Methodology for the 2023 CTCAC/HCD Opportunity Map

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Part I: Background and Purpose

ABOUT THE RESEARCH PARTNERS

In February 2017, the Department of Housing and Community Development (HCD) and the California Tax Credit Allocation Committee (CTCAC) convened a group of independent organizations and research centers, referred to henceforth as the "research partners".[1]

HCD provided a problem statement related to affirmatively furthering fair housing:

> *Housing policy, program guidelines, and regulations have untapped potential to both prevent further segregation and poverty concentration as well as encourage access to opportunity.*

HCD also shared its policy goals:

- *Avoid further segregation and concentration of poverty; and*
- *Encourage access to opportunity through land use policy and affordable housing program design and implementation.*

The research partners were convened for the following purpose:

> *To provide research, evidence-based policy recommendations, and other strategic recommendations to HCD and other related state agencies/departments to further the fair housing goals (as defined by HCD).*

ABOUT OPPORTUNITY MAPPING

Opportunity mapping is a way to measure and visualize place-based characteristics linked to critical life outcomes, such as educational attainment, earnings from employment, and economic mobility. Opportunity maps can be used to inform how to target investments and policies in a way that is conscious of the independent and inter-related effects that research has shown places have on economic, educational, and health outcomes.

Opportunity mapping also has limitations. For example, maps' accuracy is dependent on the accuracy of the data behind them. Data may be derived from self-reported surveys of subsets of an area's population, and sometimes may not be recorded or reliable in some areas. Further, even the most recent publicly available datasets typically lag by two years, meaning they may not adequately capture conditions in areas undergoing rapid change. The methodology described in this document attempts to address each of these limitations to the degree possible.

PURPOSE OF THE CTCAC/HCD OPPORTUNITY MAP

CTCAC and HCD charged the research partners with creating an opportunity map to identify areas in every region of the state whose characteristics have been shown by research to support positive economic, educational, and health outcomes for low-income families—particularly long-term outcomes for children.[2] CTCAC intended to adopt this map into its regulations, which it eventually did in December 2017, to accompany new policies aimed at increasing access to high-opportunity areas for families with children in housing financed with 9% Low Income

Housing Tax Credits (LIHTCs). For this reason, the research partners designed this map and the methodology behind it with the competitive funding infrastructure for the 9% LIHTC program (e.g., geographic competition, a separate funding pool for rural applicants).

The map has also been used to inform similar policies in other state funding programs, such as HCD's Multifamily Finance Super NOFA and the California Debt Limit Allocation Committee's regulations for 4% LIHTCs. However, some methodological adjustments may be called for if the map is applied to broader contexts and different application processes.

The research partners update the data contained within the mapping tool annually and review the methodology to make improvements over time.[3]

Part II: Research Methodology

OVERVIEW OF MAPPING APPROACH

One of the challenges in creating an opportunity map to inform statewide policy for siting affordable housing for families in California is that our state contains significant regional variation—from Central Valley cities and towns, to Los Angeles, to the San Francisco Bay Area, to rural areas throughout the state.

On the one hand, using absolute thresholds for place-based opportunity could introduce comparisons between very different areas of the state that make little sense from a policy perspective—in effect, holding a farming community to the same standard as a dense, urbanized neighborhood in one of the state's coastal cities. Deriving opportunity scores through comparison to the entirety of the state would align neither with realistic moving patterns of families, nor with the funding infrastructure for 9% LIHTCs—where applicants for family-targeted affordable housing compete with other applicants in the same region, and rural applicants compete in a separate funding pool.

On the other hand, more consistent standards can be useful for identifying areas of concern from a fair housing perspective—such as high-poverty and racially segregated areas. Assessing these factors based on intraregional comparison could mischaracterize areas in more affluent regions with relatively even and equitable development opportunity patterns as high-poverty, and could generate misleading results in regions with higher shares of objectively poor neighborhoods by holding them to a lower, intra-regional standard.

To avoid either outcome, the research partners use a hybrid approach for the CTCAC/HCD Opportunity Map—accounting for regional differences in assessing opportunity for most places, while applying more rigid standards for high-poverty, racially segregated areas in all regions. In particular:

Filtering for high-poverty, racially segregated areas. The CTCAC/HCD Opportunity Map filters areas that meet consistent standards for both poverty (30% of the population below the federal poverty line) and racial segregation (overrepresentation of people of color relative to the county) into a "High Segregation & Poverty" category. The share of each region that falls into the High Segregation & Poverty category varies from region to region.

Calculating index scores for non-filtered areas. The CTCAC/HCD Opportunity Map calculates regionally derived opportunity index scores for non-filtered tracts and rural block groups using twenty-one indicators described later in this document. These index scores make it possible to sort each non-filtered tract or rural block group into opportunity categories according to their rank within the region or rural county.

To allow CTCAC and HCD to incentivize equitable development patterns in each region to the same degree, the CTCAC/HCD Opportunity Map allocates the 20 percent of non-excluded (see below) tracts or rural block groups in each region or rural county, respectively, with the highest relative index scores to the "Highest Resource" designation and the next 20 percent to the "High

Resource" designation. Each region thus ends up with 40 percent of its total tracts with reliable data as Highest or High Resource (or 40 percent of block groups in rural counties). The remaining non-filtered tracts or rural block groups are then evenly divided into "Low Resource" and "Moderate Resource" categories.

Excluding tracts or block groups. The tool also excludes certain census areas from being categorized. To improve the accuracy of the mapping, tracts and rural block groups with the following characteristics are excluded from the application of the filter and from categorization based on index scores:

- Areas with unreliable data, as defined later in this document;
- Areas where prisoners make up at least 75 percent of the population;
- Areas with population density below 15 people per square mile and total population below 500; and
- Areas where at least half of the age 16+ population is employed by the armed forces, in order to exclude military base areas where it is not possible to develop non-military affordable housing.[4]

Excluded tracts and rural block groups are identified as "Missing/Insufficient Information" on the mapping tool or "N/A" in the public data file.

REGIONAL BOUNDARIES

To determine the regional definitions for the purpose of calculating index scores, the research partners mostly mirrored the geographic apportionments designated within CTCAC's regulations but bundled some of the geographic apportionments to create more accurate regions, with guidance from CTCAC and HCD. Following is a list of the opportunity map regions with the respective geographic apportionment(s) captured in that region:

Opportunity Mapping Region	Geographic Apportionment in CTCAC Regulations
Los Angeles Region	City of Los Angeles
	Balance of Los Angeles County
Bay Area Region	East Bay Region
	South and West Bay Region
	San Francisco County
	Marin, Napa, Solano, and Sonoma Counties (from the Northern Region)
Central Valley Region	Central Valley Region
San Diego County	San Diego County
Capital Region	Capital Region minus Sutter and Yuba Counties
Inland Empire Region	Inland Empire Region
Orange County	Orange County
Central Coast Region	Central Coast Region

Rural Areas	Non-metropolitan counties, plus Butte, Shasta, Sutter, and Yuba Counties, as well as tracts that are eligible for Section 515

Please refer to the CTCAC regulations for a list of counties included in each geographic apportionment.

MEASURING OPPORTUNITY IN RURAL AREAS

The CTCAC/HCD Opportunity Map measures opportunity in rural parts of the state at the block group level, rather than at the tract level as in the rest of the state. Since tracts in rural areas of California are approximately 37 times larger in land area than tracts in non-rural areas, tract-level data in rural areas may mask over variation in opportunity and resources within these tracts. Assessing opportunity at the block group level in rural areas reduces this difference by 90 percent (each rural tract contains three block groups), and thus allows for finer-grained analysis.

Although rural areas are evaluated at the block group level, the rural designation is assigned by Census tract, rather than block group, to maintain consistency with urban and rural evaluation, i.e. to avoid a scenario in which a tract is split between rural and urban areas, the latter of which are evaluated by tract. To capture the diverse array of rural communities across the state—both within and outside of designated metropolitan statistical areas—this methodology takes a three-tiered approach to identifying rural census tracts. For mapping purposes, tracts that fall in the "Rural Areas" category include:

1. All tracts in the following Non-Metropolitan counties: Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Humboldt, Inyo, Lake, Lassen, Mariposa, Mendocino, Modoc, Mono, Nevada, Plumas, Sierra, Siskiyou, Tehama, Trinity, and Tuolumne;
2. All tracts in Butte, Shasta, Sutter, and Yuba Counties;
3. Any other non-urbanized block group with at least half its population in an area deemed as rural on the U.S. Department of Agriculture's online multifamily mapping application.

Any tract that falls within the 25 counties listed above is designated as a "Rural Area." Beyond those counties, the research partners identified areas in the state that correspond with rural areas on the U.S. Department of Agriculture's online multifamily maps.

These areas were then overlaid with census tract boundaries to identify what share of the population within a tract falls within the rural area.[5] If at least 50 percent of a tract's population is located within census blocks which have their population-weighted centroid within the rural area, that census tract was allocated to the "Rural Areas" designation

For block groups that fall within the rural designation, the maps take a slightly different approach to allocating resource categories. Because rural areas span the state (including both poorer and wealthier regions), rural block groups are ranked in comparison to other rural block groups within the same county (e.g., 40% of rural block groups in a given rural county are allocated to the "Highest" and "High" Resource categories).

Part III: Overview of Indicators

PROCESS FOR SELECTING INDICATORS

Indicators used in the CTCAC/HCD Opportunity Map index were selected based on the following criteria:

- Evidence from peer-reviewed research that the indicator is linked to improved life outcomes for low-income families, particularly children
- Reliable data
- Publicly available data

The rationale and metric for each indicator is described in more detail below. Each census tract or rural block group receives a score for each indicator, except where data are missing.[6] To account for the fact that each indicator is measured differently (e.g., percent versus dollar amount), a unit-less "z-score" is calculated for each indicator within each region. These tract-level z-scores are averaged together by domain (with each indicator's score receiving an equal weighting), and the three domain scores are then averaged together to create an index score.

See below for the full list of indicators, measures, and data sources.

Domain	Indicator	Measure	Data Source	Table
Economic	**Poverty**	Percent of population with income above 200% of federal poverty line	2015-2019 ACS[7]	Table C17002
	Adult Education	Percent of adults with a bachelor's degree or above	2015-2019 ACS	Table B15003
	Employment	Percent of adults aged 20-64 who are employed in the civilian labor force or in the armed forces	2015-2019 ACS	Table B23004
	Job Proximity	Number of jobs filled by workers with less than a BA that fall within a given radius (determined by the typical commute distance of low-wage workers in each region) of each census tract population-weighted centroid	2019 LEHD LODES	Origin-Destination and Workplace Area Characteristics Tables

	Median Home Value	Value of owner-occupied units	2015-2019 ACS	Table B25077
Environmental[8]	**CalEnviroScreen 4.0 indicators**	CalEnviroScreen 4.0 Pollution indicators (Exposures and Environmental Effect indicators) and processed values	CalEnviroScreen 4.0	Variables: Ozone, PM2.5, Diesel PM, Drinking Water, Pesticides, Tox. Release, Traffic, Children's Lead Risk from Housing, Cleanup Sites, Groundwater Threats, Hazardous Waste, Impaired Water Bodies, Solid Waste Sites
Education	**Math proficiency**	Percentage of 4th graders who meet or exceed math proficiency standards	2018-2019[9] California Department of Education (DOE)	
	Reading proficiency	Percentage of 4th graders who meet or exceed literacy standards	2018-2019 CA DOE	
	High school graduation rates	Percentage of high school cohort that graduated on time	2020-2021 CA DOE	
	Student poverty rate	Percent of students not receiving free or reduced-price lunch	2021-2022 CA DOE	
		Measure	**Data Source**	
Filter[10]	**Poverty and Racial Segregation**	Poverty: Tracts with at least 30% of the population falling under the federal poverty line	2015-2019 ACS 2015-2019 ACS[11]	ACS Table B17020

		Racial Segregation: Tracts with a racial Location Quotient of higher than 1.25 for Black, Hispanic, Asian, or all people of color in comparison to the county		ACS Table B03002

ECONOMIC DOMAIN

Poverty Indicator

Tract-level poverty rates have been shown through numerous studies to be a strong indicator of an area's level of resources, risk, and opportunity, and predictor of key life outcomes for low-income children in particular. Living in high-poverty areas increases exposure to localized risks—such as violent crime, low-quality and underfunded schools, and pollution—that have been shown to contribute to toxic stress, poor physical and mental health, low educational attainment, and impaired cognitive development in children. On the other hand, living in low-poverty areas has been shown to generate significant benefits such as higher educational attainment and long-term earnings increases for low-income children, as well as improved mental and physical health for both children and adults.[12,13,14]

The research partners chose to use 200 percent of the poverty line to reflect the higher cost of living in California. Because each indicator in this domain is designed to measure opportunity in a positive sense, this indicator is measured as the percent of a tract's or rural block group's residents who live above 200 percent of the federal poverty line.[15]

Adult Education Indicator

The tract-level share of adults that have earned a bachelor's degree has been shown to be highly correlated with rates of upward economic mobility for low-income children.[16] Higher rates of post-secondary attainment are also predictive of higher wages and improved work opportunities for adults, meaning that families are less likely to be economically insecure.[17] Research has indicated that children living in neighborhoods with a higher average socioeconomic status (SES) are more likely to graduate from high school. Additionally, starting at age three, children living in higher SES neighborhoods and/or with a greater percentage of managerial or professional residents begin to perform better on IQ tests than their peers who live in lower SES neighborhoods.[18] Additional research has shown that an increasing supply of college graduates is associated with higher earnings for other labor force participants. These findings are especially noteworthy because they show that these "spillover" effects are even more pronounced for less-skilled workers; a more highly educated labor force leads to higher wage gains for high school dropouts and high school graduates than those with college degrees.[19]

This indicator was measured by calculating the percent of adults 25 years and older who have earned at least a bachelor's degree in each tract and rural block group.

Employment Indicator

The tract-level share of employed adults has been shown to be highly correlated with rates of upward economic mobility for low-income children.[20] Adult unemployment is commonly considered to be an indicator of neighborhood disadvantage that affects not just the individuals who do not have jobs, but members of the entire community.[21] Areas with low levels of employment see outcomes similar to those with high poverty rates, including poor health outcomes, low birthweight babies, and violent crime.[22]

The employment rate was calculated as the percent of individuals in each tract and rural block group age 20-64 who are employed in either the civilian labor force or the armed forces. The research partners opted to use the employment rate because the unemployment rate does not account for individuals who have dropped out of the labor force due to disillusionment with their job prospects.

Proximity to Jobs Indicator

Proximity to jobs—particularly to jobs that may be accessible to a low-wage or low- to moderate-skill worker—is an important place-based attribute according to the "spatial mismatch hypothesis," which maintains that communities can experience poor labor market outcomes because of the lack of nearby jobs with skill-levels and qualifications appropriate for those community members. According to this literature, the labor market and the jobs that they can potentially fill are geographically "mismatched."[23, 24] Accounting for proximity to low- and mid-skill jobs in the construction of the overall opportunity index helps avoid this spatial mismatch in the location of affordable housing.

This indicator was calculated in two stages. The first stage uses Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics (LEHD-LODES) data from 2019 to calculate the population-weighted median distance traveled by workers earning $1,250 a month or less (or the equivalent of $15,000 a year). In non-rural areas, the median distance is calculated by region. For rural areas, the median distance is calculated based on all rural areas in the state, to reflect their greater typical travel distances.

The research partners chose this benchmark in recognition that low-wage workers tend to commute shorter distances than higher-wage employees due to constraints on mode and cost of travel. (Note, this is not the same as saying low-wage workers spend less *time* commuting. The same limitations that constrain commute distances--for example, reliance on public transit--may actually lead to longer travel times for the working poor.)

To find the typical commute distance of low-wage workers in each region, the geodesic distance was calculated between each commute origin and destination. Because the level of analysis for the Opportunity Maps is the census tract, the population-weighted centroid of each census tract was used as the origin of each trip. However, to offer a finer-grain picture of job proximity, census blocks, rather than tracts, were used as the destination. A regional median was then calculated, weighted by the number of low-wage workers making each origin-destination commute. This analysis yields the following benchmarks for each region:

Opportunity Mapping Region	Median Distance Traveled by Low-Wage Workers in 2019 (in Miles)
Capital and Northern Region	8.9
Central Coast Region	10.7
Central Valley Region	7.7
Inland Empire Region	15.7
Los Angeles Region	8.8
Orange County Region	9.7
Average for Rural Areas[25]	16.6
San Diego Region	9.4
San Francisco Bay Area Region	9.1

The second stage calculates the number of "proximate" jobs by aggregating the number of jobs filled by individuals without bachelor's degrees that fall within the typical commute distance radius of each tract.

There are a few limitations to this indicator that should be noted. First, the data source for this indicator (the LEHD-LODES dataset) does not include military jobs or informal employment. Second, the indicator assumes that jobs currently filled with people without bachelor's degrees will most likely be filled by another individual without a bachelor's degree in the event of a job vacancy. In extremely competitive job markets, individuals with bachelor's degrees may apply for and secure jobs that were previously filled by people without bachelor's degrees.

Median Home Value Indicator

Home value is a strong proxy for neighborhood quality and community resources. Research suggests that neighborhood characteristics, such as school quality, public resources, crime rates, environmental quality and even perceived social benefits are all reflected in home values. For example, research has demonstrated a link between school quality and house prices.[26] Conversely, disruption of schools (such as school closings and redistricting) can be reflected in declining home values.[27] Crime, too, has been shown to negatively impact house prices, especially the prevalence of violent crime.[28] Researchers have quantified the extent to which factors such as clean air, open spaces, and even well-educated neighbors can all capitalize into house prices.[29,30,31] Collectively, home prices are directly impacted by a variety of neighborhood characteristics, and are to a large extent a bellwether of the quality of the neighborhood itself.

ENVIRONMENTAL DOMAIN

The environmental domain relies on thirteen of the indicators that are used in the California Office of Environmental Health Hazard Assessment (OEHHA)'s CalEnviroScreen 4.0 tool under the "exposures" and "environmental effect" subcomponents of the "pollution burden" domain. To mirror the CalEnviroScreen 4.0 approach to calculating pollution burden scores, the exposure indicators are weighed twice as heavily as the environmental effects burden indicators because

they are considered to have more of an impact on pollution burden. The indicators for each category are listed below:

Exposure indicators:

1. Ozone Concentrations
2. PM2.5 Concentrations
3. Diesel PM Emissions
4. Drinking Water Contaminants
5. Pesticide Use
6. Toxic Releases from Facilities
7. Traffic Density
8. Children's Lead Risk from Housing

Environmental effects indicators:

9. Cleanup Sites
10. Groundwater Threats
11. Hazardous Waste Generators and Facilities
12. Impaired Water Bodies
13. Solid Waste Sites and Facilities

CalEnviroScreen 4.0 is a statewide risk assessment tool that measures the cumulative impacts of multiple sources of pollution. The indicators were selected based on scientific literature that confirms their detrimental effects on human, and especially child, health; the completeness, accuracy, and currency of the data; and the widespread concerns about each indicator in California. CalEnviroScreen 4.0 was developed to support the Affordable Housing and Sustainable Communities program and other programs that allocate funding from sale of cap-and-trade revenue, but it is explicitly acknowledged as a tool that can be used for a variety of policy and planning purposes. For more information on CalEnviroScreen 4.0, see the OEHHA website.[32]

One limitation of the environmental quality indicators is that the levels of a pollutant are generally measured at a limited number of points statewide; the levels of the pollutant are then estimated for other areas that are not immediately adjacent to the measurement site. Additionally, there are some indicators which may have a large impact in one area of a census tract, but which could have only a marginal effect at another location in the same census tract. This is particularly true of stationary polluting sources (for example, impaired water bodies like lakes), where the impact decreases as the distance from the site decreases.

Note that, because this set of indicators moves in the opposite direction compared to the other two domains (i.e., larger shares on these indicators would reflect a negative outcome for the tract whereas larger shares for other measures—adults with at least a Bachelor's degree, for example—indicate a positive outcome), the additive inverse of this domain score is used in calculating the final index score.

EDUCATION DOMAIN

Math and Reading Proficiency Indicators

Elementary school test scores from 3rd and 4th grade are considered in the literature to be strong proxies for the level of resources and opportunity during early childhood both in local schools and more broadly in communities.[33] Indeed, studies have shown that test scores should be understood as an output of students' neighborhood conditions—such as whether they live in a high-poverty or high-crime area—and not only of students' individual abilities and family backgrounds, or the quality of the schools they attend.[34, 35] Further, test scores and other measures of school quality are highly correlated with upward mobility for low-income children.[36] Proficiency on elementary school-age standardized tests is also a strong predictor of whether individual children will eventually graduate high school,[37] which itself is associated with higher long-term earnings and other social benefits compared to dropping out.[38]

"Proficiency" is defined as the percent of students that are performing at grade-level in the 4th grade in each school. Math and reading proficiency scores are calculated as the enrollment-weighted average proficiency level of students at the three closest schools, within the same county, to each census tract's centroid. The research partners utilized the average value from three schools because the methodology does not account for school assignment boundaries, which are different from census tract boundaries.

This approach does have limitations, including that students will attend only one of the three closest schools, so the quality of the school they attend may differ somewhat from the average score that is calculated in each census tract. In addition, it does not account for non-neighborhood school district assignment policies. However, the academic literature suggests that low-income students are more likely to attend their neighborhood schools even when they have a choice to go elsewhere[39]—and that choice-based assignment policies can have the effect of worsening school segregation.[40]

High School Graduation Rate Indicator

Low graduation rates indicate that schools are not preparing students for the workforce. Students who do not graduate from high school face a variety of challenges later in life, including an increased risk of going to prison and lower wages than their classmates who graduate.[41, 42] In addition, high schools with lower graduation rates have also been found to have disciplinary practices that negatively impact low-income and minority youth as well as lower levels of teacher engagement.[43]

The high school graduation rate indicator is calculated based on the cohort-weighted average of the three high schools nearest to the tract or rural block group centroid, using California Department of Education data on the percent of students who graduate in four years.[44]

Student Poverty Indicator

Studies have consistently shown that attending low-poverty and economically integrated schools boosts educational achievement for low-income students, when compared to attending higher-poverty schools.[45] Recent studies have found that the disparity in school poverty rates that Black and white children experience is the primary mechanism through which racial segregation in schools translates to Black-white academic achievement gaps.[46,47] However, *racial* integration in schools provides benefits to low-income students and students of color that both overlap and complement the benefits of *economic* integration in the classroom—including higher levels of educational attainment, reductions in prejudice and negative attitudes across racial groups, and long-term improvements in earnings, health, and rates of incarceration—all while producing no detrimental effects for white children.[48]

As with the math and reading proficiency indicators, the research partners averaged the attributes, weighted by school enrollment, from the three closest schools to the centroid of each census tract to develop the tract level score. And similar to the poverty indicator in the economic domain, school poverty rates are measured as the percent of students that do *not* receive free and reduced price lunch, to better align with the opportunity-oriented constructions of the other variables in this domain.

Part IV: Poverty Concentration and Racial Segregation Filter

As described earlier in this document, this mapping tool uses "filtering" to identify those areas in each region that are both non-white racially segregated and high-poverty. The use of a filter is grounded in the guiding policy goals of the tool: to avoid further segregation and poverty concentration, and to increase access to opportunity for low-income families.

Racial segregation in post-war metropolitan America has functioned as a powerful mechanism for unequal distribution of resources and access to opportunity by jurisdiction and neighborhood—resulting, over time, in racially segregated neighborhoods with many predominantly Black and Latinx neighborhoods, in particular, characterized by concentrated poverty, higher levels of environmental and social risk, and fewer resources or opportunities for educational and economic advancement (particularly for African-Americans).[49] A large body of research has documented the harms of racial segregation and concentrated poverty, both independently and in combination—controlling for family background, income, and housing affordability—on children's educational attainment and long-term economic prospects, as well as on the mental and physical health of both children and adults.[50]

Applying a racial segregation and high-poverty filter also aligns with the federal Affirmatively Further Fair Housing (AFFH) designation of Racially/Ethnically Concentrated Areas of Poverty (RECAPs). However, the federal RECAP standard—which categorizes all areas where more than half the population people of color as areas of racial or ethnic concentration[51]—does not effectively reflect the level of racial and ethnic diversity in many parts of California.

The research partners developed a two-stage approach to defining this filter.

Concentrated Poverty: First, the filter identifies tracts and rural block groups where at least 30 percent of the population is living below the poverty line. Research has found that the impact of area poverty rates in producing negative outcomes for individuals--including crime, school leaving, and duration of poverty spells--begin to appear after an area exceeds approximately 20 percent poverty, whereupon the externality effects grow rapidly until the neighborhood reaches approximately 40 percent poverty.

To prevent college towns from distorting the filter's concentrated poverty measure, college and graduate students are removed from the poverty calculation in the filter in tracts where they comprise at least 25% of the population. An internal analysis found that without this adjustment, some tracts with high proportions of college students—many of which have high domain scores—are shown as having poverty rates exceeding 30 percent, likely due to the Census classifying many unemployed and partially employed students living off-campus up as poor.

The total population living in areas of extreme poverty declined in the 1990s, following government action designed to affirmatively counteract intentionally segregationist public policy.[52] Following national trends, however, concentrated poverty has risen dramatically in California since 2000.[53]

Racial Segregation: Second, the filter relies on a measure of racial segregation to capture which tracts and rural block groups have a disproportionate share of households of color. Setting an absolute threshold (as the federal RECAP metric does) does not account for substantial variation in the racial and ethnic population across California's counties. To properly account for the features of inequality operating on individuals at the neighborhood level, a relative segregation measure is more appropriate to reflect the experience of residents.[54] The filter thus relies on the location quotient of residential racial segregation (LQ), which is increasingly being used studies that seek to assess the impact of racial segregation on individual and community outcomes.[55] It can be used to examine, for example, the linkages between residential segregation and public health outcomes.[56] The LQ is a small-area measure of relative segregation calculated at the residential census tract level that represents how much more segregated an area (e.g., a census tract or block group) is relative to the larger area (in this case, the county).[57] For the filter, tracts that have a LQ higher than 1.25 for Black, Hispanic, Asian, or all people of color are flagged as being racially segregated in comparison to the county.

Census tracts and rural block groups that have both a poverty rate of over 30 percent and that are designated as being racially segregated are filtered into the "High Segregation & Poverty" category. Due to data unreliability at the block group level in the poverty indicator, the "High Poverty and Segregation" category is designated at the tract level in rural areas.

For technical questions on the CTCAC/HCD Opportunity Map methodology, please contact equity_metrics_program@berkeley.edu.

Endnotes

[1] The research partners currently include representation from the Othering & Belonging Institute at UC Berkeley, the Terner Center for Housing Innovation at UC Berkeley, the California Housing Partnership, and the UCLA Luskin School.

[2] The mapping methodology is narrowly tailored towards upward mobility for children of low-income families. Although the methodology includes indicators relevant to other populations, some indicators associated with positive outcomes for those populations may not be included.

[3] The code used to calculate the opportunity index also goes through an annual review process for quality assurance. Year over year changes in opportunity designations are also reviewed on an annual basis.

[4] Prisoner population taken from 2010 Census table PCT020002; armed forces data from ACS table B23025_006.

[5] Blocks are the smallest geographic unit available in the U.S. Census.

[6] In addition to instances where estimates were not reported or were missing at the tract level, the research partners also identified "unreliable" data points due to sample size limitations in the American Community Survey (ACS). An ACS-derived indicator was deemed unreliable if its coefficient of variation (the ratio of the standard error to the estimate) was greater than 30 percent. In those instances, the estimates were suppressed. Standard errors are calculated using 90% margins of error from the ACS data tables. If multiple indicators within a domain were designated as missing or unreliable (i.e., three of the five indicators in the economic domain, four of the twelve environmental indicators, or three of the four education domain indicators were missing or unreliable), then the calculation for that domain was suppressed. If one or more domain scores in a tract were suppressed, an opportunity category was not assigned due to insufficient or unreliable data. Opportunity categories were also suppressed in tracts with less than 15 people per square mile and less than 500 people, or if at least 75% of the tract's population was made of prisoners according to the 2010 Census.

[7] While 2020 ACS 5-year estimates were available, the research partners chose to fall back on 2019 ACS 5-year data because of pandemic related under-reporting in the 2020 data.

[8] Because CalEnviroScreen scores are designated at the tract level, each rural block group receives its tract score, meaning that rural block group environmental scores are constant within tracts. In the rare circumstance where all block groups in the same rural county have the same score for an indicator, that indicator is not ranked.

[9] 2018-2019 math and reading score data are used because data are not available for 2019-2020 and relatively few schools administered tests in 2020-2021 due to pandemic related complications.

[10] Due to data unreliability at the block group level in the poverty indicator, the "High Poverty and Segregation" designated at the tract level even in rural block groups.

[11] In previous iterations of the Opportunty Map, decennial census data were used to calculate racial segregation in order to avoid potential reliability issues associated with ACS estimates. However, because the 2010 decennial data are out of date, and because the 2020 decenial data include a new privacy algorithm which adverseley affects data reliability at smaller geographies, the research partners concluded that switching to ACS data for calculating segregation represented the best option.

[12] For a summary of this research, see "Evidence Shows that Neighborhoods Affect Children's Well-Being and Long-Term Success" in Sard, B., & Rice, D. (2016). Realizing the Housing Voucher Program's potential to enable families to move to better neighborhoods. *Washington, DC: Center on Budget and Policy Priorities*.

[13] Chetty, R., Hendren, N., & Katz, L.F. (2015). The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment. *Cambridge, MA: Harvard University and National Bureau of Economic Research.* http://www.equality-of-opportunity.org/assets/documents/mto_paper.pdf

[14] Chetty, R., Friedman, J., Hendren, N., Jones, M., Porter, S. (2018). The Opportunity Atlas: Mapping the Childhood Roots of Social Mobility. *Opportunity Insights. NBER Working Paper No. 25147.*

[15] In 2018, the federal poverty line for a family of four was $25,100.

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