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Healthy Places Index (3.0)

http://healthyplacesindex.org

by

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HPI 3.0 Update to 2020 Geographic Boundaries

In February 2026, the California Healthy Places Index (HPI 3.0) map platform was updated with the most recent, 2020-vintage geographic boundaries as provided by the US Census Bureau. Table 1 displays the updated geographies on the HPI 3.0 map platform along with their vintage and sources. HPI 3.0 data at the census tract and ZIP Code Tabulation Area (ZCTA) geographies were cross walked from 2010 to 2020 boundaries. Documentation on how this was done can be found in the section called "Geographic Crosswalks for Historical HPI Data" on page 92.

Please note: While the geographic *boundaries* have been updated, the underlying data for HPI 3.0 indicators and domains remain unchanged (Table 2).

Data Availability

In this update, we have discontinued 30 decision support layers (Appendix C) that fall within any of these categories:
-   Binary indicators
    -   Crosswalk methodology includes using selected interpolation weights and summing the weighted numerators and weighted denominators or calculating a weighted mean, which is not interpretable with binary/categorical indicators
-   Indicators at the medical service area (MSSA) geography
    -   Our crosswalk methodology replicated that of IPUMS NHGIS, who produced geographic crosswalk materials for nationally-available census geographies. Historical data aggregated to Medical Service Study Areas were not cross walked to 2020 geographies because MSSAs are a California-specific geography created by the California Department of Health Care Access and Information (HCAI), and therefore fall outside the scope of the IPUMS-produced crosswalk methodology.
-   Race-stratified indicators at the place geography
    -   Data at the census designated places (cities/towns) geography were primarily produced for the HPI 3.0 map to report race-stratified data not otherwise available at a finer geographic scale like census tracts. In the majority of cases, the relative standard error for individual strata was extremely high (> 70% on average) for almost all race/ethnicity strata.

Additionally, the geographic crosswalk would introduce another layer of uncertainty to the resulting indicator estimates. The cross walked stratified data would not meet common acceptable thresholds of reliability and was therefore omitted from the CA HPI 3.0 map at 2020 geographies.
- Exception indicators
    - The precise reason for discontinuation is noted in Appendix C

Data reported at 2020 boundaries **are not accessible** through the map platform API. However, data at 2010 boundaries will remain available. To request HPI 3.0 data at 2020 geographies, please fill out the [Complete HPI Data File request form](#).

Table 1. Available Geographies on the HPI 3.0 Map Platform, their Vintage and Sources

Geography (Display Title)	Year/Vintage	Source
Census Tracts (Tracts)	2020	Census Bureau
Zip Code Tabulation Areas (Zip Codes)	2020	Census Bureau
Unincorporated Areas+	2020	Public Health Alliance of Southern California
Census Designated Places (Cities / Towns)	2020	Census Bureau
Medical Service Study Areas	2010	Department of Health Care Access and Information
Elementary School Districts	2020	Census Bureau
Secondary School Districts	2020	Census Bureau
Unified School Districts	2020	Census Bureau
Counties	2020	Census Bureau
Congressional Districts	118th Congressional Districts	Census Bureau
State Assembly Districts	2022	Census Bureau

State Senate Districts	2022	Census Bureau
Core-Based Statistical Areas	2022	Census Bureau
Metropolitan Planning Organizations	2013	Division of Transportation Planning, Office of Regional and Interagency Planning

+Unincorporated areas are a geography produced by the Public Health Alliance of Southern California for the purposes of the HPI map platform. They are defined as all census tracts that are not within a Census Designated Place, as determined by geographic assignment of census tract centroids.

Technical Summary

INTRODUCTION

The California Healthy Places Index (HPI 3.0) summarizes the healthiness of community conditions of California census tracts based on the distribution of 23 indicators of social determinants of health. Through a mapping application, the HPI links to policies that contribute to improving community conditions and health equity. Since 2018, hundreds of governmental agencies, grant applicants, health care systems, and researchers have used HPI 2.0 to prioritize more than $1 billion in funding opportunities. HPI 2.0 reflected community conditions that were prevalent between 2011 and 2015. Our HPI 3.0 update incorporates newer data from 2015 to 2019, updated policy guides, and new features and functions to the mapping application.

METHODS

To maintain continuity, HPI 3.0 drew from the same publicly available data sources and applied the same methodology as HPI 2.0. The American Community Survey (ACS), 2015-2019, made up half of the individual indicators, which were scaled using Z-Scores and averaged by domains that correspond to policy action areas: economic, education, social, housing, transportation, clean environment, neighborhood, health care access.

(HPI 2.0 used ACS, 2011-2015.) We applied weighted quantile regression to calculate domain weights, which optimized the association of the HPI score with life expectancy at birth (LEB). We also updated and added more than 370 decision support indicators representing health outcomes, climate change exposures, and social vulnerabilities. We provided updated race/ethnicity data (2015-2019) including 22 Asian and 12 Native Hawaiian/Pacific Island subgroups, 52 Native American/Alaskan Native tribal entities and 33 race-stratified indicators (11 of which are in the HPI).

RESULTS

Compared to HPI 2.0, HPI 3.0 had 7790 eligible census tracts, a net decrease of 3, based on a 2015-2019 annual average population ≥ 1500 and group quarters percentage of < 50%. Of 25 indicators in HPI 2.0, twenty-one were retained with updated data. Three indicators were retired (two parent family, alcohol availability, access to healthy foods) based on feedback from users and lack of association with LEB. A new indicator – participation in the 2020 census – was added to the social domain. Supermarkets were added to the retail density indicator, and per capita income substituted for household income in the economic domain. Domain weights were similar between versions. Compared to HPI 2.0, HPI 3.0 had a higher correlation with LEB (r, 0.60 vs. 0.56) and greater variance-explained (R^2, 35.5% vs 31.0%). Changes in the census tract distribution of HPI scores appeared to be mostly due to updated data rather than changes in domains weights. The proportion of agreement in the quartile (Yes/No) of census tracts with the least healthy community conditions among the 7766 census tracts in both versions was 91%. On average, lower HPI 3.0 scores occurred in census tracts in the San Joaquin Valley, Los Angeles area, and the Inland Empire, and among census tracts with the highest percentage of Black and Latino residents. While there was overlap of the most disadvantaged quartile of HPI 3.0 census tracts with the corresponding quartiles of CalEnviroscreen 4.0, the Social Vulnerability Index, and 200% of the federal poverty (sensitivity 0.64, 0.75, 0.84, respectively), populations of discordant census tracts were significant (1.5 to 3.5 million), illustrating that framing an index around social determinants of health prioritizes specific populations that other indices do not.

DISCUSSION

Updates of indicator projects must navigate the imperative of more up-to-date data with the data availability from numerous governmental organizations updating their

own data at irregular intervals, technical requirements such as census tract eligibility, methodologic and data continuity, and user feedback. HPI 3.0 maintains a high degree of continuity with the previous version, and provides a platform for many new features that respond to the challenges of structural racism, climate change, and the COVID-19 pandemic. The HPI continues to be a vital community resource, whose users are helping shape its future.

Background

The purpose of this report is to provide technical information on the Healthy Places Index, HPI, (version 3.0), its 23 constituent indicators, and additional indicators that provide decision-support. The report also provides information on the features of the mapping application (https://map.healthyplacesindex.org) and policy guides that link indicators to a menu of policy actions.

Many governmental entities, academic institutions, and private organizations have developed composite indexes of disadvantage or opportunity.[1-9] These measures allow policy makers and communities to target interventions and resources to areas with the greatest cumulative extent of deprivation. The international practice of disadvantage measurement shares several common concepts and approaches. First, the indexes define deprivation as having multiple dimensions. For example, according to Townsend [10, p.125], people are deprived when they lack the types of diets, clothing, housing, household facilities and fuel and environmental, educational, working and social conditions, activities and facilities which are customary. Second, the experience of disadvantage is a cumulative function of the number and types of deprivation that people experience.[11]   Accordingly, deprivation indexes at the small geographic area include the economic resources, social inclusion, health, educational resources, and shared public infrastructure, and physical environmental hazards. Third, the individual domains comprising disadvantage are both components of and consequences of disadvantage. Neighborhood disadvantage predicts poorer human development outcomes, including lower levels of human health, impaired child development, lower educational achievement, and the experience of violence. At the same time, these outcomes may be considered elements of cumulative neighborhood disadvantage.[1-9]

WHAT IS THE HEALTHY PLACES INDEX?

The Healthy Places Index is the product of the Public Health Alliance of Southern California ("Alliance") who, in 2014, convened a Steering Committee of approximately 20 public health practitioners and researchers from health departments across California (see Appendix A for the list of Steering Committee members), including the California Department of Health and the Bay Area Regional

Health Inequities Initiative (BARHII). With Steering Committee guidance, the Alliance staff and consultants conducted literature reviews and embarked on constructing the index. The HPI utilizes the following definition of *health disadvantage*:

> Health disadvantage is the inability of people to fulfill basic human needs required for full social participation and optimal health and well-being. These needs include but not limited to the needs for economic security, food, shelter, safety, transportation, education, social connection and political participation.

The definition incorporates a holistic concept of health and recognition that health is produced by community factors not addressed by our health care system. As articulated by the World Health Organization, health is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" and the fundamental resources for health are   "... peace, shelter, education, food, income, a stable ecosystem, sustainable resources, social justice, and equity." Similarly, the definition of health disadvantage is inclusive of the diverse non-medical economic, cultural, political, and environmental factors that influence physical and cognitive function, behavior, and disease. These factors are often called health determinants, social determinants of health (SDOH), or social drivers of health.[12]

VERSION HISTORY AND WHAT'S NEW IN HPI?

Health Disadvantage Index (HDI, ~HPI 1.0), 2015-2016

The first version of the HPI was published by the Public Health Alliance in February 2015 as the Health Disadvantage Index.[13] The HDI presented a composite score for each California census tract based on 28 individual indicators, organized into 8 groupings, or domains. The most recent data then available was generally from 2008 to 2012. For each census tract, each indicator was expressed on a standardized scale (Z-scores) of increasing disadvantage, and averaged for each domain. The overall score was calculated as the weighted sum of domain scores. The weights of each domain were informed by a literature review that assessed the relative impact of the domain on overall

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health status. With enhanced technical documentation, the HDI appeared as a Web-based mapping application in January of 2016.[14]

Healthy Places Index (HPI 2.0), 2017-2020

In May 2016, the Steering Committee made several recommendations to Alliance staff to guide future versions:

- Update the indicator values using the most recent available data
- Shift a few individual indicators between the education and social domains
- Exclude health outcomes as a component of the index
- Validate the index against a health outcome
- Revise the method for assigning weights
- Explore a version that optionally includes an explicit measure of race/ethnicity, and
- Harmonize the index with indicator projects at the California Department of Public Health.

In 2017, to implement the recommendations, the Alliance partnered with the Center on Society and Health of the Virginia Commonwealth University (https://societyhealth.vcu.edu/) to assist with index construction and help further develop a communications strategy. The result was the Healthy Places Index (HPI 2.0),[15] which preserved the same conceptual roots as HDI from the social determinants of health, but communicated the overall score and indicators in a positive frame – opportunities for community health improvement – rather than as a negative and potentially stigmatizing "disadvantage". The HPI 2.0 updated many of the same domains and indicators as HDI, and included the following features:

- Updated indicator data from the 2011 to 2015 time period
- A revised Education domain consolidating all education indicators
- Health outcomes available to users as decision support layer, but omitted from the index
- Revised domain weights using statistical methods that optimize the correlation between life expectancy at birth and the HPI score for California census tracts

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- A separate version of HPI that included residential, racial segregation domains.

In June 2018, we launched a new mapping application (http://map.healthyplacesindex.org) that:

- Visualized the HPI score and indicator profiles of user-selected census tracts
- Linked indicators and domains to actionable policies that address the social determinants of health
- Provided complementary data layers on climate threats and community resilience, health outcomes, health behaviors, and other indices of disadvantage
- Aggregated HPI scores and indicator values to user-selected geographies and jurisdictional boundaries of cities, counties, legislative districts, and other geographies.
- Created a customized report for user-selected geographies and indicators, and
- Created a custom index based on user-selected indicator.

Healthy Places Index (HPI 3.0)

An updated version of the HPI was launched in 2022 and includes:

- Updated census tract data, centering on 2015-2019, for HPI scores, core indicators, and life expectancy at birth
- Zip code tabulation areas (ZCTA) as a new geography
- Increased emphasis on race/ethnicity and race/ethnicity-stratified indicators
- Expanded set of decision support data layers including health outcomes, homelessness, disability, public school educational outcomes, and climate change and climate-health vulnerability
- "Point" data layers that represent the locations of health care facilities, schools, toxics emitters, and other sensitive sites
- Updated mapping platform with even faster response times and the ability to filter indicators by race/ethnicity
- Side-by-side maps of indicators for geographic or longitudinal comparisons
- Dynamically generated policy opportunities tailored to neighborhood conditions
- Updated policy guides with supporting evidence

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- Peer-review and publication in *Public Health Reports*.[16]

In response to the COVID-19 pandemic, a companion mapping application was created (https://covid19.healthyplacesindex.org/) to track ongoing 14-day average case rates and death rates stratified by race/ethnicity for California counties and cumulative case rates and death rates by county (starting April 2020). Drawing data from HPI indicators and decision support layers, the mapping application also displays community conditions and medical conditions that increase the risk for COVID-19 exposure, transmission, hospitalization and death.

HPI 3.0 Documentation Change Notes

March 6, 2022
Initial release.

June 9, 2022
Clarification of HPI version history, pages 2 - 3.
Added methodology for calculation of HPI quartiles, pages 13, 18, and 39.

June 23, 2022
Added developer information on the HPI 3.0 mapping application, page 64.

July 26, 2022
Updated description of features available on the HPI 3.0 mapping application, page 65.

September 20, 2022
Clarification of spatial aggregation methodology used on HPI 3.0 mapping application, page 65.

February 6, 2026
Description of cross-walking HPI 3.0 map using 2020 census tract and zip code tabulation area geographies, pages 92-96.

METHODS: INDEX CONSTRUCTION

An overview of index construction is presented below.

Steering Committee:
Alliance & BARHII Data
Committees, CDPH, Others
(TCE & Kaiser funded)

Social Determinants of Health

→ Literature Review ←

Domains

Indicators/ Geographic Unit

Data Sources

Index Production

Communication/ Dissemination → User Feedback
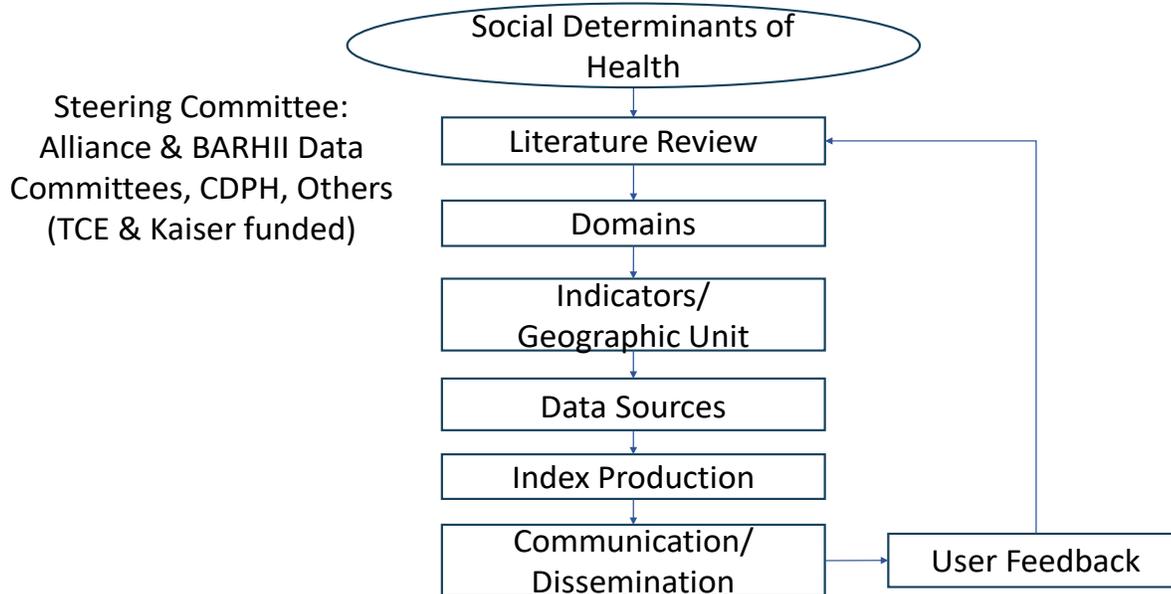
Figure 1. Overview of Index construction

DOMAINS AND INDICATORS

The grouping of indicators within domains or "policy action areas" reflect widely recognized thematic areas of the social determinants of health[17,18] and are consistent with those described by the Centers for Disease Control.[17] Informed by the literature and our Steering Committee, we grouped potential indicators to eight thematic groups or policy action areas:

- Economics
- Education
- Healthcare access
- Housing
- Neighborhood conditions
- Clean Environment

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- Social environment, and
- Transportation.

The criteria for selection of individual indicators were:

- Accessible public data sources
- Up-to-date data at the geographical level of census tract
- Geographical coverage for all eligible 2010 census tracts
- Linkage to policy and other actions ("actionability")
- Association with life expectancy at birth in California census tracts
- Low levels of collinearity with other indicators within a domain
- Continuity with previous HPI versions, and
- Alignment with indicator projects at CDPH.

To maintain consistency across versions, the pool of candidate indicators included those in the previous version of HPI (Table 2).[15] [Table 3] Three of the candidate indicators were inconsistent with the above criteria or posed challenges to communicate policy actions:

- Feedback from users raised concerns that "Two parent families" communicated a potentially stigmatizing message regarding other family types.
- Likewise, "Off-site alcohol sales" was difficult to communicate with positive framing.
- For "access to supermarkets"[19] in updated data (2014-2018), the criteria for a positive correlation with life expectancy was not met.

In response, we retired "Two parent family" from the Social domain, and "Off-site alcohol sales" and "access to supermarkets" from the Neighborhood domain. To ensure that access to healthy foods was represented in the Neighborhood domain, we modified the existing "Retail density" indicator to include supermarkets and similar food establishments. After a literature review of social capital indicators,[20,21] we added "Census response rate" to the Social domain as a measure of social capital or social cohesion.

We also received user feedback that "median household income" may inadequately describe the economic hardships of multigenerational households with few income earners. In response, we now use "per capita income".

Thus, there were 23 indicators in HPI 3.0. As in previous versions of the HPI, data at the census tract were not publicly available for several desirable indicators

Table 2. Policy Action Areas (Domains), Indicators and their Data Sources for the Healthy Places Index 3.0 and 2.0

	Data Source[†], Year	
Policy Action/Indicator	HPI 3.0	HPI 2.0
Economic		
Percent of the population with an income exceeding 200% of federal poverty level	ACS, 2015-2019	ACS, 2011-2015
Percentage of population aged 20-64 who are employed	ACS, 2015-2019	ACS, 2011-2015
~~Median Household Income~~	~~ACS, 2015-2019~~	~~ACS, 2011-2015~~
Per capita income	ACS, 2015-2019	
Education		
Percentage of population over age 25 with a bachelor's education or higher	ACS, 2015-2019	ACS, 2011-2015
Percentage of 15-17 year olds enrolled in school	ACS 2015-2019	ACS, 2011-2015
Percentage of 3 and 4 year olds enrolled in pre-school	ACS, 2015-2019	ACS, 2011-2015
Social		
Percentage of registered voters voting in the general election	UC Berkeley, 2020	UC Berkeley, 2012
~~Percentage of family households with children under 18 with two parents~~		~~ACS, 2011-2015~~
Percent of the population responding to the 2020 census (short form)	Census, 2020	
Transportation		
Percentage of households with access to an automobile	ACS, 2015-2019	ACS, 2011-2015
Percentage of workers (16 years and older) commuting by walking, cycling, or transit (excluding working from home)	ACS, 2015-2019	ACS, 2011-2015
Healthcare Access		
Percentage of adults aged 18 to 64 years currently insured	ACS, 2015-2019	ACS, 2011-2015
Neighborhood		

Percentage of the population living within ½ -mile of a park, beach, or open space greater than 1 acre	GreenInfo, 2012	GreenInfo, 2012
Population-weighted percentage of the census tract area with tree canopy	NLCD, 2011	NLCD, 2011
~~Percentage of the population residing within ¼ mile of an off-site sales alcohol outlet~~		~~ABC, 2014~~
~~Percentage of the urban and small town population residing less than 1/2 mile from a supermarket/large grocery store, and the percent of the rural population living less than 1 miles from a supermarket/large grocery store~~		~~USDA, 2015~~
Combined employment density for retail, entertainment, supermarkets, and educational uses (jobs/acre)	LODES, 2014-2018	USEPA, 2006-2010
Housing		
Percentage of occupied housing units occupied by property owners	ACS, 2015-2019	ACS, 2011-2015
Percent of households with complete kitchen facilities and plumbing	CHAS, 2014-2018	CHAS, 2010-2014
Percentage of low income homeowners paying more than 50% of income on housing	CHAS, 2014-2018	CHAS, 2010-2014
Percentage of low income renter households paying more than 50% of income on housing	CHAS, 2013-2017	CHAS, 2010-2014
Percentage of households with less or equal to 1 occupant per room	ACS, 2015-2019	ACS, 2011-2015
Clean Environment		
Annual average spatial distribution of gridded diesel PM emissions from on-road and non-road sources 2016 (tons/year).	CalEPA, 2016	CalEPA, 2012
CalEnviroScreen 4.0 drinking water contaminant index for selected contaminants	CalEPA, 2011-2019	CalEPA, 2005-2013
Mean of summer months (May-October) of the daily maximum 8-hour ozone concentration (ppm), averaged over three years (2017 to 2019)	CalEPA, 2017-2019	CalEPA, 2011-2013

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Annual mean concentration of PM2.5 (µg/m^3) over three years.	CalEPA, 2015-2017	CalEPA, 2012-2014

Note: Indicators in bold were added in HPI 3.0; Indicators in ~~strikethrough~~ were retired in HPI 3.0

[†] ABC, Alcoholic Beverage Commission[22]; ACS, American Community Survey[23]; CHAS, Comprehensive Housing Assessment System[24]; CalEPA; California Environmental Protection Agency[25]; GreenInfo, (CaLANDS)[26]; NLCD, National Land Cover Database[27]; USDA FARA, U.S. Department of Agriculture Food Access Research Atlas[19]; USEPA, U.S. Environmental Protection Agency[28]; LODES, LEHD Origin-Destination Employment Statistics (LODES)[29] ; UC Berkeley, University of California, Berkeley[30]

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including crime, school quality and performance, and health care quality. We do provide county level data for crime, law enforcement, and public school educational outcomes in the decision support layers.

Geographic Inclusion and Exclusion Criteria

HPI 3.0 geographies are based on 2010 census tract boundaries. Boundary files for the 2020 census were released in September 2021; however, other than population counts, much of the data incorporated into HPI relies on multiple year (e.g., 2015-2019) data collection tied to 2010 census tract boundaries. Until the major data providers such as the American Community Survey release data using the newer 2020 census boundary files, we will continue to use 2010 census tract boundaries.

Census tracts were included in the index if they had a population of 1500 or greater AND a group quarters population less than 50% of the total population in 5-year annual average estimates of the American Community Survey, 2015-2019.[23] These eligibility criteria aimed to improve the statistical reliability and validity of the index. Census tracts with a large share of institutional populations that are mobility restricted (e.g. nursing homes, prisons) and/or are (temporarily) economically dependent on others (e.g. college students) often generate spurious results.

Missing Data

As in previous versions of the HPI, a handful of indicators had a small percentage of eligible census tracts with missing data. Rather than exclude the entire census tract from the HPI, imputation of missing data was done using a nearest (covariate) neighbor algorithm (knnImputation option in the DMwR R package). Updated estimates of life expectancy for California census tracts, 2010-2015, were available from the USALEEP project of the Centers for Disease Control and Prevention.[31] A small number of HPI-eligible census tracts also had missing LEB. To determine whether *knn* or geographic near neighbors was an appropriate method of imputation, we used the Average Nearest Neighbor Index in ArcGIS 10.8 (ESRI, Redlands, CA) to assess whether the distribution tracts with missing LEB were randomly distributed or clustered. We found no clear pattern of randomness in the 10 counties where most (77%) missing data occurred, which favors geographic near neighbors as the most appropriate imputation method. We used the ArcGIS 10.8

Toolbox 'Near Table' to generate up to 10 geographic neighboring census tracts for computing an average LEB assigned to a tract with missing LEB.

Indicator Standardization and Scaling

Each indicator was standardized by computing its Z-score, which is aligned so that higher values indicated greater advantage. This required "flipping" (multiplying by - 1 or subtracting from 100%) for Clean Environment variables and severe housing cost burden, which were framed in the negative direction: higher values indicate less advantage.

For a given indicator, the Z score, Z, for the ith census tract is the difference between the census tract value, X, and the overall variable mean, μ, divided by the variable's standard deviation, σ:

$$Z_i = \frac{X_i - \mu}{\sigma}.$$

Multicollinearity was assessed for each of the domains by calculating a within-domain variance inflation factor (VIF) for each candidate indicator. A VIF of 4 or greater was used as a criteria for identifying excessive multi-collinearity among domain indicators.

Domain Weighting

Domain weights were empirically estimated using weighted and constrained least squares regression model of the eight domain scores against LEB.[32] This regression model, also called weighted quantile sums (WQS), is fit using the eight domain scores and LEB for each census tract. This model simultaneously estimates the domain weights and the association between the HPI score and LEB in such a way that:

- The association between HPI score and LEB is maximized.
- Domains are allotted more weight if they contribute more the prediction of LEB.

- All domains are guaranteed a minimum 5% weight. Because all domains and indicators were carefully chosen based on expert opinion and evidence for an association with health in the literature, we wanted to ensure that each domain retained a minimum weight. A minimum weight of 5% leaves 60% of the weighting to the modeling process (8 domains × 5% = 40% will be in the model based on this criteria).
- If a modeled domain weight were much larger than expected based on expectations from the literature and prior experience with an index like this, we would consider instituting an upper bound with the advice and consent of the Steering Committee. (This contingency did not occur.)

The model was run using LEB data for all HPI-eligible tracts, include a small number with imputed data (see above). We updated the R program used to carry out the WQS regression using a fixed seed value. This avoided slight variations in domain weights from run-to-run of the model.

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Final Index, Percentile Rankings and Quartiles

The Z-scores of each domain were first averaged to produce a domain score, Z.

The HPI was then calculated for each census tract by multiplying each domain score by the corresponding estimated domain weight, and summing across the eight domains.

$$HPI = (w_1 \times Z_{Economic}) + (w_2 \times Z_{Education}) + (w_3 \times Z_{HealthcareAccess}) + (w_4 \times Z_{Housing}) + (w_5 \times Z_{Neighborrhods}) + (w_6 \times Z_{Clean\ Environment}) + (w_7 \times Z_{Social}) + (w_8 \times Z_{Transportation})$$

The census tract percentile of individual indicators, domain Z scores, and the overall HPI score was based on their rank order among 7790 census tracts. Ties were assigned the arithmetic average of their ranks. Zero percentile was the least healthy community conditions, and 100 percentile was the most healthy.

Quartiles were assigned according to the percentile rank assigned. The assignments are as follows:
- Percentiles [0th, 25th] were assigned Quartile 1 (Least Healthy)
- Percentiles (25th, 50th] were assigned Quartile 2
- Percentiles (50th, 75th] were assigned Quartile 3
- Percentiles (75th, 100th] were assigned Quartile 4 (Most Healthy)

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Sensitivity Analyses of Domain Weights

In HPI 2.0, we examined sensitivity of the domain weights to different estimation methods and rural vs urban census tracts.[15] The domain weights varied little with or with imputing missing data. We observed

that algorithms that maximized the association with LEB led to some domains having less than a 5% weight. For the update, we used methods of the preferred WQS approach of constraining the model so the each domain had at least a 5% weight.

The consistency of HPI in rural and urbanized census tracts was analyzed through a comparison of correlations between the index and LEB. The definition of rural and urban followed the three categories used in U.S. 2010 Census and

American Community Survey, which factors population thresholds, populations density, land use, and distance to and continuity with adjacent population centers.[33] Generally, urbanized areas are those with 50,000 or more people. Urban clusters are areas with at least 2,500 but fewer than 50,000 people, and rural is any other area.

Race/Ethnicity and the HPI Update

As a complement to the standard HPI, we previously created a version with a ninth domain that used the

Index of Dissimilarity of Black residents as an indicator of racial residential segregation.[15] This indicator aggregates race-specific population counts from 2020 Census blocks to census tracts. We were not able to update this indicator because block-level data from the 2020 Census was not available.

Since developing the race/ethnicity version of HPI, we received feedback from users regarding methodological limitations of the Index of Dissimilarity, and, more broadly, concern with indicators that focused on a single race/ethnicity rather than multiple race/ethnicities.[34] We also received feedback that

the positive association between the HPI score and the percentage of Latino or Asian census tract residents was emblematic of the Latino/immigrant paradox,[35] whose contributors appear to be related to recent immigration, health selection for emigration, and social cohesion – even in the presence of racism and socio-economic isolation by the larger society. We reached out to several national experts on race/ethnicity, including sociologists and social epidemiologists, who concurred that additional strategies would help elucidate the complexities of race and place. The adverse impact of COVID-19 on American Indian/Alaskan Native, Latinx, Black, Asian and Native Hawaiian/Pacific Islander communities also highlighted the need to disaggregate race/ethnicity at the finest geographic level possible.

In response, we made several significant additions to the HPI:

- Stratification of 11 HPI indicators by race/ethnicity (Table 2) using census categories: Latinx (Hispanic) and non-Latinx (non-Hispanic) American Indian/Alaskan Native, Asian, Black, Multiple races, Other, and White. The stratification was available at the geographic level of city or place for indicators of poverty, income, college educational attainment in adults, health insurance, housing cost burden,

uncrowded housing, and availability of a vehicle.

- Race/ethnicity stratification of indicators in the decision support layers, including infant death rates at the county geography (Table 3).
- New county layers in decision support describing historical red lining, the representation of different race/ethnicities among elected officials.[36]
- New indicators in the decision support layers describing multi-racial/ethnic diversity (Diversity Index, Theil H Index).
- New city/place layers in decision support providing detailed breakdowns (2015-2019) of Asian subgroups (22 categories) and subgroups of Native Hawaiian/Pacific Islanders (10 categories).
- The mapping platform has added a new feature that allows users to filter an indicator's census tracts by a user selected threshold for one or more racial/ethnicity (e.g. above poverty in census tracts with 10 percent or more Native Hawaiian/Pacific Islander residents). Selections can be made for specific, mutually exclusive race/ethnic groups, or non-mutually exclusive groups made up a single race alone and in combination with other races.

Decision-Support Indicators and Domains

Our Steering Committee and many users recognized the utility of including retired HPI indicators, indicators that did not have complete statewide census tract coverage, and other indicators reflecting a wide range of topics that can be used in conjunction with the census tract HPI scores and rankings. Under the rubric of "decision support indicators", these topic areas include:

- Health outcomes from the CDC/Robert Wood Johnson PLACES Project[37]

- Climate health threats
- Demographic and built environment indicators of climate change vulnerability or resilience developed by CDPH,
- Candidate indicators for the HPI that did not meet all the inclusion criteria, and
- All HPI and decision support indicators from HPI 2.0.

For indicators that are consistent across time periods, it is also possible to display the same indicator from 2011-2015 and 2015-2019, providing a longitudinal portrait of census tracts.

Table 3. Retired Census Tracts from HPI 2.0 and Newly Eligible Census tracts in HPI 3.0

Typology/Indicator	Geolevel	Race/Ethnicity Categories
Non-Mutually Excl. 9 Categories		
HPI:		
abovepoverty	county, place	
bachelorsed	county, place	
commute	county, place	
employed	county, place	
homeownership	county, place	All
income	county, place	American Indian and Alaska Native alone
inhighschool	county, place	Asian alone
inpreschool	county, place	Black or African American alone
insured	county, place	Hispanic or Latino
percapitaincome	county, place	Native Hawaiian & Other Pacific Islander alone
uncrowded	county, place	Some other race alone
		Two or more races
		White alone, not Hispanic or Latino

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Decision Support:

foreignborn_citizen	county, place
foreignborn_notcitizen	county, place
broadband	county, place
computer	county, place

Mutually Exclusive 9 Categories

		Total
		Latino
census_participation	county, place	Non-Hispanic Black
		Non-Hispanic American Indian and Alaska Native
		Non-Hispanic Asian
Infant_mortality	county	Non-Hispanic Native Hawaiian/Pacific Islander Non-Hispanic Two or More Races
		Non-Hispanic White
		Non-Hispanic Other

Mutually Exclusive 8 Categories

chronic_absenteeism	county	Total
denied_mortgages	county, place	Latino
hs_grad	county	Non-Hispanic Black
low_birthweight	county	Non-Hispanic American Indian and Alaska Native
perception_of_safety	county	
police_race	county, place	Non-Hispanic Asian
staff_diversity	county	Non-Hispanic Native Hawaiian/Pacific Islander Non-Hispanic Two or More Races
student_homelessness	county	
suspension	county	Non-Hispanic White

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Mutually Exclusive 7 Categories		Total
gr3_ela_scores	county	Latino
		Non-Hispanic Black
		Non-Hispanic American Indian and Alaska Native
gr3_math_scores	county	Non-Hispanic Asian
		Non-Hispanic Two or More
		Races Non-Hispanic White

Mutually Exclusive 6 Categories (NHPI, Multiple race, Other not included)		Total
asthma	county	Latino
		Non-Hispanic Black
		Non-Hispanic American Indian and Alaska
life_expectancy	county	Native
		Non-Hispanic Asian
		Non-Hispanic White

Mutually Exclusive 6 Categories (NHPI, Multiple race, Other not included)		Total
		Latino
		Non-Hispanic Black
usual_source_of_care	county	Non-Hispanic
		Asian
		Non-Hispanic Two or More
		Races Non-Hispanic White

Mutually Exclusive 5 Categories (AIAN, NHPI, Multiple race, Other not included)

got_help	county	Total
		Latino
		Non-Hispanic Black
		Non-Hispanic
		Asian
		Non-Hispanic White

DESCRIPTIVE AND CONCORDANCE ANALYSES

We described the census tract distribution of HPI scores, and quartiles of census tract HPI scores by California regions and race/ethnicity. Quartiles were distributed as follows: quartile 1 [0th percentile, 25th percentile], quartile 2 (25th percentile, 50th percentile], quartile 3 (50th percentile, 75th percentile], and quartile 4 (75th percentile, 100th percentile]. To stratify census tracts by race/ethnicity, we classify census tracts by the quartile of the highest percentage of a specific race/ethnicity. The quartile with the highest percentage had a majority for Asian, Latino and White residents.

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HPI 3.0 vs HPI 2.0

To assess the continuity between the updated and previous version of HPI, we compared the concordance between census tracts in their most disadvantaged quartile quartiles. We computed the following agreement statistics for dichotomous variables in 2 by 2 contingency tables:

	Alternative Index	
HPI 3.0	Most Dis-Advantaged 25%	Least Dis-Advantaged 75%
Least Healthy Community Conditions, 25%	a	b
Most Healthy Community Conditions, 75%	c	d

where Sensitivity = $\frac{a}{a+c}$

Specificity = $\frac{d}{b+d}$

Positive predictive value = $\frac{a}{a+b}$

Proportion of agreement = $\frac{a+d}{a+b+c+d}$;

To assess the independent impacts of updated data and domain weights, we carried out concordance analyses in which HPI scores were recomputed using updated data and previous domain weights. We then carried out a concordance analysis between the updated version (with both updated data and domain weights) and the previous version.

Other Indices of Disadvantage

The updated Healthy Places Index was also compared to individual indicators and indices that are used by California and federal governmental agencies and local health departments to define disadvantaged communities (Table 4). These include:

- CalEnviroScreen 4.0[38], developed in 2014 by the California Environmental Protection Agency
- The federal poverty level, a long-standing component of many indices of disadvantage
- 80% of the median household income, and
- Social Vulnerability Index (SVI).[39]

For HPI, CES, SVI, and poverty we dichotomized the percentile distribution of the total score at 25% (i.e. 25% most disadvantaged census tracts). The 25% percentile cut point was chosen because California EPA designated the 25% highest scoring census tracts in CES as disadvantaged communities. We chose cut points above and below 80% of the 2015-2019 California annual median household income ($61,818 × 0.8 = $49,454).

We computed sensitivity, specificity, positive predictive value, and proportion of agreement for the different index comparisons using HPI as the screening variable and the alternative index as the reference. In addition to the number of census tracts, we used 2015-2019 ACS data on census tracts to estimate the size of residential population in agreement or disagreement areas. All comparisons included only HPI eligible census tracts based on a 5-year (2015-2019) annual average population of ≥1500 residents and a group quarters population <50%.

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Table 4. Description of Indices to Describe Community Disadvantage

Index/ Indicator	CES 4.0[38]	Social Vulnerability Index[39,40] _ENREF_9_2	Poverty/ 80% Median Income
Purpose	Identify pollution- burdened census tracts for enforcement, training, and public outreach	Help public health officials and emergency response planners identify communities needing support before, during, and after a hazardous event	Identify economically disadvantaged communities
Conceptual basis	Disadvantage is determined by exposure to air, soil, and water pollution and its interaction with biological, social, and health characteristics of population subgroups	Factors associated with poor outcomes in communities impacted by severe weather, floods, disease outbreaks, chemical exposure, and other emergencies.	The amount of family income falls below a threshold to sustain adequate standard of living
Number of Indicators	21	15	Poverty, 200% of federal poverty level; 80% of median household income
Domains	Pollution Burden and Population Burden	Socio-economic, Household Composition & Disability, Minority Status & Language, Housing Type & Transportation	NA

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Standardization of indicators	Quintile distribution score (1-5)	Percentile	NA
Weighting	Equal	Equal	N/A
Final Score	Multiply domain scores, rescale	Sum percentile of each indicator, rescale 0-100	

CalEnviroScreen 4.0

CalEnviroScreen (October 2021 update25) was developed by the California Environmental Protection Agency, which states "CalEnviroScreen is primarily designed to assist the Agency in carrying out its environmental justice mission to conduct its activities in a manner that ensures the fair treatment of all Californians, including minority and low-income populations." Its original purpose was to guide its internal enforcement, education, and training efforts. With the passage of SB535, its use broadened to include designating disadvantaged communities for enhanced funding in California climate change and transportation programs.

CES organizes indicators into two broad domains representing pollution burden and population characteristics, which include sensitive populations and socioeconomic factors. The final score represents the multiplicative interaction of the pollution burden and population characteristics. This follows observations in the epidemiologic and toxicological literature in which population characteristics amplify health effects of specific environmental pollutants. Seven of the 21 indicators in CES are also used in the HPI (unemployment, poverty, low educational attainment, PM2.5, ozone, diesel particulate matter, drinking water contaminants).

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Poverty

Multiples of the federal poverty level are commonly used to describe economic disadvantage and establish eligibility for some federal and state health and human service programs. The poverty level is an income threshold adjusted for family composition and size and includes money income before taxes, but excludes capital gains and noncash benefits such as public housing, Medicaid, and food stamps.[41] The Women, Infant, and Children Program[42] administered by the California Department of Public Health is an example of a state governmental program that uses the federal poverty level (185% of FPL) to establish program eligibility. For HPI and CES, poverty was defined at 200% of the federal poverty level.

Median Household Income

Percent of median household income for a given geographic area is used by several governmental agencies to define low income households that are eligible for benefits programs such as housing assistance,[43,44] or a disadvantaged community (80%).[45] (Of note, per capita income is one of the indicators in the HPI economic resources domain).

Social Vulnerability Index

The Social Vulnerability Index (SVI)[39] was developed by the Agency for Toxic Substances & Disease Registry (part of the Centers for Disease Control & Prevention) to help public health officials and emergency planners identify communities that need support before, during, and after a public health emergency associated with natural disasters or disease outbreaks. The SVI organizes 15 variables for each census tract in the United

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States into 4 themes: 1) Socio-economic, 2) Household Composition & Disability, 3) Minority Status & Language, and 4) Housing Type & Transportation. Census tracts for each of the 15 indicators are given a percentile and an overall score is based on the sum of percentile ranks, which is rescaled from 0 to 100 with 100 being the most vulnerable. For the comparison with HPI, we downloaded the California version (2014-2018) and created an overall score based on California census tracts. Six of the 15 indicators (poverty, educational attainment, employment, income, crowded housing, and access to vehicle) are exact or near matches with those in the HPI. Several SVI indicators are included in HPI decision support layers (age 65 years and older, disability, minority, English language proficiency).

DATA PROCESSING AND QUALITY ASSURANCE PROCEDURES

Data were acquired from application programming interfaces (APIs) or as downloaded comma separated values files from public websites of the organizations that developed or processed data from primary sources. R programs were written to abstract numerator, denominator, and outcomes (e.g. percent or rate), and the margin of error when available. The specific construction of indicators from source files is provided in Appendix B (Data Dictionary and Source Data Variable Transformations for HPI Files). Data quality was first checked by examining distributions, missing data, and potential outliers of individual indicators and their percentile rankings (for correct directionality). The resulting data files were rechecked using an R program that generated distributions, missing data, Z-scores,and domain averages, and recomputed the HPI score using reported domain weights. A discrepant indicator was checked and corrected, if necessary, until the indicators values matched exactly or with slight rounding error.

RESULTS

CENSUS TRACT ELIGIBILITY

Of the 8057 California census tracts, 7,790 met our eligibility criteria based on population size (≥ 1,500; ACS 2015-2019) and living in group quarters (<50%). Of the 268 excluded census tracts, 63 met both exclusion criteria, 136 were excluded because of insufficient population alone, and 68 were excluded for group quarters alone. Table 5 lists the census tracts that were retired from HPI 2.0 and those newly eligible in HPI 3.0. The geographic distribution of new and retired tracts is shown in Figure 2. There was no distinct geographic shift in the distribution of eligible tracts (e.g., newly eligible tracts were not more urban than retired tracts.)

HPI INDICATORS, DOMAINS, AND WEIGHTS

The final set of 23 indicators of HPI 3.0 are presented in Table 6 with their association with LEB. The assessment of multicollinearity within domains did not show any VIF values above 4 and no indicators were excluded within domains due to concerns with multi-collinearity. Applying the WQS package in R to HPI indicators, weights were obtained for the eight domains (Table 7, Figure 3). The correlation between LEB and the HPI score was strong (r = 0.60) and a large proportion of the variation was explained (R^2 = 0.36) in simple linear regression.

Rural/Urban

Associations (Pearson r) between life expectancy at birth and the HPI score were positively correlated in each of three strata of urbanization, but showed a stronger association in urban census tracts compared to urban clusters in rural

areas and rural census tracts: 0.60 (N=7049 urban census tracts), 0.46 (N=371 urban clusters in rural areas), and 0.47 (N= 369 rural census tracts).
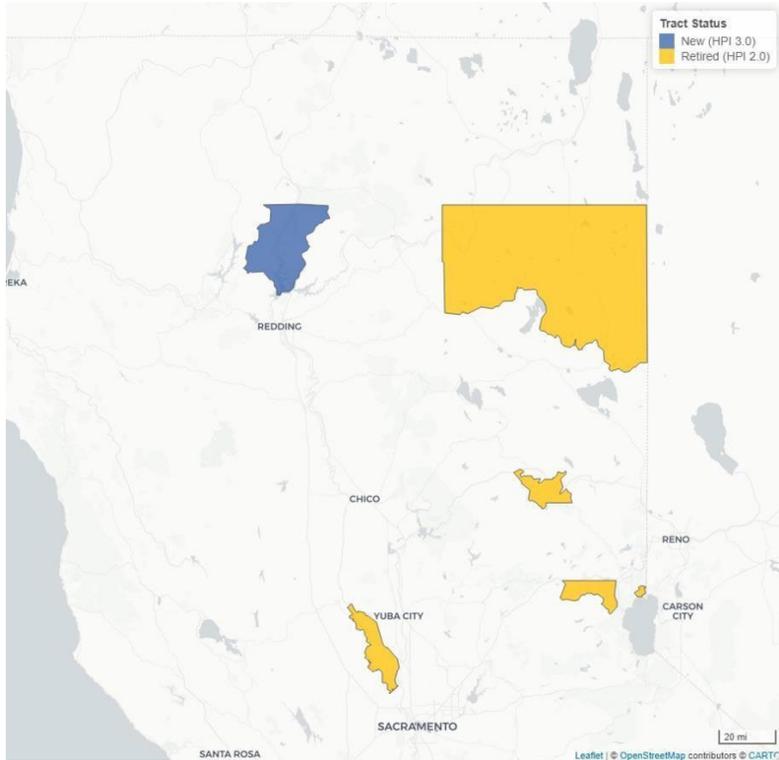
Table 5. Retired Census Tracts from HPI 2.0 and Newly Eligible Census tracts in HPI 3.0

Retired (HPI 2.0)		Newly Eligible (HPI 3.0)	
County	Census Tract	County	Census Tract
Calaveras	6009000503	Alameda	6001450102
Kern	6029006004	Fresno	6019005605
Lassen	6035040100	Kern	6029001600
Los Angeles	6037265410	Kern	6029003303
Los Angeles	6037277400	Kern	6029003304
Los Angeles	6037550400	Los Angeles	6037137000
Los Angeles	6037554103	Los Angeles	6037461700
Los Angeles	6037930401	Los Angeles	6037502802
Mariposa	6043000400	Los Angeles	6037573401
Merced	6047002401	Los Angeles	6037920303
Placer	6061020106	Monterey	6053010306
Placer	6061022014	Orange	6059042106
Plumas	6063000201	Orange	6059052404
Riverside	6065044404	Riverside	6065044807
Riverside	6065044405	Riverside	6065045122
Riverside	6065044520	Sacramento	6067000800
Sacramento	6067005201	Sacramento	6067005301
San Bernardino	6071011002	Sacramento	6067009110

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San Bernardino	6071011203	San Bernardino	6071002207
San Bernardino	6071025100	San Bernardino	6071011204
San Bernardino	6071940100	San Diego	6073010501
San Diego	6073009106	San Francisco	6075011800
San Diego	6073013415	San Luis Obispo	6079010603
Santa Clara	6085513000	Shasta	6089012500
Santa Cruz	6087123300		
Sutter	6101050900		
Ventura	6111005700		

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A. Northern California

B. Mid-California
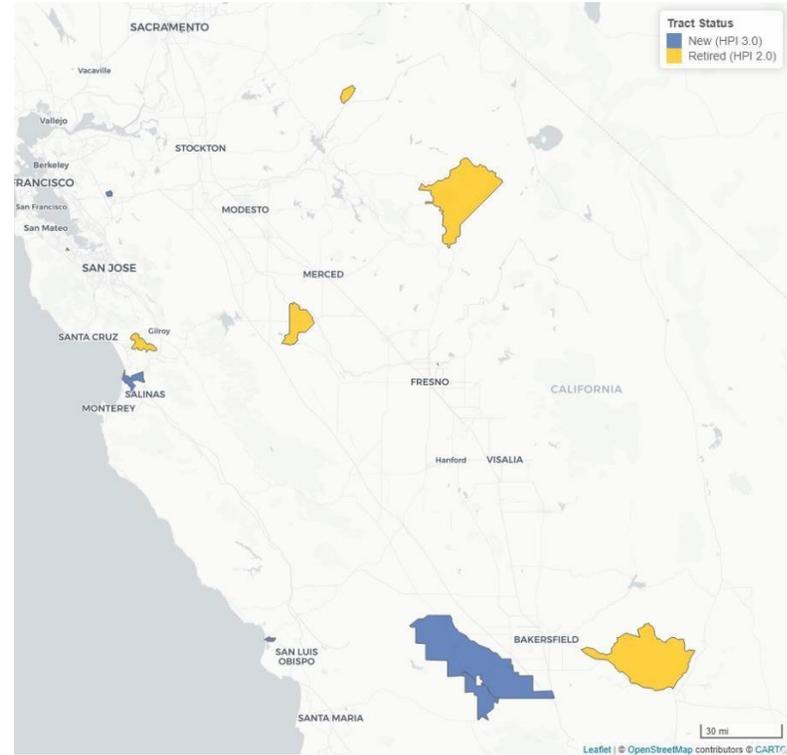
Figure 2. Distribution of Retired Census Tracts (HPI 2.0) and New Census Tracts (HPI 3.0)
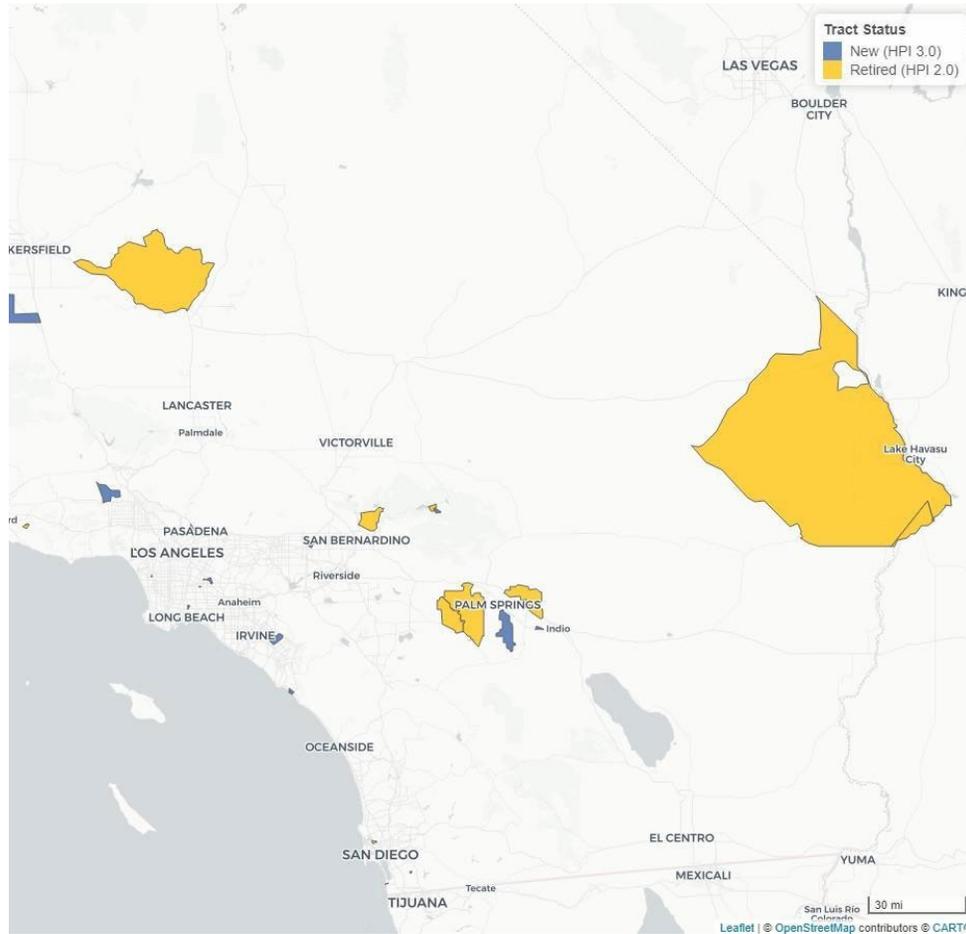
C. Southern California

Figure 2. Distribution of Retired Census Tracts (HPI 2.0) and New Census Tracts (HPI 3.0)

Table 6. Policy Action Areas (Domains), Indicators and their Data Sources for the Healthy Places Index 3.0

Policy Action/ Indicator	Definition	Correlation with LEB	Data Source[†], Year
Economic			
abovepoverty	Percent of the population with an income exceeding 200% of federal poverty level	0.58	ACS, 2015-2019
employed	Percentage of population aged 20-64 who are employed	0.40	ACS, 2015-2019
percapitaincome	Per capita income	0.53	ACS, 2015-2019
Education			
bachelorsed	Percentage of population over age 25 with a bachelor's education or higher	0.57	ACS, 2015-2019
inhighschool	Percentage of 15-17 year olds enrolled in school	0.08	ACS, 2015-2019
inpreschool	Percentage of 3 and 4 year olds enrolled in pre-school	0.29	ACS, 2015-2019
Social			
voting	Percentage of registered voters voting in the general election	0.52	UC Berkeley, 2020
censusresponse	Percentage of 2020 decennial households who completed census forms online, by mail, or by phone	0.37	Decennial Census 2020
Transportation			
automobile	Percentage of households with access to an automobile	0.25	ACS, 2015-2019
commute	Percentage of workers (16 years and older) commuting by walking, cycling, or transit (excluding working from home)	0.02	ACS, 2015-2019
Healthcare Access			
insured	Percentage of adults aged 18 to 64 years currently insured	0.37	ACS, 2015-2019

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Neighborhood			
parkaccess	Percentage of the population living within ½ -mile of a park, beach, or open space greater than 1 acre	0.08	GreenInfo, 2012
treecanopy	Population-weighted percentage of the census tract area with tree canopy	0.13	NLCD, 2011
retail	Combined employment density for retail, entertainment, and educational uses (jobs/acre)	0.02	USEPA, 2010
Housing			
homeownership	Percentage of occupied housing units occupied by property owners	0.33	ACS, 2015-2019
houserepair	Percent of households with complete kitchen facilities and plumbing	0.09	ACS, 2015-2019
ownsevere	Percentage of low income homeowners paying more than 50% of income on housing costs	-0.13	CHAS, 2010-2014
rentsevere	Percentage of low income renter households paying more than 50% of income on housing costs	-0.26	CHAS, 2010-2014
uncrowded	Percentage of households with less or equal to 1 occupant per room	0.29	ACS, 2015-2019
Clean Environment			
dieselpm	Spatial distribution of gridded diesel PM emissions from on-road and non-road sources for a 2016 summer day in July (tons/year) Census tracts were ordered by diesel PM concentration values and assigned a percentile based on the statewide distribution of values.	-0.08	CalEPA, 2016
h20contam	Cal EnviroScreen 4.0 drinking water contaminant index for selected contaminants	-0.06	CalEPA, 2011-2019

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Results

ozone	Mean of summer months (May-October) of the daily maximum 8-hour ozone concentration (ppm), averaged over three years (2017 to 2019). Census tracts were ordered by ozone concentration values and assigned a percentile based on the statewide distribution of values.	-0.21	CalEPA, 2017-2019
pm25	Annual mean concentration of PM2.5 (average of quarterly means, µg/m^3), over three years. Census tracts were ordered by	-0.09	CalEPA, 2015-2017
	PM2.5 concentration values and assigned a percentile based on the statewide distribution of values.		

[†] ACS, American Community Survey[23]; CHAS, Comprehensive Housing Assessment System[24]; CalEPA; California Environmental Protection Agency[25]; GreenInfo, (CaLANDS)[26]; NLCD, National Land Cover Database[27]; USEPA, U.S. Environmental Protection Agency[28]; LODES, LEHD Origin-Destination Employment Statistics (LODES)[29] ; UC Berkeley, University of California, Berkeley[30]

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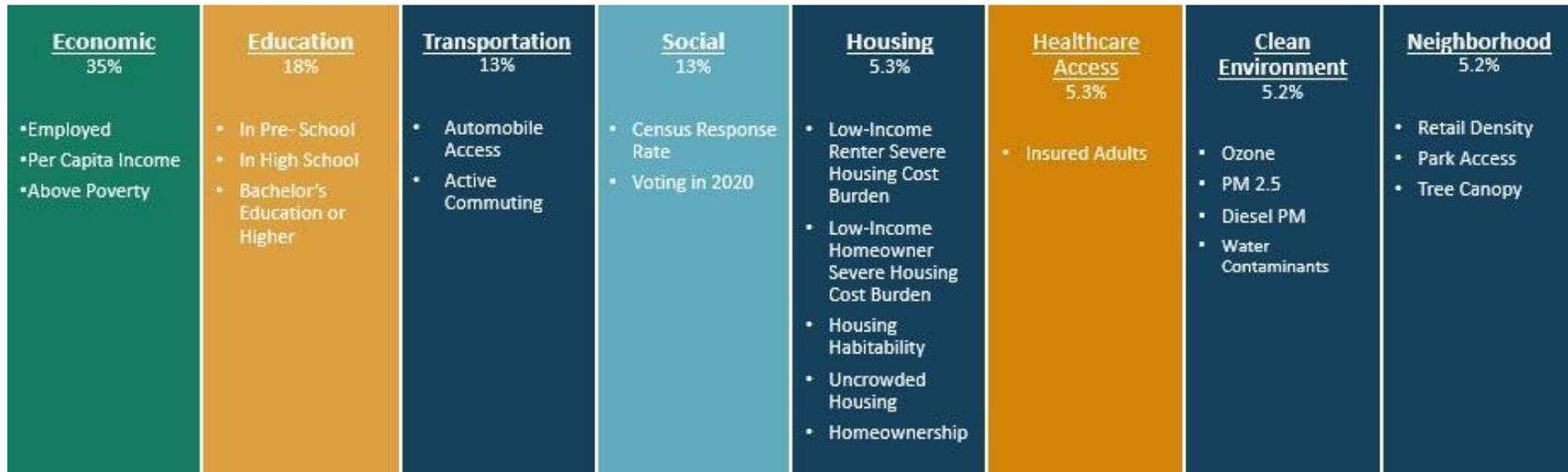OF SOUTHERN CALIFORNIA

Figure 3. Healthy Places Index Policy Action Areas (Domains), Weights, and Individual Indicators

Table 7. Weighted Quantile Sums Domain Weights

Domain	Weight
Economic	0.35
Education	0.18
Social	0.13
Transportation	0.13
Housing	0.053
Insurance	0.053
Clean Environment	0.052
Neighborhood	0.052

DESCRIPTIVE ANALYSES

This frequency distribution of census tracts by HPI score is presented in Figure 4. The distribution ranges from -2.4 to 1.7 with a mean centered at 0, and approximates a normal curve.

Distribution of Raw HPI 3.0 Scores
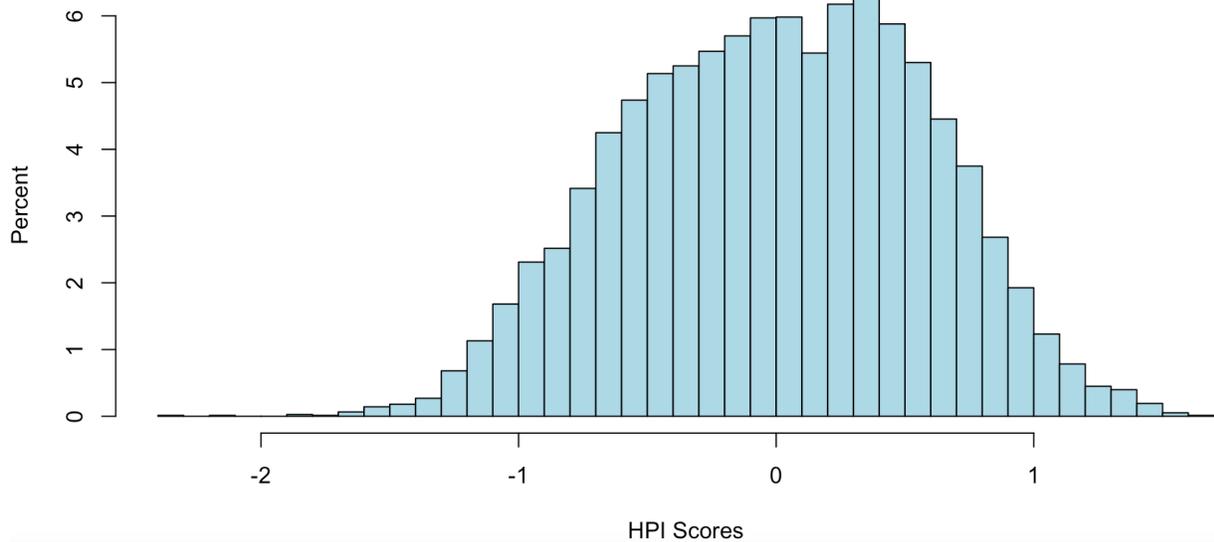
Figure 4. Distribution of HPI scores for 7,790 California census tracts

Most indicator domains were positively correlated with each other. Figure 5 illustrates Pearson correlations among the HPI score and component unweighted indicator domain scores. Domain scores for economic, education, social and healthcare domains tended to have high correlations with each other.

Domain	Economic	Education	Social	Trans.	Health-care	Neighbor-hood	Housing	Clean Env.
Economic	1							
Education	0.63	1						
Social	0.73	0.48	1					
Transportation	0.44	0.35	0.35	1				
Healthcare	0.61	0.46	0.66	0.28	1			
Neighborhood	0.29	0.28	0.17	0.13	0.21	1		
Housing	0.55	0.33	0.67	0.32	0.62	0.02	1	
Clean Environment	0.33	0.23	0.39	0.3	0.31	0.28	0.29	1

Figure 5. Pearson Correlations Among HPI Domains, California, 2010

Geographic Distribution of HPI and Domain Scores

Table 8 gives the distribution of census tracts by quartile of HPI score by California region. The San Joaquin Valley and Inland Empire have a disproportionate share of census tracts in the quartile with the least healthy community conditions and lower mean HPI scores. The Bay Area has the smallest share of such census tracts.

Population counts show a similar pattern (Table 9). All California counties except

Alpine had an HPI-eligible census tract. Twelve counties, mostly in the northern and central Sierras and the Bay Area, did not have any census tracts in the quartile with the least healthy community conditions (Alpine, Colusa, El Dorado, Inyo, Mono, Napa, Nevada, Plumas, San Benito, Sierra, Sonoma, Tuolumne). However, rural areas had a higher proportion of the census tracts in the least healthy quartile (31.7%; 117/369) than urban areas (24.7%, 1830/7420).

Table 8. Distribution of Disadvantaged Census Tracts by Region, California, 2019

Region	Quartile of HPI Score				Sum	Percent Least Healthy (Least/Sum)
	Least Healthy Community Conditions 1	2	3	Most Healthy Community Conditions 4		
Bay Area	69	199	384	896	1548	4%
Inland Valley	317	282	175	24	798	40%
Los Angeles Area	846	737	664	589	2836	30%
Sacramento Area	71	136	183	110	500	14%
San Diego	117	160	188	176	641	18%
San Joaquin Valley	384	214	123	17	738	52%
Other	143	220	230	136	729	20%
Sum	1947	1948	1947	1948	7790	25%

† Regions by County:

Bay Area: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma

San Joaquin Valley: Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare Inland Valley: Riverside, San Bernardino

Sacramento Area: El Dorado, Placer, Sacramento, Sutter, Yolo, Yuba Los Angeles Area: Los Angeles County,

Orange County

San Diego: Imperial, San Diego

Other: Butte, Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, Tuolumne, Monterey, San Benito, Santa Cruz, Del Norte, Humboldt, Lake,
    Mendocino, Trinity, Lassen, Modoc, Nevada, Plumas, Sierra, Siskiyou, Colusa, Glenn, Tehama, San Luis Obispo, Santa Barbara,
    Shasta, Ventura

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Table 9. Distribution of Populations by Region by HPI Quartile, California, 2019

Region	Quartile of HPI Score				Sum	Percent Least Healthy
	Least Healthy Community Conditions 1	2	3	Most Healthy Community Conditions 4		
Bay Area	317,090	1,008,659	1,959,180	4,364,259	7,649,188	4%
Inland Valley	1,697,675	1,562,796	1,111,713	122,658	4,494,842	38%
Los Angeles Area	3,748,347	3,533,888	3,094,188	2,755,163	13,131,586	29%
Sacramento Area	364,758	627,473	924,141	538,635	2,455,007	15%
San Diego	635,500	860,581	1,033,748	921,926	3,451,755	18%
San Joaquin Valley	2,002,118	1,267,542	772,654	88,741	4,131,055	48%
Other	647,899	1,053,589	1,164,487	613,638	3,479,613	19%
Sum	9,413,387	9,914,528	10,060,111	9,405,020	38,793,046	24%

† Regions by County:

Bay Area: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma

San Joaquin Valley: Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare

Inland Valley: Riverside, San Bernardino

Sacramento Area: El Dorado, Placer, Sacramento, Sutter, Yolo, Yuba

Los Angeles Area: Los Angeles County, Orange County

San Diego: Imperial, San Diego

Other: Butte, Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, Tuolumne, Monterey, San Benito, Santa Cruz, Del Norte, Humboldt, Lake,

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Mendocino, Trinity, Lassen, Modoc, Nevada, Plumas, Sierra, Siskiyou, Colusa, Glenn, Tehama, San Luis Obispo, Santa Barbara, Shasta, Ventura
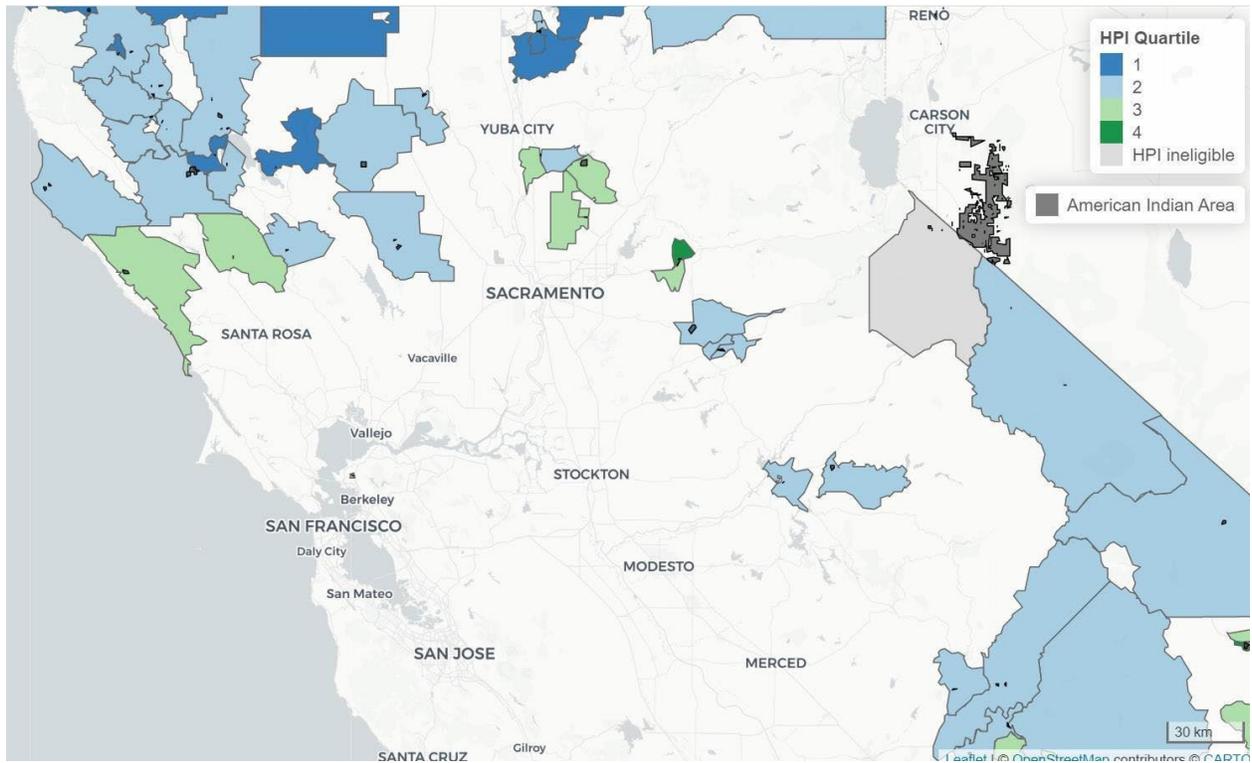
American Indian Areas Coverage

There are 196 census tracts in California that partially overlap with American Indian Areas. Of those 196 tracts, 182 (93%) met our HPI eligibility criteria and 14 (7%) were excluded due to insufficient population and/or percentage of population living in group quarters. Most American Indian Areas in California that overlap with an excluded census tract also overlap with one or more adjacent eligible tracts. Of the 110 distinct American Indian Areas, 105 (95%) have at least partial coverage by HPI-eligible tracts. The geographic distribution of American Indian Areas and their overlap with HPI-eligible census tracts is shown in Figure 6.

A. Northern California
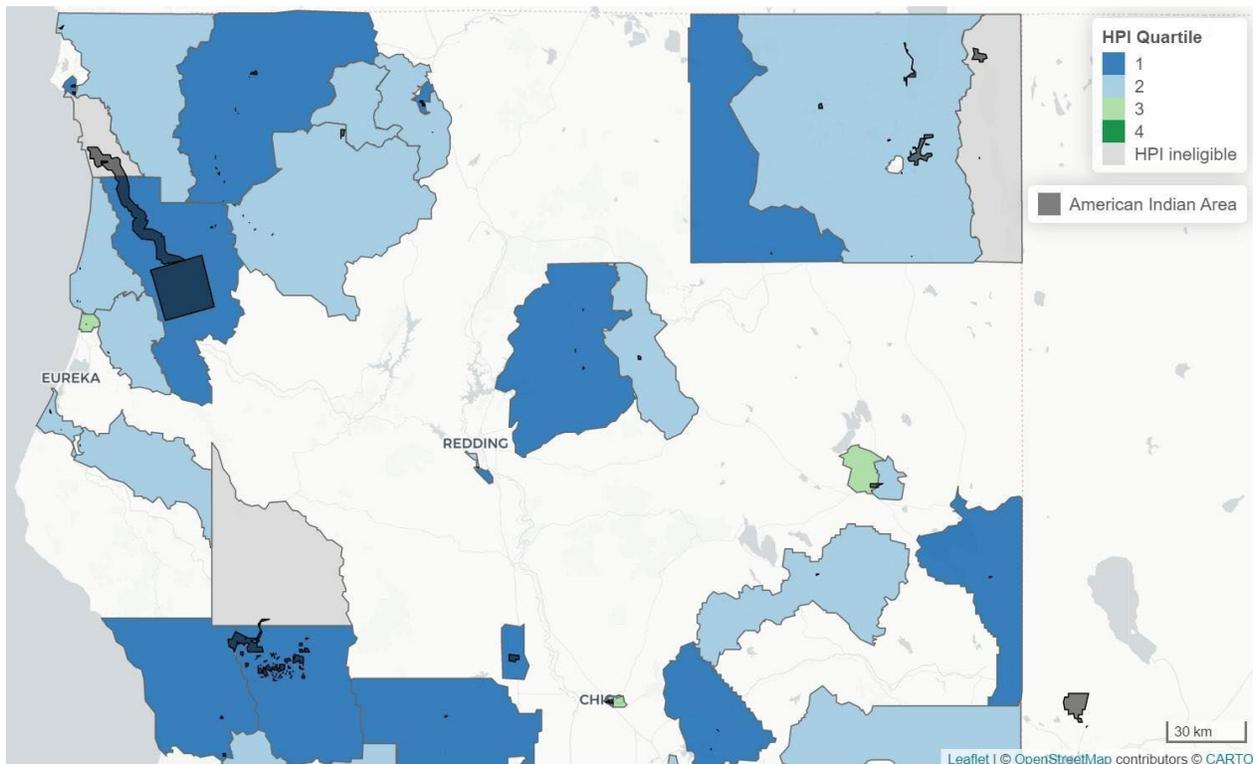
Figure 6. Distribution of American Indian Areas and HPI 3.0 Eligible Census Tracts

B. Mid-California

C. Southern California
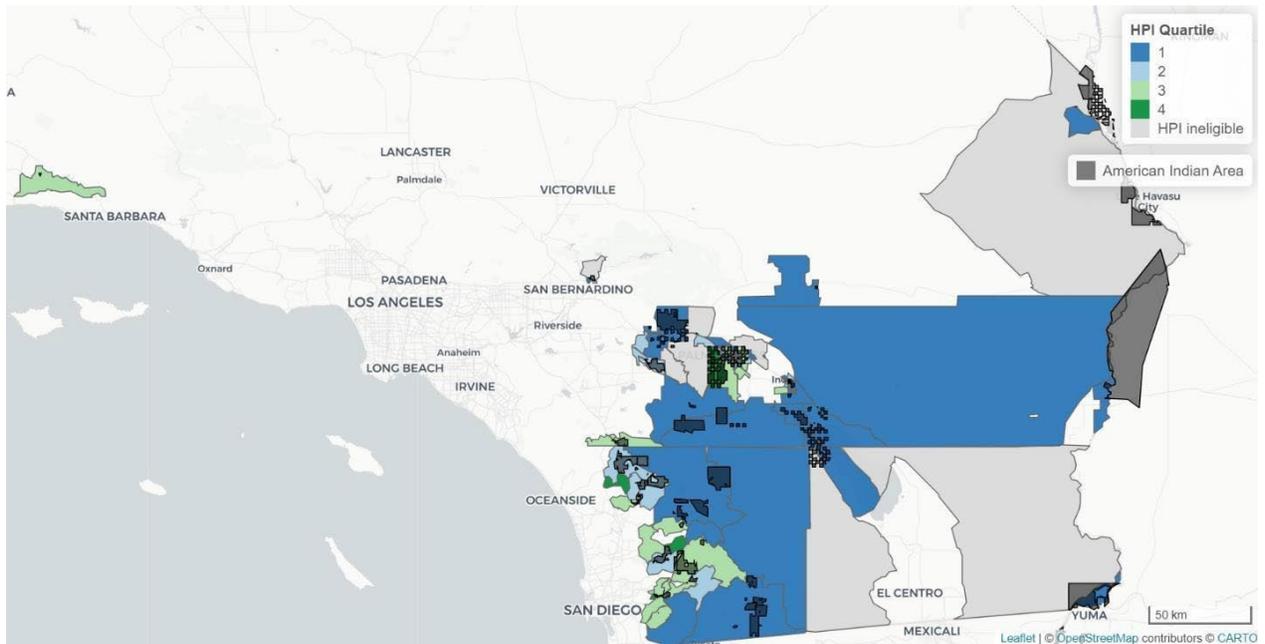
Figure 6. Distribution of American Indian Areas and HPI 3.0 Eligible Census Tracts

Distribution of HPI Scores by Race/Ethnicity

To describe the distribution of HPI scores by race/ethnicity, we used area-based (census tract) measures of race/ethnicity, focusing on the quartile of census tracts with the greatest proportion of a given race/ethnicity (Figure 7). Given the geographic dispersion and small proportion of Native American/Alaskan Native and Native Hawaiian/Pacific Islanders in any given census tract, we restricted the analysis to Asian, Black, Latinx, and White.
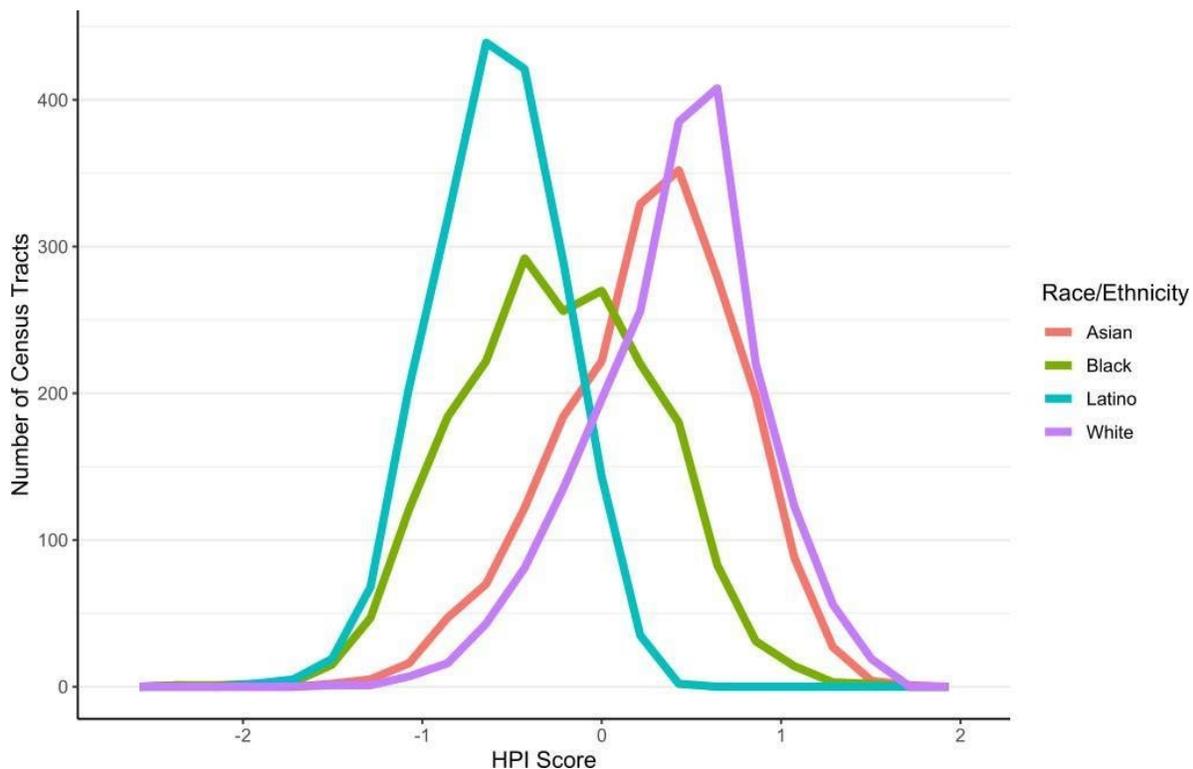
Figure 7. Distribution of HPI 3.0 Scores in Quartile of Census Tracts With the Highest Proportion of Asian, Black, Latino, and White Residents, California, 2015-2019 (Higher HPI Score = Healthier Community Conditions)

HPI scores in census tracts with high concentration of Asian (median 31%) and White (median 72%) skewed towards higher values (more opportunity). HPI scores in census tracts with high concentration of Latinx (median 76%) and Black

![Public Health Alliance of Southern California logo]

(median 12%) skewed toward less healthy community conditions.

Comparison of HPI 3.0 and HPI 2.0

HPI 3.0 and HPI 2.0 are similar in that they have the same domains, common definitions of indicators, and the same methodology to determine domain weights. They differ in that a small subset of census tracts in HPI 2.0 did not meet eligibility criteria in an updated time period, the values of indicators changed with updated data, and there was a net change in the number of indicators (four dropped, two added). Table 10 compares domains weights and R^2 values of the regression of HPI score and LEB for the two HPI versions.

Compared to HPI 2.0, HPI 3.0 had a higher correlation with LEB (r, 0.60 vs. 0.56) and greater variance-explained (R^2, 35.5% vs 31.0%). Compared to HPI 2.0, the HPI 3.0 domains of economic, education, and social domains increased by ≤0.05, and the transportation domain decreased by 0.03.

Table 10. Comparison of domain weights, R^2 values

Weights	HPI 3.0	HPI 2.0
Economic	0.35	0.32
Education	0.18	0.19
Social	0.13	0.10
Transportation	0.13	0.16
Housing	0.053	0.05
Insurance	0.053	0.05
Clean Environment	0.052	0.05
Neighborhood	0.052	0.08
R^2 for HPI Score on LEB	0.36	0.31

To assess the independent contributions of updated data and changes in domains and indicators, we first examined census tract concordance of the HPI 2.0 quartile with the least healthy community conditions and that of a version with updated data (2015-2019), but that retained HPI 2.0 eligible census tracts,

domain weights, and indicators (Table 11A). To assess the change in census tract concordance, simultaneously updating data and domain weights, we compared the 25% least healthy census tracts between HPI 3.0 and HPI 2.0 for the 7767 census tracts they have in common (Table 11B). The least healthy quartile (Quartile 1) included any census tract with an HPI score between the 0th and 25th percentile, inclusive.

Updating data, but retaining HPI domain weights, shifted 18% (~348) census tracts from HPI 2.0 quartile with the least healthy community conditions (Table 11A).

Simultaneous updating of data and domain weights in HPI 3.0 had a similar shift in the least healthy census tracts from HPI 2.0. This suggests that there is high concordance and continuity in census tracts with the least healthy community conditions between HPI 2.0 and HPI 3.0, and that updating data (from 2011-2015 to 2015-2019) accounted for most of the change. (This is not surprising given that the indicators and domain weights changed little between versions).

Table 11. Concordance of HPI 2.0 and HPI 3.0 Census Tracts in the Quartile with the Least Healthy Community Conditions in Versions with Updated Data and Updated Domain Weights

Census Tracts

A. Updated Data and HPI 2.0 Domain Weights

		HPI 2.0 with Updated Data (2015-2019)		
		Least Healthy 25%		
HPI 2.0 (2011-2015)		Y	N	Sum
Least Healthy Community	Y	1600	348	1948
Conditions, 25%	N	347	5497	5844
	Sum	1947	5845	7792

B. Updated Data and Updated Domain Weights

		HPI 3.0		
		Least Healthy 25%		
HPI 2.0 (2011-2015)		Y	N	Sum
Least Healthy Community	Y	1608	330	1938
Conditions, 25%	N	333	5495	5828
	Sum	1941	5825	7766

The geographic distribution of concordant and discordant census tracts (Table 13B) are presented in Figure 8.

Figure 8. Concordance of the Quartile of Census Tracts with the Least Healthy Community Conditions, HPI 3.0 vs HPI 2.0, Northern California
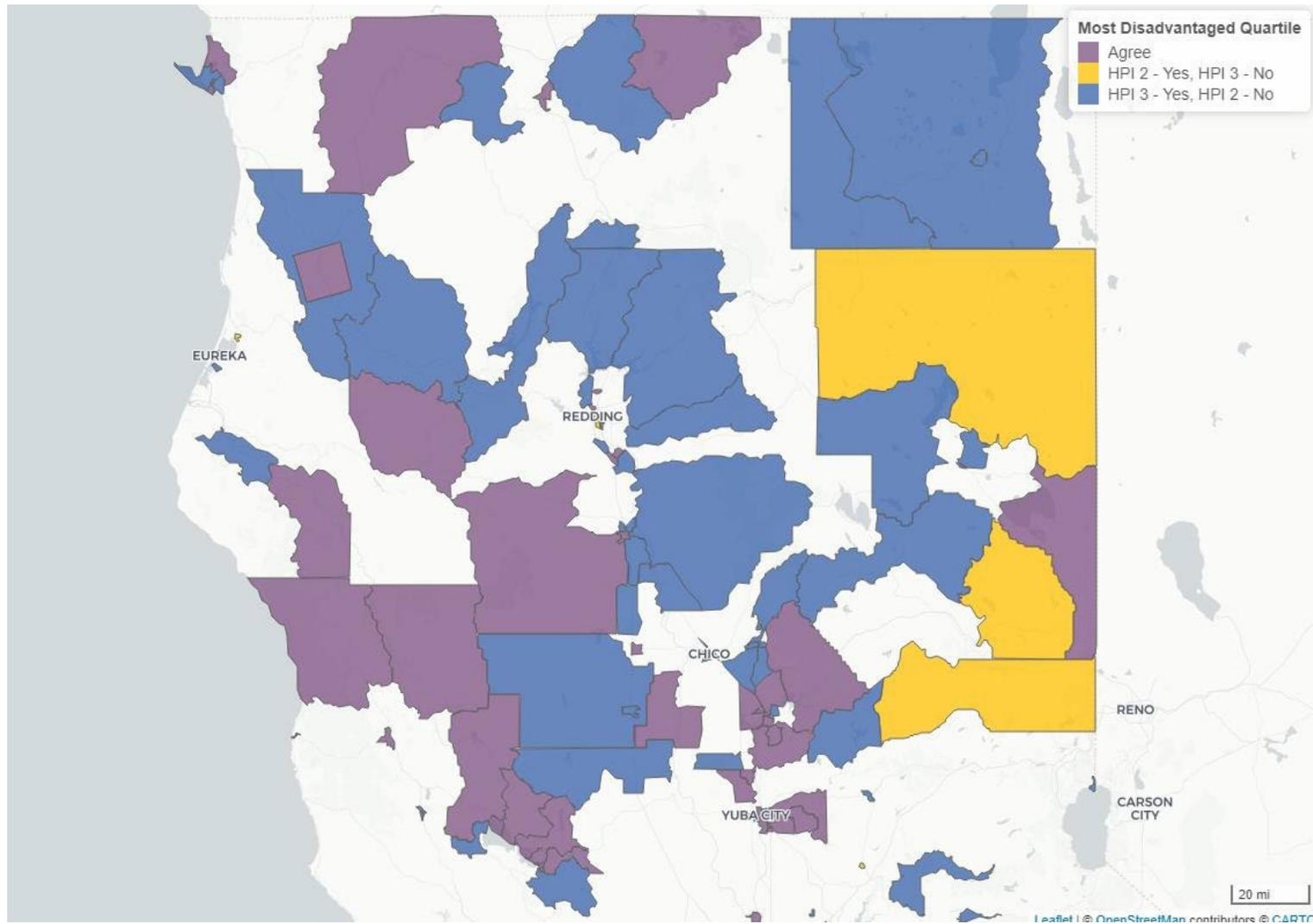
Figure 8. **Concordance of the Quartile of Census Tracts with the Least Healthy Community Conditions, HPI 3.0 vs HPI 2.0, Mid-California**
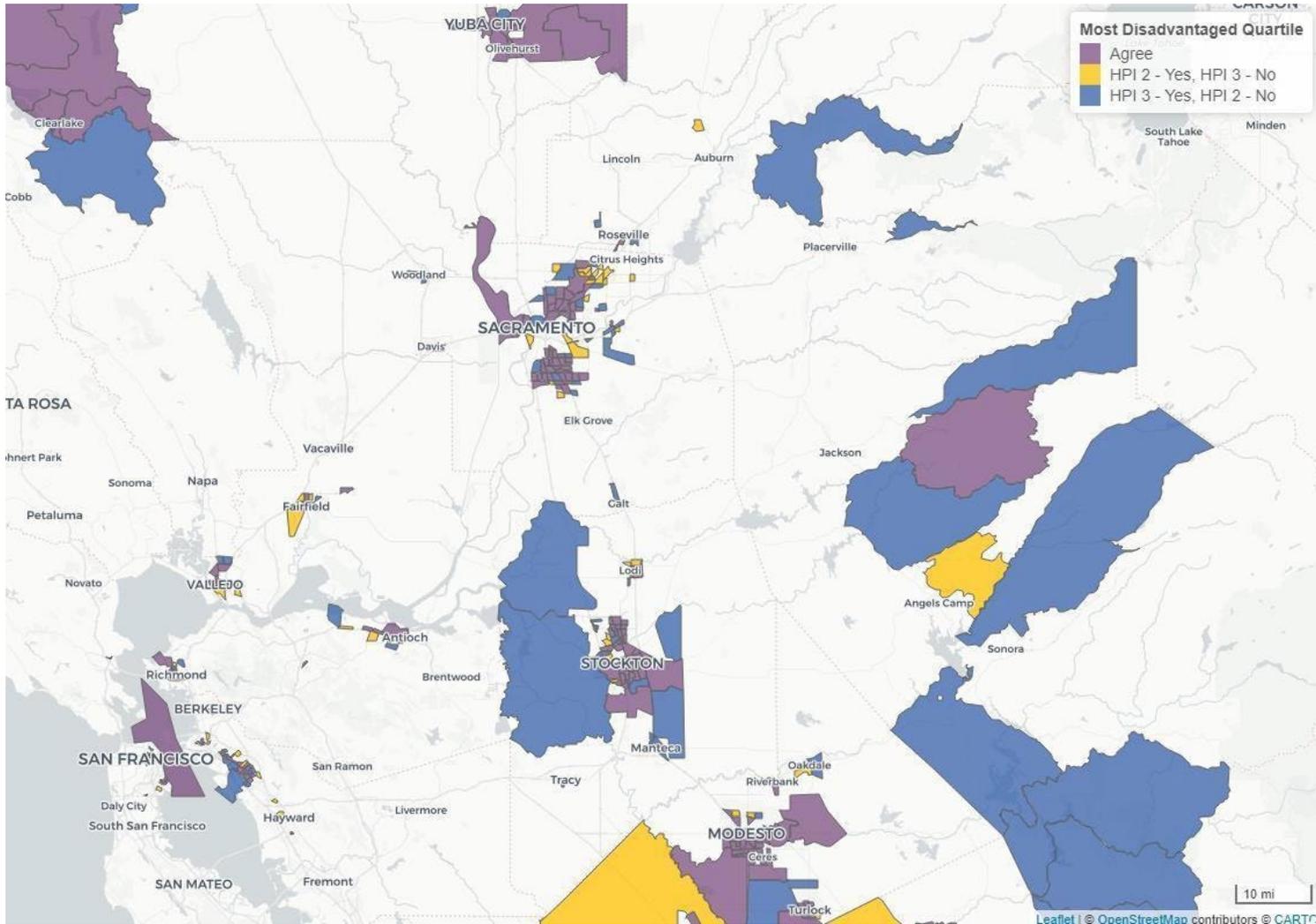
Figure 8. Concordance of the Quartile of Census Tracts with the Least Healthy Community Conditions, HPI 3.0 vs HPI 2.0, San Joaquin Valley
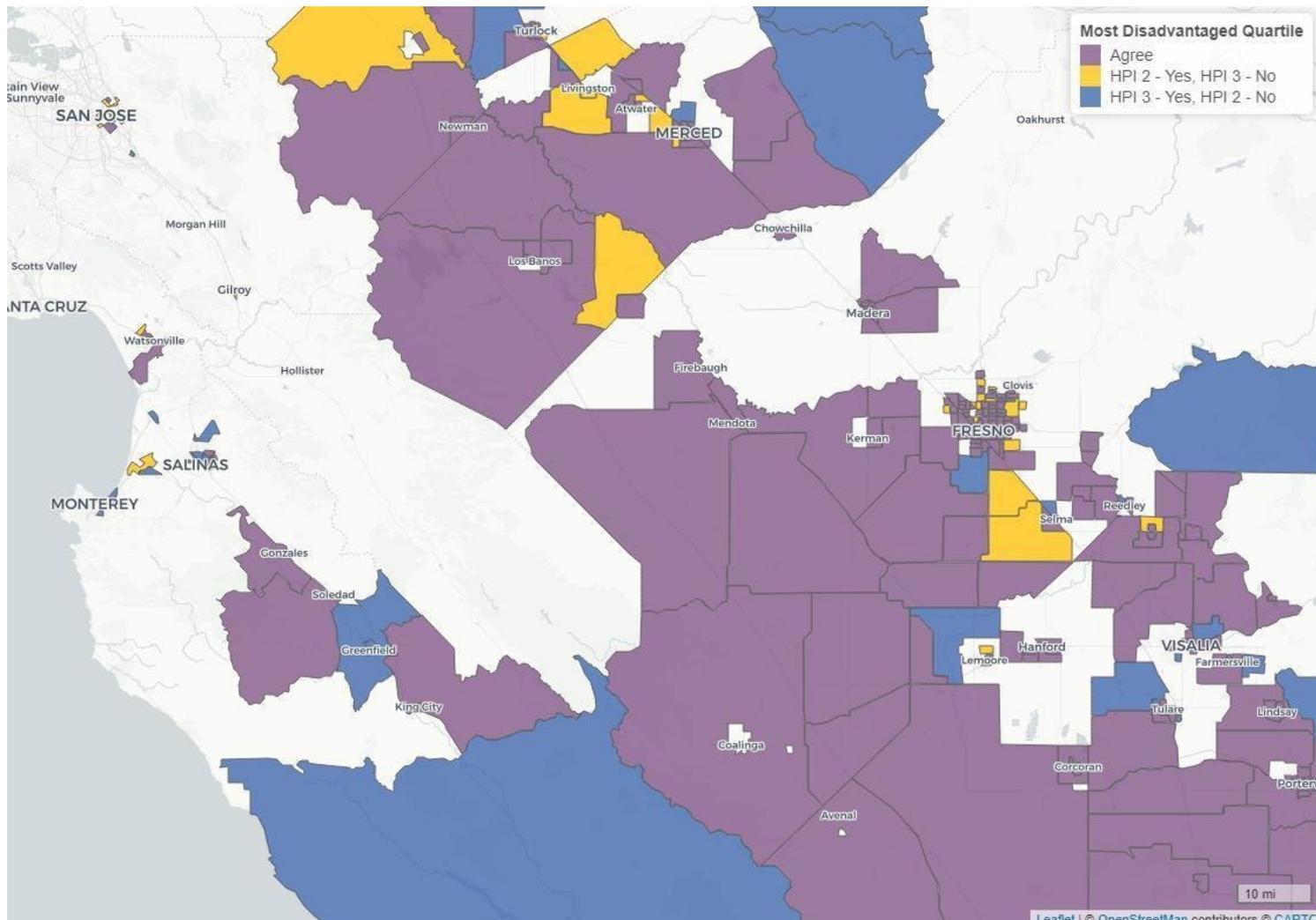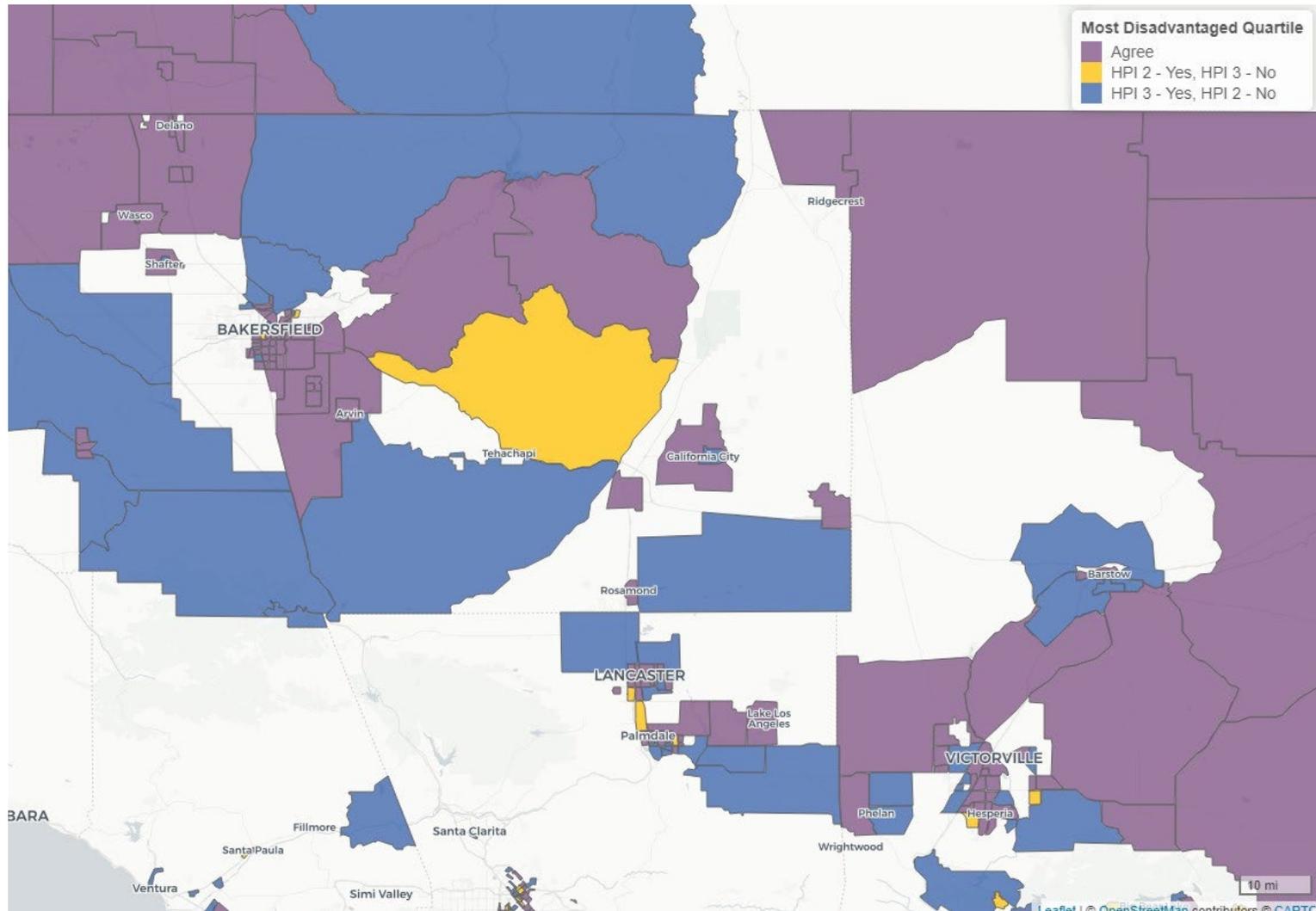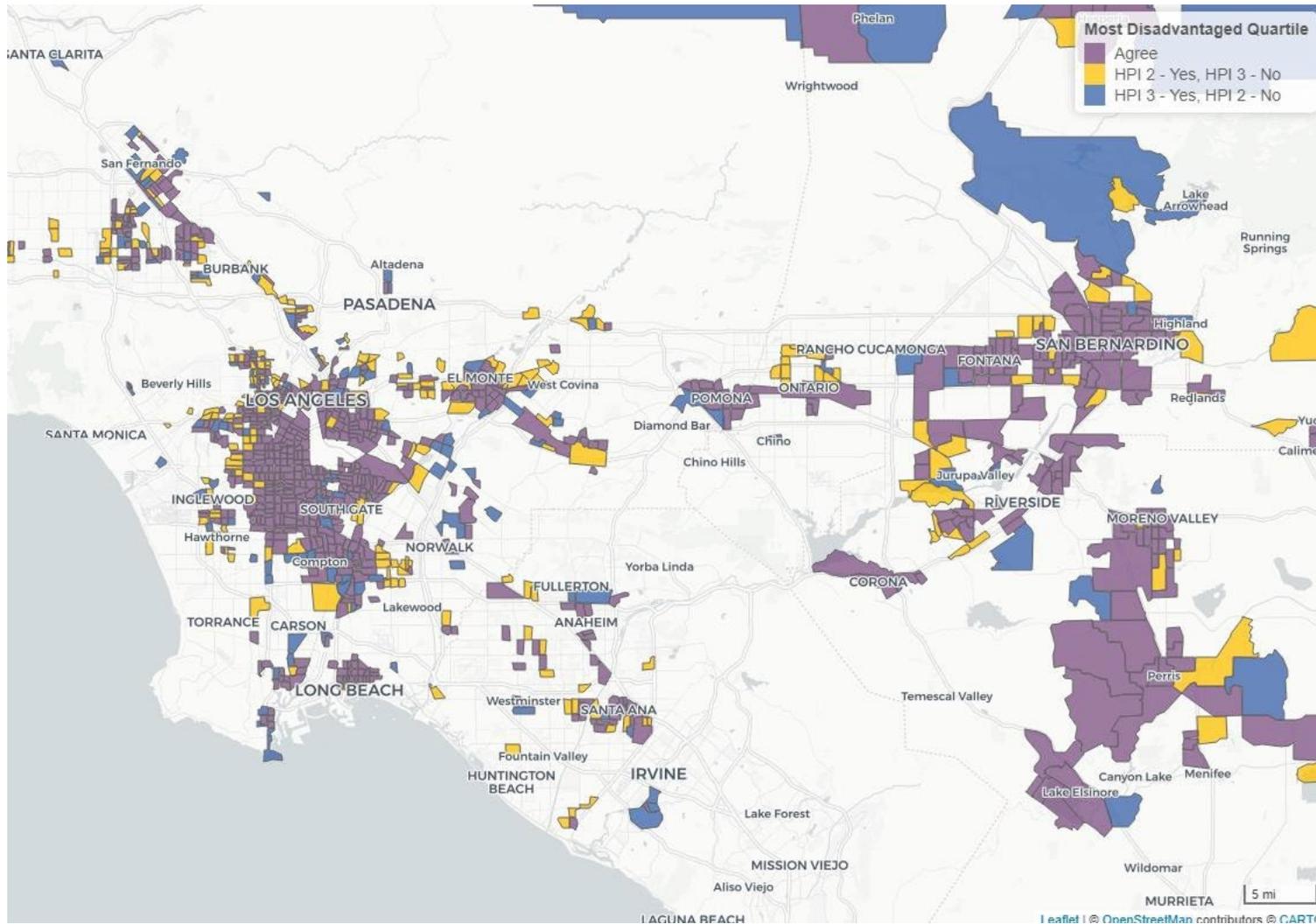
**Figure 8. Concordance of the Quartile of Census Tracts with the Least Healthy Community Conditions, HPI 3.0 vs HPI 2.0, San Joaquin Valley**

Figure 8. Concordance of the Quartile of Census Tracts with the Least Healthy Community Conditions, HPI 3.0 vs HPI 2.0, Los Angeles

Figure 8. Concordance of the Quartile of Census Tracts with the Least Healthy Community Conditions, HPI 3.0 vs HPI 2.0, Southern California
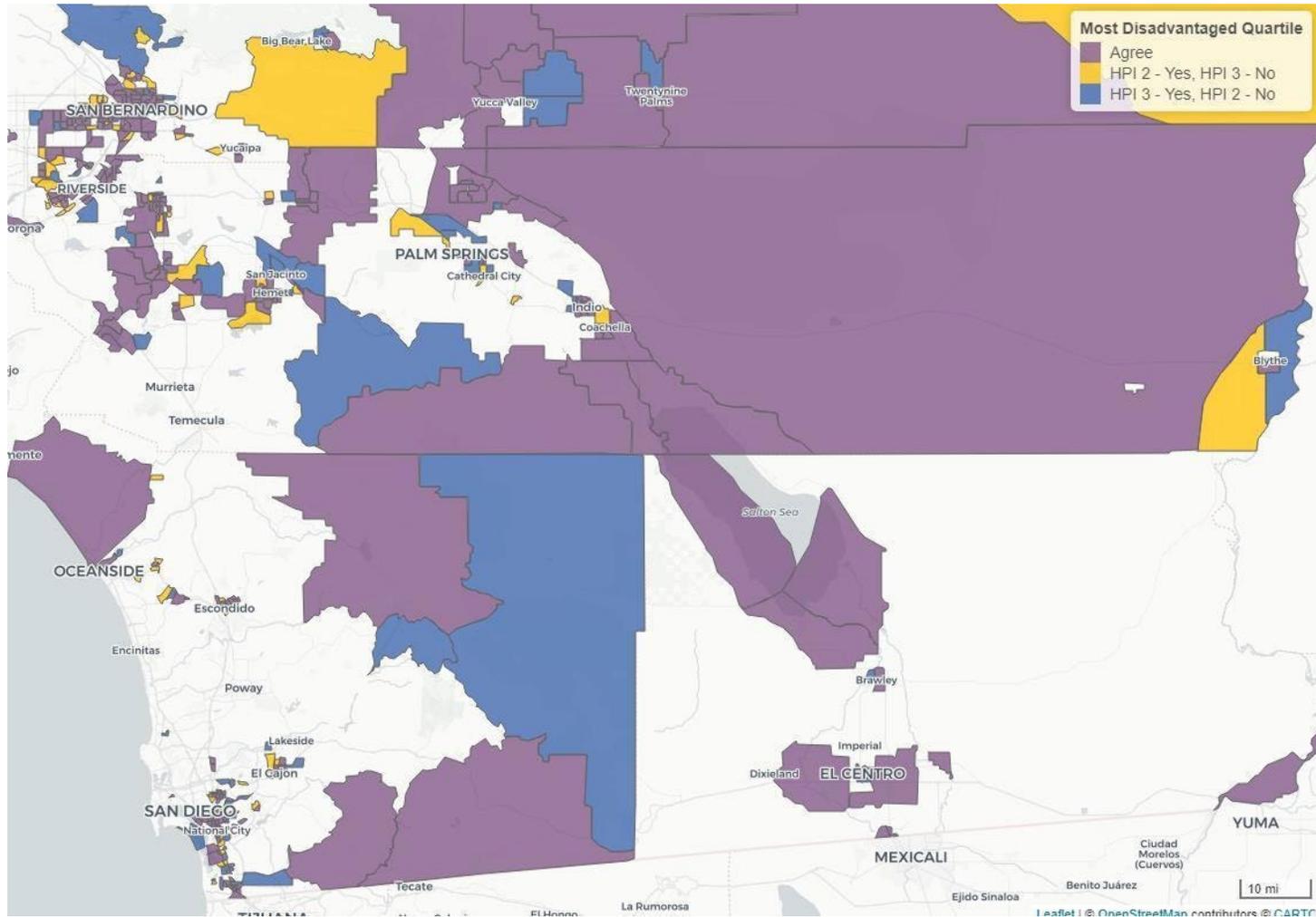
Impact of Weighting Domains (compared to equal weighting)

Of the 1947 (25%) census tracts with the lowest HPI scores, 257 (13.2%) were discordant between the HPI and a re-calculated HPI in which there was no weighting (Table 12). Weighting has a modest impact on membership of census tracts in the quartile with the least healthy community conditions.

Table 12. Concordance of HPI Weighted and Equal Weighted Domains
Census Tracts

		HPI 3.0		
		Least Healthy 25%		
HPI 3.0 Equal Weight		Y	N	Sum
Least Healthy Community Conditions, 25%	Y	1690	257	1947
	N	257	5586	5843
	Sum	1947	5843	7790

Comparison with Other Indices of Disadvantage

The concordance of the least healthy 25% of HPI census tracts and the 25% of those with the least favorable scores in CalEnviroScreen and the Social Vulnerability Index are presented in Tables 13 and 14 along with comparisons census tracts below 200% of the federal poverty level and 80% ($49,454) of the median household income.

Approximately 640 census tracts, accounting for 3 million Californians, were in disagreement. CES had more California counties than HPI without any census tracts in the least advantaged quartile (27 vs. 12): Alpine, Amador, Calaveras, Colusa, Del Norte, El Dorado, Humboldt, Inyo, Lake, Lassen, Marin, Mariposa, Mendocino, Modoc, Mono, Napa, Nevada, Placer, Plumas, San Benito, San Luis Obispo, Shasta, Sierra, Siskiyou, Tehama, Trinity, and Tuolumne. Sixteen counties had at least one census tract in the quartile of HPI with the least healthy community conditions but

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no census tract in the most disadvantaged CES 4.0 quartile.

Table 13. Census Tract Agreement Between HPI and Alternative Indexes

A. CES 4.0

25% Most Disadvantaged

		Y	N	Sum	Sensitivity	Specificity	PA	PPV
HPI 3.0	Y	1311	636	1947	0.67	0.89	0.84	0.67
Least Healthy	N	642	5200	5842				
Community Conditions, 25%	Sum	1953	5836	7789				

B. SVI

25% Most Disadvantaged

		Y	N	Sum	Sensitivity	Specificity	PA	PPV
HPI 3.0	Y	1508	439	1947	0.76	0.92	0.88	0.77
Least Healthy	N	466	5377	5843				
Community Conditions, 25%	Sum	1974	5816	7790				

C. Poverty

25% Most Disadvantaged

		Y	N	Sum	Sensitivity	Specificity	PA	PPV
HPI 3.0	Y	1636	311	1947	0.84	0.95	0.92	0.84
Least Healthy	N	311	5532	5843				
Community Conditions, 25%	Sum	1947	5843	7790				

D. <80% Median Household Income

25% Most Disadvantaged

		Y	N	Sum	Sensitivity	Specificity	PA	PPV
HPI 3.0	Y	1789	158	1947	0.67	0.97	0.87	0.92
Least Healthy	N	882	4961	5843				
Community Conditions, 25%	Sum	2671	5119	7790				

CES, CalEnviroScreen 4.0; SVI, Social Vulnerability Index

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Table 14. Residential Population in Census Tracts by Agreement Status for HPI and Alternative Indexes

A. CES

		CES						
		25% Most Disadvantaged						
HPI 3.0		Y	N	Sum	Sensitivity	Specificity	PA	PPV
Least Healthy	Y	6,295,085	3,118,302	9,413,387	0.66	0.89	0.84	0.67
Community Conditions,	N	3,265,203	26,109,389	29,374,592				
25%	Sum	9,560,288	29,227,691	38,787,979				

B. SVI

		SVI						
		25% Most Disadvantaged						
		Y	N	Sum	Sensitivity	Specificity	PA	PPV
HPI 3.0	Y	7,382,915	2,030,472	9,413,387	0.75	0.93	0.88	0.78
Least Healthy	N	2,503,362	26,876,297	29,379,659				
Community Conditions, 25%	Sum	9,886,277	28,906,769	38,793,046				

C.

		Poverty						
		25% Most Disadvantaged						
		Y	N	Sum	Sensitivity	Specificity	PA	PPV
HPI 3.0	Y	7,870,092	1,543,295	9,413,387	0.84	0.95	0.92	0.84
Least Healthy	N	1,546,607	27,833,052	29,379,659				
Community Conditions, 25%	Sum	9,416,699	29,376,347	38,793,046				

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D.   <80% Median Household Income

		25% Most Disadvantaged			Sensitivity	Specificity	PA	PPV
		Y	N	Sum	Sensitivity	Specificity	PA	PPV
HPI 3.0	Y	8,595,955	817,432	9,413,387	0.68	0.97	0.87	0.91
Least Healthy Community Conditions, 25%	N	4,113,310	25,266,349	29,379,659				
	Sum	12,709,265	26,083,781	38,793,046				

CES, CalEnviroScreen 4.0; SVI, Social Vulnerability Index

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These 16 counties are rural and are from California's north and central coast and northern Sierras: Calaveras, Del Norte, Glenn, Humboldt, Lake, Lassen, Mendocino, Placer, Plumas, San Luis Obispo, Santa Barbara, Shasta, Sierra, Siskiyou, Tehama, and Trinity.

The positive predictive value of HPI with the indices that emphasized economic status (poverty, and 80% median household income) ranged from 0.87 to 0.92. Federal poverty level (<200%) had the fewest number of discordant census tracts and population.

Decision-Support Indicators and Domains

HPI 3.0 supports 373 indicators in its decision support layers. These encompass:

- Race/ethnicity, residential racial segregation and diversity, and economic inequality (N=232)
- Climate change exposure, adaptive capacity, and population sensitivity (N= 74) to extreme heat, sea level rise, and wildfires, which build on CDPH's Climate Change Vulnerability Indicators and the HPI Extreme Heat Edition, which is a partnership between the UCLA Luskin Center and the Public Health Alliance of Southern California
- Health outcomes and health behaviors from the CDC PLACES[37] project (N=37)
- Indicators not elsewhere included from the Well-Being in the Nation (WIN) Project[46] (N = 28)
- Indictors from other indexes (such as CalEnviroScreen and the Social Vulnerability Index), and indictors unique to the earlier version (2.0) of the HPI.

The decision support indicators are listed in Table 15 and Appendix B includes a data dictionary. The majority of these are available at census tract geography; approximately 40 are available only for counties, including food insecurity, homelessness, and school academic performance. Race/ethnicity stratified indicators are available at city/tow geographies.

In addition to indicators representing populations or environmental exposures in census tracts and other geographical areas, we have included one GIS layer for California tribal areas and 11 point layers that represent the location of hospitals, skilled nursing homes and other health care facilities, schools, subsidized housing, and other types of facilities (Table 16).

Table 15. Variables and Definition, Healthy Places Index (HPI 3.0), Decision Support Indicators

2010 US Census Classification of Race/Ethnicity and Country of Origin: Asian, Native Hawaiian/Pacific Islander, and Hispanic Subgroups

Mutually Exclusive Race/Ethnicity	Alone and in Combination with Other Races	Subgroups a) Alone and b) Alone and In Combination		
		Asian	NHPI	Hispanic Country of Origin
American Indian/Alaskan Native	AIAN	Indian	Hawaiian	Central American:
Asian	Asian	Bangladeshi	Samoan	Costa Rican
Black	Black	Bhutanese	Tongan	Guatemalan
Hispanic or Latino		Burmese	Other Polynesian	Honduran
Native Hawaiian/Pacific Islander	NHPI	Cambodian	Guamanian	Nicaraguan
Other	Other	Chinese	Marshallese	Other Central American
Two or more races	Two or more races	Filipino	Other Micronesian	Panamanian
White	White	Hmong	Fijian	Salvadoran
		Indonesian	Other Melanesian	Cuban
		Japanese	Other Pacific Islander	Dominican (Dominican Republic)
		Korean		Mexican
		Laotian		Other Hispanic or Latino:
		Malaysian		All other Hispanic or Latino
		Mongolian		Spaniard
		Nepalese		Spanish
		Okinawan		Spanish American
		Pakistani		Puerto Rican
		Sri Lankan		South American:
		Taiwanese		Argentinean
		Thai		Bolivian
		Vietnamese		Chilean
				Colombian
				Ecuadorian
				Other South American
				Paraguayan
				Peruvian

Uruguayan
Venezuelan

2010 US Census Classification of Tribal Identification of Native American/Alaskan Native Subgroups	
Subgroup	Subgroup
Apache	Ottawa
Arapaho	Paiute
Blackfeet	Pima
Canadian and French American Indian	Potawatomi
Central American Indian	Pueblo
Cherokee	Puget Sound Salish
Cheyenne	Seminole
Chickasaw	Shoshone
Chippewa	Sioux
Choctaw	South American Indian
Colville	Spanish American Indian
Comanche	Tlingit-Haida
Cree	Tohono O'Odham
Creek	Tsimshian
Crow	Two or More American Indian or Alaska Native Tribes
Delaware	Ute
Hopi	Yakama
Houma	Yaqui
Inupiat	Yuman
Iroquois	Yup'ik
Kiowa	Alaska Native Not Specified
Lumbee	Alaskan Athabascan
Menominee	Aleut
Mexican American Indian	All other American Indian tribes (with only one tribe)
Navajo	American Indian Not specified

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Osage   American Indian or Alaska Native tribes, not specified

* Groups are available for a) Alone and b) Alone and in combination with Other Races

Variable Name	Definition	Data Source, Year
Racial Residential Segregation and Economic Inequality		
diversity_index	Diversity Index: How likely it is that two people, chosen randomly, will be of different race/ethnicities	ACS, 2015-2019
electeds_diff	Difference in percent of County elected officials who are non-White and percent of residents who are non-White	WhoLeadsUs, 2015-2019
redlined	Neighborhood historically redlined	Mapping Inequality, 1935-1940
gini_city	Gini Coefficient: Measure of unequal incomes within a city	ACS, 2011-2015
gini	Gini Coefficient: Measure of unequal incomes within a county	ACS, 2011-2015
lq_aian	Location Quotient: Measure of American Indian or Alaska Native residential segregation	ACS, 2015-2019
lq_asian	Location Quotient: Measure of Asian residential segregation	ACS, 2015-2019
lq_black	Location Quotient: Measure of Black or African American residential segregation	ACS, 2015-2019
lq_hispanic	Location Quotient: Measure of Hispanic or Latino residential segregation	ACS, 2015-2019
lq_nhpi	Location Quotient: Measure of Native Hawaiian or Other Pacific Islander residential segregation	ACS, 2015-2019
lq_white	Location Quotient: Measure of White residential segregation	ACS, 2015-2019
police_race	Rate of race of police force (per 1,000 people of that race)	Adv Project CA, 2017
iod_nonwhite	Index of Dissimilarity: Measure of non-White residential segregation	Decennial Census, 2010
iod_asian	Index of Dissimilarity: Measure of Asian residential segregation	Decennial Census, 2010
iod	Index of Dissimilarity: Measure of Black or African American residential segregation	Decennial Census, 2010
iod_latino	Index of Dissimilarity: Measure of Hispanic or Latino residential segregation	Decennial Census, 2010
theilh	Theil Index (0 to 1) measuring racial segregation with 0 as least diverse	ACS2019
Health Outcomes		
ARTHRITIS	Percent of adults diagnosed with arthritis	CDC PLACES, 2018
asthma	Percent of people with asthma by race/ethnicity	Adv. Project CA, 2017

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| asthmaer | Rate of emergency room visits for asthma (per 10,000 ER visits) | CES3.0, 2011-2013 |
| BPHIGH | Percent of adults diagnosed with high blood pressure | CDC PLACES, 2018 |

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Variable Name	Definition	Data Source, Year
CANCER	Percent of adults diagnosed with cancer (except skin cancer)	CDC PLACES, 2018
CASTHMA	Percent of people with asthma	CDC PLACES, 2018
CHD	Percent of adults diagnosed with angina or coronary heart disease (CHD)	CDC PLACES, 2018
COPD	Percent of adults diagnosed with chronic obstructive pulmonary disease (COPD), emphysema, or chronic bronchitis	CDC PLACES, 2018
DIABETES	Percent of adults diagnosed with diabetes (other than diabetes during pregnancy)	CDC PLACES, 2018
deathsdespair	Average number of yearly deaths due to suicide, drugs, or alcohol (per 100,000)	CDC/WONDER, 2015-2019
got_help	Percent of adults who got help for mental/emotional or alcohol/drug issues by race/ethnicity	Adv. Project CA, 2017
heartattack	Rate of emergency room visits for heart attacks (per 10,000 ER visits)	CES 3.0, 2011-2013
infant_mortality	Rate of infant deaths (per 1,000)	CDPH, 2021
KIDNEY	Percent of adults diagnosed with chronic kidney disease	CDC PLACES, 2018
lbw	Percent of babies born with a low birth weight	CES 3.0, 2006-2012
leb	Estimate of life expectancy at birth	CDC USALEEP, 2018
life_expectancy	Estimate of life expectancy at birth by race/ethnicity	Adv. Project CA, 2017
low_birthweight	Percent of babies born with a low birth weight by race/ethnicity	Adv. Project CA, 2017
MHLTH	Percent of adults who felt their mental health was not good during 2 or more weeks of the previous month	CDC PLACES, 2018
OBESITY	Percent of adults with obesity (a BMI of at least 30.0 kg/m^2)	CDC PLACES, 2018
pedshurt	Average rate of severe and fatal injuries, over the past five years, to people walking (per 100,000 people)	HCI/SWITRS, 2006-2010
PHLTH	Percent of adults who felt their physical health was not good during 2 or more weeks of the previous month	CDC PLACES, 2018
PretermBirths	Percent of singleton births delivered preterm (<37 weeks of gestation)	CEHTP, 2015 - 2015
STROKE	Percent of adults who have been diagnosed with a stroke	CDC PLACES, 2018
YouthAsthmaEDvisits	Asthma emergency department visits among 0-17 year olds (per 10,000 residents)	CA HCAI, 2017
disability	Percent of people who have a disability	ACS, 2015-2019

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Variable Name	Definition	Data Source, Year
Health Risk Factors		
BINGE	Percent of adults who drank 5 or more alcoholic drinks (men) or 4 or more alcoholic drinks (women) at least once within the past month	CDC PLACES, 2018
CSMOKING	Percent of adults who currently smoke	CDC PLACES, 2018
LPA	Percent of people who do not exercise or participate in physical activities (outside of their regular job)	CDC PLACES, 2018
Climate Change and Sensitive Populations (People)		
DaysAbove100F _2035_2064	Projected number of days above 100 degrees F in Mid-Century (2035 - 2064) under the RCP 8.5 scenario.	CalAdapt 2.0
DaysAbove100F _2070_2099	Projected number of days above 100 degrees F in End of Century (2070 - 2099) under the RCP 8.5 scenario.	CalAdapt 2.0
DaysAbove90F_ 2035_2064	Projected number of days above 90 degrees F in Mid-Century (2035 - 2064) under the RCP 8.5 scenario.	CalAdapt 2.0
DaysAbove90F_ 2070_2099	Projected number of days above 90 degrees F in End of Century (2070 - 2099) under the RCP 8.5 scenario.	CalAdapt 2.0
EH_RCP8.5_203 5_2064	Projected number of extreme heat days in Mid-Century (2035 - 2064) under the RCP 8.5 scenario exceeding the 98th percentile historical temperature threshold (1960-1991)	CalAdapt 2.0
EH_RCP8.5_207 0_2099	Projected number of extreme heat days in End of Century (2070 - 2099) under the RCP 8.5 scenario exceeding the 98th percentile historical temperature threshold (1960-1991)	CalAdapt 2.0
sealevel	Percent of people expected to be in flood zones in 2100, due to sea level rise and a 100-year flood event	Pacific Institute, 2009
wildfire	Percent of people living in areas with a very high risk for wildfires	CalFIRE, 2007
aircon	Percent of households with air conditioning	RAS, 2009
impervsurf	Percent impervious surface cover	NLCD, 2011
UHII	Index measuring urban-rural heat difference	CalEPA, 2015
Age_under5	Percent of population who are young children	ACS, 2014 - 2018
Age5_14	Percent of people aged between 5-14	ACS, 2014 - 2018
children	Percent of people under 5 years old	ACS, 2011-2015

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| Disability65 | Percent of people 65 years and older with disabilities | ACS, 2014 - 2018 |
| english_ltvw | Percent of people, aged 5 and older, that speak English "less than very well" | ACS, 2015-2019 |

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Variable Name	Definition	Data Source, Year
englishspeak	Percent of households where at least one person, aged 14 years or older, speaks English well	ACS, 2011-2015
ExposedWorkers_2016	Percent of workers who spend over half of their time in a place that is not indoors and air-conditioned.	CA EDD, 2016
ExposedWorkers_2026	Projected percent of workers who will spend over half of their time in a place that is not indoors and air-conditioned in 2026	CA EDD, 2026
foreignborn_citizen	Percent of people born outside of the US who are naturalized US citizens	ACS, 2015-2019
foreignborn_notcitizen	Percent of people born outside of the US that are not US citizens	ACS, 2015-2019
immigrant	Percent of people born outside of the US	ACS, 2011-2015
lang_arabic	Percent of people, aged 5 and older, that speak Arabic at home	ACS, 2015-2019
lang_chinese	Percent of people, aged 5 and older, that speak Chinese (incl. Mandarin & Cantonese) at home	ACS, 2015-2019
lang_english	Percent of people, aged 5 and older, that speak English at home	ACS, 2015-2019
lang_french	Percent of people, aged 5 and older, that speak French, Haitian, or Cajun at home	ACS, 2015-2019
lang_german	Percent of people, aged 5 and older, that speak German/ West Germanic languages at home	ACS, 2015-2019
lang_korean	Percent of people, aged 5 and older, that speak Korean at home	ACS, 2015-2019
lang_other	Percent of people, aged 5 and older, that speak other or unspecified languages at home	ACS, 2015-2019
lang_other_api	Percent of people, aged 5 and older, that speak other Asian/Pacific Island languages at home	ACS, 2015-2019
lang_other_indo	Percent of people, aged 5 and older, that speak other Indo-European languages at home	ACS, 2015-2019
lang_russian	Percent of people, aged 5 and older, that speak Russian, Polish, other Slavic languages at home	ACS, 2015-2019
lang_spanish	Percent of people, aged 5 and older, that speak Spanish at home	ACS, 2015-2019
lang_tagalog	Percent of people, aged 5 and older, that speak Tagalog (including Filipino) at home	ACS, 2015-2019
lang_vietnamese	Percent of people, aged 5 and older, that speak Vietnamese at home	ACS, 2015-2019
Language65	Percent of people 65 years and older who do not speak English fluently	ACS, 2014 - 2018
Livealone65	Percent of people 65 years and older living alone	ACS, 2014 - 2018
Nonwhite65	Percent of people 65 years and older who are non-White	ACS, 2014 - 2018
outdoors	Percent of workers older than 16 who work outdoors.	ACS, 2011-2015

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| Perc65plus | Percent of people aged 65 or older | ACS, 2014 - 2018 |

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Variable Name	Definition	Data Source, Year
Perc75plus	Percent of people aged 75 or older	ACS, 2014 - 2018
Poverty65	Percent of population 65 years and older with incomes below the poverty level	ACS, 2014 - 2018
Projected_pop_under5_2050	Projected percent of people under 5 in 2050	CDOF
ProjectedPop_2050_5to14	Projected percent of people aged between 5 to 14 in 2050	CDOF
ProjectedPop_2050_65plus	Projected percent of people aged 65 and older in 2050	CDOF
ProjectedPop_2050_total	Projected population in 2050	CDOF
usual_source_of_care	Percent of people with a usual source of medical care	Adv Project CA, 2017
multgen	Percent of population living in multigenerational households (PEW definition)	iPUMS, 2015-2019
incarceration	Rate of people incarcerated (per 1,000)	Adv Project CA, 2017
Climate Change and Sensitive Housing Characteristics (Place)		
HCVunits_17	Housing Choice Voucher units, for every 1,000 housing units	HUD/ACS , 2017
AllHUDunits_17	Number of housing units subsidized by any HUD program, for every 1,000 housing units	HUD/ACS , 2017
LIHTC_HU_18	Number of active Low-Income Housing Tax Credits units for every 1,000 housing units	HUD/ACS , 2018
OtherHUDunits_17	Number of housing units subsidized through the Section 8 moderate rehabilitation; Section 8 project-based rental assistance; rent supplement; rental assistance payment; Section 236; Section 202 for the elderly; or Section 811 for persons with disabilities, for every 1,000 housing units	HUD/ACS , 2017
PHunits_17	Number of public housing units, for every 1,000 housing units	HUD/ACS , 2017
Housebuild1940	Percent of homes built before 1940	ACS, 2014 - 2018
MobileHomes	Percent of households living in mobile homes	ACS, 2014 - 2018
RV_Van_Boat	Percent of households living in RV, van, or boat	ACS, 2014 - 2018

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denied_mortgages	Percent of mortgage applications that were denied	Adv Project CA, 2017
homevalue	Median home value	ACS, 2015-2019

Variable Name	Definition	Data Source, Year
rent	Median rent	ACS, 2015-2019
recentmove	Percent of households with new (moved in 2015 or later) residents	ACS, 2015-2019
computer	Percent of people in households with a computer	ACS, 2015-2019
broadband	Percent of people in households with an internet subscription (broadband of any type)	ACS, 2015-2019
perception_of_safety	Percent of adults who reported feeling safe in their neighborhood all of the time	Adv Project CA, 2017
crimerate	Number of violent crimes per 1,000 people	FBI Uniform Crime Reporting, 2013
use_of_force	Average rate of civilians injured in law enforcement incidents (per 100,000)	Adv Project CA, 2017
Youth and Schools		
gr3_ela_scores	Percent of 3rd graders scoring proficient or better in English Language Arts	Adv Project CA, 2017
gr3_math_scores	Percent of 3rd graders scoring proficient or better in Mathematics	Adv Project CA, 2017
chronic_absenteeism	Rate of chronically absent students (per 100)	Adv Project CA, 2017
staff_diversity	Ratio of staff of a race per 100 students of the same race	Adv Project CA, 2017
hs_grad	Percent of high school students who graduate within a four-year period	Adv Project CA, 2017
student_homelessness	Percent of students experiencing homelessness	Adv Project CA, 2017
suspension	Rate of students suspended (per 100)	Adv Project CA, 2017
frm	Percent of K-12 students who are eligible to participate in the Free & Reduced Meal Program	CDE, 2015-2016
status_offenses	Annual average of youth arrests for status offenses (per 10,000)	Adv Project CA, 2017
Well-Being In the Nation (WIN) Project, not included elsewhere		
difficultycognitive	Percent of people who have difficulty remembering, concentrating, or making decisions	ACS, 2015-2019
difficultyhearing	Percent people who are deaf or have serious hearing difficulty	ACS, 2015-2019

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difficultyindependent	Percent of people who have difficulty doing errands such as visiting a doctor's office or shopping	ACS, 2015-2019

Variable Name	Definition	Data Source, Year
difficultyselfcare	Percent of people who have difficulty bathing or dressing	ACS, 2015-2019
difficultyvision	Percent of people who are blind or have serious difficulty seeing, even when wearing glasses	ACS, 2015-2019
edspend	Spending per student	CDE, 2018-2019
femalegender	Percent of people who are female	ACS, 2015-2019
foodinsecure	Percent of people who lack adequate access to food	CHR2021/MapMealGap2018, 2021
hsgrad	Percent of students who graduate high school within four years of entering ninth grade	CDE, 2018-2019
Variable Name	Definition	Data Source, Year
idleteen	Percent of 16 to 19 year olds not enrolled in school or working	ACS, 2015-2019
infantdeaths	Average yearly rate of infant deaths (per 1,000)	CHHSA/, 2021
mva	Average number of yearly deaths due to motor vehicle injuries (per 100,000)	CDC/WONDER, 2015-2019
netmigration	The difference between the number of immigrants entering a county and the number of emigrants leaving a county from 2000 to 2010	UW/ICPSR, 2000-2010
nonenglishspeaking	Percent of people, aged 5 and older, that speak a language other than English at home	ACS, 2015-2019
walkability	US EPA walkability score (intersection density, proximity to transit, employment/housing mix)	USEPA/SLD3NWI, 2018
homeless	5-year average of the 1-day census of people experiencing homelessness per 10,000 population	USHUD/NAEH, 2019
lawenforcement	Five-year annual average number of law enforcement personnel per 1,000 population	CADOJ/OJ/CJP, 2019
Other Indexes of Disadvantage		
CES30Score	CalEnviroScreen 3.0 Score (Index score measuring population-pollution interaction)	CES 3.0, 2018
ces40score	CalEnviroScreen 4.0 Score (Index score measuring population-pollution interaction)	CCES 4.0, 2021
lt80pct	Low-income households (80% of median household income)	ACS, 2015-2019
svi	Social Vulnerability Index: Index measuring social vulnerability	CDC ATSDR, 2018

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hi_score	Hardship Index: score measuring economic hardship	ACS, 2011-2015

Variable Name	Definition	Data Source, Year
Retired Indicators from HPI 2.0		
alcoffsale	Percent of people who live further than a quarter-mile from a store that sells alcohol	ABC, 2014
alconsale	Percent of people who live further than a quarter mile from a store that sells alcohol for consumption on-site	ABC, 2014
income	Median annual household income	ACS, 2015-2019
supermkts	Percent of people in urban areas who live less than a half mile from a supermarket/large grocery store, or less than 1 mile in rural areas	USDA FARA, 2017
traffic_impacts	Traffic density on highways within 150 feet of census tract boundaries	CES 4.0, 2021
transitaccess	Percent of people living close to convenient, reliable transit, as defined by a half-mile or ten-minute walk, that comes every fifteen minutes or less during peak commute times	MTC SACOG SCAG SANDAG, 2012
twoparent	Percent of children with two married or partnered parents/caregivers	ACS, 2011-2015
voter12	Percent of registered voters who voted in the 2012 general election	UCBSD , 2012
voter16	Percent of registered voters who voted in the 2016 general election	UCBSD , 2016

[†] ABC, California Alcoholic Beverage Commission; ACS, American Community Survey; Adv. Project CA, Advancement Project California (Race Counts); ATSDR, Agency for Toxic Substances Disease Registry; CHAS, Comprehensive Housing Assessment System, US Dept. of Housing and Urban Development (HUD); CDE, California Department of Education;, CalEPA; California Environmental Protection Agency; CDOF, California Department of Finance; CalFIRE, California Department of Forestry and Fire Protection; CES, CalEnviroScreen; HCAI, California Department of Health Care Access and Information; CHHSA, California Health & Humans Services Agency; CDPH, California Department of Public Health; CDC, Centers for Disease Control; Census, 2010 U.S. Decennial Census; CHR, County Health Rankings; iPUMS, Public Use Microdata, American Community Survey; MTC; Metropolitan Transportation Commission; NLCD, National Land Cover Database; RAS, Report on Appliance Saturation; SACOG, Sacramento Area Council of Governments; SANDAG, San Diego Association of Governments; SCAG, Southern California Association of Governments; SWITRS, Statewide Integrated Traffic Records System; USDA FARA, U.S. Department of Agriculture Food Access Research Atlas; USEPA, U.S. Environmental Protection Agency; UCBSD, UC Berkeley, Statewide Database; UCR, Uniform Crime Report; UW/ICPSR, University of Wisconsin; VCU, Virginia Commonwealth University

Table 16. Facilities and Other Points of Interest

Variable	Data Source	Table	Variable(s)
air_pollution	US EPA, 2021	Air_pollution	URL: https://geopub.epa.gov/arcgis/rest/services/EMEF/efpoints/MapServer/
brownfields	US EPA, 2021	Brownfields	URL: https://geopub.epa.gov/arcgis/rest/services/EMEF/efpoints/MapServer/
superfund	US EPA, 2021	Superfund	URL: https://geopub.epa.gov/arcgis/rest/services/EMEF/efpoints/MapServer/
toxics	US EPA, 2021	Toxic_Substances_Control_Act	URL: https://geopub.epa.gov/arcgis/rest/services/EMEF/efpoints/MapServer/
hazardous_waste	US EPA, EJSCREEN, 2020	Hazardous waste (TSDF)	URL: https://geopub.epa.gov/arcgis/rest/services/ejscreen/ejscreen_v2020/MapServer/
water_dischargers	US EPA, 2021	Water_dischargers	URL: https://geopub.epa.gov/arcgis/rest/services/EMEF/efpoints/MapServer/
hospitals	Office of Statewide Health Planning and Development Geohub, 2020	OSHPD Healthcare Facilities	URL: https://oshpd-chhsagency.opendata.arcgis.com/datasets/oshpd-healthcare-facilities/ Filtered by license_category_desc == "General Acute Care Hospital" and facility_status_desc == "Open"
prisons	US Dept. of Homeland Security, 2020	Prison_Boundaries	URL: https://services1.arcgis.com/Hp6G80Pky0om7QvQ/ArcGIS/rest/services/Prison_Boundaries/FeatureServer
public_housing	US Department of Housing and Urban Development, 2021	PUBLIC_HOUSING_BUILDING	URL: https://services.arcgis.com/VTyQ9soqVukalItT/arcgis/rest/services/Public_Housing_Buildings/FeatureServer/
subsidized_housing	US Department of Housing and Urban Development, 2021	MULTIFAMILY_PROPERTIES_ASSISTED	URL: https://services.arcgis.com/VTyQ9soqVukalItT/arcgis/rest/services/Multifamily_Properties_Assisted/FeatureServer/
public_schools	National Center for Education Statistics, 2020	Public School Locations 2019-20	URL: https://nces.ed.gov/opengis/rest/services/K12_School_Locations/EDGE_GEOCODE_PUBLICSCH_1920/MapServer/

| CA_American_Indian_Areas | Census TIGER/line, 2019 and American Community Survey, 2019 | B01001 | URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html B01001_001E Estimate!!Total |

Note: all layers are point spatial type, except CA_American Indian Areas, which are polygons

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MAPPING APPLICATION

The HPI 3.0 mapping application was purpose-built using open source tools by
Axis Maps, a geospatial web design and development company. The new
application significantly expanded the content and functionality found in the HPI
2.0 application. The HPI score, domains, and individual indicators are presented as
interactive maps (Figure 9) that provide the values and percentile rankings for 1) all
23 HPI indicators, 8 domains and the overall HPI score and 2) more than 370
decision support indicators (Table 15).
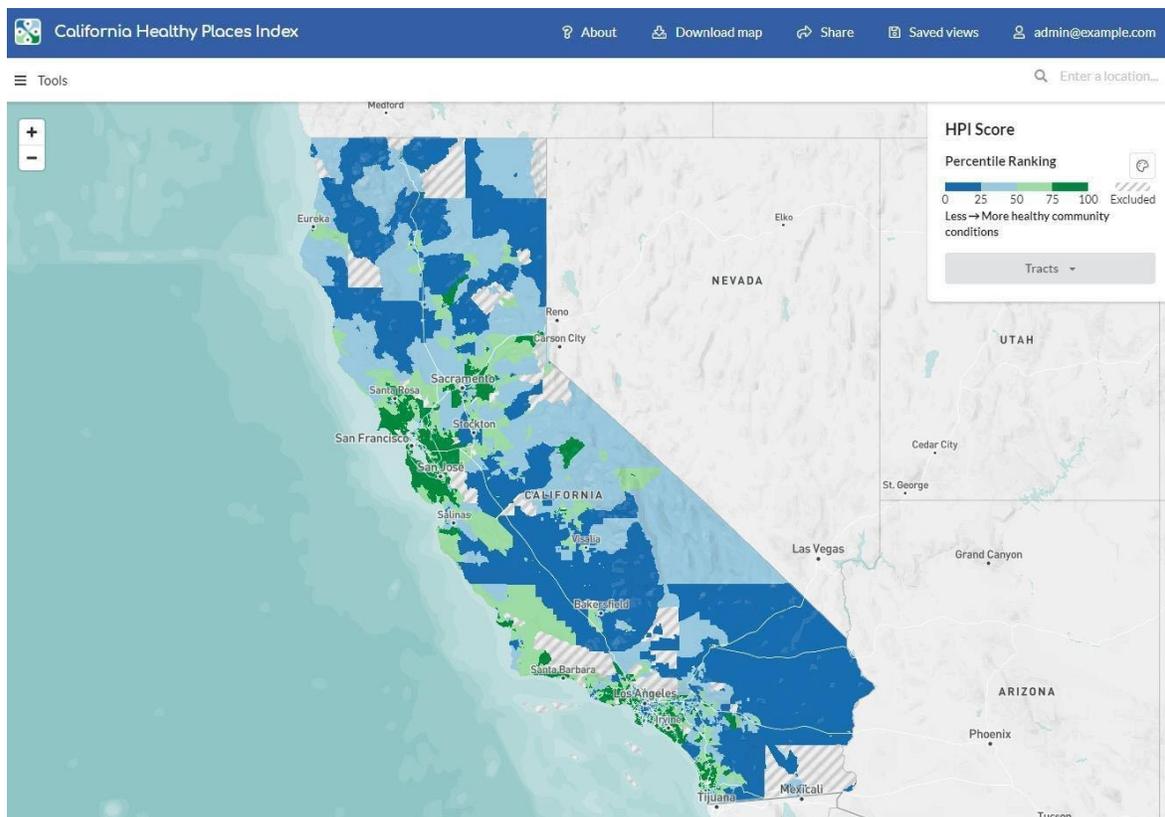
Figure 9. Interactive HPI Map (http://map.healthyplacesindex.org)

A navigation panel allows users to explore potential policy options for improving
health by linking domains and indicators to briefs that describe 32 policy guides and
311 policy actions. In addition to the 23 HPI indicators, the mapping application also
provides more than 370 selectable decision-support data layers covering health

outcomes, behavioral risk factors, climate change threats and vulnerabilities, and additional information. The mapping application also allows users to pool adjacent census tracts and calculate population-weighted average HPI

scores and aggregate census tract data to city, county, and other large geographies. Other features let users filter the map by race/ethnicity or the indicator criteria of their choice, upload their own geographies and data, and compare data over time in a split-map view.

The HPI at Different Geographic Scales

One of the most useful features of the mapping application is the availability of the HPI, its indicators, and indicators in most decision support layers at the level of census tracts as well as nine other telescoping civil-political geographies. Our methods for calculating the HPI and indicator values at multiple geographies are specific to:

- ZIP Code Tabulation Areas (ZCTA),
- All other geographies,
    - With numerator/denominator
    - Without numerator/denominator (value only)

Calculating HPI and indicator values at ZIP code tabulation areas posed a special challenge. We were able to compute ZCTA values for 12 HPI indicators directly from the American Community Survey, 2015-2019. For other non-ACS sourced HPI indicators, as well as HPI score and domain scores, we used the US Census ZCTA-to-census tract relationship file[47] to compute a population-weighted allocation of census tract values to the ZCTAs they intersect. This method produced more accurate estimates compared to alternatives based on centroids, simple areal allocation, or areal interpolation using kriging.

For all other geographies, which includes counties and their aggregations (Core Based Statistical Areas, and transportation planning regions of Metropolitan Planning Organizations), cities and CDPs, elementary school districts, Medical Service Study Areas, and congressional and state legislative districts, we use proportional areal allocation to generate HPI score and indicator values. An area weight is calculated as the percent of the source (census tract) polygon that

intersects the target geography polygon. The following steps of the proportional areal allocation methodology depend on whether the HPI indicator 1) has numerator and denominator estimates available from the data source, such as the percent above poverty indicator, or 2) has only a value available, such as HPI score or the ozone indicator. Given that distinction, this area weight is either:

1) multiplied by census tract-level numerators and denominators for HPI indicators to calculate weighted numerators and denominators for the intersecting area. These weighted numerators and denominators are summed for all census tracts intersecting the target geography and the target geography value is calculated as the summed weighted numerators divided by the summed weighted denominators.

2) multiplied by the census tract population (ACS 2015-2019) to calculate the weighted population size of the intersecting area. Values for the target geographies are then created from the population-weighted average of intersecting census tracts using the area-weighted population estimates.

This same weighting methodology is applied to both geographies that are congruent with census tracts, such as counties, and those that are not congruent with census tracts, such as elementary school districts. In the case of congruent geographies, however, the area weight will always equal one and the resulting weighted population size or weighted numerators and denominators of the intersecting area will always be the original population, numerator, or denominator estimates.

Geographic Crosswalks for Historical HPI Data

As of February 2026, the HPI 3.0 map displays data at the most up-to-date geographic boundaries, sourced from the US Census Bureau, which includes 2020 census tracts and ZIP Code Tabulation Area (ZCTA) boundaries. HPI 3.0 data were originally produced using 2010 vintage boundaries. To preserve all historical HPI data produced at 2010 tracts, we implemented a crosswalk methodology that harmonizes HPI score and indicator data across census geography vintages. This methodology, adapted from IPUMS NHGIS at the University of Minnesota[48] allows HPI users to investigate the change in community conditions over time, and produces higher-quality indicator estimates at census tracts than a simple areal weighting method.[49]

IPUMS NHGIS makes geographic crosswalk files, designed to support high-quality tabulations of census data across geography vintages, publicly available on their website. They leveraged advanced models and target density weighting (TDW) to derive block-level interpolation weights for crosswalking data from 2010 blocks to 2020 blocks. Using guidance provided on their website, we aggregated the block-to-block geographic crosswalk files to census tracts, ZCTAs, and census designated places to generate geographic crosswalk files at the geographies used for the HPI map platform (most other geographies supported on the HPI map platform had no functional change from 2010 to 2020 so no geographic crosswalk was needed). The resulting tract-to-tract, ZCTA-to-ZCTA and place-to-place geographic crosswalk files contained six total interpolation weights to choose from, which are each based on different block-level characteristics (total population, total housing units, etc.) (Table 3). The interpolation weight type was individually selected for each indicator based on the target population or universe. For example, Per Capita Income was crosswalked using the total population interpolation weight while Homeownership used the household interpolation weight. The selected interpolation weight types for each HPI indicator are presented in Table 4.

A subset of historical HPI indicator data was available stratified by race/ethnicity (14 indicators) or language (1 indicator) at either the census tract or census designated place geography. In these instances, only the "All" or "Total" strata were crosswalked from 2010 to 2020 geographies, rather than each individual race/ethnicity or language strata. The relative standard error for individual strata was extremely high (> 70% on average) for almost all race/ethnicity and language strata, even at the census designated place geography. Additionally, the geographic crosswalk would introduce another layer of uncertainty to the resulting indicator estimates. The crosswalked stratified data would not meet common acceptable thresholds of reliability and was therefore omitted from the HPI 3.0 map.

Table 17. Description of Interpolation Weight Types Included in Geographic Crosswalk Files

Interpolation weight	Description

type	
pop	Expected proportion of source zone's **population** located in target zone
adult	Expected proportion of source zone's **adult population** (18 years and over) located in target zone
fam	Expected proportion of source zone's **families** located in target zone.
hh	Expected proportion of source zone's **households** located in target zone. Note: household counts are equal to counts of occupied housing units and of householders.
hu	Expected proportion of source zone's **housing units** located in target zone
area	Expected proportion of source zone's **land area** located in target zone

Table 18. Selected Interpolation Weights for HPI Indicators, Domains and HPI Score for Geographic Crosswalk from 2010 Census Geographies to 2020 Census Geographies

Indicator/Domain	Definition	Weight Type
Above Poverty	Percentage of the population with an income exceeding 200% of federal poverty level.	pop
Automobile Access	Percentage of households with access to an automobile.	hh
Bachelor's Education or Higher	Percentage of population over age 25 with a bachelor's education or higher.	adult
Census Self-Response Rate+	Percent of 2020 decennial households who completed census forms online, by mail, or by phone.	*

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Clean Environment	Clean Environment HPI domain score.	pop
Active Commuting	Percentage of workers (16 years and older) who commute to work by transit, walking, or cycling.	pop
Diesel PM	Spatial distribution of gridded diesel PM emissions from on-road and non-road sources in 2016.	pop
Economic	Economic HPI domain score.	pop
Education	Education HPI domain score.	pop
Employed	Percentage of population aged 20-64 who are employed.	adult
Drinking Water Contaminants	CalEnviroScreen 4.0 drinking water contaminant index for selected contaminants, 2011 to 2019.	pop
Healthcare Access	Healthcare Access HPI domain score.	pop
Homeownership	Percentage of occupied housing units occupied by property owners.	hh
Housing Habitability	Percent of households with kitchen facilities and plumbing.	hh
Housing	Housing HPI domain score.	hh
HPI Score	Total HPI 3.0 Score.	pop
High School Enrollment	Percentage of 15-17 year olds enrolled in school.	pop
Preschool Enrollment	Percentage of 3 and 4 year olds enrolled in school.	pop
Insured Adults	Percentage of adults aged 19 to 64 years currently insured.	adult
Neighborhood	Neighborhood HPI domain score.	pop
Low-Income Homeowner Severe Housing Cost Burden	Percent of owner-occupied households that are low-income (household income is less than or equal to 80% of the HUD area median family income) and have housing costs exceeding 50% of income.	hh

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Ozone	Mean of summer months (May-October) of the daily maximum 8-hour ozone concentration (ppm), averaged over three years.	pop
Park Access	Percent of the population living within a half-mile of a park, beach, or open space greater than 1 acre.	pop
Per Capita Income	Per capita income in the past 12 months (in 2020 inflation-adjusted dollars).	pop
PM 2.5	Annual mean concentration of PM2.5 (weighted average of measured monitor concentrations and satellite observations, microgram/m^3), over three years.	pop
Low-Income Renter Severe Housing Cost Burden	Percent of renter-occupied households that are low-income (household income is less than or equal to 80% of the HUD area median family income) and have housing costs exceeding 50% of income.	hh
Retail Density	Gross retail, entertainment, services, and education employment density (jobs/acre) on unprotected land.	pop
Social	Social HPI domain score.	pop
Transportation	Transportation HPI domain score.	pop
Tree Canopy	Population-weighted percentage of the census tract area with tree canopy.	pop
Uncrowded Housing	Percentage of households with 1 or fewer occupants per room.	hh
Voting	Percent of registered voters who voted in the general election.	adult

+Census Self-Response Rate was natively produced at 2020 tracts by the Census Bureau, so it did not need to be crosswalked for the purposes of the HPI map.

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Race/Ethnicity Stratification and Filtering

Several HPI indicators (Table 2, Methods) are available at the place and county geographies from the ACS, 2015-2019, stratified by non-mutually exclusive categories of race/ethnicity. These categories are non-Hispanic White; Latino; and, of any ethnicity: Asian, Black, American Indian/Alaskan Native, Native Hawaiian/Pacific Islander, Two or more races, and Other.

A new map feature allows users to filter census tracts based on the percentage of residents of one or more race/ethnicity groups. For example, if one wanted to view HPI scores (or any other indicator) for census tracts with at least 100 Native Hawaiian or other Pacific Islanders alone, one would move the Population Count slider lower limit to 100 (Figure 10). One can also specify combinations of race/ethnicity groups meeting thresholds (e.g., Asian + Latino > 50%).
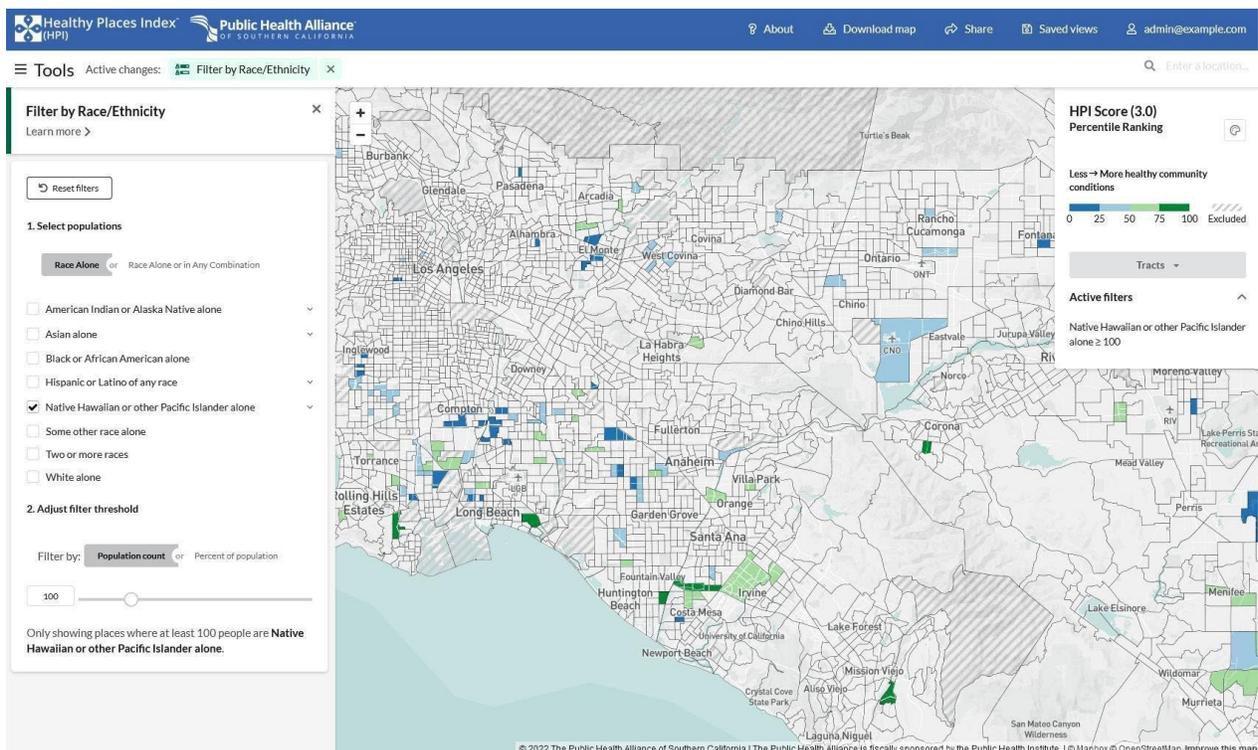
Figure 10. Filtering by Race/ethnicity
APPLICATION PROGRAMMING INTERFACE (API)

HPI scores, indicators, and decision support layers may be downloaded from an application programming interface endpoint. Year of data, geography, and race/ethnicity stratification (optional) may be selected. People who are interested should request an API key through https://map.healthyplacesindex.org/. Documentation on use of the API endpoint is available through the Healthy Places Index website.

POLICY PLATFORM

Overview

The HPI is built on the premise that an important part of improving health outcomes and health equity in California requires both accurate data to understand the conditions that shape health, *and* strong action to shift resources and reshape the places we live. While primarily a data tool, the HPI is designed to facilitate efforts to improve community conditions on the ground by linking each HPI indicator and Climate and Health Vulnerability Indicators (CHVI) to policy action, exemplified through 31 Policy Guides. Each policy guide offers a menu of best practices and emerging policy options that target that indicator. In some cases, these are very directly connected, for instance, policies designed to boost educational opportunity are tied to the education policy action area. Where appropriate, we have also included policies intended to address the root drivers of indicator values, such as policies to improve economic opportunity, which will in turn shape housing affordability, insurance access, and the possibilities open to single-parent households.

Methods and Updates

Each policy guide is based on a review of the literature connecting a given indicator to health combined with a scan of best practices and conversations with and review from experts in each field (See examples[50–53] ENREF_16_1 ENREF_16_1 ENREF_16_1). Where possible we have included policies that are evidence based (see below), or are considered industry best-practices. We also recognize that qualitative data and stories that relate lived experience from communities are powerful means to shape policy as well. However, since many policy areas in California are rapidly evolving as innovative

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practices are introduced on the ground, we have also included emerging practices with the potential to improve health. Policy Guides evolve along with best practices, and we encourage user feedback and suggestions about policies and resources to include. It should also be noted that we have prioritized policies that specifically address equity and have the potential to close racial, ethnic, gender, economic and geographic disparities in health outcomes.

For HPI 3.0, we reviewed the 30 policy guides from HPI 2.0 with an explicit framework to assess the level of evidence for each policy: strong, sufficient, emergent, promising, insufficient, and against (Table 19). These classifications were derived from *The Community Guide*[54] of the Community Preventive Service's Task Force and industry best practices for assessing public health evidence.

Table 19. Level of Evidence for Policy Actions

Recommen-dation	Level of Evidence
Strong	A policy action is recommended based on multiple high-quality, well-designed research studies demonstrating a clear causal relationship between a policy action and the intended outcome. Research studies with a high level of internal and external validity lead us to a high level of confidence that an intervention will achieve its intended outcomes across varied contexts
Sufficient	A body of evidence supports the policy recommendation, but due to a smaller number of high-quality studies, the degree of confidence is not as high.
Emergent	The policy action is supported by theoretical evidence and expert opinion but has not yet had a body of research assessing the impact of the intervention. Actions in this classification may be of a critical nature for intervention due to major focusing events, such as an emerging health crisis.
Promising	The policy action is based on sound theory and expert opinion with initial supportive evidence. Policies in this classification may also be particularly difficult to assess in a research study.

Insufficient	The policy action has either a conflicting body of evidence-based on context or has not had requisite high-quality research design applied to the subject matter.
Against	Research Analysis shows that a policy action is either ineffective or is harmful.

We also understand that public health policy can be challenging to assess from a strict empirical approach due to the complicated set of variables at play in any community. While randomized controlled trials (RCTs) are the gold standard for assessing efficacy in a clinical health setting, the rigorous methodology of RCTs are not be suitable for complex public health interventions due to the highly contextual and costly nature of controlled trials. Alternative research methods such as quasi-experimental designs and observational studies may be more advantageous for capturing the impacts of policy actions targeted at public health and community building. To allow stakeholders to make informed decisions about emergent and promising practices, we base our recommendations on sound theory, expert opinion, and the developing body of research evidence.

Our recommended policy actions are only included if they fall into the categories of strong, sufficient, emergent, or promising evidence. Insufficient or deleterious policies are not recommended to our stakeholders for evidence-informed policymaking.

Of note, a few policy areas in HPI 2.0 were modified in HPI 3.0. These include a narrower scope of screening for developmental delays in children (Preschool Enrollment>Early Child Wellness) and more focused us of Ban the Box policies for employment (Employed>Build Workforce Development and Pathways). The literature suggests that more targeted application of these policies will reduce unintended adverse consequences. Review of evidence also did not support the inclusion of microenterprise support programs (Employed>Develop Community Economic Capacity), which has an inconsistent track record.

 A new guide corresponding to the new indicator "Census Response Rate" was added in HPI 3.0. Research supports this indicator as a measure of social cohesion and/or social capital.[20,21,55] New policies address improving census response rates in historically marginalized (social domain, 18 policies) and conducting a census during public health emergencies such as the COVID-19 pandemic (economic, 6; education, 1; housing, 5; and neighborhood, 4).

The content of all policy guides in HPI 3.0 were rewritten to reflect the CDC's style guide for framing health equity and avoiding stigmatizing language.[56]

Use

Each HPI indicator is tied to a variety of policy options that are designed to directly address that indicator, or to influence the root drivers of that indicator. These options are grouped by the general pathway through which they influence health, for instance "Economic Opportunity", "Health Coverage", "Transportation", and then further divided into specific types of intervention, such as "Support Walking and Biking", or "Plan for Green Communities". Users can access these options from within the HPI web tool by clicking on a given indicator, or through the stand-along Policy Guide site.

Since many decisions that shape health are made at the local level, and by actors outside of public health, policy guides are directed to local jurisdictions outside the public health field. Each local jurisdiction is different, and will need different approaches to address long-standing health inequities. The policy guide therefore provides a menu of potential policies for jurisdictions to consider—not a one-size fits all template.

Users wishing to improve community conditions, and their corresponding HPI scores, can use these menus of policies to select a set of policy interventions for further consideration. For each policy, the Policy Guide includes links to guidance documents, examples, and in some cases funding sources. Where possible we have utilized documents produced by government agencies or other authoritative sources, although there also many examples of community-led or smaller scale interventions.

Dynamic Policy Opportunities

To simplify policy selection, the interactive HPI map includes a Policy Opportunities panel that dynamically displays a subset of policies tied to low-ranking indicators within a selected neighborhood. This function works by first prioritizing the tract's HPI indicators based on their association with life expectancy at birth. HPI indicators are sorted by the inverse of their percentile rank multiplied by the domain weight. From this sorted list, the top three indicators are selected, with no more than one indicator from each domain. Policy opportunities from the selected indicators are then displayed.

DISCUSSION

Since its introduction in 2015, we have documented well over 100 instances of the HPI being used by scores of organizations from local, regional, and state government; health care organizations, advocacy groups, academics, and individuals.[57] For the purpose of documenting community need, the HPI is used in directing more than one billion of state grant-making dollars. Perhaps the most significant use case is the California Department of Public Health incorporating the HPI in metrics for implementing non-pharmacological interventions,[58,59] vaccine distribution,[60] and conducting public health surveillance of COVID-19, including case rates, test positivity, vaccination rates, and mortality rates.[61]

Since the last update of the HPI in 2018, three events have transformed the health equity landscape. The killing of George Floyd has made individuals and institutions confront the pervasiveness and recalcitrance of structural racism in the United States. Wildfires, accelerated by climate change, have devastated scores of California communities. The COVID-19 pandemic has revealed how the social determinants of health and race are inextricably linked to community health, particularly among those with the least opportunity.[61]

The Alliance has responded to these "tri-demics" by elevating data on race/ethnicity into its COVID-19 website and the HPI 3.0 update. Users can quickly identify census tracts with non-white populations and highlight their community conditions using the HPI, its individual indicators, and a large number of other indicators covering health, climate change, and community demographics. Through data, we also elevated the visibility of diverse racial/ethnicity groups within major census categories. These include 22 Asian subgroups and 12 subgroups of Native Hawaiian/Pacific Islander. These groupings are available in mutually exclusive race/ethnicity categories and non-mutually exclusive categories of a single race alone and in combination with other races. In addition to data, we provide many other resources to support local health departments and public health professionals combat racism and promote health equity.[62] Likewise, we have added new climate change layers that provide detail on predicted heat exposures due to different carbon emission levels, and population sensitivities related to age, housing stock, poverty, and outdoors work.

Updates of indicator projects must navigate the imperative of more up-to-date data

with the data availability from numerous governmental organizations updating their own data at irregular intervals, technical requirements such as census tract eligibility, methodologic and data continuity, and user feedback. Of the 25 indicators in HPI 2.0, 22 were substantively the same in HPI 3.0, and one indicator was new (census response rate). A modest number of census tracts entered or left eligibility based on population and groups quarters thresholds, and after updating data and applying the same methodology for scaling and weighting, a large percentage (82%) of the most disadvantaged quartile of census tracts were common to both HPI 2.0 and HPI 3.0.

BEST PRACTICES TO EXPLORE RACE AND PLACE

HPI is a powerful tool to reveal neighborhood conditions that drive the health of the communities. Viewing the drivers of health through the lens of neighborhood conditions is one among a number of important perspectives to understand community health.

Multiple Perspectives for the Drivers of Health

The health of individuals and the communities are intimately tied to race and other characteristics of people and the places they live. For example, research has shown that people living in poverty have poorer health outcomes than people living above poverty, and that this has been repeatedly observed no matter what neighborhood the poor and rich live in. However, poor people living in neighborhoods of concentrated poverty have worse health than the poor who live in other neighborhoods.[63] These findings emphasize that individual and community environments both contribute to a person's health and well-being. "Race, place, and people" are shaped by larger economic, social, housing, transportation forces or systems that drive resource allocation for individuals and communities. These systems are often called "upstream" drivers of health but it is methodologically challenging to incorporate these influences in tools that focus on individuals and neighborhoods. This is an important data gap (see below), although conceptual models provide insights on how these upstream forces work across people and places.[64–66]

Exploring Race, Place, and People with the Healthy Places Index

The HPI 3.0 has new features that adds a people (population) perspective to the place perspective. We provide indicators that are specific to different race/ethnicity groups. This allows users to see the community conditions of members of the same race/ethnicity across small and large areas of California. When mapped side-by-side with the overall HPI score, this comparison can reveal census tracts with very healthy living conditions overall, but with subgroups with less opportunity. This is salient for race/ethnicity groups who are numerically small and geographically dispersed (e.g. Native Hawaiian/Pacific Islander), and whose community conditions would be obscured by limiting data exploration to the "average" census tract population. These new tools can also help visualize situations in which unhealthy community conditions of a specific race/ethnicity group are geographically widespread, which suggests policy action that goes beyond a strict place-based approach. Additional data on small populations within census tracts also advances our understanding, but this is currently a challenging data gap (discussed below).

In addition to the HPI score, we urge users to create HPI maps with our race/ethnicity stratification and filtering tools to assure that no subgroup has been overlooked. In addition to data tools, we rely on "ground truthing" of our results by community-based organizations and residents, who identify potential data gaps and limitations so policy makers can be alerted and benefit from the knowledge of and engagement by community-based organizations and residents.

DATA GAPS

The Healthy Places Index is built on public data collected by governmental agencies, universities, and nonprofit organizations. Some government agencies collect data themselves by conducting surveys of the public or by monitoring environmental conditions with specialized instruments in the field. By statute, some governmental agencies are charged with collecting data from private and public businesses such as health care facilities. Universities may conduct their own surveys or compile public records. Some non-profit organizations also compile data on their own members or public records. These efforts are largely funded by government and philanthropies. What makes the use of the data possible in the Health Places Index is the convergence of all the following attributes:

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- Centralized
- Standardized
- Complete and accurate
- Digitized and machine readable
- Geographically resolved at the census tract
- Public and non-confidential
- Statistically reliable sample size
- Timely

If data collection does not fulfill one of more of these attributes, there could be a breakdown that creates a data gap. Table 20 illustrates these attributes and gives examples of barriers, impacted indicators, and potential solutions. The solutions are specific to indicators, but include changes to: a) state laws and regulations, b) agencies' data collection methods and data processing, c) agencies' internal policies on public release of data, and/or d) funding to maximize data yield.

FUTURE IMPROVEMENTS

Health Outcomes Equity Tool

We are in the development phase for several new features. The incorporation of the HPI into the pandemic response of the California Department of Public illustrates that social drivers of health can become a routine component of public health surveillance and population-based clinical quality.[67] We are developing an interactive feature that will allow users to upload their "cases", which can be linked to census tract values of the HPI and populations categorized by HPI scores/quantiles. This "Health Outcomes Equity Tool" can produce case- and rate-based metrics which can be mapped along with HPI percentiles. This type of visualization will help identify geographic areas of both high rates and high disadvantage. Carried out over time, this produces a time series to help assess whether interventions narrow gaps in equity.

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Story telling

We are in the development phase of incorporating lived experience of users and story-telling into the HPI mapping application. Links to photographs, slideshows, and videos are potential venues to complement numerical data with qualitative data of compelling stories of neighbors and neighborhoods.

Table 20. Data Attributes, Barriers, and Solutions to Close Data Gaps that Impact the Healthy Places Index

Attribute	Barrier	Example(s)	Possible Solutions
Centralized	●Multiple, autonomous local agencies collect data	Farm Labor Housing; bicycle/pedestrian counts	●Require local agencies to report to State agency (HCD), and/or ●Provide funding to non-governmental organizations to compile from public sources
Standardized	●Multiple competing indicators	Gentrification	●Governmental adoption/endorsement or recommendation of experts
Complete and accurate	●Partial coverage of eligible population ●Database poorly maintained	Physician to population ratio	●Statute/regulation requiring collection of data ●Adoption of data quality standards by agency collecting information
Digitized/Machine Readable	●Paperbound record keeping or non-standardized databases	Court records home foreclosure	●Require agency to digitize data and/or provide funding to do so
Geographic Resolution	●Data collection uses ZIP code for convenience or by statute ●Street address or location not geocoded to census tract	Hospitalization/ emergency department rates; police related violence;	●Modify state law to allow collection of address information to geocode to census tract ●Assist state agencies with funding and/or technical support to geocode address/location information

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| Public Availability | ●No statute or regulation that requires public release with geographic detail
 ●Internal policy of data collection agency to not release data at all or at fine geographic detail | Crime data, hate crimes, incarceration data by race/ethnicity | ●Modify existing statutes/regulations/guidance to permit public reporting at census tract
 ●Modify internal agency policies to allow disclosure consistent with California law |

Attribute	Barrier	Example(s)	Possible Solutions
Statistically Reliable Sample	● Sample protocol adequate for large geographic areas or large populations ● Multi-year data not pooled	Racial attitudes; sexism; Gender identity/sexual orientation; Asian subgroups; Native Hawaiian Pacific Islander subgroups; American Indian; religion; Latino subgroups; unhoused population	● Increases funding of data collection entity (e.g. California health Interview Survey, CHIS) to allow greater sampling and oversampling of numerically small populations ● Leverage multi-year datasets by pooling ● Engage with groups understand their data needs
Timely	● Data collection interval is not continuous or infrequent	Tree canopy, land cover	● Change of agencies' methodology/increase funding to enhance geographic detail and timeliness
Scope	● Important issue not included or dropped from data collection	Physical activity in CHIS. Reasons for WIC utilization changes; immigration status	● Provide stable and adequate funding to collect data ● Prohibit law enforcement agencies from accessing personal identifiers in surveys

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National HPI

Organizations throughout the United States have expressed an interest in a national version of the Healthy Places Index. They are particularly attracted to the asset-based positive framing, validation of the index with life expectancy, the granularity of data, the ease of navigating the map application, and the linkage of data to action/policy via the policy guides. Because most of the individual indicators in the HPI are sourced from national datasets, a national HPI is feasible. We are seeking resources and welcome partnerships to take the HPI to other states and the entire United States.

LIMITATIONS AND CHALLENGES

There were a few limitations in data availability for the update: 1) ACS data overlapped for 2015; 2) updates for some indicators (tree canopy, parks) were not available. Data on crime at the census tract was still not available from public sources. Geographically refined data on sexual orientation and gender identity are also lacking.

There are inherent limitations in ACS data collection, which relies on a continuous probability sample, which produces reasonably stable estimates for census tracts over a 5-year period. These are cumulative cross-sectional measures that cannot reflect sudden or rapid changes in the population or its characteristics.

In-person data collection for the ACS during the pandemic was severely curtailed, leading to a higher reliance on statistical modeling than data aggregation. The pandemic was associated with intra- and inter-regional population movements (e.g., college students returning home, higher income groups migrating to less urban settings, etc.) and housing instability as eviction moratoria lapse. The durability of these effects is unknown, but will play out over the next several years. We will seek guidance of public health and national data organizations on how to approach discontinuities in data collection and analysis caused by the pandemic.

Place-based, cross-sectional measures are in general sensitive to other population dynamics such as mass evacuation due to wildfires and climate emergencies, gentrification, community succession, and displacement.

We anticipate that, with the completion of the 2020 decennial census, census tract boundaries will change. When data are produced for 2020 census tract boundaries by the many U.S. governmental agencies we rely on for the bulk of HPI data, we will begin the process of migrating our data and the mapping application to the 2020 census boundaries.

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APPENDICES

A. HPI STEERING COMMITTEE, COMMUNICATIONS ADVISORS, FOCUS GROUPS, AND BETA TESTERS

Members of the HPI Steering Committee (HPI 2, HPI 3)

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Linda Rudolph, Public Health Institute (2,3)

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Elizabeth Baca, California Office of Planning and Research Rye

Baerg, Southern California Council of Governments Dalila

Butler, PolicyLink

Lianne Dillon and Julia Caplan, CA Strategic Growth Council, Health In All Policies Team Solange

Gould & Meredith Millet, California Dept. of Public Health, Office of Health Equity Melissa

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Jones, Bay Area Regional Health Inequities Initiative

Jennifer Lopez, Kaiser

Kate Meis and Paul Zykofsky, Local Government Commission Sarah

Reyes, The California Endowment

Kathi Shaff, Berkeley Media Studies Group

Kerri Timmer, Sierra Business Council

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Elva Yanez and Rob Baird, Prevention Institute

Members of HPI 3.0 Focus Groups and Beta Testers
Jackie Tran, AAPI Data Disaggregation Committee
Doreena Wong, Asian Resources
Heather Berg, San Joaquin Valley Health Coalition
Matt Beyers, BARHII and Alameda County Public Health
Grace Cotangco, Prevention Institute
Michael Castro, San Bernardino PHD
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Mashariki Kudumu, March of Dimes
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Jonathan Matz, Safe Routes Partnership
Kevin Meconis, Riverside University Health System
Ninez Ponce, UCLA/CHPR
Santa Barbara County Public Health
     Timothy Watts
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Pedro Spindler-Ruiz, Los Angeles
Matt Swope, Kaiser Permanente

Ventura County Public Health
    Aruni Ganewatte
    Erin Slack
Lucas Zucker, CAUSE

B. DATA DICTIONARY AND SOURCE DATA VARIABLE TRANSFORMATIONS FOR HPI

HPI Indicators Data Dictionary

Variable Name	Data Source	Table	Variable(s)

abovepoverty	ACS2019API/5Y	S1701	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html
			
			S1701_C01_001E = Estimate of population for whom poverty status is determined
			S1701_C01_001M = Margin of Error of all individuals with income below 200 percent poverty level
			S1701_C01_042E = Estimate of all individuals with income below 200 percent poverty level
			S1701_C01_042M = Margin of Error of all individuals with income below 200 percent poverty level
			
			Numerator = S1701_C01_042E
			Denominator = S1701_C01_001E
			Numerator SE = S1701_C01_042E / 1.645
			Denominator SE = S1701_C01_001M / 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator
			
			To reframe indicator as positive:
			Value = 1 - (Numerator / Denominator)
			Numerator = Denominator - Numerator

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automobile	ACS2019API/5Y	DP04	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html DP04_0058PE = Percent; vehicles available - Occupied housing units - No vehicles available DP04_0058PM = Percent Margin of Error; vehicles available - Occupied housing units - No vehicles available DP04_0057E = Estimate of vehicles available - Occupied housing units

			Value = 1 - (DP04_0058PE / 100) Denominator = DP04_0057E Numerator = Value * Denominator SE = (DP04_0058PM/100) / 1.645

bachelorsed	ACS2019API/5Y	DP02	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html
			
			DP02_0059E = Estimate of total population ages 25 and older DP02_0059M
			= Margin of Error of total population ages 25 and older
			DP02_0068E = Estimate of educational attainment - Bachelor's degree or higher DP02_0068M
			= Margin of Error of educational attainment - Bachelor's degree or higher
			
			Numerator= DP02_0068E
			Denominator= DP02_0059E
			Value = Numerator / Denominator
			Numerator SE = DP02_0068M / 1.645
			Denominator SE = DP02_0059M / 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

commute	ACS2019API/5Y	B08006	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			B08006_001E = Estimate of total
			B08006_001M = Margin of Error of total
			B08006_008E = Estimate of public transportation (excluding taxicab) B08006_008M
			= Margin of Error of public transportation (excluding taxicab) B08006_014E =
			Estimate of bicycle
			B08006_014M = Margin of Error of bicycle
			B08006_015E = Estimate of walked
			B08006_015M = Margin of Error of walked

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			B08006_017E = Estimate of worked at home
			B08006_017M = Margin of Error of worked at home
			
			Numerator = B08006_008E + B08006_014E + B08006_015E
			Denominator = B08006_001E - B08006_017E
			Value = Numerator/Denominator
			Numerator SE = sqrt((B08006_008M/1.645)^2 + (B08006_014M/1.645)^2 +
			       (B08006_015M/ 1.645)^2)
			Denominator SE = sqrt((B08006_001M/1.645)^2-(B08006_017M/1.645)^2)
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

dieselpm	CalEPA_CES_4. 0		URL: https://services1.arcgis.com/PCHfdHz4GlDNAhBb/ArcGIS/rest/services/DraftResultsCES4082520/FeatureServer/ Value = diesel_4_0
employed	ACS2019API/5Y	S2301	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html S2301_C01_021E = Estimate of total population ages 20-64 S2301_C03_021E = Estimate of population to Employment Ratio, ages 20-64 S2301_C03_021M = Margin of Error of population to Employment Ratio, ages 20-64 Denominator = S2301_C01_021E Value = S2301_C03_021E / 100 Numerator = Value * Denominator

			SE = (S2301_C03_021M/100) / 1.645

h20contam	CalEPA_CES_4. 0		URL: https://services1.arcgis.com/PCHfdHz4GlDNAhBb/ArcGIS/rest/services/DraftResultsCES4082520/FeatureServer/ Value = drink_4_0

homeownership	ACS2019API/5Y	DP04	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html
			
			DP04_0045E = Estimate of housing tenure - occupied housing units
			DP04_0045M = Margin of Error of housing tenure - occupied housing units
			DP04_0046E = Estimate of housing tenure - occupied housing units Owner-occupied DP04_0046M = Margin of Error of housing tenure - occupied housing units Owner-occupied
			
			Numerator = DP04_0046E
			Denominator = DP04_0045E
			Value = Numerator / Denominator
			Numerator SE = DP04_0046M / 1.645
			Denominator SE = DP04_0045M / 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

| houserepair | CHAS_2013-2017_Tables15A_15B_15C | Table 15A, Table 15B, Table 15C | URL: https://www.huduser.gov/portal/datasets/cp.html#2006-2017_data

ACS cannot be used because kitchen and plumbing are not exclusive of each other
T15A_est3 = Estimate of owner occupied with mortgage AND has complete kitchen and plumbing facilities
T15A_moe3 = Margin of Error of owner occupied with mortgage AND has complete kitchen and plumbing facilities
T15B_est3 = Estimate of owner occupied with no mortgage AND has complete kitchen and plumbing facilities
T15B_moe3 = Margin of Error of owner occupied with no mortgage AND has complete kitchen and plumbing facilities
T15C_est3 = Estimate of renter occupied AND has complete kitchen and plumbing facilities
T15C_moe3 = Margin of Error of renter occupied AND has complete kitchen and plumbing facilities
T15A_est1 = Estimate of owner occupied with mortgage T15A_moe1
= Margin of Error of owner occupied with mortgage T15B_est1 =
Estimate of owner occupied with no mortgage T15B_moe1 = Margin
of Error of owner occupied with no mortgage T15C_est1 = Estimate
of renter occupied
T15C_moe1 = Margin of Error of renter occupied

Numerator = T15A_est3 + T15B_est3 + T15C_est3
Denominator = T15A_est1 +T15B_est1 + T15C_est1
Value = (Numerator/denominator)
Numerator SE = SQRT((T15A_moe3/1.645)^2 + (T15B_moe3/1.645)^2 + (T15C_moe3/1.645)^2)
Denominator SE = SQRT((T15A_moe1/1.645)^2 + (T15B_moe1/1.645)^2 + (T15C_moe1/1.645)^2)

If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator |

			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

percapitainco me	ACS2019API/5Y	B19301	URL: https://api.census.gov/data/2019/acs/acs5/variables.html B19301_001E = Estimate of per capita income in the past 12 months (in 2019 inflation-adjusted dollars) B19301_001M = Margin of Error of per capita income in the past 12 months (in 2019 inflation-adjusted dollars) Value = B19301_001E SE = B19301_001M / 1.645

inhighschool	ACS2019API/5Y	S1401	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html
			
			S1401_C01_019E = Estimate of population 15 to 17 years
			S1401_C01_020E = Estimate of population 15 to 17 years - Enrolled in School;
			S1401_C01_019M = Margin of Error of population 15 to 17 years
			S1401_C01_020M = Margin of Error of population 15 to 17 years - Enrolled in School;
			
			Numerator = S1401_C01_020E
			Denominator = S1401_C01_019E
			Value = Numerator/denominator
			Numerator SE = S1401_C01_020M /1.645
			Denominator SE = S1401_C01_019M /1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

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inpreschool	ACS2019API/5Y	S1401	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html
			S1401_C01_013E = Estimate of population 3 to 4 years
			S1401_C01_014E = Estimate of population 3 to 4 years - Enrolled in School;
			S1401_C01_013M = Margin of Error of population 3 to 4 years
			S1401_C01_014M = Margin of Error of population 3 to 4 years - Enrolled in School;

			Numerator = S1401_C01_014E
			
			Denominator = S1401_C01_013E
			
			Value = Numerator/denominator
			
			Numerator SE = S1401_C01_014M /1.645
			
			Denominator SE = S1401_C01_013M /1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

insured	ACS2019API/5Y	S2701	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html S2701_C02_012M = Margin of Error of those insured AGE - 19 to 64 years S2701_C02_012E = Estimate of those insured AGE - 19 to 64 years S2701_C01_012E = Estimate of civilian non-inst. pop - 19 to 64 years Numerator= S2701_C02_012E Denominator= S2701_C01_012E Value = Numerator/denominator SE = S2701_C03_012M /1.645

rentsevere and ownsevere	CHAS, 2013-2017	Table 8	URL: https://www.huduser.gov/portal/datasets/cp.html#2006-2017_data
			
			See table below for variable names
			Own Severe
			Numerator = T8_est10 + T8_est23 + T8_est36
			Denominator = T8_est2
			
			Value = Numerator/denominator
			Denominator SE = T8_moe2/1.645
			Numerator SE = sqrt[(T8_moe10/1.645)2 + (T8_moe23/1.645)2 + (T8_moe36/1.645)2]
			
			Rent Severe
			Numerator = T8_est76 + T8_est89 + T8_est102
			Denominator = T8_est68
			Value = Numerator/denominator
			Denominator SE = T8_moe68/1.645
			Numerator SE = sqrt[(T8_moe76/1.645)2 + (T8_moe89/1.645)2 + (T8_moe102/1.645)2]
			
			For both Own Severe and Rent Severe:
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

	Owners				Renters			
	Cost Burden				Cost Burden			
Income	>50%	>50%	Total		>50%	>50%	Total	
<80% HAFMI	Estimate	MOE	Estimate	MOE	Estimate	MOE	Estimate	MOE
<30	T8_est10	T8_moe10	T8_est3		T8_est76	T8_moe76	T8_est69	

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| 30-50 | T8_est23 | T8_moe23 | T8_est16 | | T8_est89 | T8_moet89 | T8_est82 | |
| 50-80 | T8_est36 | T8_moe36 | T8_est29 | | T8_est102 | T8_moe102 | T8_est95 | |

ozone	CalEPA_CES_4. 0		URL: https://services1.arcgis.com/PCHfdHz4GlDNAhBb/ArcGIS/rest/services/DraftResultsCES4082520/FeatureServer/ Value = ozone_4_0
parkaccess	CDPH_HCI	HCI_AccessToParks_4 69_CA_RE_CO_CD_PL_CT-7-3-2017-ADA.xlsx	URL: https://www.cdph.ca.gov/Programs/OHE/Pages/HCI-Search.aspx Value = Estimate / 100 SE = se / 100
pm25	CalEPA_CES_4. 0		URL: https://services1.arcgis.com/PCHfdHz4GlDNAhBb/ArcGIS/rest/services/DraftResultsCES4082520/FeatureServer/ Value = pm_4_0

| retail | USEPA | SmartLocation Database 3.0 (2021) | URL: https://geodata.epa.gov/arcgis/rest/services/OA/SmartLocationDatabase/MapServer/3/

Note: files is at census block group (CBG) and must be aggregated to census tract

D1C8_Ret = Gross retail (8-tier) employment density (jobs/acre) on unprotected land D1C8_Ent = Gross entertainment (8-tier) employment density (jobs/acre) on unprotected land D1C8_Ed = Gross education(8-tier) employment density (jobs/acre) on unprotected land D1C8_SVC = Gross service (8-tier) employment density (jobs/acre) on
unprotected land

Value = D1C8_RET + D1C8_ENT + D1C8_SVC + D1C8_ED |

treecanopy	HCI/National Land Cover Database	BRACE_TreeCanopy_458_CT_PL_CO_RE_CA	URL: https://www.cdph.ca.gov/Programs/OHE/Pages/HCI-Search.aspx Value = (100 - estimate) / 100 SE = SE/100

uncrowded	ACS2019API/5Y	DP04	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html
			
			DP04_0077M = Margin of Error of occupants per room - Occupied housing units - 1.00 or less
			DP04_0076M = Margin of Error of occupants per room - Occupied housing units
			DP04_0077E = Estimate of occupants per room- Occupied housing units - 1.00 or less
			DP04_0076E = Estimate of occupants per room- Occupied housing units
			
			Numerator= DP04_0077E
			Denominator= DP04_0076E Value
			= Numerator/denominator
			Numerator SE = DP04_0077M /1.645
			Denominator SE = DP04_0076M /1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

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voting	UC_Berkeley_St atewide_Datab ase		URL: https://statewidedatabase.org/d10/g20.html Crosswalk source: https://statewidedatabase.org/d10/g20_geo_conv.html Note: files is at census block group (CBG) and must be aggregated to census tract PCTRGPREC = Percent of total registered voters in the RG precinct that are located within the transecting census block BLKREG = Voter registration by block TOTREG_R = Registered Voters (from crosswalk variable TOTREG_R)

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			Numerator = PCTRGPREC/100 * TOTREG_R Denominator = BLKREG Value = Numerator / Denominator SE = sqrt (value*(1-value)/ denominator)
census	Dec2020Censu sAPI	Respon se Rate	URL: https://api.census.gov/data/2020/dec/responserate/variables.html Note: file uses 2020 census tracts and must be crosswalked to 2010 tracts. CRALL = Cumulative Self-Response Rate - Overall Value = CRALL

Decision Support Layer Data Dictionary (Alphabetical)

Variable Name	Data Source	Table	Variable(s)
Age_under5	ACS_18_5YR_S0101		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of population aged younger than 5
Age5_14	ACS_18_5YR_S0101		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of population aged between 5-14
air_pollution	US EPA, Sites Reporting to EPA, 2021		URL: https://geopub.epa.gov/arcgis/rest/services/EMEF/efpoints/MapServer/
aircon	RAS 2009		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of households with air conditioning
alcoffsale	CDPH/ABC		URL: https://www.cdph.ca.gov/Programs/OHE/Pages/HCI-Search.aspx HCI_AlcoholOutletsQ_774_CA_RE_CO_CD_PL_CT-A-N-5-16-14.xlsx HCI_AlcoholOutletsQ_774_CO_CD_PL_CT-O-Y-5-16-14.xlsx Excel files must be appended and filtered for race_eth_code==9 & geotype=="CT" & (license_type == "Off_sale") Percent = alcoffsale_pct SE = alcoffsale_se_pct

alconsale			URL: https://www.cdph.ca.gov/Programs/OHE/Pages/HCI-Search.aspx
			Excel files must be appended and filtered for race_eth_code==9 & geotype=="CT" & (license_type == "On_sale")
			Percent = alconsale_pct SE = alconsale_se_pct

AllHUDunits_17	2015 HUD Picture of Subsidized Households; ACS2017API/5Y	B25002	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Number of housing units subsidized by any HUD program, for every 1,000 housing units
asthma	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in percentage format) and numerator were provided by Race Counts Numerator = Number of people ever diagnosed with asthma Value = Percent of people ever diagnosed with asthma Value = data provided / 100 Denominator = Value / Numerator
asthmaer	CalEnviroScreen 3.0		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Spatially modeled, age-adjusted rate of emergency department (ED) visits for asthma per 10,000

broadband	ACS2019API/5Y/	B28009 / B28003	URL: https://api.census.gov/data/2019/acs/acs5/variables.html For race/ethnicity stratified indicators: B28009_001E = Estimate of Total Households B28009_001M = Margin of Error of Total Households B28009_004E = Estimate of total households that have a computer with broadband internet B28009_004M = Margin of Error of total households that have a computer with broadband internet Value = B28009_004E / B28009_001E SE = [(B28009_004M / 1.645) ^2] / [(B28009_001M / 1.645) ^2]

			For census-tract level indicator:
			B28003_001E = Estimate of Total Households
			B28003_001M = Margin of Error of Total Households
			B28003_004E = Estimate of total households that have a computer with broadband internet
			B28003_004M = Margin of Error of total households that have a computer with broadband internet
			Value = B28003_004E / B28003_001E
			SE = [(B28003_004M / 1.645) ^2] / [(B28003_001M / 1.645) ^2]
brownfields	US EPA, Sites Reporting to EPA, 2021		URL: https://geopub.epa.gov/arcgis/rest/services/EMEF/efpoints/MapServer/
CA_American_Indian_Areas	Census TIGER/line, 2019 and American Community Survey, 2019	B01001	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html B01001_001E = Total Estimate
census_participation	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in percentage format) were provided by Race Counts Value = Percent of population who participated in the 2010 decennial census Value = data provided / 100
CES30Score	CalEnviroScreen 3.0		URL: https://oehha.ca.gov/calenviroscreen/ Value = CES 3.0 Score Pctile_st = CES 3.0 Percentile
CES40Score	CalEnviroScreen 4.0		URL: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40 Value = Ciscore Pctile_st = CIscoreP

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childpoverty	ACS2019API/5Y	S1701	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html S1701_C02_002E = Estimate of population under 18 below poverty level S1701_C01_002E = Estimate of total population under 18 S1701_C03_002M = Margin of error (percent) of population under 18 below poverty level Numerator = S1701_C02_002E Denominator = S1701_C01_002E Proportion = Numerator/Denominator SE(proportion)= (S1701_C01_003M/100) /1.645
children	ACS2015API/5Y	S0101	URL: https://api.census.gov/data/2015/acs/acs5/variables.html HC01_EST_VC01 = Estimate of total population HC01_EST_VC03 = Estimate of population under 5 years old (percent HC01_MOE_VC03 = Margin of error of population under 5 years old Denominator = HC01_EST_VC01 Numerator = HC01_EST_VC01* HC01_EST_VC03/100 Percent = HC01_EST_VC03 pct_se = HC01_MOE_VC03/1.645

chrabs	Cal Dept of Ed	chronicabsenteei sm19	URL: https://www.cde.ca.gov/ds/ad/filesabd.asp
			Percent of K-12 students absent for $\geq$ 10% of eligible school days, 2018-2019
			Download txt file: https://www3.cde.ca.gov/demo-downloads/attendance/chrabs1819.txt
			File contains State, County (C), District, and School levels (AggregateLevel) for multiple race/ethnicities (TA = ALL), for School types (CharterSchool):
			For county averages, filter file: AggregateLevel == "C" & ReportingCategory == "TA" & CharterSchool == "All" " Numerator = ChronicAbsenteeismCount Denominato r= ChronicAbsenteeismEligibleCumulativeEnrollment Value = numerator/denominator SE = sqrt(value*(1-value)/denominator) binomial se for a percent
chronic_absente eism	Race_Counts_2017	2017	URL: https://www.racecounts.org/
			Value (provided in rate per 100 students/staff) and numerator were provided by Race Counts Numerator = Estimate of chronically absent students per 100 students Value = Rate of chronically absent students per 100 students
			Value = data provided Denominator = (Value/100) / Numerator

civilianveteran	ACS2019API/5Y	S0102	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html
			S0102_C01_041E = Estimate of civilian population S0102_C01_042E = Percent estimation of civilian veterans over 18 S0102_C01_042M = Margin of error of civilian veterans over 18

			Numerator = S0102_C01_041E*(S0102_C01_042E/100)
			Denominator = S0102_C01_041E
			Proportion = S0102_C01_042E/100
			SE(proportion) = (S0102_C01_042E/100)/1.645
computer	ACS2019API/5Y/	B28009 / B28004	URL: https://api.census.gov/data/2019/acs/acs5/variables.html For race/ethnicity stratified indicators: B28009_001E = Estimate of Total Households B28009_001M = Margin of Error of Total Households B28009_002E = Estimate of total households that have a computer B28009_002M = Margin of Error of total households that have a computer Value = B28009_002E / B28009_001E SE = [(B28009_002M / 1.645) ^2] / [(B28009_001M / 1.645) ^2] For census-tract level indicator: B28003_001E = Estimate of Total Households B28003_001M = Margin of Error of Total Households B28003_002E = Estimate of total households the have a computer B28003_002M = Margin of Error of total households that have a computer Value = B28003_002E / B28003_001E SE = [(B28003_002M / 1.645) ^2] / [(B28003_001M / 1.645) ^2]
crime_rate	UCR/CDPH, 2015		URL: https://www.cdph.ca.gov/Programs/OHE/Pages/CC-Health-Vulnerability-Indicators.aspx filter on Violent crime total value = rate se = se

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DaysAbove100F_2035_2064	CalAdapt_CanESM2 _ CNRM CM5_HadGEM2-ES_MIROC5_LOCA_RCP8.5	2035 - 2064	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected number of days above 100F in Mid-Century (2035 - 2064) under the RCP 8.5 scenario, using data from California's four priority global climate models (HadGEM2-ES, CNRM-CM5, CanESM2, MIROC5).
DaysAbove100F_2070_2099	CalAdapt_CanESM2 _ CNRM CM5_HadGEM2-ES_MIROC5_LOCA_RCP8.5	2070 - 2099	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected number of days above 100F in End of Century (2070 – 2099) under the RCP 8.5 scenario, using data from California's four priority global climate models (HadGEM2-ES, CNRM-CM5, CanESM2, MIROC5).
DaysAbove90F_2035_2064	CalAdapt_CanESM2 _ CNRM CM5_HadGEM2-ES_MIROC5_LOCA_RCP8.5	2035 - 2064	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected number of days above 90F in Mid-Century (2035 - 2064) under the RCP 8.5 scenario, using data from California's four priority global climate models (HadGEM2-ES, CNRM-CM5, CanESM2, MIROC5).
DaysAbove90F_2070_2099	CalAdapt_CanESM2 _ CNRM CM5_HadGEM2-ES_MIROC5_LOCA_RCP8.5	2070 - 2099	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected number of days above 90F in End of Century (2070 – 2099) under the RCP 8.5 scenario, using data from California's four priority global climate models (HadGEM2-ES, CNRM-CM5, CanESM2, MIROC5).

deathsdespair	CDC WONDER	Underlying cause, 2015-2019	URL: https://wonder.cdc.gov/ucd-icd10.html https://www.jec.senate.gov/public/index.cfm/republicans/methodological-appendix-to-long-term-trends-in-deaths-of-despair/

ICD Version	Years in Use, U.S.	Suicide	Alcohol-Related Deaths	Drug-Related Deaths
10	1999-2016	X60-X84, Y87.0	E24.4, F10, G31.2, G62.1, G72.1, I42.6, K29.2, K70, K85.2, K86.0, O35.4, P04.3, Q86.0, R78.0, X45, Y15	F11-16, X40-44, Y10-14

1. Group by: County
2. Location: California
4. Years: 2015-2019
6. Cause of Deaths: ICD Codes
Advanced Finder Options
Open (Expand) ICD codes and move to selection box

Numerator = Deaths/5
Denominator = Population/5
Value = 100000*Deaths/Population
Se = value/sqrt(Deaths)

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| demographic variables | ACS2019API/5Y | B02014, B02015, B02016, B02017, B02018, B02019, B03001, B03002 | URL: https://api.census.gov/data/2019/acs/acs5/variables.html

Numerator = See table below
Denominator = _001E of each respective table
Proportion = Numerator / Denominator |

B02014 (AIAN alone)		B02016 (NHPI alone)		B02018 (Asian alone or in combination)	
Variable Name	**ACS Variable**	**Variable Name**	**ACS Variable**	**Variable Name**	**ACS Variable**
alaska_native_not_specified_pct	B02014_053E	fijian_pct	B02016_009E	asian_indian_combo_pct	B02018_002E
alaskan_athabascan_pct	B02014_047E	other_melanesian_pct	B02016_010E	bangladeshi_combo_pct	B02018_003E
aleut_pct	B02014_048E	guamanian_or_chamorro_pct	B02016_006E	bhutanese_combo_pct	B02018_004E
all_other_american_indian_tribes_pct	B02014_044E	marshallese_pct	B02016_007E	burmese_combo_pct	B02018_005E

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american_indian_not_specified_pct	B02014_045E	other_micronesian_pct	B02016_008E	cambodian_combo_pct	B02018_006E
american_indian_or_alaska_native_tribes_no t_specified_pct	B02014_054E	other_pacific_islander_pct	B02016_011E	chinese_combo_pct	B02018_007E
apache_pct	B02014_003E	native_hawaiian_pct	B02016_002E	filipino_combo_pct	B02018_008E
arapaho_pct	B02014_004E	other_polynesian_pct	B02016_005E	hmong_combo_pct	B02018_009E
blackfeet_pct	B02014_005E	samoan_pct	B02016_003E	indonesian_combo_pct	B02018_010E
canadian_and_french_american_indian_pct	B02014_006E	tongan_pct	B02016_004E	japanese_combo_pct	B02018_011E
central_american_indian_pct	B02014_007E	two_or_more_nhpi_pct	B02016_012E	korean_combo_pct	B02018_012E
cherokee_pct	B02014_008E	**B02017 (AIAN alone or in combination)**		laotian_combo_pct	B02018_013E
cheyenne_pct	B02014_009E	**Variable Name**	**ACS Variable**	malaysian_combo_pct	B02018_014E
chickasaw_pct	B02014_010E	alaska_native_not_specified_combo_pct	B02017_053E	mongolian_combo_pct	B02018_015E
chippewa_pct	B02014_011E	alaskan_athabascan_combo_pct	B02017_047E	nepalese_combo_pct	B02018_016E
choctaw_pct	B02014_012E	aleut_combo_pct	B02017_048E	okinawan_combo_pct	B02018_017E

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colville_pct	B02014_013E	all_other_american_indian_tribes_combo_ pct	B02017_044E	other_asian_not_specified_combo_pct	B02018_024E
comanche_pct	B02014_014E	american_indian_not_specified_combo_pc t	B02017_045E	other_asian_specified_combo_pct	B02018_023E
cree_pct	B02014_015E	american_indian_or_alaska_native_tribes_ not_specified_combo_pct	B02017_054E	pakistani_combo_pct	B02018_018E
creek_pct	B02014_016E	apache_combo_pct	B02017_003E	sri_lankan_combo_pct	B02018_019E
crow_pct	B02014_017E	arapaho_combo_pct	B02017_004E	taiwanese_combo_pct	B02018_020E
delaware_pct	B02014_018E	blackfeet_combo_pct	B02017_005E	thai_combo_pct	B02018_021E
hopi_pct	B02014_019E	canadian_and_french_american_indian_co mbo_pct	B02017_006E	vietnamese_combo_pct	B02018_022E
houma_pct	B02014_020E	central_american_indian_combo_pct	B02017_007E	**B02019 (NHPI alone or in combination)**	
inupiat_pct	B02014_049E	cherokee_combo_pct	B02017_008E	**Variable Name**	**ACS Variable**
iroquois_pct	B02014_021E	cheyenne_combo_pct	B02017_009E	fijian_combo_pct	B02019_009E
kiowa_pct	B02014_022E	chickasaw_combo_pct	B02017_010E	other_melanesian_combo_pct	B02019_010E
lumbee_pct	B02014_023E	chippewa_combo_pct	B02017_011E	guamanian_or_chamorro_combo_pct	B02019_006E
menominee_pct	B02014_024E	choctaw_combo_pct	B02017_012E	marshallese_combo_pct	B02019_007E
mexican_american_indian_pct	B02014_025E	colville_combo_pct	B02017_013E	other_micronesian_combo_pct	B02019_008E
navajo_pct	B02014_026E	comanche_combo_pct	B02017_014E	other_pacific_islander_combo_pct	B02019_011E
osage_pct	B02014_027E	cree_combo_pct	B02017_015E	native_hawaiian_combo_pct	B02019_002E
ottawa_pct	B02014_028E	creek_combo_pct	B02017_016E	other_polynesian_combo_pct	B02019_005E
paiute_pct	B02014_029E	crow_combo_pct	B02017_017E	samoan_combo_pct	B02019_003E
pima_pct	B02014_030E	delaware_combo_pct	B02017_018E	tongan_combo_pct	B02019_004E
potawatomi_pct	B02014_031E	hopi_combo_pct	B02017_019E	**B03001 (Hispanic/Latino by Origin)**	
pueblo_pct	B02014_032E	houma_combo_pct	B02017_020E	**Variable Name**	**ACS Variable**
puget_sound_salish_pct	B02014_033E	inupiat_combo_pct	B02017_049E	central_american_pct	B03001_008E
seminole_pct	B02014_034E	iroquois_combo_pct	B02017_021E	central_american_costa_rican_pct	B03001_009E
shoshone_pct	B02014_035E	kiowa_combo_pct	B02017_022E	central_american_guatemalan_pct	B03001_010E
sioux_pct	B02014_036E	lumbee_combo_pct	B02017_023E	central_american_honduran_pct	B03001_011E

Variable Name	ACS Variable				
south_american_indian_pct	B02014_037E	menominee_combo_pct	B02017_024E	central_american_nicaraguan_pct	B03001_012E
spanish_american_indian_pct	B02014_038E	mexican_american_indian_combo_pct	B02017_025E	central_american_other_central_american_p ct	B03001_015E
tlingit-haida_pct	B02014_050E	navajo_combo_pct	B02017_026E	central_american_panamanian_pct	B03001_013E
tohono_o'odham_pct	B02014_039E	osage_combo_pct	B02017_027E	central_american_salvadoran_pct	B03001_014E
tsimshian_pct	B02014_051E	ottawa_combo_pct	B02017_028E	cuban_pct	B03001_006E
two_or_more_american_indian_or_alaska_na tive_tribes_pct	B02014_055E	paiute_combo_pct	B02017_029E	dominican_pct	B03001_007E
ute_pct	B02014_040E	pima_combo_pct	B02017_030E	mexican_pct	B03001_004E
yakama_pct	B02014_041E	potawatomi_combo_pct	B02017_031E	other_hispanic_or_latino_pct	B03001_027E
yaqui_pct	B02014_042E	pueblo_combo_pct	B02017_032E	other_hispanic_or_latino_all_other_hispanic _or_latino_pct	B03001_031E
yuman_pct	B02014_043E	puget_sound_salish_combo_pct	B02017_033E	other_hispanic_or_latino_spaniard_pct	B03001_028E
yup'ik_pct	B02014_052E	seminole_combo_pct	B02017_034E	other_hispanic_or_latino_spanish_pct	B03001_029E
B02015 (Asian alone)		shoshone_combo_pct	B02017_035E	other_hispanic_or_latino_spanish_american _pct	B03001_030E
Variable Name	**ACS Variable**	sioux_combo_pct	B02017_036E	puerto_rican_pct	B03001_005E
asian_indian_pct	B02015_002E	south_american_indian_combo_pct	B02017_037E	south_american_pct	B03001_016E
bangladeshi_pct	B02015_003E	spanish_american_indian_combo_pct	B02017_038E	south_american_argentinean_pct	B03001_017E
bhutanese_pct	B02015_004E	tlingit-haida_combo_pct	B02017_050E	south_american_bolivian_pct	B03001_018E
burmese_pct	B02015_005E	tohono_o'odham_combo_pct	B02017_039E	south_american_chilean_pct	B03001_019E
cambodian_pct	B02015_006E	tsimshian_combo_pct	B02017_051E	south_american_colombian_pct	B03001_020E
chinese_pct	B02015_007E	ute_combo_pct	B02017_040E	south_american_ecuadorian_pct	B03001_021E
filipino_pct	B02015_008E	yakama_combo_pct	B02017_041E	south_american_other_south_american_ pct	B03001_026E
hmong_pct	B02015_009E	yaqui_combo_pct	B02017_042E	south_american_paraguayan_pct	B03001_022E
indonesian_pct	B02015_010E	yuman_combo_pct	B02017_043E	south_american_peruvian_pct	B03001_023E
japanese_pct	B02015_011E	yup'ik_combo_pct	B02017_052E	south_american_uruguayan_pct	B03001_024E
korean_pct	B02015_012E			south_american_venezuelan_pct	B03001_025E

laotian_pct	B02015_013E
malaysian_pct	B02015_014E
mongolian_pct	B02015_015E
nepalese_pct	B02015_016E
okinawan_pct	B02015_017E
other_asian_not_specified_pct	B02015_024E
other_asian_specified_pct	B02015_023E
pakistani_pct	B02015_018E
sri_lankan_pct	B02015_019E
taiwanese_pct	B02015_020E
thai_pct	B02015_021E
two_or_more_asian_pct	B02015_025E
vietnamese_pct	B02015_022E

B03002 (Hispanic/Latino by Race)	
Variable Name	**ACS Variable**
NativeAm_hispanic_pct	B03002_015E
asian_hispanic_pct	B03002_016E
black_histpanic_pct	B03002_014E
pi_hispanic_pct	B03002_017E
other_hispanic_pct	B03002_018E
multiple_other_hispanic_pct	B03002_020E
three_hispanic_pct	B03002_021E
multiple_hispanic_pct	B03002_019E
white_hispanic_pct	B03002_013E
NativeAm_pct	B03002_005E
asian_pct	B03002_006E
black_pct	B03002_004E
latino_pct	B03002_012E

Variable	Source	Table	Variable(s)
denied_mortgage s	Race_Counts_20 17	2017	URL: https://www.racecounts.org/ Value (provided in percentage format) and numerator were provided by Race Counts Numerator = Estimate of denied mortgage applications denied Value = Percent of denied mortgage applications denied Value = data provided / 100 Denominator = Value / Numerator
disability	ACS2019API/5Y	S1810	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html , variables in parentheses S1810_C01_001E = Estimate of total civilian noninstitutionalized population (disability) S1810_C02_001E = Estimate of total civilian noninstitutionalized population with a disability S1810_C02_019E = Estimate of total civilian noninstitutionalized population with a hearing disability (difficultyhearing) S1810_C02_029E = Estimate of total civilian noninstitutionalized population with a vision difficulty (difficultyvision) S1810_C02_039E = Estimate of total civilian noninstitutionalized population with a cognitive difficulty (difficultycognitive) S1810_C02_047E Estimate of total civilian noninstitutionalized population with an ambulatory difficulty (difficultyambulatory) S1810_C02_055E = Estimate of total civilian noninstitutionalized population with a self-care difficulty (difficultyselfcare) S1810_C02_063E = Estimate of total civilian noninstitutionalized population with an independent living difficulty (difficultyindependent) Numerator = S1810_C02_0XXE, where XX = 01, 19, 29, 39, 47, 55, 63 Denominator= S1810_C01_001E

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			Proportion = numerator/Denominator SE = (S1810_C03_0XXM/100)/1.645, where X = 01, 19, 29, 39, 47, 55, 63

Disability65	ACS2018API/5Y	B1810	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of population 65 years and older with disabilities
diversity_index	ACS2019API/5Y	DP05	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html DP05_0070E = Total DP05_0071E = Latino DP05_0077E = White, Non-Hispanic DP05_0078E = Black, Non-Hispanic DP05_0079E = AIAN, Non-Hispanic DP05_0080E = Asian, Non-Hispanic DP05_0081E = NHPI, Non-Hispanic DP05_0082E = Other race, Non-Hispanic DP05_0083E = Multiple races, Non-Hispanic Denominator = DP05_0070 pct_re = Proportion of a given race/ethnicity in the population, e.g., DP05_0071 / DP05_0070 sq_pct = pct_re^2 Value = 1 - Sum of sq_pct per county

| edspend | Cal Dept of Ed | Current Expense, 18-19 | URL: https://www.cde.ca.gov/ds/fd/ec/currentexpense.asp

Download Excel file (https://www.cde.ca.gov/ds/fd/ec/documents/currentexpense1819.xlsx)

Select County Averages tab, cut-paste County, EDP 365, Current Expense ADA, Current Expense per ADA fields for 58 counties into CDOEcurrentexpense18-19/csv, add GEO_ID identifier column.
Numerator = EDP365
Denominator = CurrentExpenseADA
Value = CurrentExpensePerADA
SE = NA |

EH_RCP8.5_2035_2064	CalAdapt_CanESM2_CNRMCM5_HadGEM2-ES_MIROC5_LOCA_RCP8.5	2035 - 2064	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected number of extreme heat days in Mid-Century (2035 - 2064) under the RCP 8.5 scenario. Defined as the projected number of days above the 98th percentile of daily maximum temperatures (based on observed historical data from 1961 – 1990 between April and October).
EH_RCP8.5_2070_2099	CalAdapt_CanESM2_CNRMCM5_HadGEM2-ES_MIROC5_LOCA_RCP8.5	2070 - 2099	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected number of extreme heat days in End of Century (2070 – 2099) under the RCP 8.5 scenario. Defined as the projected number of days above the 98th percentile of daily maximum temperatures (based on observed historical data from 1961 – 1990 between April and October).

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| electeds_diff | ACS2019API/5Y WhoLeadsUs | DP05 N/A | URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html

From ACS2019API/5Y/DP05
DP05_0070E = Total
DP05_0071E = Latino
DP05_0077E = White, Non-Hispanic
DP05_0078E = Black, Non-Hispanic
DP05_0079E = AIAN, Non-Hispanic
DP05_0080E = Asian, Non-Hispanic
DP05_0081E = NHPI, Non-Hispanic
DP05_0082E = Other race, Non-Hispanic
DP05_0083E = Multiple races, Non-Hispanic

From WhoLeadsUS
White.Non.White = Race of elected official (White, Non-White, or Unknown)
Office.Level = Level of elected office. For this indicator, only "administrativeArea2" (county) is used.

pct_nonwhite = (DP05_0071 + DP05_0078 + DP05_0079 + DP05_0080 + DP05_0081 + |

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			DP05_0082 + DP05_0083) / DP05_0070 elected_nonwhite = Recode of White.Non.White, 1 = Non-White, 0 = White, NA = Unknown pct_elected_nonwhite = sum of elected_nonwhite per county / total elected officials per county Value = pct_elected_nonwhite - pct_nonwhite
english_ltvw	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html Each variable has an estimate and margin of error (MOE) C16001_001 = Total population over age 5 C16001_005 = Spanish speakers who speak English "less than very well" C16001_008 = French speakers who speak English "less than very well" C16001_011 = German speakers who speak English "less than very well" C16001_014 = Russian speakers who speak English "less than very well" C16001 _017 = Other Indo-European language speakers who speak English "less than very well" C16001 _020 = Korean speakers who speak English "less than very well" C16001 _023 = Chinese speakers who speak English "less than very well" C16001_026 = Vietnamese speakers who speak English "less than very well" C16001_029 = Tagalog speakers who speak English "less than very well" C16001_032 = Other A/PI speakers who speak English "less than very well" C16001_035 = Arabic speakers who speak English "less than very well" C16001 _038 = Other and Unspecified language speakers who speak English "less than very well" Numerator = C16001_005 + C16001_008 + C16001_011 + C16001_014 + C16001_017 + C16001_020 + C16001_023 + C16001_026 + C16001_029 + C16001_032 + C16001_035 + C16001_038 Denominator = C16001_001 Value = Numerator / Denominator

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			Numerator SE = sqrt((C16001_005 MOE / 1.645)^2 + (C16001_008 MOE / 1.645)^2 + (C16001_011 MOE / 1.645)^2 + (C16001_014 MOE / 1.645)^2 + (C16001_017 MOE / 1.645)^2 + (C16001_020 MOE / 1.645)^2 + (C16001_023 MOE / 1.645)^2 + (C16001_026 MOE / 1.645)^2 + (C16001_029 MOE / 1.645)^2 + (C16001_032 MOE / 1.645)^2 + (C16001_035 MOE / 1.645)^2 +

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			(C16001_035 MOE / 1.645)^2)
			Denominator SE = C16001_001 MOE / 1.645
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

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englishspeak	ACS2015API/5Y		URL: https://api.census.gov/data/2015/acs/acs5/variables.html
			HD01_VD04 = Estimate of Spanish-speaking limited English speaking household HD02_VD04 = Margin of error of Spanish-speaking limited English speaking household HD01_VD07 = Estimate of other Indo-European language speaking limited English speaking household HD02_VD07 = Margin of error of other Indo-European language speaking limited English speaking household HD01_VD10 = Estimate of Asian and Pacific Island language speaking limited English speaking household HD02_VD10 = Margin of error of Asian and Pacific Island language speaking limited English speaking household HD01_VD13 = Estimate of other language speaking limited English speaking household HD02_VD13 = Margin of error of other language speaking limited English speaking household HD01_VD01 = Estimate of total population HD02_VD01 = Margin of error of total population Numerator = Denominator- (HD01_VD04 + HD01_VD07 + HD01_VD10 + HD01_VD13) Denominator = HD01_VD01 Percent = (100- Numerator/denominator) x 100 Numerator SE = sqrt((HD02_VD04/1.645)^2 + (HD02_VD07/1.645)^2 + (HD02_VD10/1.645)^2 + (HD02_VD13/1.645)^2) Denominator SE = HD02_VD01/1.645

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			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

EOZ	California Qualified Opportunity Zones		URL: http://dof.ca.gov/Forecasting/Demographics/opportunity_zones/ Value = Yes/No whether area is qualified opportunity zone
ExposedWorkers_2016	CA_EDD2016 & DOL_ONET2019		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of workers in "high environmental exposure occupations," defined as occupations in which over 50% of time is spent in a place that is not an indoor, air-conditioned space.
ExposedWorkers_2026	CA_EDD2026 & DOL_ONET2019		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected percent of workers in "high environmental exposure occupations" (over 50% of time spent in a place that is not an indoor, air-conditioned space) in 2026

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femalegender	ACS2019API/5Y	DP05	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html
			DP05_0001E = Estimate of total population
			DP05_0003E = Estimate of female population
			DP05_0003PM = Percent margin of error of female population
			Numerator = DP05_0003E
			Denominator = DP05_0001E
			Proportion = DP05_0003E / DP05_0001E
			SE(proportion) = (DP05_0003PM /100)/1.645

Five Hundred Cities: ARTHRITIS BPHIGH CANCER CASTHMA CHD COPD DIABETES KIDNEY MHLTH PHLTH STROKE LPA CSMOKING BINGE OBESITY	PLACES (CDC)	12/2020	URL: https://chronicdata.cdc.gov/500-Cities-Places/PLACES-Local-Data-for-Better-Health-Census-Tract-D/cwsq-ngmh To create the indicators of unduplicated census tracts for crude prevalence of all the outcomes, the data were downloaded via the PLACES API, and filtered for state (StateAbbr = CA) and measure ID (ex. measureid = DIABETES) Crude prevalence in adults > 18 years = CrdPrev

foodinsecure	County Health Rankings, 2021	Food Insecure	URL: https://www.countyhealthrankings.org/explore-health-rankings/rankings-data-documentation
			
			Download Excel data file, filter on California, cut and paste # Food Insecure, Percent Food Insecure, FIPS, and County name into new file (CHR2021_FoodInsecure2018.csv)
			
			Numerator = # Food Insecure
			Denominator = # Food Insecure/(Percent Insecure/100)
			Value = Percent Insecure/100
			SE = sqrt(value*(1-value)/denominator) - binomial se for a percent

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foreignborn_citizen	ACS2019API/5Y	B05003A	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			B05003_005E = Estimate of Total Foreign-Born Males Under 18 B05003_005M = Margin of Error of Total Foreign-Born Males Under 18 B05003_006E = Estimate of Foreign-Born Naturalized Citizen Males Under 18
			B05003_006M = Margin of Error of Total Foreign-Born Naturalized Citizen Males Under 18
			B05003_010E = Estimate of Total Foreign-Born Males Over 18
			B05003_010M = Margin of Error of Total Foreign-Born Males Over 18
			B05003_011E = Estimate of Total Foreign-Born Naturalized Citizen Males Over 18
			B05003_011M = Margin of Error of Total Foreign-Born Naturalized Citizen Males Over 18
			B05003_016E = Estimate of Total Foreign-Born Females Under 18
			B05003_016M = Margin of Error of Total Foreign-Born Females Under 18
			B05003_017E = Estimate of Foreign-Born Naturalized Citizen Females Under 18
			B05003_017M = Margin of Error of Total Foreign-Born Naturalized Citizen Females Under 18
			B05003_021E = Estimate of Total Foreign-Born Females Over 18
			B05003_021M = Margin of Error of Total Foreign-Born Females Over 18
			B05003_022E = Estimate of Total Foreign-Born Naturalized Citizen Females Over 18
			B05003_022M = Margin of Error of Total Foreign-Born Naturalized Citizen Females Over 18
			Numerator = Sum of Estimates of Total Foreign-Born Naturalized Citizens
			Denominator = Sum of Estimates of Total Foreign-Born
			Value = numerator / denominator
			Numerator SE = For every foreign-born naturalized citizen margin of error, sqrt(sum((MOE/1.645)^2)
			Denominator SE = For every foreign-born total margin of error, sqrt(sum((MOE/1.645)^2)
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then

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			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

foreignborn_notc itizen	ACS2019API/5Y/	B05003A :l	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			B05003_005E = Estimate of Total Foreign-Born Males Under 18
			B05003_005M = Margin of Error of Total Foreign-Born Males Under 18
			B05003_006E = Estimate of Foreign-Born Non-Citizen Males Under 18
			B05003_006M = Margin of Error of Total Foreign-Born Non-Citizen Males Under 18
			B05003_010E = Estimate of Total Foreign-Born Males Over 18
			B05003_010M = Margin of Error of Total Foreign-Born Males Over 18
			B05003_011E = Estimate of Total Foreign-Born Non-Citizen Males Over 18
			B05003_011M = Margin of Error of Total Foreign-Born Non-Citizen Males Over 18 B05003_016E = Estimate of Total Foreign-Born Females Under 18
			B05003_016M = Margin of Error of Total Foreign-Born Females Under 18
			B05003_017E = Estimate of Foreign-Born Non-Citizen Females Under 18
			B05003_017M = Margin of Error of Total Foreign-Born Non-Citizen Females Under 18 B05003_021E = Estimate of Total Foreign-Born Females Over 18
			B05003_021M = Margin of Error of Total Foreign-Born Females Over 18
			B05003_022E = Estimate of Total Foreign-Born Non-Citizen Females Over 18
			B05003_022M = Margin of Error of Total Foreign-Born Non-Citizen Females Over 18
			Numerator = Sum of Estimates of Total Foreign-Born Non-Citizen
			Denominator = Sum of Estimates of Total Foreign-Born
			Value = numerator / denominator
			Numerator SE = For every foreign-born non-citizen margin of error, sqrt(sum((MOE/1.645)^2)
			Denominator SE = For every foreign-born total margin of error, sqrt(sum((MOE/1.645)^2)
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator

			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

frm	California Department of Education		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of K-12 students eligible for the Free & Reduced Meal Program in all school sites located in this census tract.
gini (county and city)	ACS2015API/5Y	B19083	URL: http://data.census.gov gini_pct = HD01_VD01 gini_se_pct = HD02_VD01/1.645
got_help	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in percentage format) and numerator were provided by Race Counts Numerator = Estimate of people who sought help for mental/emotional or alcohol/drug Issues Value = Percent of people who sought help for mental/emotional or alcohol/drug Issues Value = data provided / 100 Denominator = Value / Numerator
gr3_ela_scores	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in percentage format) and numerator were provided by Race Counts Numerator = Estimate of 3rd graders scoring proficient or better in English Language Arts Value = Percent of 3rd graders scoring proficient or better in English Language Arts Value = data provided / 100 Denominator = Value / Numerator

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gr3_math_scores	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in percentage format) and numerator were provided by Race Counts Numerator = Estimate 3rd graders scoring proficient or better in Mathematics Value = Percent of 3rd graders scoring proficient or better in Mathematics Value = data provided / 100 Denominator = Value / Numerator
hazardous_waste	US EPA, EJSCREEN, 2020		URL: https://geopub.epa.gov/arcgis/rest/services/ejscreen/ejscreen_v2020/MapServer/
HCVunits_17	2015 HUD Picture of Subsidized Households; ACS2017API/5Y	B25004	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Housing Choice Voucher units, for every 1,000 housing units
heartattack	CalEnviroScreen 3.0		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Spatially modeled, age-adjusted rate of emergency department visits for acute myocardial infarction per 10,000
hi_score	ACS	DP03, DEC_10_DP_DPDP1, DP02, B19301, DP04; S1701	Methods after: Nathan RP, Adams CF. Four Perspectives on Urban Hardship. Political Science Quarterly. 1989;104(3):483-508 and Wright DJ, Montiel LM. Divided They Fall: Hardship in America's Cities and Suburbs. Albany, NY: The Nelson A. Rockefeller Institute of Government; 2007

homeless	USHUD/ACS/National Coalition to End; ACS2019API/5Y	Interactive Map by County/CoC	URL (numerator): https://endhomelessness.org/homelessness-in-america/homelessness-statistics/state-of-homelessness-dashboards/?State=California URL (denominator): URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html

		(num); DP05_00 70E (denom)	Select last 10 years from options box Scroll down to time series (line graphs) of county of Continuum of Care (CoC) Move cursor over data points for 2015 to 2019 and manually enter into a spreadsheet with county population 5-year annual average counts Calculate 5-year (2015-2019) annual average number of residents (CA_Homeless2019.csv) Downscaling of county-specific expected 5 year annual average homeless counts (numerator) for COCs covering multiple counties is CoC rate ´ county population Numerator = 5-year annual average of homeless counts (manually entered) Denominator = DP05_0070E Value = 10,000*numerator/denominator SE = value/sqrt(numerator * 5) Nevada county (6057) has only 1 year (2019) of data; se = value/sqrt(numerator)
homevalue	ACS2019API/5Y	DP04	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html DP04_0089E = Estimate of Median Home Value DP04_0089M = Margin of Error of Median Home Value Value = DP04_0089E SE = DP04_0089M / 1.645

| hospitals | California Health and Human Services Office of Statewide Health Planning and Development Geohub, 2020 | | URL: https://oshpd-chhsagency.opendata.arcgis.com/datasets/oshpd-healthcare-facilities/
 Filtered by license_category_desc == "General Acute Care Hospital" and facility_status_desc == "Open" |
| Housebuild1940 | ACS2018API/5Y | B25034 | Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) |

			Value = Percent of housing units built before 1940
hpi2score	Healthy Places Index, 2.0		URL: https://healthyplacesindex.org/ The Healthy Places Index 2.0 combines 25 community characteristics, based on the social determinants of health, into a single score for each California census tract.
hs_grad	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in percentage format) and numerator were provided by Race Counts Numerator = Estimate of students who graduate high school (2018-19) within 4 years of entering ninth grade Value = Percent of students who graduate high school (2018-19) within 4 years of entering ninth grade Value = data provided / 100 Denominator = Value / Numerator
hsgrad	Cal Dept of Ed	ACGR19	URL: https://www.cde.ca.gov/ds/ad/filesacgr.asp Four-year Adjusted Cohort Graduation Rate, 2018-2019 Download txt file: https://www3.cde.ca.gov/demo-downloads/acgr/cohort1819.txt File contains State, County (C), District, and School levels (AggregateLevel) for multiple race/ethnicities (TA = ALL), for School types (CharterSchool) and participation in Dashboard Alternative School Status Program, DASS: For county averages, filter file: AggregateLevel == "C" & ReportingCategory == "TA" & CharterSchool == "All" & DASS == "All" Numerator = Regular HS Diploma Graduates Count Denominator = CohortStudents

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			Value = numerator/denominator
			SE = sqrt(value*(1-value)/denominator) binomial se for a percent
idleteen	ACS2019API/5Y	S0902	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html
			Not available at census tract; partially available at county and place; S0902_C01_017E is actually a percent, not a integer for numerator
			S0902_C01_016E = Estimate of total population between ages 16 and 19 S0902_C01_017E = Percent of total population between ages 16 and 19 not enrolled in school and not in the labor force
			S0902_C01_017M = Margin of error (percent) of total population between ages 16 and 19 not enrolled in school and not in the labor force
			Numerator = S0902_C01_016E*(S0902_C01_017E/100)
			Denominator = S0902_C01_016E
			Proportion = S0902_C01_017E/100
			SE(proportion) = (S0902_C01_017E/100)/1.645

immigrant	ACS2015API/5Y	B05002	URL: https://api.census.gov/data/2015/acs/acs5/variables.html
			HD01_VD13 = Estimate of foreign born population HD02_VD13= Margin of error of foreign born population HD01_VD01 = Estimate of total population HD02_VD01 = Margin of error of total population
			Numerator = HD01_VD13 Denominator = HD01_VD01 Percent = Numerator/denominator x 100 Numerator SE= HD02_VD13/1.645 Denominator SE = HD02_VD01/1.645
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator

			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator
impervsurf	NLCD2011		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent impervious surface cover
incarceration	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in rate per 1,000 of that race) and numerator were provided by Race Counts Numerator = Estimate of incarcerations per 1,000 people Value = Rate of incarcerations per 1,000 people Value = data provided Denominator = (Value/1000) / Numerator
income	ACS2019API/5Y	DP03	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html DP03_0062E = Estimate of median household income (dollars) DP03_0062M = Margin of error of median household income (dollars) Value = DP03_0062E SE = DP03_0062M / 1.645
infant_mortality	CDPH County Health Status Reports	Table 24B	URL: https://data.ca.gov/dataset/county-health-status-profiles Numerator = Numerator_Total Denominator = Denominator_Total Value = Rate.Percentage

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infantdeaths	CHHSA/CHSP	Table24A	URL: https://data.chhs.ca.gov/api/3/action/datastore_search?resource_id=3781a514-d658-4779-abb5-3c71e15c1944&q=24A Numerator = Numerator_Total/3 Denominator = Denominator_Total/3 Value = 1000*numerator/denominator SE = Value/sqrt(Numerator_Total)

iod, iod_asian, iod_latino, iod_nonwhite	2010 US Census	SF 1 census blocks	URL: https://data.census.gov/cedsci/table?d=DEC%20Summary%20File%201 (download) Methods follow: https://www.census.gov/prod/2002pubs/censr-3.pdf

lang_arabic	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			
			C16001_001E = Estimate of total population over age 5
			C16001_001M = Margin of Error of total population over age 5
			C16001_033E = Estimate of Arabic speaking population
			C16001_033M = Margin of Error of Arabic speaking population
			
			Numerator = C16001_033E
			Denominator = C16001_001E Value
			= Numerator / Denominator
			Numerator SE = C16001_033M / 1.645
			Denominator SE = C16001_001M / 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

lang_chinese	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			C16001_001E = Estimate of total population over age 5
			C16001_001M = Margin of Error of total population over age 5
			C16001_021E = Estimate of Chinese speaking population
			C16001_021M = Margin of Error of Chinese speaking population
			Numerator = C16001_021E
			Denominator = C16001_001E Value
			= Numerator / Denominator
			Numerator SE = C16001_021M/ 1.645
			Denominator SE = C16001_001M/ 1.645

			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

lang_english	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			
			C16001_001E = Estimate of total population over age 5
			C16001_001M = Margin of Error of total population over age 5
			C16001_002E = Estimate of population that speak only English
			C16001_002M = Margin of Error of population that speak only English
			
			Numerator = C16001_002E
			Denominator = C16001_001E Value
			= Numerator / Denominator
			Numerator SE = C16001_002M / 1.645
			Denominator SE = C16001_001M / 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

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lang_french	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html C16001_001E = Estimate of total population over age 5 C16001_001M = Margin of Error of total population over age 5 C16001_006E = Estimate of French speaking population C16001_006M = Margin of Error of French speaking population Numerator = C16001_006E Denominator = C16001_001E

			Value = Numerator / Denominator
			
			Numerator SE = C16001_006M / 1.645
			
			Denominator SE = C16001_001M / 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

lang_german	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			
			C16001_001E = Estimate of total population over age 5
			
			C16001_001M = Margin of Error of total population over age 5
			
			C16001_009E = Estimate of German speaking population
			
			C16001_009M = Margin of Error of German speaking population
			
			Numerator = C16001_009E
			
			Denominator = C16001_001E Value
			
			= Numerator / Denominator
			
			Numerator SE = C16001_009M / 1.645
			
			Denominator SE = C16001_001M / 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

lang_korean	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html C16001_001E = Estimate of total population over age 5 C16001_001M = Margin of Error of total population over age 5 C16001_018E = Estimate of Korean speaking population C16001_018M = Margin of Error of Korean speaking population

			Numerator = C16001_018E
			Denominator = C16001_001E Value
			= Numerator / Denominator
			Numerator SE = C16001_018M / 1.645
			Denominator SE = C16001_001M / 1.645
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator
lang_other	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			C16001_001E = Estimate of total population over age 5
			C16001_001M = Margin of Error of total population over age 5
			C16001_036E = Estimate of other and unidentified language speaking population
			C16001_036M = Margin of Error of other and unidentified language speaking population
			Numerator = C16001_036E
			Denominator = C16001_001E Value
			= Numerator / Denominator
			Numerator SE = C16001_036M / 1.645
			Denominator SE = C16001_001M / 1.645
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

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lang_other_api	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			C16001_001E = Estimate of total population over age 5 C16001_001M = Margin of Error of total population over age 5 C16001_030E = Estimate of other A/PI speaking population C16001_030M = Margin of Error of other A/PI speaking population
			Numerator = C16001_030E
			Denominator = C16001_001E Value
			= Numerator / Denominator
			Numerator SE = C16001_030M / 1.645
			Denominator SE = C16001_001M / 1.645
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

lang_other_indo	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html C16001_001E = Estimate of total population over age 5 C16001_001M = Margin of Error of total population over age 5 C16001_015E = Estimate of other Indo-European speaking population C16001_015M = Margin of Error of other Indo-European speaking population Numerator = C16001_015E Denominator = C16001_001E Value = Numerator / Denominator Numerator SE = C16001_015M / 1.645 Denominator SE = C16001_001M/ 1.645 If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator

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			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

lang_russian	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			
			C16001_001E = Estimate of total population over age 5 C16001_001M = Margin of Error of total population over age 5 C16001_012E = Estimate of Russian speaking population C16001_012M = Margin of Error of Russian speaking population
			
			Numerator = C16001_012E
			Denominator = C16001_001E Value
			= Numerator / Denominator
			Numerator SE = C16001_012M / 1.645
			Denominator SE = C16001_001M / 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

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lang_spanish	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			C16001_001E = Estimate of total population over age 5 C16001_001M = Margin of Error of total population over age 5 C16001_003E = Estimate of Spanish speaking population C16001_003M = Margin of Error of Spanish speaking population
			Numerator = C16001_003E
			Denominator = C16001_001E Value
			= Numerator / Denominator
			Numerator SE = C16001_003M / 1.645
			Denominator SE = C16001_001M / 1.645

			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

lang_tagalog	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			
			C16001_001E = Estimate of total population over age 5 C16001_001M = Margin of Error of total population over age 5 C16001_027E = Estimate of Tagalong speaking population C16001_027M = Margin of Error of Tagalong speaking population
			
			Numerator = C16001_027E
			Denominator = C16001_001E Value
			= Numerator / Denominator
			Numerator SE = C16001_027M / 1.645
			Denominator SE = C16001_001M/ 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

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lang_vietnamese	ACS2019API/5Y	C16001	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			C16001_001E = Estimate of total population over age 5 C16001_001M = Margin of Error of total population over age 5 C16001_024E = Estimate of Vietnamese speaking population C16001_024M = Margin of Error of Vietnamese speaking population
			Numerator = C16001_024E
			Denominator = C16001_001E

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			Value = Numerator / Denominator
			Numerator SE = C16001_024M / 1.645
			Denominator SE = C16001_001M/ 1.645
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator
Language65	ACS2018API/5Y	B16004	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of population 65 years and older who speak English "not well" or "not at all"
lawenforce	California Dept. of Justice; ACS2019API/5Y	Criminal Justice Personnel "Open Justice" interactive tool (num); DP05_0070E (denom)	URL: https://openjustice.doj.ca.gov/exploration/crime-statistics/criminal-justice-personnel Select individual county, year range 2015-2019 Copy and paste row "Law Enforcement" (sworn and civilian) (not TOTAL, which includes non-law enforcement personnel) Manual data entry (cut-paste) into Excel worksheet, take 5-year average; merge with county population data (5-year annual counts by county) Numerator = 5-year annual average of homeless counts (manually entered) Denominator = DP05_0070E Value = 1000*numerator/denominator SE = value/sqrt(numerator * 5)

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lbw (County)	CDPH		Value (provided in percentage format), numerator, denominator, and lower 95% confidence intervals (CI) were provided by CDPH NAME = State/County Numerator = Number of LBW Births Denominator = Number of Births Value = Percent LBW Births / 100

			Stratalevel = Race/Ethnicity SE = (Value - Lower 95% CI)/1.96
lbw (MSSA)	CDPH		Value (provided in percentage format), numerator, denominator, and lower 95% confidence intervals (CI) were provided by CDPH NAME = MSSA Name Numerator = Number of LBW Births Denominator = Number of Births Value = Percent LBW Births / 100 Stratalevel = Race/Ethnicity SE = (Value - Lower 95% CI)/1.96
Leb	CDC USALEEP 2015		URL: https://www.cdc.gov/nchs/nvss/usaleep/usaleep.html#life-expectancy e.0. = Estimate of life expectancy at birth (LEB) se.e.0 = Standard error of LEB Value = e.0. SE = se.e.0
life_expectancy	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Data provided by Race Counts were solely life expectancy estimates in years
LIHTC_HU_18	2018 National Housing Preservation Database2015 HUD Picture of Subsidized Households; ACS2018API/5Y	B25003	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Number of active Low-Income Housing Tax Credits units for every 1,000 housing units

Livealone65	ACS2018API/5Y	B09020	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of population 65 years and older living alone
low_birthweight	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in percentage format) and numerator were provided by Race Counts Numerator = Estimate of infants born weighing less than 2,500 grams or about 5 lbs, 8 oz by race/ethnicity of mother Value = Percent of infants born weighing less than 2,500 grams or about 5 lbs, 8 oz by race/ethnicity of mother Value = data provided / 100 Denominator = Value / Numerator
lq_aian	ACS2019API/5Y	B03002	URL: https://api.census.gov/data/2019/acs/acs5/variables.html B03002_001 = Total Population B03002 _005 = Non-Hispanic American Indian / Alaska Native Numerator = B03002_005 / B03002_001 (Tract) Denominator = B03002_005 / B03002_001 (County) Value = Numerator / Denominator
lq_asian	ACS2019API/5Y	B03002	URL: https://api.census.gov/data/2019/acs/acs5/variables.html B03002_001 = Total Population B03002 _006 = Non-Hispanic Asian Numerator = B03002_006 / B03002_001 (Tract) Denominator = B03002_006 / B03002_001 (County)

			Value = Numerator / Denominator
lq_black	ACS2019API/5Y	B03002	URL: https://api.census.gov/data/2019/acs/acs5/variables.html B03002_001 = Total Population B03002_004 = Non-Hispanic Black Numerator = B03002_004 / B03002_001 (Tract)

			Denominator = B03002_004 / B03002_001 (County)
			Value = Numerator / Denominator
lq_hispanic	ACS2019API/5Y	B03002	URL: https://api.census.gov/data/2019/acs/acs5/variables.html B03002_001 = Total Population B03002_012 = Hispanic/Latino Numerator = B03002_012 / B03002_001 (Tract) Denominator = B03002_012 / B03002_001 (County) Value = Numerator / Denominator

lq_nhpi	ACS2019API/5Y	B03002	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			B03002_001 = Total Population
			B03002_007 = Non-Hispanic Native Hawaiian / Pacific Islander
			Numerator = B03002_007 / B03002_001 (Tract)
			Denominator = B03002_007 / B03002_001 (County)
			Value = Numerator / Denominator
lq_white	ACS2019API/5Y	B03002	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			B03002_001 = Total Population
			B03002_003 = Non-Hispanic White
			Numerator = B03002_003 / B03002_001 (Tract)
			Denominator = B03002_003 / B03002_001 (County)
			Value = Numerator / Denominator
lt80pct	ACS2019API/5Y	DP03	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html
			DP03_0062 = Median Household Income (State, Census tract)
			80pct_mhi = .8 * DP03_0062 (State)
			Value = DP03_0062 (Tract) < 80pct_mhi, "Yes", DP03_0062 (Tract) > 80pct_mhi, "No"
MobileHomes	ACS2018API/5Y	B25024	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/)
			Value = Percent of households living in mobile homes

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| mva | CDC WONDER | Underlying cause, 2015-2019 | URL: https://wonder.cdc.gov/ucd-icd10.html

1. Group by: County
2. Location: California
4. Years: 2015-2019
6. Cause of Deaths: ICD Codes: V01-V89
Advanced Finder Options
Open (Expand) ICD codes and move to selection box

Numerator = Deaths/5
Denominator = Population/5
Value = 100000*Deaths/Population
SE = value/sqrt(Deaths) |

Net Migrants		Expected Population	
Variable	Age Group	Variable	Age Group
m0ttt0	ages 0-4	e0ttt0	ages 0-4
m0ttt5	ages 5-9	e0ttt5	ages 5-9
m0ttt10	ages 10-14	e0ttt10	ages 10-14
m0ttt15	ages 15-19	e0ttt15	ages 15-19
m0ttt20	ages 20-24	e0ttt20	ages 20-24
m0ttt25	ages 25-29	e0ttt25	ages 25-29
m0ttt30	ages 30-34	e0ttt30	ages 30-34
m0ttt35	ages 35-39	e0ttt35	ages 35-39
m0ttt40	ages 40-44	e0ttt40	ages 40-44
m0ttt45	ages 45-49	e0ttt45	ages 45-49
m0ttt50	ages 50-54	e0ttt50	ages 50-54
m0ttt55	ages 55-59	e0ttt55	ages 55-59
m0ttt60	ages 60-64	e0ttt60	ages 60-64
m0ttt65	ages 65-69	e0ttt65	ages 65-69
m0ttt70	ages 70-74	e0ttt70	ages 70-74
m0ttt75	ages 75-79	e0ttt75	ages 75-79
m0ttt80	ages 80-84	e0ttt80	ages 80-84
m0ttt85	ages 85+	e0ttt85	ages 85+

netmigration	University of Wisconsin		URL: https://netmigration.wisc.edu/ https://netmigration.wisc.edu/data-details download (ICPSR_NME_2000_2010.CSV) Select California (stname=="California")

			Numerator = Σ net migration
			Denominator = Σ Expected population
			Value = numerator/denominator
			Se = sqrt(abs(value)*(1-abs(value))/denominator) binomial SE for a percent

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nonenglishspeaking	ACS2019API/5Y	S1601_C01	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html
			
			C16001_001E = Estimate of total population over age 5 C16001_001M = Margin of Error of total population over age 5 C16001_003E = Estimate of non-English speaking population C16001_003M = Margin of Error of non-English speaking population
			
			Numerator = C16001_003E
			Denominator = C16001_001E Value
			= Numerator / Denominator
			Numerator SE = C16001_003M / 1.645
			Denominator SE = C16001_001M/ 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

nonenglishspeaking	ACS2019API/5Y	S1601	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html S1601_C01_001E = Estimate of total population over 5 S1601_C01_003E = Estimate of total population over 5 that speak a language other than English S1601_C02_003M = Percent margin of error of total population over 5 that speak a language other than English Numerator = S1601_C01_003E Denominator = S1601_C01_003E Proportion = Numerator/Denominator

			SE(proportion)= (S1601_C02_003M/100) /1.645

Nonwhite65	ACS2018API/5Y	B0100	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of population 65 years and older who are non-White
OtherHUDunits_17	2017 HUD Picture of Subsidized Households; ACS2017API/5Y	B25006	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Number of housing units subsidized through the Section 8 moderate rehabilitation; Section 8 project-based rental assistance; rent supplement; rental assistance payment; Section 236; Section 202 for the elderly; or Section 811 for persons with disabilities, for every 1,000 housing units
outdoors	ACS2015_/5Y	S2401	URL: https://data.census.gov/cedsci/table?q=S2401 HC01_EST_VC01 = Estimate of total civilian employed population over 16 HC01_MOE_VC01 = Margin of error of total civilian employed population over 16 HC01_EST_VC30 = Estimate of farming, fishing and forestry occupations HC01_EST_VC31 = Estimate of construction and extraction occupations HC01_MOE_VC30 = Margin of error of farming, fishing and forestry occupations HC01_MOE_VC31 = Margin of error of construction and extraction occupations Numerator = HC01_EST_VC30 + HC01_EST_VC30 Denominator = HC01_EST_VC01 Percent = Numerator/denominator Denominator SE = HC01_MOE_VC01 / 1.645 Numerator SE = (HC01_MOE_VC30/1.645)^2 + (HC01_MOE_VC31/1.645^2)^0.5 If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator

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			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

ParkAcres_per1000	CSP_2015_Park Access		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Number of park acres per 1,000 residents
pedshurt	SWITRS	HCI	Note this is the 5-year (2006-2010) annual average rate of severe and fatal pedestrian injuries per 100,000 population Download two files (HCI_RoadTrafficInjuries_753_CT_PL_CO_RE_R4_CA-12-17-13_A-N.zip, HCI_RoadTrafficInjuries_753_CT_PL_CO_12-17-13_O-Y.zip) from https://www.cdph.ca.gov/programs/Pages/HealthyCommunityIndicators.aspx Filter for reportyear (2006-2010), geotype (CT), and mode (pedestrian), copy and paste as .csv then add A-N and O-Y counties into single file (HCI_RoadTrafficInjuriesA-Z.csv) Serious and fatal injuries and rates are added together. R Program does this aggregation se_pct = sqrt(Numerator)/Denominator Note: census tracts with no recorded injuries in SWITRS are set to 0 injuries and 0 injury rate
Perc65plus	ACS2018API/5Y	S0101	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of Population aged 65 or Older
Perc75plus	ACS2018API/5Y	S0101	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of Population aged 75 or Older

percapitaincome	ACS2019API/5Y/	B19301	URL: https://api.census.gov/data/2019/acs/acs5/variables.html
			B19301_001E: Estimate of per capita income in the past 12 months (in 2019 inflation-adjusted dollars) B19301_001M: Margin of Error of per capita income in the past 12 months (in 2019 inflation-adjusted dollars) Value = B19301_001E SE = B19301_001M / 1.645

perception_of_safety	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in percentage format) and numerator were provided by Race Counts Numerator = Estimate of adults who reported feeling safe in their neighborhood all of the time Value = Percent of adults who reported feeling safe in their neighborhood all of the time Value = data provided / 100 Denominator = Value / Numerator
PHunits_17	2016 HUD Picture of Subsidized Households; ACS2017API/5Y	B25005	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Number of public housing units, for every 1,000 housing units
police_race	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in rate per 1,000 of that race) and numerator were provided by Race Counts Numerator = Estimate of race of police force (per 1,000 people of that race) Value = Rate of race of police force (per 1,000 people of that race) Value = data provided Denominator = (Value/1000) / Numerator
Poverty65	ACS2018API/5Y	S1701	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of population 65 years and older with incomes below the poverty level

PretermBirth (County)	CDPH		Value (provided in percentage format), numerator, denominator, and lower 95% confidence intervals (CI) were provided by CDPH NAME = State/County Numerator = Number of PTBs Denominator = Number of Births Value = Percent PTBs / 100

			Stratalevel = Race/Ethnicity SE = (Value - Lower 95% CI)/1.96
PretermBirth (MSSA)	CDPH		Value (provided in percentage format), numerator, denominator, and lower 95% confidence intervals (CI) were provided by CDPH NAME = MSSA Name Numerator = Number of PTBs Denominator = Number of Births Value = Percent PTBs / 100 Stratalevel = Race/Ethnicity SE = (Value - Lower 95% CI)/1.96
prisons	United States Department of Homeland Security, 2020		URL: https://services1.arcgis.com/Hp6G80Pky0om7QvQ/ArcGIS/rest/services/Prison_Boundaries/FeatureServer
Projected_pop_under5_2050	CDF_20_projectedpop		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected percent of population aged under 5 in 2050
ProjectedPop_2050_5to14	CDF_20_projectedpop		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected percent of population aged between 5-14 in 2050
ProjectedPop_2050_65plus	CDF_20_projectedpop		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected percent of population aged 65 and older in 2050

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ProjectedPop_20 50_total	CDF_20_project edpop		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Projected population in 2050

public_housing	US Department of Housing and Urban Development, 2021		URL: https://services.arcgis.com/VTyQ9soqVukalItT/arcgis/rest/services/Public_Housing_Buildings/FeatureServer/
public_schools	National Center for Education Statistics, 2020		URL: https://nces.ed.gov/opengis/rest/services/K12_School_Locations/EDGE_GEOCODE_PUBLICSCH_1920/MapServer/

recentmove	ACS2019API/5Y	DP04	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html
			
			DP04_0052E = Estimate of population moved in 2015-2016
			DP04_0051E = Estimate of population moved in 2017 or later
			DP04_0050E = Estimate of total occupied housing units DP04_0052M
			= Margin of error of population moved in 2015-2016 DP04_0051M =
			Margin of error of population moved in 2017 or later DP04_0050M =
			Margin of error of total occupied housing units
			
			Numerator = DP04_0052E + DP04_0051E
			Denominator = DP04_0050E
			Value = Numerator/Denominator
			Numerator SE = sqrt((DP04_0052M /1.645)^2 + (DP04_0051M /1.645)^2)
			Denominator SE = DP04_0050M / 1.645
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator

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redlined	Mapping Inequality	UW/ICPSR_NME_2000_2010	Calculate spatial intersection of redlined polygons with 2010 Census tract centroids. Tract centroids that intersect redlined polygons are assigned value "Yes", tract centroids that do not intersect are assigned value "No"

rent	ACS2019API/5Y	DP04	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html DP04_0134E = Estimate of Median Gross Rent DP04_0134M = Margin of Error of Median Gross Rent Value = DP04_0134E SE = DP04_0134M / 1.645
RV_Van_Boat	ACS2018API/5Y	B25024	Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Percent of households living in RV, van, or boat
sealevel	PacInstitute2009		URL: https://www.cdph.ca.gov/Programs/OHE/Pages/CC-Health-Vulnerability-Indicators.aspx http://pacinst.org/the-impacts-of-sea-level-rise-on-the-california-coast-gis-data-downloads/ Manually filtered BRACE_SLR_784_CT_PL_CO_RE_CA_11-1-2016.xlsx on Total race/ethnicity and census tract geography to create csv file BRACE_Wildfire_CT8-11-2016.csv, which was reformatted in HDI_BRACE_DS_Indicators2017-07-XX.R Percentile calculated only for census tracts with any inundation

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staff_diversity	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in rate per 100 students/staff) and numerator were provided by Race Counts Numerator = Estimate of staff of a race per 100 students of the same race Value = Ratio of staff of a race per 100 students of the same race Value = data provided Denominator = (Value/100) / Numerator

status_offenses	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in rate per 10,000 people) and numerator were provided by Race Counts Numerator = Estimate of arrests for status offenses per 10,000 youth under 18 Value = Annual average of arrests for status offenses per 10,000 youth under 18 Value = data provided Denominator = (Value/10000) / Numerator
student_homelessness	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in percentage format) and numerator were provided by Race Counts Numerator = Estimate of students experiencing homelessness as a percentage of all enrolled students Value = Percent of students experiencing homelessness as a percentage of all enrolled students Value = data provided / 100 Denominator = Value / Numerator
subsidized_housi ng	US Department of Housing and Urban Development, 2021		URL: https://services.arcgis.com/VTyQ9soqVukalltT/arcgis/rest/services/Multifamily_Properties_Assisted/FeatureServer/
superfund	US EPA, Sites Reporting to EPA, 2021		URL: https://geopub.epa.gov/arcgis/rest/services/EMEF/efpoints/MapServer/

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supermkts	USDA Food Access research Atlas, 2015		URL: https://www.ers.usda.gov/data-products/food-access-research-atlas/download-the-data/ lapophalf = Population count beyond 1/2 mile from supermarket (numerator urban) lapop1 = Population count beyond 1 mile from supermarket (numerator rural) POP2010 = Population count from 2010 census (denominator) UrbanType (HDI/Census) urban(urban_area), rural (urban_cluster, rural) lapophalf_pct = 100*lapophalf/POP2010 for urban_area lapop1pct = 100*lapop1/POP2010 for urban cluster and rural se_pct = sqrt(percent*(1-percent)/denominator) percentiles only calculated for HDI eligible census tracts
suspension	Race_Counts_2017	2017	URL: https://www.racecounts.org/ Value (provided in rate per 100 students/staff) and numerator were provided by Race Counts Numerator = Estimate of students suspended per 100 students Value = Rate of students suspended per 100 students Value = data provided Denominator = (Value/100) / Numerator
svi	CDC/ADSDR_SVI		https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html SPL_Themes = overall score RPL_Themes = percentile rank Value = SPL_Themes Percentile_st = RPL_Themes

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theil	ACS2019API/5Y	DP05	URL: https://api.census.gov/data/2019/acs/acs5/profile/variables.html
			DP05_0070E = Estimate of Total population
			DP05_0071E = Estimate of Latino population
			DP05_0077E = Estimate of White, Non-Hispanic population
			DP05_0078E = Estimate of Black, Non-Hispanic population
			DP05_0079E = Estimate of AIAN, Non-Hispanic population
			DP05_0080E = Estimate of Asian, Non-Hispanic population
			DP05_0081E = Estimate of NHPI, Non-Hispanic population
			DP05_0082E = Estimate of Other race, Non-Hispanic population
			DP05_0083E = Estimate of Multiple races, Non-Hispanic population
			Computed for counties, comparing county entropy to population-weighted (tract) average entropy (are tracts on average more (1) or less (0) diverse than county average entropy/diversity.
			The entropy index h for a tract i is:
			$$h_i = -\sum_{j=1}^{k} p_{ij} \ln(p_{ij})$$ Where: k = number of ethnic groups ("ethnicities") p_{ij} = proportion of population of jth ethnicity in tract i (=n_{ij}/n_i) n_{ij} = number of population of jth ethnicity in tract i n_i = total number of population in tract i
			To compare Entropy Indices between different cities as a whole, $$H = \left(\hat{H} - \overline{H}\right)/\hat{H}$$ $\hat{H}$ = Entropy Index for the city as a whole ("H hat") $\overline{H}$ = the average of the individual tracts' values of h, weighted by population ("H bar")

			See: Benjamin Forest. Measures of Segregation and Isolation. Dartmouth College, Hanover, NH; 2005. https://www.dartmouth.edu/~segregation/IndicesofSegregation.pdf

toxics	US EPA, Sites Reporting to EPA, 2021		URL: https://geopub.epa.gov/arcgis/rest/services/EMEF/efpoints/MapServer/
traffic_impacts	CES 4.0		URL: https://services1.arcgis.com/PCHfdHz4GlDNAhBb/ArcGIS/rest/services/DraftResults CE_S4082 520/FeatureServer/ Value = traffic_4_0
transitaccess	HCI2013		URL: https://archive.cdph.ca.gov/programs/Pages/CalBRACE-Indicators2017.aspx Manually filtered RailFerryBus10_MTC_Output_11-15-13.xls, RailFerryBus10_SACOG_Output-11-26-13.xls, RailFerryBus10_SANDAG_Output8-29-13.xls, RailFerryBus10_SCAG_Output9-5-13.xls on Total race/ethnicity and census tract geography to create csv file RailFerryBusMTC_SCAG_SACOG_SANDAG2013HCI.csv, which was reformatted in HDI_BRACE_DS_Indicators2017-07-XX.R geotypevalue redefined as text(geotypevalue,"6000000000")
treecanopy	CDPH/National Land Cover Database		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/ Value = Population-weighted percentage of the census tract area with tree canopy

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twoparent	ACS2019API/5Y	B09008	URL: https://api.census.gov/data/2019/acs/acs5/subject/variables.html B09005_001E = Estimate of total households B09005_001M = Margin of error of total households B09005_002E = Estimate of married couple households B09005_002M = Margin of error of married couple households B09005_003E = Estimate of cohabitating couple households B09005_003M = Margin of error of cohabitating couple households Numerator = B09005_002E + B09005_003E Denominator = B09005_001E

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			Value = Numerator / Denominator
			Numerator SE = sqrt((B09005_002M/1.645)^2 + (B09005_003M/1.645)^2)
			Denominator SE = B09005_001M / 1.645
			If (Numerator SE)^2 - Value*(Denominator SE)^2] > 0, then
			SE = [(Numerator SE)^2 - Value*(Denominator SE)^2] / Denominator
			If (Numerator SE)^2 - Value*(Denominator SE)^2] <= 0, then
			SE = [(Numerator SE)^2 + Value*(Denominator SE)^2] / Denominator
UHII	CalEPA		Urban heat island index: sum of 182 day temp. differences (degree-hr) between urban and rural reference
use_of_force	Race_Counts_2017	2017	URL: https://www.racecounts.org/
			Value (provided in rate per 100,000 people) and numerator were provided by Race Counts
			Numerator = Three-year estimate number of civilians injured in law enforcement incidents per 100,000 people
			Value = Three-year average number of civilians injured in law enforcement incidents per 100,000 people
			Value = data provided
			Denominator = (Value/100000) / (Numerator/3)
usual_source_of_care	Race_Counts_2017	2017	URL: https://www.racecounts.org/
			Value (provided in percentage format) and numerator were provided by Race Counts
			Numerator = Estimate of people with a usual source of medical care
			Value = Percentage of people with a usual source of medical care
			Value = data provided / 100

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			Denominator = Value / Numerator

voter16	UC_Berkeley_Statewide_Database		URL: https://statewidedatabase.org/d10/g16.html PCTRGPREC = Percent of total registered voters in the RG precinct that are located within the transecting census block BLKREG = Voter registration by block voters = Registered Voters (from crosswalk variable TOTREG_R) Numerator = PCTRGPREC/100 * voters Denominator = BLKREG Value = Numerator / Denominator SE = sqrt (value*(1-value)/ denominator) Crosswalk source: https://statewidedatabase.org/d10/g16_geo_conv.html RGPREC_KEY = Crosswalk key
walkability	USEPA	SLD3	URL: https://www.epa.gov/smartgrowth/smart-location-mapping#SLD Download file: EPA_SmartLocationDatabase_V3_Jan_2021_Final.csv File is structured by 2010 census block groups Walkability score (census tract) = population (TotPop) weighted average of block group walkability scores (NatWalkInd)
water_discharger s	US EPA, Sites Reporting to EPA, 2021		URL: https://geopub.epa.gov/arcgis/rest/services/EMEF/efpoints/MapServer/

wildfire	CDFFP2007	FSHZ	URL: https://www.cdph.ca.gov/Programs/OHE/Pages/CC-Health-Vulnerability-Indicators.aspx http://www.fire.ca.gov/fire_prevention/fire_prevention_wildland_statewide.php Manually filtered BRACE_Wildfire_786_CT_PL_CO_RE_CA.xlsx (downloaded from on Total race/ethnicity and census tract geography to create csv file BRACE_SLR_CT11-1-2016.csv, which was reformatted in HDI_BRACE_DS_Indicators2017-07-XX.R

YouthAsthmaEDvisits	OSHPD_17_asthmaED		Processed by UCLA for the UCLA Extreme Heat Tool (URL: https://innovation.luskin.ucla.edu/climate/heat/) Value = Age-adjusted rate of asthma emergency room visits for youth

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C. Table of Discontinued Decision Support Layers

Decision Support Layer Title	Discontinued Geography	Years of Data	Reason for Discontinuation
Above Census Poverty Threshold	Places	2015-2019	Race-stratified data at place (indicator still available at other geos)
Active Commuting (Transit or Walking)	Places	2015-2019	Race-stratified data at place (indicator still available at other geos)
Adults 65 and Older	Places	2015-2019	Race-stratified data at place (indicator still available at other geos)
Agreement Between HPI 2.0 and 3.0	Tracts	NA	Binary Indicator
Bachelor's Education or Higher	Places	2015-2019	Race-stratified data at place (indicator still available at other geos)
Denied Mortgages	Places	2017	Race-stratified data at place (indicator still available at other geos)
Employed (Ages 16-64)	Places	2015-2019	Race-stratified data at place (indicator still available at other geos)

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English Speaking Households	Places	2015-2019	Race-stratified data at place (indicator still available at other geos)
Foreign-Born Citizens	Places	2015-2019	Race-stratified data at place (indicator still available at other geos)
Foreign-Born Non-Citizens	Places	2015-2019	Race-stratified data at place (indicator still available at other geos)
Gini (City)	Places	2011-2015	Other Indicators Produced at Place or MSSA
Homeownership	Places	2015-2019	Race-Stratified Data at Place (indicator still available at other geos)
Households with Broadband Internet	Places	2015-2019	Race-Stratified Data at Place (indicator still available at other geos)
Households with a Computer	Places	2015-2019	Race-Stratified Data at Place (indicator still available at other geos)
Insured Adults	Places	2015-2019	Race-Stratified Data at Place (indicator still available at other geos)

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Limited English Speaking	Places	2015-2019	Race-Stratified Data at Place (indicator still available at other geos)
Low Birthweight Infants (Stratified)	MSSAs	2015-2019	Other Indicators Produced at Place or MSSA
Low-Income Households (<80% Median Household Income)	Tracts	2015-2019	Binary Indicator
Median Household Income	Places	2015-2019	Race-Stratified Data at Place (indicator still available at other geos)
Per Capita Income	Places	2015-2019	Race-Stratified Data at Place (indicator still available at other geos)
Population in Sea Level Rise Inundation Area	Tracts	2009	Exception Indicator: indicators produced from raster sources are best re-produced at updated 2020 geos rather than crosswalked. Updated indicators with more recent data will be produced in the future.
Preterm Births (Stratified)	MSSAs	2015-2019	Other Indicators Produced at Place or MSSA
Qualified opportunity zones	Tracts	2018	Binary Indicator

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Race of Police Force	Places	2017	Race-Stratified Data at Place (indicator still available at other geos)
Redlined	Tracts	1935-1940	Binary Indicator
Residential Segregation	Tracts	2010	Exception Indicator: the crosswalk process creates uninterpretable/inaccurate index values
Uncrowded Housing	Places	2015-2019	Race-Stratified Data at Place (indicator still available at other geos)
Wildfire Risk	Tracts	2007	Exception Indicator: indicators produced from raster sources are best re-produced at updated 2020 geos rather than crosswalked. Updated indicators with more recent data will be produced in the future.
2010 Census Participation	Places	2010	Race-Stratified Data at Place (indicator still available at other geos)
65+ with Disability	Places	2015-2019	Race-Stratified Data at Place (indicator still available at other geos)

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