California Fair Housing Taskforce

Opportunity Mapping Methodology

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Part I: Background and Purpose

ABOUT THE CALIFORNIA FAIR HOUSING TASKFORCE

In February 2017, the Department of Housing and Community Development (HCD) and the California Tax Credit Allocation Committee (TCAC) convened a group of independent organizations and research centers that would become the California Fair Housing Taskforce ("Taskforce").

HCD provided a problem statement related to 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 additional access to opportunity through land use policy and affordable housing program design and implementation.*

The Taskforce was established with 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).*

The Taskforce was asked to assist TCAC and HCD in creating evidence-based approaches to increasing access to opportunity for families with children living in housing subsidized by the Low-Income Housing Tax Credit (LIHTC) program. TCAC and HCD asked the Taskforce to create a statewide opportunity mapping tool that could be adopted into TCAC regulations to accompany regulations to incentivize development of large-family, new construction developments with 9% LIHTCs in neighborhoods whose characteristics have been shown by research to support childhood development and economic mobility for low-income families. This mapping tool could also be used in HCD programs and policies.

ABOUT OPPORTUNITY MAPPING

Opportunity mapping is a tool for understanding how public and private resources are spatially distributed. "Opportunity," loosely defined, can be thought of as all of the pathways to better lives, including through health, education, and employment. Mapping these pathways involves quantifying positive or negative attributes of life outcomes using data from multiple sources, and conveying the information in a visual format. In essence, opportunity maps are intended to display which areas, according to research, offer low-income children and adults the best chance at economic advancement, high educational attainment, and good physical and mental health.

Opportunity mapping is a valuable approach to understanding the realities that communities experience because it can demonstrate the cumulative impacts of multiple neighborhood stressors, while also displaying the full spectrum of opportunity from high to low. Additionally,

it is a useful tool for determining where investments should be targeted because indices can be constructed using any combination of indicators, meaning that the policy purpose can direct the information that is captured and presented.

While opportunity mapping is useful for synthesizing a large amount of information, it is not without limitations. The accuracy of the maps is dependent on the accuracy of the data, which may be an estimate or an approximation of the reality "on the ground." Data is sometimes not recorded for some areas. Additionally, there are limitations to maps constructed at the census tract level because tracts can vary significantly in geographic size. In some areas census tracts are approximations for neighborhoods, while in others there may be only a few census tracts within an entire county. Especially in larger tracts, conditions may vary from one point in a census tract to another. Finally, because the data lags the reality on the ground by a couple of years, there may be some neighborhoods where change rapidly occurs and the data cannot capture the rate of change.

PURPOSE OF THE CALIFORNIA OPPORTUNITY MAPPING TOOL

The Taskforce designed an opportunity mapping tool to demonstrate the spatial dynamics of opportunity in each California neighborhood and region – that is, to indicate which areas have the greatest and least private and public resources associated with childhood development and economic mobility.

The tool is intended to inform regulations related to the siting of 9% new construction, large-family LIHTC developments in California, which have historically been concentrated in low-resource and segregated areas. It is the Taskforce's intent that the mapping tool be used in conjunction with new regulations to help incentivize more housing opportunities for families to live in high-resourced neighborhoods.

The Taskforce intends for the application of this tool to be part of a balanced statewide policy approach that increases access for low-income families to high-resource neighborhoods where there historically have been limited affordable housing opportunities, *and* provides investments to revitalize under-resourced neighborhoods.

Part II: Research Methodology

OVERVIEW OF MAPPING APPROACH

One of the challenges in creating an opportunity map to inform state-level 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 neighborhood-level opportunity could introduce unfair comparisons between very different areas of the state—in effect, holding a farming community to the same standard as a dense, urbanized neighborhood in San Francisco. Therefore, deriving opportunity scores through comparison to the entirety of the state could produce an unfair result, and would also not align with realistic moving patterns of families. On the other hand, deriving opportunity scores based on an intraregional comparison could mischaracterize some neighborhoods in regions with relatively even and equitable development opportunity patterns as having less opportunity, and present a favorable picture of regions with higher shares of objectively low-resource neighborhoods by holding them to a lower, intra-regional standard.

To avoid either outcome, the Taskforce created a hybrid opportunity mapping tool. This mapping tool uses twenty-one **indicators** grouped into three domains, and one **filter**. Each indicator and filter is measured at the unit of the census tract.

Calculating index scores. The tool calculates regionally derived index scores for all tracts in eight California regions using twenty-one indicators described later in this document. The tool takes a slightly different approach for rural areas (see below). These index scores are used to sort each tract into opportunity categories.

The tool allocates the 20 percent of the tracts in each region 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 as "Highest" or "High" resource. These two categories are intended to help State decision-makers identify those tracts within each region that the research suggests low-income families are most likely to thrive, and where they typically do not have the option to live—but might, if given the choice. In effect, this approach is intended to incentivize development in higher-resourced neighborhoods, as defined by local and regional context.

Filtering for high-poverty, racially segregated areas. The tool establishes rigid standards for high-poverty, racially segregated areas that apply to all regions, while accounting for regional differences by identifying higher resource areas within each region. In this way, the mapping tool presented in this document uses an approach for deriving neighborhood-level resource designations that is tailored to state-level decision-making in California, and which is attuned to the reality that low-income families typically choose housing within the regions they currently live.

To operationalize this approach, the tool the tool uses "filtering" to set an absolute poverty threshold, identifying neighborhoods with a poverty rate of at least 30 percent. It then identifies which of these neighborhoods have a high concentration of minority households in comparison to the county, and that are considered to be racially segregated compared to the areas around them. Tracts that have both a high level of poverty and a high level of racial segregation are filtered into the "High Segregation & Poverty" category. In regions with larger shares of high-poverty and racially segregated neighborhoods, more tracts will be designated as falling within the "High Segregation & Poverty" category.

Excluding tracts. The tool also excludes certain census tracts from being categorized. To improve the accuracy of the mapping, the following census tracts are excluded from the application of the filter and the categorization of census tracts:

- ***Tracts with unreliable data.*** 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.
- ***Tracts where prisoners make up at least 75 percent of the population.*** Tracts where prisoners make up at least 75 percent of the population are typically tracts primarily occupied by a large prison and where little to no residential housing will be built.
- ***Low-population tracts where the population density is lower than 15 people (or five households) per square mile.*** Tracts with the low population density are likely uninhabitable tracts due to geographic limitations such as heavily wooded areas or mountain ranges. To prevent the density measure from excluding large communities that happen to be within spatially large census tracts, this measure is limited to tracts with a population of under 500 people.

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

Categorizing by Resource Level. As tracts are filtered to the "High Segregation & Poverty" category or excluded from categorization, non-filtered and non-excluded tracts fill-in to the "High Resource" and "Highest Resource" categories as necessary, based on the index score ranking. This ensures that regardless of the number of filtered or excluded tracts, every region (or county in rural areas) receives the same proportion of "High Resource" and "Highest Resource" tracts.

Finally, the remaining non-filtered and non-excluded tracts in each region are divided evenly into the "Moderate Resource" and "Low Resource" categories based on index scores.

REGIONAL BOUNDARIES

To determine the regional boundaries of the maps, the Taskforce mostly mirrored the geographic apportionments designated within TCAC's 2018 regulations but bundled some of the geographic apportionments to create more accurate regions with the guidance of TCAC and HCD. Following is a list of the opportunity map regions with the respective geographic apportionment(s) captured in that region:

Opportunity Mapping Region	QAP Geographic Apportionment
Los Angeles Region	City of Los Angeles
	Balance of Los Angeles County
SF Bay Area Region	North and East Bay Region
	South and West Bay Region
	San Francisco County
Central Valley Region	Central Valley Region
San Diego County	San Diego County
Capital Region	Capital Region
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 2018 TCAC regulations for a list of counties included in each geographic apportionment. The Taskforce intends to update the data contained within the mapping tool annually, as well as review the mapping methodology to make improvements over time.

IDENTIFYING AND CATEGORIZING OPPORTUNITY IN RURAL TRACTS

To capture the diverse array of rural communities across the state--both within and outside of designated metropolitan statistical areas--the Taskforce took a three-tiered approach to identifying rural census tracts. For mapping purposes, tracts that fall in the "Rural Areas" category include:

1. All tracts located in the following 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. Butte, Shasta, Sutter, and Yuba Counties;
3. Any other non-urbanized tract that has 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 falling within the "Rural Areas" designation. Beyond those counties, the Taskforce 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 block boundaries to identify what share of the population within a census tract falls within the rural area.[1] If at least 50 percent of a census 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 tracts that fall within the rural areas designation, the maps take a slightly different approach to allocating resource categories. Because rural areas span the state (including both poorer and wealthier regions), tracts within the rural area designation are ranked in comparison to other tracts within the same county. The tool follows the same approach but scaled to the county-level. This means that each county in rural areas ends up with 40 percent of its rural tracts as "Highest" or "High" resource.

Part III: Overview of Indicators

PROCESS FOR SELECTING INDICATORS

Indicators are numerical representations of neighborhood conditions. The Taskforce had an extensive process for determining which indicators should be included in this index, and met several times to draft and finalize a list of indicators. Indicators were selected based on a rigorous quantitative analysis of their utility and 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 receives a score for each indicator, except where data is missing.[2] 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. Alone, indicators have a relatively small impact on the complete tract index score, so for example, a single indicator with a very high positive score in a tract with many indicators with low scores will not be enough to change the tract's designation from low resource to high resource.

See Table A for the full list of indicators.

Table A: Full List of Indicators and Filters				
Domain	**Indicator**	**Measure**	**Data Source**	**Table**
Economic	**Poverty**	Percent of population with income above 200% of federal poverty line	2012-2016 ACS	Table S1701
	Adult Education	Percent of adults with a bachelor's degree or above	2012-2016 ACS	Table S1501
	Employment	Percent of adults aged 20-59 who are employed in the civilian labor force or in the armed forces	2012-2016 ACS	Table B23001
	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	2015 LEHD LODES	Origin-Destination and Workplace Area Characteristics Tables
	Median Home Value	Value of owner-occupied units	2012-2016 ACS	Table B25077
Environment	**CalEnviroScreen 3.0 indicators**	CalEnviroScreen 3.0 Pollution indicators (Exposures and Environmental Effect indicators)and processed values	CalEnviroScreen 3.0	Variables: Ozone, PM2.5, Diesel PM, Drinking Water, Pesticides, Tox. Release, Traffic, 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	2015-2016 California Department of Education (DOE)	

	Reading proficiency	Percentage of 4th graders who meet or exceed literacy standards	2015-2016 CA DOE	
	High school graduation rates	Percentage of high school cohort that graduated on time	2015-2016 CA DOE	
	Student poverty rate	Percent of students not receiving free or reduced-price lunch	2017-2018 CA DOE	
		Measure	**Data Source**	
Filter	**Poverty and Racial Segregation**	Poverty: Tracts with at least 30% of the population falling under the federal poverty line Racial Segregation: Tracts with a racial Location Quotient of higher than 1.25 for Blacks, Hispanics, Asians, or all people of color in comparison to the county	2012-2016 ACS Estimate 2010 Decennial Census	ACS Table S1701 Census Table SF1DP1

ECONOMICS DOMAIN

Poverty Indicator

Tract-level poverty rate is a widely accepted indicator of a neighborhood's level of resources, risk, and opportunity. Living in high-poverty neighborhoods 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 neighborhoods 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.[3, 4]

In this instance, the Taskforce 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 residents who live above 200 percent of the federal poverty line.[5]

Adult Education Indicator

Higher rates of post-secondary attainment are predictive of higher wages and improved work opportunities for adults, meaning that families are less likely to be economically insecure.[6] 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.[7] 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.[8]

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

Employment Indicator

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.[9] Neighborhoods with low levels of employment see outcomes similar to those with high poverty rates, including poor health outcomes, low birthweight babies, and violent crime.[10]

The employment rate was calculated as the percent of individuals 20-59 who are employed in either the civilian labor force or the armed forces. The Taskforce 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--and particularly to jobs that may be accessible to a low-wage or low- to moderate-skill worker--is an important neighborhood attribute according to the "spatial mismatch hypothesis," which maintains that communities 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."[11, 12] Proximity to a larger number of low- and mid-skill jobs is therefore a positive indicator of opportunity.

This indicator was calculated in two stages. The first stage uses Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics (LEHD-LODES) data from 2015 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 Taskforce 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 2015 (in Miles)**
Capital and Northern Region	8.8
Central Coast Region	10.2
Central Valley Region	7.3
Inland Empire Region	14.6
Los Angeles Region	8.5
Orange County Region	9.6
Average for Rural Areas[1]	15.3
San Diego Region	9.5
San Francisco Bay Area Region	8.8

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. 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

[1] The median distance traveled by low-wage workers is calculated at the county-level in rural areas.

demonstrated a link between school quality and house prices.[13] Conversely, disruption of schools (such as school closings and redistricting) can be reflected in declining home values.[14] Crime, too, has been shown to negatively impact house prices, especially the prevalence of violent crime.[15] 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.[16],[17],[18] 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 QUALITY DOMAIN

The environmental quality domain relies on twelve of the indicators that are used in CalEnviroScreen 3.0 under the "exposures" and "environmental effect" subcomponents of the "pollution burden" domain:

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

CalEnviroScreen 3.0 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 3.0 was developed primarily to support the Affordable Housing and Sustainable Communities program, 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 3.0, see the California Office of Environmental Health Hazard Assessment website.

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 good proxies for the level of resources and opportunity during early childhood both in local schools and more broadly in communities.[19] 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.[20, 21] Further, test scores and other measures of school quality are highly correlated with upward mobility for low-income children.[22] Proficiency on elementary school-age standardized tests is also a strong predictor of whether individual children will eventually graduate high school,[23] which itself is associated with higher long-term earnings and other social benefits compared to dropping out.[24]

"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 Taskforce utilized the average value from three schools because our 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.[25]

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.[26, 27] 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.[28]

The high school graduation rate indicator is measured using California Department of Education data on the percent of students who graduate in four years.[29] The data is reported at the school district level; school districts graduation rates are then apportioned to census tracts using a "crosswalk" tool. As with all of the education indicators, there is a possibility that students who

live in a given census tract will attend a school that is outside of their district. Additionally, district-level rates may obscure differences in graduation rates across schools.

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.[30] One recent study concluded 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.[31] 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.[32]

As with the math and reading proficiency indicators, the Taskforce 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 neighborhoods in each region that are the most racially segregated and poverty concentrated. The use of a filter is grounded in the guiding policy goals of the tool: to avoid further segregation 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 areas 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).[33] A large body of "neighborhood effects" research has consistently shown that living in these neighborhoods has independent, harmful effects—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.[34] Beyond disparities in rates of chronic diseases, even the acuity of the same disease can vary significantly by the level of neighborhood poverty.[35] Further, some negative effects of racial segregation hold even when controlling for neighborhood poverty rates and family income.[36]

Applying a 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 assumes that all areas which are more than 50 percent non-white are areas of racial or ethnic concentration[37]--does not effectively reflect California's racial and ethnic diversity.

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

Concentrated Poverty: First, the filter identifies neighborhoods where at least 30 percent of the population is living below the poverty line. Research has found that the impact of neighborhood poverty rates in producing negative outcomes for individuals--including crime, school leaving, and duration of poverty spells--begin to appear after a neighborhood exceeds about 20 percent poverty, whereupon the externality effects grow rapidly until the neighborhood reaches approximately 40 percent poverty. Similarly, analysis of this "threshold" notion has found that a neighborhood poverty rate below 15 percent has no effect on opportunity indicators such as the employment rate.[38] The total population living in neighborhoods of extreme poverty declined in the 1990s, following government action designed to affirmatively counteract intentionally segregationist public policy.[39]Following national trends, however, concentrated poverty has risen dramatically in California since 2000.[40]

Residential Segregation: Second, the filter relies on a measure of residential segregation to capture which neighborhoods have a disproportionate share of minority households. 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[41] 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.[42] It can be used to examine, for example, the linkages between residential segregation and public health outcomes.[43] The LQ is a small-area measure of relative segregation calculated at the residential census tract level. It is a relatively simple and intuitive representation of how much more segregated a person's neighborhood (census tract) is relative to the larger overall metropolitan area (or in this case, county).[44] For the filter, tracts that have a LQ higher than 1.25 for Blacks, Hispanics, Asians, or all people of color are flagged as being racially segregated in comparison to the county.

Census tracts 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.

For more technical questions on the mapping tool's methodology, please contact equity_metrics_program@berkeley.edu.

Endnotes

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

[2] In addition to instances where estimates were not reported or were missing at the tract level, the Taskforce 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. 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.

[3] 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.*

[4] 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

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

[6] See Bureau of Labor Statistics (2016), "Unemployment Rates and Educational Attainment." Accessed at https://www.bls.gov/emp/ep_chart_001.htm

[7] For a full review of the literature on how living in neighborhoods with high socio-economic statuses and/or high adult education rates, see Leventhal, T., & Brooks-Gunn, J. (2000). The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin*, *126*(2), 309–337. https://doi.org/10.1037//0033-2909.126.2.309

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