 2014
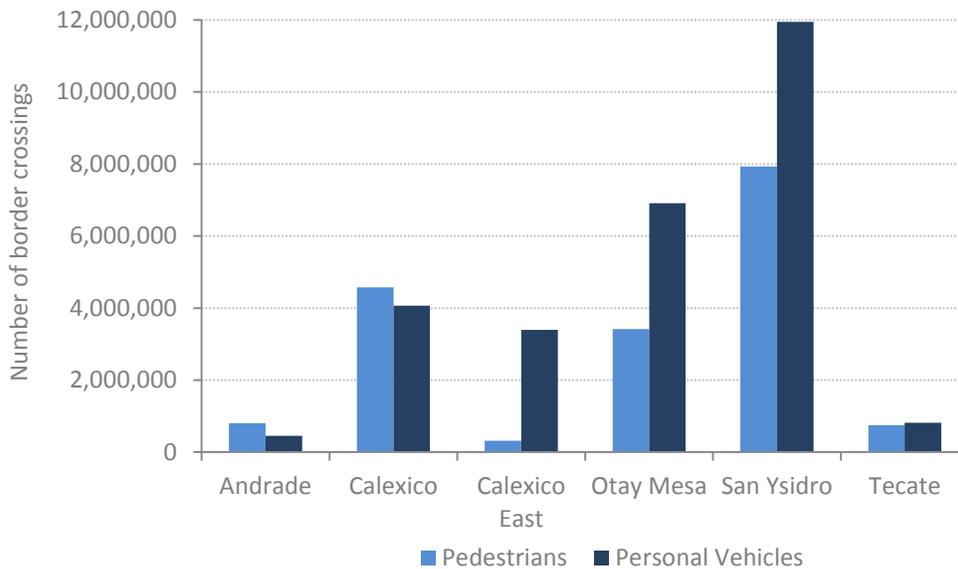
Source: Bureau of Transportation Statistics -
http://transborder.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BC_Index.html.

Traffic data were available for some roads in Baja California, but not readily accessible for use in mapping software. Traffic count data are currently provided in PDF form without geospatial reference. Border crossing data for border entry into Mexico are not readily available online.

Toxic Emissions

SUMMARY FINDINGS
- There is a high concentration of facilities required to report to the Toxic Release Inventory in San Diego County
- There are many facilities along the Baja California border required to report with the Registro de Emisiones y Transferencias de Contaminantes in Mexico

The U.S. EPA Toxic Release Inventory (TRI) Program tracks the management of various toxic chemicals that are hazardous to human health. The program includes industries that must identify and publicly report on toxic chemicals, and their management and release into the environment. Toxic chemicals include those that are known to cause cancer or other chronic human health effects, have significant adverse acute health effects, or have significant adverse environmental effects. Mandatory reporting facilities typically include larger facilities involved in manufacturing, mining, power generation, chemical manufacturing, and hazardous waste treatment.

The TRI database includes annually reported geospatial information about facilities and more than 650 toxic chemicals. The Facility Registry System (FRS), also maintained by the U.S. EPA, contains more general information on the facilities, sites, or places of environmental interest that are subject to regulation. A sample of TRI data is shown for the city of San Diego and surrounding areas is shown in Maps 8 and 9.

Map 8. TRI facilities located in the California border region

Sources: U.S. EPA TRI - http://www2.epa.gov/toxics-release-inventory-tri-program/tri-data-and-tools.
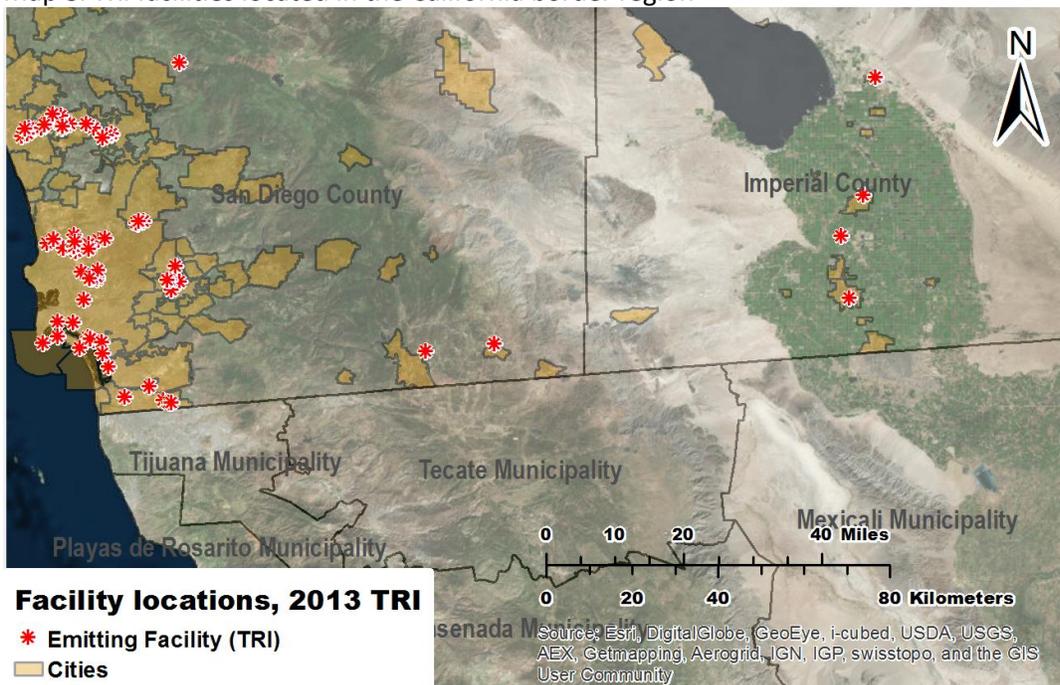
Map 9. TRI facilities located in the city of San Diego, with population density

Sources: U.S. EPA TRI - http://www2.epa.gov/toxics-release-inventory-tri-program/tri-data-and-tools.
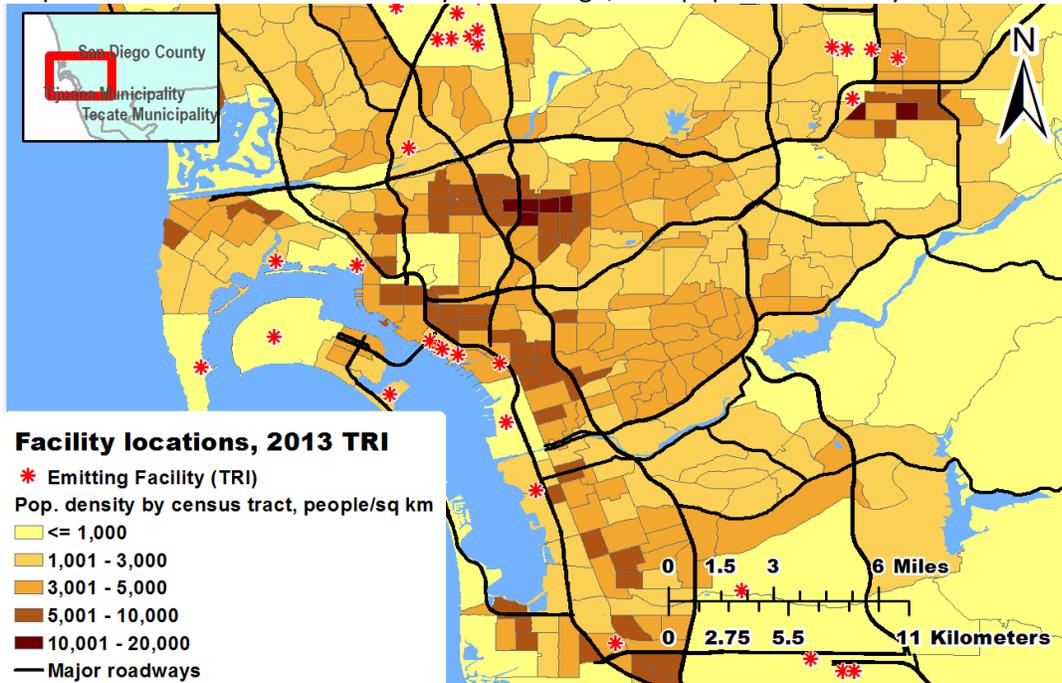
The Registro de Emisiones y Transferencias de Contaminantes (RETC – the Registry of Transfers and Emissions of Pollutants), a program of SEMARNAT, is analogous to the U.S. EPA TRI Program. RETC is usually paired with the TRI as a comparable resource. Facility locations in the Baja California border region and Tijuana are shown in Maps 10 and Map 11, respectively.

Map 10. RETC facilities located in the Baja California border region

Source: Secretaría del Medio Ambiente y Recursos Naturales - http://app1.semarnat.gob.mx/retc/retc/index.php.
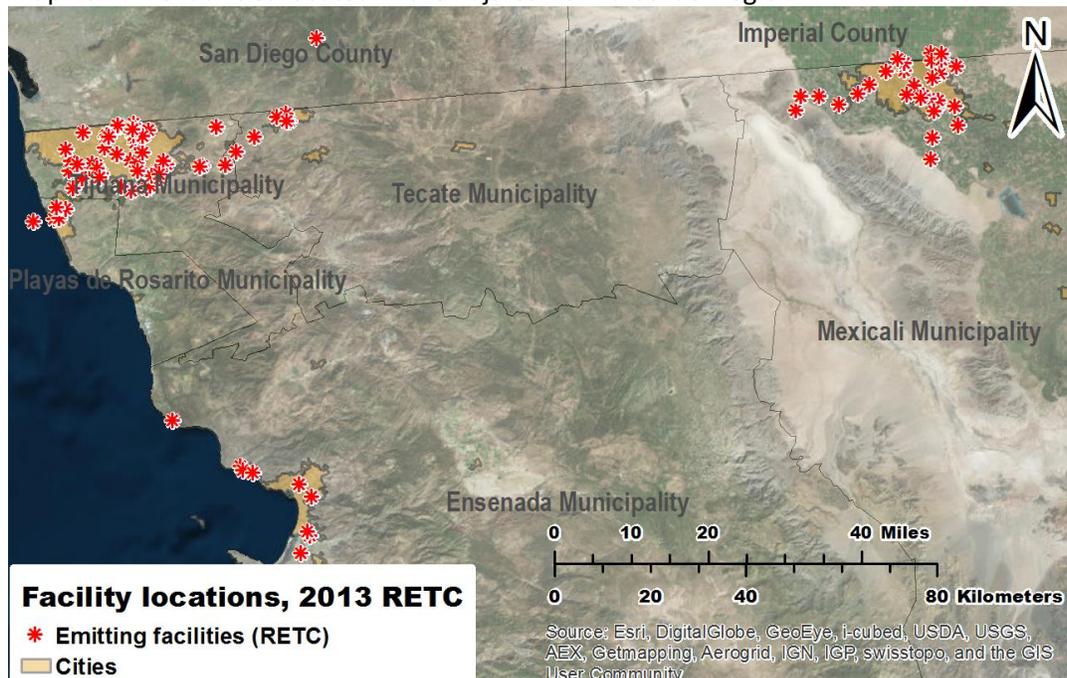
Map 11. RETC facilities located near the city of Tijuana and population density

Source: Secretaría del Medio Ambiente y Recursos Naturales - http://app1.semarnat.gob.mx/retc/retc/index.php.
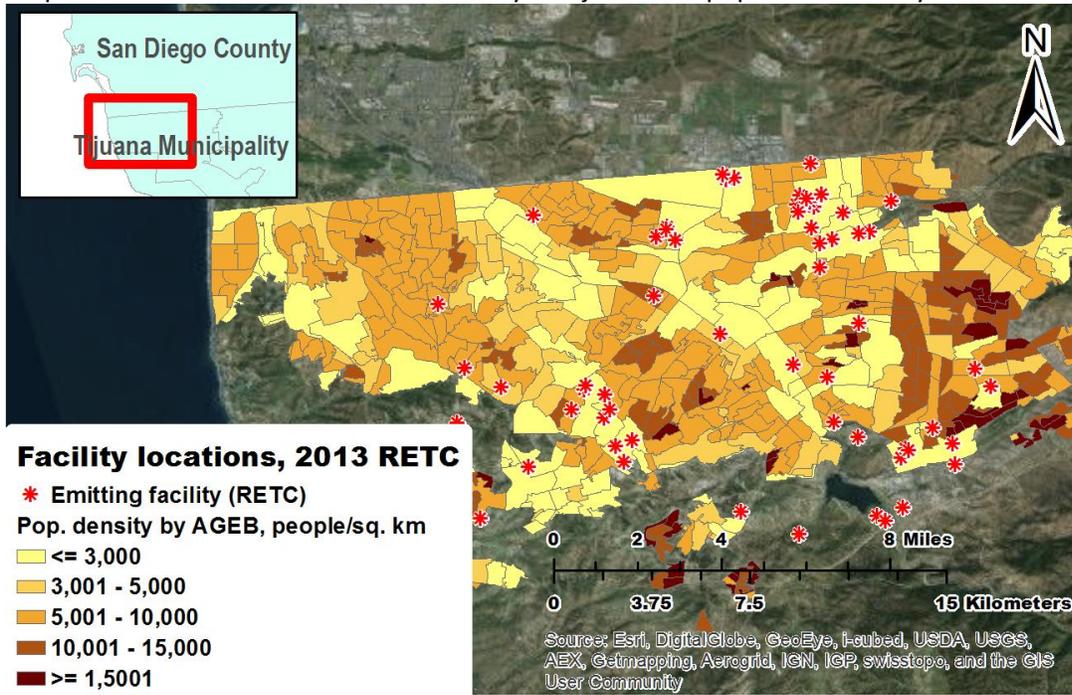
Overall Findings & Models to Advance Environmental Health Surveillance

Core Findings
Overall, the California-Baja California border region faces many environmental health challenges related to its unique geography and social, cultural, and political history. Imperial County, in particular, has many persistent environmental health disparities. We found that:

Many sources of environmental hazards uniquely impact the California border region
- Air pollution continues to be a pervasive hazard in the border region with myriad sources, such as traffic, industrial pollutants, unpaved roads, and the drying Salton Sea
- Imperial County has more days each year classified as unhealthy to very unhealthy compared to San Diego County
- Climate change may have very serious health impacts in the border region given its hot and dry climate, existing environmental hazards, and underlying population vulnerabilities
- Many areas in the border region, particularly in rural communities, continue to experience high levels of drinking water contamination
- Agricultural pesticides are a common environmental hazard in Imperial County
- Traffic is an important pollution source in the border region, with very concentrated traffic near the border crossings and high traffic density in urban areas of San Diego County

Because of these environmental hazards and underlying population vulnerabilities, many residents continue to experience poorer than average health outcomes
- Asthma continues to severely impact residents of Imperial County
- There are fewer valley fever cases in the border region compared to some Central Valley counties, but it will continue to pose a risk as the climate changes
- Imperial County has very high rates of heat-related illness, likely a result of the combination of high heat, limited infrastructure to deal with extreme heat, and underlying population vulnerabilities (such as a high proportion of outdoor laborers or low income)
- Cardiovascular disease remains elevated in Imperial County, and slightly lower in San Diego County, when compared to California
- Lead exposures continue to decrease throughout California, though compared to the California average, the prevalence of young children with elevated blood lead levels is nearly two-fold in Imperial County, and slightly elevated in San Diego County

Better data will be imperative in the future to track, intervene upon, and monitor ongoing environmental health conditions in the California-Baja California border region
- Better data are needed to track, predict, and assess the impacts of climate change on health, likely one of the greatest public health challenges in the coming decades
- Greater priority should be placed on the need to collect the location of and contamination in water sources, public drinking water systems, and well water, especially in rural communities
- Heat-related illnesses are expected to continue to be an emerging public health priority
- Valley fever is likely underreported, but it will continue to be a serious health risk into the future
- Birth defects data are not systematically reported in Imperial and San Diego County
- Pesticide illness and exposure data are likely underreported, and not currently amenable to assessing long term health effects
- Data are not systematically reported for pesticide use on buildings and structures

Despite these many challenges, it is also noted that the region has rich data that can assist in determining environmental health priorities, developing community-specific interventions, and evaluating their impact over time. In order to maximize existing data infrastructure to improve environmental health, the systematic and ongoing collection and reporting of relevant environmental health indicators must be prioritized.

Environmental Health Data Needs
In our survey of environmental health data for the California-Baja California border region, we found that there were opportunities to improve environmental health data surveillance throughout the region. The challenges encountered were consistent with the challenges faced by the authors of this report in the establishment and maintenance of the California Environmental Health Tracking Program.

- **Data metrics were often inconsistent, making data comparisons difficult throughout the border region.** Environmental and health data for various content areas are collected and reported differently by multiple agencies. Inconsistent data metrics may be a result of differing data priorities, funding, or the context within which the data are collected. Establishing consistent data standards for the region would allow for more meaningful data comparisons and consistency in data metrics over time. These data standards should reflect regional data needs and be responsive to local community priorities as well.

- **Data were often not accessible to users.** Some data were not publicly accessible, data queries were not supported on modern web browsers, or data were delivered in formats that were not user-friendly (such as relational databases or PDF documents). For maximum data accessibility, it is essential that data are publicly available across multiple web-browsers, to users with varying levels of technical expertise, and in a machine-readable format that is easy to extract, transform, and process.

- **Data documentation was often limited or non-existent.** Standardized codebooks, data dictionaries, and metadata are essential for increasing data accessibility for a wide range of users and tracking data over time.

- **Data from sub-state and sub-county/municipality geographies had limited availability**. Greater efforts should be made to collect and report data at geographies that are relevant to local communities, while ensuring that data privacy is protected in these communities.

- **Greater coordination among agencies would allow for datasets to be accessed from a centralized hub.** Environmental health surveillance programs and open data portals can better serve users from a single centralized data system.

To maximize data utility, data must be relevant and responsive to community stakeholders, accompanied by linguistically and audience-appropriate messaging, and reported in a timely manner in publicly accessible formats, such as easily queryable online data systems with maps, charts, and downloadable data tables. Very few datasets are currently available in such a format from both sides of the U.S.-Mexico border, making it difficult for users to easily ascertain a complete picture of environmental health trends throughout the border region.

Environmental health surveillance programs act collaboratively and independently across political jurisdictions to track, collate, and report disparate datasets related to the environment and health in a

manner that is relevant and actionable for impacted communities. The Center for Disease Control and Prevention's National Environmental Public Health Tracking Program (National EPHT) can serve as a model for environmental health surveillance across the U.S.-Mexico border region.

National Environmental Public Health Tracking Program:
A Model for Environmental Health Surveillance across the Border Region

In January 2001, the Pew Environmental Health Commission issued the report "America's Environmental Health Gap: Why the Country Needs a Nationwide Health Tracking Network." The report highlighted that no systems were in place at the federal or state level to track exposures or health outcomes related to environmental hazards. In response, in 2002, the U.S. Congress provided funding to the Centers for Disease Control and Prevention (CDC) to develop the National Environmental Public Health Tracking Program (www.ephtracking.cdc.gov). Currently, 26 U.S. states and New York City are funded to participate in the National EPHT. Two U.S.-Mexico border states – California and New Mexico – are already members of the National EPHT.
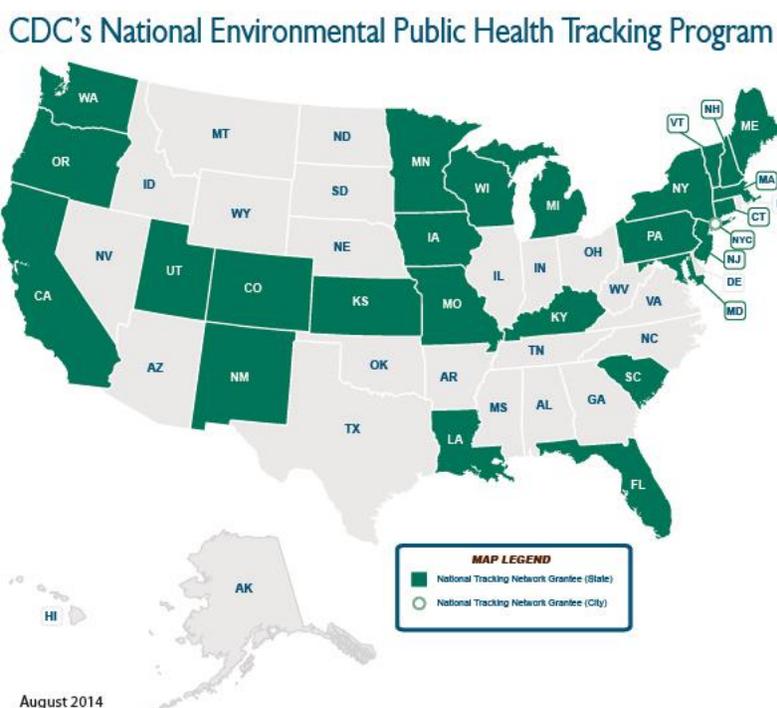
The network of states participating in the National EPHT support the ongoing collection, integration, analysis, and interpretation of data on environmental hazards, exposures, and environmentally-related diseases at the state level. Common health effects tracked by participating states include asthma, heat illness, cancer, heart disease, carbon monoxide poisoning, childhood lead poisoning, birth defects, and reproductive outcomes. Environmental hazards tracked include air and water quality, pesticide exposure, climate change, and toxic substance releases.

In addition, states often function as laboratories within the National EPHT, tracking various health and environmental data that are particularly relevant for their communities. For example, many states in the northeastern United States actively collect and report data on algae in water bodies, while states in the more arid western United States have initiated projects on drinking water data. These locally-initiated

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data surveillance efforts often serve as models for other states that see a similar data need in their communities, lowering the overall cost of enabling data collection within a given content area.

California Environmental Health Tracking Program (CEHTP)
The California Environmental Health Tracking Program (CEHTP) was one of the original National EPHT grantees. CEHTP regularly collaborates with diverse stakeholders that include community organizations, local and state government, academic researchers, and urban planners who utilize the CEHTP tools and services for public health surveillance, research, policy, education, and advocacy.

Much of CEHTP's success over the past decade is related to the relationships it has built with its data stewards, the robust group of advisory members who offer recommendations on making data relevant to their own work, and a willingness to expand its data resources to meet community needs. Specifically in California, CEHTP expertise has informed cutting-edge public health projects such as:

➢ Mapping community vulnerabilities to climate change
➢ Evaluating the association between pesticides and health
➢ Conducting statewide mapping of breast cancer at the sub-county level
➢ Estimating the amount of agricultural pesticides used near public schools
➢ Developing dynamic and interactive data tools that
    1. Can link pesticide or traffic data to various health outcomes
    2. Allow for the easy visualization and querying of pesticide use data
    3. Crowd-source the collection and visualization of drinking water system boundaries

The projects listed above are in addition to CEHTP's central function to collect, clean, communicate, and disseminate core environmental health data in a queryable form on its website. Those data are available at www.CEHTP.org.

Recommendations for Successful Environmental Health Surveillance
The decade-long experience in developing and maintaining a successful National EPHT can help inform the development of a U.S.-Mexico EPHT program. Based on the lessons learned from the CDC's experience, the following recommendations should be considered:

1. **Determine the needs of a U.S.-Mexico EPHT program**
   Although the broad goal of developing an environmental health surveillance system is to improve the health of all communities, assessing the specific needs of communities and jurisdictions along the U.S.-Mexico border is essential. Current efforts like the U.S. Border 2020, border health reports (like this one), and working with key stakeholders (see Recommendation #2) should all be considered when establishing program and community needs.

2. **Identify and engage diverse bi-national stakeholders**
   The success of the National and California EPHT Programs rely on the inclusion of a network of diverse stakeholders that have been engaged at every phase of the development and ongoing maintenance of the Network. In California, stakeholders have represented local, state, and national government; academic researchers; health affected groups and advocates; non-governmental organizations; community-based organizations; and urban planners. Stakeholder input is solicited through needs assessments, focus groups, surveys, key informant interviews, and regular in-person meetings and webinars. Establishing an advisory group to guide the development and implementation of any U.S.-Mexico EPHT Program would be essential. Some key government

stakeholders would likely include: BECC, U.S. EPA, PAHO, CDC, all U.S. and Mexico Border States, SEMARNAT, INEGI, INSP and Mexican government equivalents. Non-governmental and community-based environmental health organizations along the border should be engaged early on as well.

3. **Set up appropriate governance, infrastructure, and funding mechanisms**
   The structure and governance of the U.S.-Mexico EPHT program should allow the program to be flexible and responsive to new environmental health threats as they emerge, while also meeting local community needs. Within the National EPHT program, for each state/city grantee a principal investigator (PI) is required. Each PI is a member of a governance committee headed by the CDC, and the governance committee discusses and votes on which topics will be part of the surveillance system. Subject matter experts from the funded states/cities, along with other national experts, form working groups on each topic and provide data recommendations to the governing committee. The topics of each work group would depend on the priorities of the U.S.-Mexico EPHT program and data availability. Adequate and consistent funding is essential to continue to develop data for emerging environmental health threats, while maintaining existing infrastructure.

4. **Establish data sharing agreements (DSA) and/or memorandums of understanding (MOU)**
   Once the priority topics have been selected and accompanying data sources identified, it is crucial to establish relationships with data stewards and determine the type of DSA and/or MOU necessary when transferring and sharing data. Within the National EPHT Program, DSAs vary by grantee, data steward, and data source. The National EPHT has developed templates for DSAs and MOUs that can be shared and adapted for a U.S.-Mexico EPHT program.

5. **Develop consistent data and measures**
   To ensure consistent data by geography and over time, the National EPHT has developed nationally consistent data and measures (NCDMs) that each grantee is responsible for compiling, submitting to CDC, and displaying on each grantee website (or portal). For each NCDM, grantees developed standard how-to-guides and other documentation that can also be shared and adapted for the U.S.-Mexico program. In addition to NCDMs, each U.S. or Mexico state involved should have the autonomy to compile and display data relevant to their specific population. This ensures that data remain locally relevant, while also serving broader regional needs.

6. **Develop a web-based platform to disseminate data**
   One of the key successes for the National EPHT Program and all grantees was the development of a website (i.e. portal) to publicly display and disseminate NCDMs. The National and State portals were launched in 2009, and they continue to evolve as content is added and technology advances. EPHT has been recognized as one of the first "open data pioneers" in its commitment to democratizing data. This is done by providing an abundance of non-confidential data on the EPHT portals to the public, extensive messaging on each content area, and information on how to use the data.

7. **Develop data communication, dissemination, and capacity-building strategies among stakeholders**
   In addition to web-based data dissemination, building the capacity of stakeholders to access, understand, and utilize the data is an essential component of National EPHT's success. This may include conducting trainings, demonstrations, and presentations targeted towards key stakeholder groups. This is an extremely important function of environmental health surveillance, especially when there is concern about misinterpretation or misuse of the data.

Appendix: Metadata for Health and Environmental Data Indicators

Health Indicators

Asthma	
Indicator: Prevalence of asthma - California, U.S.	
Definition	Lifetime prevalence of asthma
Dates Available	2001-2011
Geography	State and county
Date Sources & Availability	California Breathing, the California Asthma Surveillance Program, presents the asthma prevalence indicators by county for adults and children http://www.californiabreathing.org/ Original data comes from the California Health Interview Survey (CHIS). Full CHIS survey results are also available online: http://ask.chis.ucla.edu/main/default.asp **Format:** PDF, CSV, Excel
Units & Coverage	**Units:** Rate **Coverage**: California - statewide
Notes & Data Limitations	CHIS is a population-based telephone health survey designed to provide estimates for all counties and major racial and ethnic groups. The survey covers both adults and children, every two years. Self- report survey. No address level data.

Asthma	
Indicator: Age-adjusted rates of hospitalizations & emergency department (ED) visits due to asthma - California, U.S.	
Definition	Emergency department (ED) visits and hospitalizations with a principle diagnosis of Asthma (ICD-9: 493.0-493.9)
Dates Available	ED: 2005-2012 Hospitalizations: 1998-2012
Geography	State, county, and zip code
Date Sources & Availability	The Office of Statewide Health Planning and Development (OSHPD provides a comprehensive source of hospital discharge information for all inpatient admissions statewide California Environmental Health Tracking Program (CEHTP) utilizes OSHPD data to provide a data query that allows the user to create tables, charts, and maps using data on hospitalization and emergency department visits. Rates and counts are available by age group, race/ethnicity, county, and year at www.cehtp.org/p/asthma. **Format:** PDF, HTML, CSV, Excel, and JSON
Units & Coverage	**Units:** Age-adjusted rate per 10,000 **Coverage**: California-statewide (except federal hospitals)
Notes & Data Limitations	OSHPD annually compiles data from all hospitals to create the patient discharge database (PDD) and emergency department (ED) database. Data are released annually. There is a six month lag for the patient discharge and emergency department datasets. Patient addresses are not reported; data are only collected by zip code. Imperial County has a significantly smaller population than San Diego County, and when comparing trends between the two, one should keep in mind that smaller populations characteristically tend to be more statistically more volatile than large ones. A small numerical

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	difference could result in a comparatively large percentage change.

Cancer	
Indicator: Age-adjusted incidence rates of selected cancers - California, U.S.	
Definition	Aggregated five year rate (2007-2011) of newly diagnosed (bladder, breast-female only, kidney, leukemia, lung & bronchus, liver & bile duct, thyroid, and non-Hodgkin lymphoma) cancer cases among all ages.
Dates Available	1988-2012
Geography	State and county
Date Sources & Availability	California Cancer Registry (CCR) collects information on cancer cases throughout California. The CCR is California's statewide population-based cancer surveillance system. Data on cancer in California are available at: http://www.ccrcal.org/. Data query produces maps and tables by county and statewide. **Format:** CSV, PDF
Units & Coverage	**Units:** Age-adjusted rate per 100,000 **Coverage**: California-statewide (except federal hospitals)
Notes & Data Limitations	Lag time between diagnosis and reporting. Data available by county and state only.

Cancer	
Indicator: Crude incidence rate of malignant neoplasm of the breast - Baja California, Mexico	
Definition	Rate of new cases of breast cancer in women aged 25 years and older.
Dates Available	1995-2012
Geography	National and state
Date Sources & Availability	Statistical data on morbidity are compiled and analyzed through the Sistema Nacional de Vigilancia Epidemiológica- which is overseen by the Dirección General de Epidemiológia. Reported for all first-secondary and third tier care facilities Data available annually. One of the 110 reportable illnesses. Can query annual morbidity reports: http://www.epidemiologia.salud.gob.mx/anuario/html/anuarios.html . 1. Counts available for age group by state 2. Population distribution available by age group by state 3. Crude rates available by age group by state **Format:** PDF
Units & Coverage	**Units:** Rate per 100,000 women aged 25 years and older **Coverage:** Nationwide
Notes & Data Limitations	Data are not publicly available at the municipality level. Demographic data are limited

Heat Illness	
Indicator: Age-adjusted rates of hospitalizations & emergency department (ED) visits due to heat - California, U.S.	
Definition	Hospitalizations & ED visits with a principle diagnosis of a heat-related illness

	Heat related ICD-9 principle diagnoses include: 992.0　Heat stroke and sunstroke 992.1　Heat syncope 992.2　Heat cramps 992.3　Heat exhaustion from water depletion 992.4　Heat exhaustion from salt depletion 992.5　Heat exhaustion, unspecified 992.6　Heat fatigue, transient 992.7　Heat edema 992.8　Other specified heat effects 992.9　Unspecified effects of heat and light E900.0　Health effect caused by excessive heat due to weather (e.g. sunstroke/heatstroke) E900.9　Effect from unknown cause of excessive heat Only hospitalizations and emergency department visits occurring during May-September are counted.
Dates Available	ED: 2005-2012 Hospitalizations: 1998-2012
Geography	State, county, zip code
Date Sources & Availability	The Office of Statewide Health Planning and Development (OSHPD) provides a comprehensive source of hospital discharge information for all inpatient admissions statewide California Environmental Health Tracking Program (CEHTP) utilizes OSHPD data to provide a data query that allows the user to create tables, charts, and maps using data on hospitalization and emergency department visits. Rates and counts are available by age group, race/ethnicity, county, and year at www.cehtp.org/p/climate_change. **Format:** PDF, HTML, CSV, Excel, and JSON
Coverage	**Units:** Age-adjusted rate per 100,000 **Coverage**: California-statewide (except federal hospitals)
Notes & Data Limitations	OSHPD annually compiles data from all hospitals to create the patient discharge database (PDD) and emergency department (ED) database. Data are released annually. There is a six month lag for the patient discharge and emergency department datasets. Patient addresses are not reported; data are only collected by zip code. Imperial County has a significantly smaller population than San Diego County and when comparing trends between the two one should keep in mind that smaller populations characteristically tend to be more statistically volatile than large ones. A small numerical difference could result in a comparatively large percentage change.

Cardiovascular Disease	
Indicator: Age-adjusted rates of hospitalizations due to myocardial infarctions (MI) - California, U.S.	
Definition	Hospitalizations with a principle diagnosis of myocardial infarctions (ICD-9: 410) for adults over the age of 35.
Dates Available	ED: 2005-2012 Hospitalizations: 1998-2012
Geography	State, county, zip code
Date Sources & Availability	The Office of Statewide Health Planning and Development (OSHPD) provides a comprehensive source of hospital discharge information for all inpatient admissions statewide. California Environmental Health Tracking Program (CEHTP) utilizes OSHPD data to provide a data

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	query that allows the user to create tables, charts, and maps using data on hospitalizations. Rates and counts are available by age group, race/ethnicity, county, and year at www.cehtp.org/p/heart_attacks **Format:** PDF, HTML, CSV, Excel, and JSON
Coverage	**Units:** Age-adjusted rate per 10,000 adults over the age of 35. **Coverage**: California-statewide (except federal hospitals)
Notes & Data Limitations	OSHPD annually compiles data from all hospitals to create the patient discharge database (PDD) and emergency department (ED) database. Data are released annually. There is a six month lag for the patient discharge and emergency department datasets. Patient addresses are not reported; data are only collected by zip code. Imperial County has a significantly smaller population than San Diego County and when comparing trends between the two one should keep in mind that smaller populations characteristically tend to be more statistically volatile than large ones. A small numerical difference could result in a comparatively large percentage change.

Cardiovascular Disease	
Indicator: Crude Incidence rate of ischemic heart disease - Baja California, Mexico	
Definition	Crude rate of new cases with a clinical diagnosis of ischemic heart disease (ICD-10: I20-I25).
Dates Available	1995-2012
Geography	National and state

Date Sources & Availability	Statistical data on morbidity are compiled and analyzed through the Sistema Nacional de Vigilancia Epidemiológica, which is overseen by the Dirección General de Epidemiológia. Reported for all first, secondary, and third-tier care facilities. Data available annually.
	
	One of the 110 reportable illnesses. Can query annual morbidity reports: http://www.epidemiologia.salud.gob.mx/anuario/html/anuarios.html .
	    1. Counts available for age group by state
	    2. Population distribution available by age group by state
	    3. Crude rates available by age group by state
	
	Format: PDF

Units & Coverage	**Units:** Rate per 100,000 people over the age of 14 **Coverage:** Nationwide
Notes & Data Limitations	Data not publicly available at the municipality level. Demographic data are limited.

Lead Poisoning	
Indicator: Percent of children (aged less than 6yrs) tested with blood lead levels above 4.5 µg/dL - California, U.S.	
Definition	Percent of children who have been screened (blood lead tested) for lead poisoning and had blood lead levels greater than 4.5 µg/dL.
Dates Available	2007-2011
Geography	State and county

Date Sources & Availability	These data are from the statewide database for childhood lead poisoning, the Response and Surveillance System for Childhood Lead Exposures (RASSCLE II) maintained by the California Childhood Lead Poisoning Prevention Branch. http://www.cdph.ca.gov/programs/clppb/Pages/default.aspx California Environmental Health Tracking Program (CEHTP) utilizes CLPPB data to provide a data query that allows the user to create tables, charts, and maps using data on cancer rates. Rates and counts are available by county, and year at www.cehtp.org/p/lead **Format:** PDF, HTML, CSV, Excel, and JSON
Units & Coverage	**Units:** Percent **Coverage:** California - statewide
Notes & Data Limitations	Data is only for children screened and does not indicate the total burden of childhood lead poisoning.

Maternal and Infant Health	
Indicator: Percent of preterm births - California, U.S.	
Definition	Number of babies born prior to 37 completed weeks of pregnancy.
Dates Available	1998-2011
Geography	State and county
Date Sources & Availability	These data are based on birth and death certificate records compiled by the California Center for Health Statistics (CHSI), Office of Health Information and Research. California Environmental Health Tracking Program (CEHTP) utilizes CHSI data to provide a data query that allows the user to create tables, charts, and maps using data on preterm birth rates. Rates and counts are available by race/ethnicity, county, and year at www.cehtp.org/p/mih. **Format:** PDF, HTML, CSV, Excel, and JSON
Units & Coverage	**Units:** Percent **Coverage:** California - statewide
Notes & Data Limitations	Currently, data only publicly available at the county and state level.

Maternal and Infant Health	
Indicator: Percent of babies born with low birth weight - California, U.S.	
Definition	Number of babies weighing less than 2,500 grams (about 5.5 pounds) born after 37 completed weeks of pregnancy divided by the number of singleton births (i.e. no twins, triplets, etc.) born after 37 completed weeks of pregnancy.
Dates Available	1998-2011
Geography	State and county
Date Sources & Availability	These data are based on birth and death certificate records compiled by the California Center for Health Statistics (CHSI), Office of Health Information and Research. California Environmental Health Tracking Program (CEHTP) utilizes CHSI data to provide a data query that allows the user to create tables, charts, and maps using data on preterm birth rates. Rates and counts are available by race/ethnicity, county, and year at www.cehtp.org/p/mih. **Format:** PDF, HTML, CSV, Excel, and JSON
Units &	**Units:** Percent

Coverage	**Coverage:** California - statewide
Notes & Data Limitations	Currently, data only publicly available at the county and state level.

Maternal and Infant Health	
Indicator: Percent of babies born with low birth weight - Baja California, Mexico	
Definition	Number of babies born weighing less than 2,500 grams (about 5.5 pounds) born after 37 completed weeks of pregnancy divided by the number of live births born after 37 completed weeks of pregnancy.
Dates Available	2000-2009
Geography	National and state
Date Sources & Availability	Raw data available through SINAIS http://www.sinais.salud.gob.mx/descargas/zip/anuario2009.zip **Format:** Excel
Units & Coverage	**Units:** Percent **Coverage:** Nationwide
Notes & Data Limitations	Data not publicly available at the municipality level. Demographic data are limited.

Birth Defects	
Indicator: Crude incidence rate of selected Birth Defects - Baja California, Mexico	
Definition	Number of new cases with a clinical diagnosis of: Anencephaly (ICD 10: Q00.0) Spina Bifida (ICD 10: Q05) Cleft Lip with cleft palate (ICD 10: Q05, Q35-Q37)
Dates Available	1995-2012
Geography	National and state
Date Sources & Availability	Statistical data on morbidity are compiled and analyzed through the Sistema Nacional de Vigilancia Epidemiológica, overseen by the Dirección General de Epidemiológia. Reported for all first, secondary, and third-tier care facilities. Data available annually. One of the 110 reportable illnesses. Can query annual morbidity reports: http://www.epidemiologia.salud.gob.mx/anuario/html/anuarios.html. 1. Counts available by state 2. Population distribution available by state 3. Crude rates available by state **Format:** PDF
Units & Coverage	**Units:** Rate per 1,000 children under 1 year of age **Coverage:** Nationwide
Notes & Data Limitations	Data are not publicly available at the municipality level. Demographic data are limited.

Pesticide Exposure
Indicator: Pesticide Illness Reports -California

Definition	Number of pesticide illness cases. Only cases classified as definitely, probably, and possibly related to pesticide exposure are included. A **possible** relationship indicates that health effects correspond generally to the reported exposure, but evidence is not available to support a relationship. A **probable** relationship indicates that limited or circumstantial evidence supports a relationship to pesticide exposure. A **definite** relationship indicates that both physical and medical evidence document exposure and consequent health effects.
Dates Available	1992-2012
Geography	State and county
Date Sources & Availability	CalPIQ-California Pesticide Illness Query-retrieves data from the Department of Pesticide Regulation's (DPR) Pesticide Illness Surveillance Program (PISP) database. CalPIQ is accessible at: http://apps.cdpr.ca.gov/calpiq/ **Format:** Excel
Units & Coverage	**Units:** Counts **Coverage:** California - statewide
Notes & Data Limitations	Reporting is likely to be incomplete. The reporting systems are biased toward acute effects of pesticide exposures rather than chronic effects.

Pesticide Exposure	
Indicator: Crude incidence rate of Pesticide Intoxication-Baja California, Mexico	
Definition	Rate of new cases with a clinical diagnosis of pesticide intoxication (ICD-10: T 60).
Dates Available	1995-2012
Geography	National and State

Date Sources & Availability	Statistical data on morbidity are compiled and analyzed through the Sistema Nacional de Vigilancia Epidemiológica, overseen by the Dirección General de Epidemiológia. Reported for all first, secondary, and third-tier care facilities. Data available annually.
	
	One of the 110 reportable illnesses. Can query annual morbidity reports: http://www.epidemiologia.salud.gob.mx/anuario/html/anuarios.html .
	   1. Counts available for age group by state
	   2. Population distribution available by age group by state
	   3. Crude rates available by age group by state
	
	Format: PDF

Units & Coverage	**Units:** Rate per 100,000 **Coverage:** Reported by all first, secondary, and third-tier care facilities
Notes & Data Limitations	Data are not publicly available at the municipality level. Demographic data are limited.

Coccidioidomycosis - Valley fever	
Indicator: Incidence rate of Coccidioidomycosis- California, U.S.	
Definition	Rate of confirmed coccidioidomycosis cases
Dates Available	2001-2013
Geography	State and county

Date Sources & Availability	Valley fever is a reportable disease in California. The California Department of Public Health (CDPH) maintains the reporting system for reportable communicable disease cases. An annual summary of communicable diseases is released every year. http://www.cdph.ca.gov/healthinfo/discond/Pages/Coccidioidomycosis.aspx **Format:** PDF
Units & Coverage	**Units:** Rate per 100,000 **Coverage:** California - statewide
Notes & Data Limitations	Surveillance is passive and relies on reporting by clinicians and laboratories.

Border Deaths	
Indicator: Migrant Deaths by border sector	
Definition	Border crossing deaths located either inside the target zone or outside of the target zone if Border Patrol was directly involved in the incident. The target zone includes 45 countries on or near the border of CA, AZ, NM, and TX. Border Patrol classifies deaths into sectors based on the Border Patrol station that recorded the death
Dates Available	1998-2014
Geography	Data reported by Border Patrol Sectors (9) which includes 45 counties on or near the border in CA, AZ, NM, TX.
Date Sources & Availability	U.S. Customs and Border Protection. http://www.cbp.gov/sites/default/files/documents/BP%20Southwest%20Border%20Sector%20Deaths%20FY1998%20-%20FY2014_0.pdf **Format:** PDF
Units & Coverage	**Units:** Counts **Coverage:** The southwest border of the United States.
Notes & Data Limitations	Very likely to be underreported. Only those deemed to be "border crossing" deaths and within the target zone are counted. A border crossing death is a death that occurred while attempting illegal entry. Definition of a border crossing death may be inconsistently applied across sectors. Cause of death is not available publicly.

Environmental Indicators

Basemap and Demographic Data – California, U.S.	
Definition	Basemap data and a selection of other general GIS data relevant to the border area
Dates Available	Various
Geography	Various
Data Sources & Availability	• Regional GIS Data Warehouse, San Diego Association of Governments (SANDAG): http://www.sandag.org/index.asp?subclassid=100&fuseaction=home.subclasshome • GIS Library, Southern California Association of Governments (SCAG): http://gisdata.scag.ca.gov/Pages/GIS-Library.aspx • TIGER/Line Shapefiles and TIGER/Line files, US Census Bureau: https://www.census.gov/geo/maps-data/data/tiger-line.html and https://www.census.gov/geo/maps-data/data/tiger-data.html • Available Data Layers, US- Mexico Border Environmental Health Initiative (BEHI): http://borderhealth.cr.usgs.gov/datalayers.html • Map Files, Commission for Environmental Cooperation (CEC): http://www.cec.org/Page.asp?PageID=924&ContentID=2336 • U.S. population estimates available at Factfinder (U.S. Census Bureau): http://factfinder.census.gov/
Units and Coverage	**Units:** Various **Coverage:** Nationwide
Notes & Data Limitations	This is a small selection of the total available data.

Basemap and Demographic Data - Baja California, Mexico	
Definition	Basemap data and a selection of other general GIS data relevant to the border area
Dates Available	Various
Geography	Various
Data Sources & Availability	• Baja California BaseMap, Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO): http://www.conabio.gob.mx/informacion/metadata/gis/bcaprgn.xml?_httpcache=yes&_xsl=/db/metadata/xsl/fgdc_html.xsl&_indent=no • CONABIO also maintains a portal for dynamic data viewing and downloading (shapefile format): http://www.conabio.gob.mx/informacion/gis/ • Topographic Maps, Instituto Nacional de Estadística y Geografía (INEGI): http://www3.inegi.org.mx/sistemas/productos/ (search for cartas topográficas) • A catalog to look up dataset availability is found here: http://www.inegi.org.mx/geo/contenidos/topografia/productos_geograficos.aspx • Censo de Población y Vivienda (2010), Sistema para la consulta de información censal, Instituto Nacional de Estadística y Geografía (INEGI): http://www.inegi.org.mx/est/scince/scince2010.aspx • Available Data Layers, U.S.- Mexico Border Environmental Health Initiative (BEHI): http://borderhealth.cr.usgs.gov/datalayers.html • Map Files, Commission for Environmental Cooperation (CEC): http://www.cec.org/Page.asp?PageID=924&ContentID=2336 • Roadways: available from INEGI via la Red Nacional de Caminos (http://www3.inegi.org.mx/sistemas/biblioteca/ficha.aspx?upc=702825278724) or from INEGI(http://www.inegi.org.mx/est/scince/scince2010.aspx) • Mexico 2010 population estimates at Censo de Población y Vivienda 2010: http://www.inegi.org.mx/sistemas/consulta_resultados/iter2010.aspx

Units and Coverage	**Units:** Various
	Coverage: Nationwide
Notes & Data Limitations	This is a small selection of the total available data.

Air Quality	
Indicator: County level Air Quality Index (AQI)- California, U.S.	
Definition	Air Quality Index (AQI)
Dates available	1980-2015
Geography	State, city (selected cities), or county
Data Sources & Availability	1980-2015: Air Quality Index Report at U.S. EPA http://www.epa.gov/airdata/ad_rep_aqi.html **Format:** CSV
Units and Coverage	**Units:** Air Quality Index, calculated using air monitor pollution measurements (categories: good, moderate, unhealthy for some groups, unhealthy, very unhealthy) **Coverage:** Nationwide, using applicable monitors in select locations (not all large cities have AQI measurements)
Notes & Data Limitations	Network of air monitors used to calculate AQI for areas is sparse in areas of Imperial County and San Diego County.

Air Quality	
Indicator: Air quality at sampling points – U.S. and parts of CA/BC border area	
Definition	Air quality for contaminants sampled in Baja California, Mexico and California, U.S.
Dates Available	2005-2015
Geography	Point locations
Data Sources & Availability	EPA Air Quality System (AQS): http://aqsdr1.epa.gov/aqsweb/aqstmp/airdata/download_files.html **Format:** CSV
Units and Coverage	**Units:** ppm or Air Quality Index (0 to >300, where >100 is harmful to certain groups) **Coverage:** Nationwide (AQS)
Notes & Data Limitations	Air sampling is sparse and imperfect. Data in U.S. EPA file includes Baja California air monitors in Mexicali and Tijuana. Additional resource: Cal EnviroScreen shows measures of specific air quality indicators, such as ozone and particulate matter at the census tract level. Available statewide for California: http://oehha.ca.gov/ej/ces2.html.

Air Quality	
Indicator: Air quality at sampling points – Baja California, Mexico	
Definition	Air quality for contaminants sampled in Baja California, Mexico and California, U.S .
Dates Available	1997-2008 and 2011-2015
Geography	Point locations
Data Sources & Availability	1997-2008: Calidad del Aire-Concentraciones históricas (Air Quality-Historical Concentrations), Instituto Nacional de Ecología y Cambio Climático (INECC). Downloadable by city – not all cities represented: http://www2.inecc.gob.mx/dgicurg/calaire/tend/horarias/concentra.php **Format:** Excel

	2005-2015: Baja California Calidad del Aire (Air Quality): http://www.spabc.gob.mx/dependencia/GestionAmbiental/id/404 **Format:** Not available for download. Displayed as values.
Units and Coverage	**Units:** ppm or Air Quality Index (0 to >300, where >100 is harmful to certain groups) **Coverage:** Baja California- statewide
Notes & Data Limitations	Data for Baja California is also recorded by U.S. EPA monitors that are maintained by SEMARNAT. Air sampling is sparse.

Air Quality	
Indicator: Emissions inventory – California, U.S.	
Definition	Locations of facilities emitting toxic and criteria air pollutants with amounts
Dates Available	1987-2012
Geography	Point locations
Data Sources & Availability	Facility Search Engine, California Air Resources Board (CARB) http://www.arb.ca.gov/app/emsinv/facinfo/facinfo.php **Format:** CSV
Units and Coverage	**Units:** pollutant amounts in tons/year **Coverage:** Nationwide
Notes and Data Limitations	Data may include gaps.

Air Quality	
Indicator: Emissions inventory – Baja California, Mexico	
Definition	Locations of facilities emitting toxic and criteria air pollutants with amounts
Dates Available	2005
Geography	Point locations
Data Sources & Availability	Inventario de Emisiones (Emissions Inventory), Secretaria de Protección al Ambiente, Baja California: Mexicali, general emissions inventory: http://www.spabc.gob.mx/views/files/tmp/c5e078c89220bfa7ae9fcec643160531.pdf Baja California, Greenhouse Gases http://www.spabc.gob.mx/views/files/tmp/2b07fc4a8301d5e7fdca42c991333fcc.pdf **Format:** PDF
Units and Coverage	**Units:** Various **Coverage:** Baja California- statewide
Notes & Data Limitations	We know that this dataset is considered incomplete based on other work by the CEHTP in Imperial County.

Climate Change	
Indicator: Temperature and precipitation changes – California, U.S.	
Definition	Temperature and precipitation changes
Dates Available	1950-2099
Geography	raster data (surface)
Data Sources	1950-2099 (past and future projections)

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& Availability	• Average, max, or min temperature by month or year • Available using 4 different models: CCSM3, CNRM, GFDL, and PCM1 • Two emissions scenarios: A2 and B1 Cal-Adapt: http://cal-adapt.org/data/download/ **Format:** GeoTIFF, ASCII Grid
Units and Coverage	**Units:** Temperature: degrees Celsius; precipitation: mm **Coverage:** California-statewide
Notes & Data Limitations	

Climate Change	
Indicator: Temperature and precipitation changes – Baja California, Mexico	
Definition	Temperature and precipitation changes
Dates Available	Temperature: 1923-2009 Precipitation: 1922-2008 Projections (Temperature & Precipitation): 2010-2099
Geography	Point locations: data by station and state (146 stations in Baja California)
Data Sources & Availability	Northwestern Mexico's Climate Database. Programa Estatal de Acción ante el Cambio Climático, Baja California. Base de datos climáticos del noroeste de México. http://peac-bc.cicese.mx/datosclim/dcbc.php • Observed temperature (also available as max and min temperature): http://peac-bc.cicese.mx/datosclim/descargardatos/BC/temperaturaGeneral.txt • Precipitation: http://peac-bc.cicese.mx/datosclim/descargardatos/BCS/precipitacionGeneral.txt Projections (under scenarios B1 and A2) for 2010-2099: • Annual average temperature (also available as max and min temperature): http://peac-bc.cicese.mx/datosclim/images/images/unoSG.png • Annual average precipitation: http://peac-bc.cicese.mx/datosclim/images/images/tresSG.png **Format:** Text, PNG
Units and Coverage	**Units:** Temperature: deg. C, precipitation: mm **Coverage:** Northwestern Mexico, also includes modeling on U.S. side
Notes & Data Limitations	More information: http://peac-bc.cicese.mx/ Data are available for the northwestern regions of Mexico.

Water	
Indicator: Water Systems – California, U.S.	
Definition	Drinking water system service areas
Dates Available	Updated 2015
Geography	Water systems (polygons)
Data Sources & Availability	Water Systems Geographic Reporting Tool, California Environmental Health Tracking Program: http://cehtp.org/page.jsp?page_key=762 **Format:** Shapefile
Units and Coverage	**Units:** N/A **Coverage:** California-statewide
Notes & Data Limitations	Current water system boundaries recorded in the system cover over 90% of the population of California, according to US Census data and geographic boundaries.

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Water	
Indicator: Water quality – California, U.S.	
Definition	Water quality indicators (drinking or otherwise)
Dates Available	Updated October 2014
Geography	Census tract averaged water quality.
Data Sources & Availability	Cal EnviroScreen 2.0, Office of Environmental Health Hazard Assessment http://www.oehha.ca.gov/ej/ces2.html **Format:** Shapefile, KML Original water quality data at State Water Resources Control Board: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/EDTlibrary.shtml
Units and Coverage	**Units:** Drinking water contaminant index **Coverage:** California-statewide
Notes & Data Limitations	Methods for calculation of drinking water contaminant index available at OEHHA: http://www.oehha.ca.gov/ej/pdf/CES20FinalReportUpdateOct2014.pdf

Water	
Indicator: Water quality – Baja California, Mexico	
Definition	Indicator relating to water quality (drinking or otherwise)
Dates Available	2003-2013
Geography	Point locations where water quality is measured
Data Sources & Availability	Surface water quality data at Sistema Nacional de Información del Agua, Comisión Nacional del Agua: http://www.conagua.gob.mx/CONAGUA07/Contenido/Documentos/CALIDAD_AGUA_2013.xlsx **Format:** Excel file
Units and Coverage	**Units:** map uses several indicators, listed and available here: http://www.conagua.gob.mx/Contenido.aspx?n1=3&n2=63&n3=98&n4=98 **Coverage:** Nationwide
Notes & Data Limitations	Further information may be available via the Subgerencia de Información Geográfica del Agua (SIGA): http://siga.cna.gob.mx/

Green Spaces	
Indicator: Green areas, land cover- California, U.S and Baja California, Mexico	
Definition	Green spaces determined by land cover data
Dates Available	2009
Geography	Global raster data
Data Sources & Availability	GlobCover, European Space Agency. High resolution land cover data available for 2009 via Google Earth Engine (https://earthengine.google.org/#workspace). Includes 22 land cover classes and a quality assurance layer. Original data available from the European Space Agency (https://earth.esa.int/web/guest/home).
Units and Coverage	**Units:** Land cover classes (by raster) **Coverage:** Global

Notes & Data Limitations	Uses 22 land cover classes defined by the United Nations Land Cover Classification System and used globally (http://www.fao.org/docrep/008/y7220e/y7220e00.HTM)

Green Spaces	
Indicator: Green areas, recreational spaces - California, U.S.	
Definition	Lands that are owned in fee and protected for open space purposes by almost 1,000 public agencies or non-profit organizations.
Dates Available	2014
Geography	Polygons
Data Sources & Availability	California Protected Areas Data Portal: California Protected Areas Database (CPAD): http://www.calands.org/data **Format:** Shapefile
Units and Coverage	**Units:** N/A **Coverage:** California - statewide
Notes & Data Limitations	These data are not determined using satellite data.

Green Spaces	
Indicator: Green areas, recreational spaces – Baja California, Mexico	
Definition	Green areas
Dates Available	2010
Geography	Polygons
Data Sources & Availability	Instituto Nacional de Estadística y Geografía: Censo de Población y Vivienda 2010: Sistema para la Consulta de Información Censal (SCINCE versión 05/2012) - servicios: http://www.inegi.org.mx/est/scince/scince2010.aspx **Format:** Shapefile
Units and Coverage	**Units:** N/A **Coverage:** Nationwide
Notes & Data Limitations	These data are not determined using satellite data.

Pesticide Use and Crops	
Indicator: Pesticide use – California, U.S.	
Definition	Use of pesticides in defined geographic subdivisions
Dates Available	2014
Geography	Polygons (area) by counties, townships, and sections
Data Sources & Availability	Agricultural Pesticide Use Web Mapping Service, California Environmental Health Tracking Program: http://www.ehib.org/tool.jsp?tool_key=18 **Format:** Visual tool only
Units and Coverage	**Units:** Summed pounds, acres treated, or pounds per acre of a given pesticide (or all pesticides) **Coverage:** California-statewide
Notes & Data Limitations	Original data for this tool are available from the California Department of Pesticide Regulation, at http://www.cdpr.ca.gov/dprdatabase.htm assigned to Public Land Survey System (PLSS) subdivisions (http://www.blm.gov/ca/st/en/prog/cadastral/gcdbpage.html).

Pesticide Use and Crops	
Indicator: Cropland data – Baja California, Mexico	
Definition	Crop land data
Dates Available	N/A
Geography	Cropland data available at municipality level
Data Sources & Availability	Several sources of information may be useful in learning about crop land: • Land use and vegetation from INEGI (includes varying types of agricultural usage but not specific crop data): http://www.inegi.org.mx/geo/contenidos/recnat/usosuelo/ • Crop data at municipality level from Servicio de Información Agroalimentaria y Pesquera (SIAP): http://www.siap.gob.mx/cierre-de-la-produccion-agricola-por-cultivo/.
Units and Coverage	**Units:** N/A **Coverage:** Nationwide
Notes & Data Limitations	Very little geospatial data is publicly available regarding pesticide use in Baja California.

Traffic	
Indicator: Traffic volume – California, U.S.	
Definition	Annual Average Daily Traffic, or other comparable measure, for roadways
Dates Available	2004 (current version – 2014 data will be available in the next version of the tool)
Geography	Traffic volume at a specific point
Data Sources & Availability	Traffic Volume Linkage Tool, California Environmental Health Tracking Program http://cehtp.org/page.jsp?page_key=136 **Format:** Metrics available for a given point via web tool. Data in spreadsheet form by request.
Units and Coverage	**Units:** Variety of units, related to AADT (annual average daily traffic count) **Coverage:** California-statewide
Notes & Data Limitations	CalEnviroScreen includes a traffic exposure relative score at the census tract level: http://oehha.ca.gov/ej/ces2.html California Department of Transit (CalTrans) data available here for major roadways at points (shapefile) on the Caltrans Traffic Census database: http://www.dot.ca.gov/hq/tsip/gis/datalibrary/Metadata/AADT.html or in other file formats: http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/index.htm. CalTrans data only includes roads of functional class 1, 2, and 3. Most datasets only include major roads, or estimates of minor roadway traffic. In general, traffic volume data is inconsistently sampled and often estimated.

Traffic	
Indicator: Traffic volume – Baja California, Mexico	
Definition	Annual Average Daily Traffic, or other comparable measure, for roadways
Dates Available	2004-2015
Geography	Traffic volumes at given points on roadways
Data Sources & Availability	Traffic data are not dynamically available for Baja California. Sources list traffic data for major roads to be joined with geographic roadway data (see basemap and demographic data section). 2004-2015: Datos Viales, Secretaria de Comunicaciones y Transportes

	http://www.sct.gob.mx/fileadmin/DireccionesGrales/DGST/Datos-Viales-2015/02_BAJA_CALIFORNIA.pdf with data guide: http://www.sct.gob.mx/fileadmin/DireccionesGrales/DGST/Datos-Viales-2015/00_INTRODUCCION.pdf **Format:** PDF
Units and Coverage	**Units:** TDPA (Transito diario promedio anual, or annual average daily traffic) **Coverage:** Nationwide, major roads
Notes & Data Limitations	Traffic data are limited and only major roadways are included. Private vendors, such as TrafficMetrix (KSS Fuels) may provide geographically joined traffic data for Mexico.

Traffic	
Indicator: Documented border crossings - California-Baja California border	
Definition	Border crossings at the California-Baja California border
Dates available	1995-2014
Geography	Available at border crossing points
Data Sources & Availability	U.S. Department of Transportation, Bureau of Transportation Statistics Border Crossing/Entry Data. Query Detailed Statistics: http://transborder.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCQ.html **Format:** CSV Locations of border crossings given via RITA National Transportation Atlas Database: http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_atlas_database/2012/index.html **Format:** Shapefile
Units and Coverage	**Units:** Number of [vehicle or person units: trucks, loaded trucks containers, empty truck containers, trains, loaded rail containers, empty rail containers, train passengers, buses, bus passengers, personal vehicles, personal vehicle passengers, pedestrians] per [time unit: month or year] per border crossing **Coverage:** All border crossing points
Notes & Data Limitations	Data comes from U.S. authorities (crossings from Mexico into the U.S.). Average border crossing wait times available at third party site: http://traffic.calit2.net/border/border-crossing-wait-times-map.php# Current border crossing wait times available here: http://bwt.cbp.gov/

Toxic Sites	
Indicator: Toxic sites – California, U.S.	
Definition	Locations of facilities emitting toxic substances
Dates Available	1987-2013
Geography	Point locations
Data Sources & Availability	Toxic release Inventory (TRI), U.S. EPA http://www2.epa.gov/toxics-release-inventory-tri-program/tri-basic-data-files-calendar-years-1987-2013 **Format:** CSV
Units and Coverage	**Units:** N/A **Coverage:** Nationwide

Notes & Data Limitations	There are missing locational data in both KML and CSV files for California.

Toxic Sites	
Indicator: Toxic sites – Baja California, Mexico	
Definition	Locations of facilities emitting toxic substances
Dates Available	2004-2013
Geography	Point locations
Data Sources & Availability	Registro de Emisiones y Transferencias de Contaminantes (RETC), SEMARNAT: http://app1.semarnat.gob.mx/retc/retc/index.php **Format:** Excel with DMS lat/long coordinates
Units and Coverage	**Units:** N/A **Coverage:** Nationwide
Notes & Data Limitations	Number of sites calculated according to registration information, i.e., if a city was listed. However, some locations have no city listed but may still be located within a city boundary. Therefore, numbers may be slight underestimates RETC data includes brief description of site, for example: Fabricación de equipo no electrónico para uso médico, dental y para laboratorio (manufacturing of non-electric dental, medical, and lab equipment), Transporte por ductos de productos refinados del petróleo (duct transport of refined petroleum products), Fabricación de herrajes y cerraduras (manufacturing of ducts and locks), Fabricación de envases de cartón (manufacturing of cardboard boxes).

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