

TRANSPORTATION SYSTEM
PUBLIC HEALTH

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS



TECHNICAL REPORT

AS ADOPTED ON MAY 7, 2020

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EXECUTIVE SUMMARY

The six-county SCAG region is home to a diverse population and a variety of built and natural environments. With this diversity comes a wide range of health outcomes and challenges, but also opportunities to plan for healthy communities and to prioritize policies that support healthy outcomes for people of all ages and socioeconomic backgrounds. As the Metropolitan Planning Organization (MPO) responsible for developing the Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS), or “Connect SoCal”, the Southern California Association of Governments (SCAG) has an opportunity to highlight current health outcomes, trends and identify health outcomes that may be impacted by Connect SoCal.

The Public Health Technical Report to Connect SoCal presents an overview of health outcomes in the SCAG region as they relate to the built environment and the plan’s impacts. The multimodal transportation and land use strategies of Connect SoCal include many co-benefits for improving health outcomes and present opportunities to ensure investments result in equitable health outcomes and benefit all populations in the region.

SCAG has conducted a continuous stakeholder engagement and input process since the adoption of the 2016 RTP/SCS. Through this process, SCAG has adopted seven priority focus areas to analyze public health outcomes, expanded analysis related to affordable housing, climate change, and health equity, and integrated Environmental Justice analysis into the public health analysis of Connect SoCal. The health focus areas of Connect SoCal relate to the Social Determinants of Health, or the circumstances in which people are born,

live, work, play and age. The Office of Disease Prevention and Health Promotion organizes the SDOH into five areas: 1. Social and Community Context; 2. Health and Health Care; 3. Economic Stability; 4. Education; and, 5. Neighborhood and Built Environment. As illustrated in **FIGURE 1**, SCAG has adopted these focus areas and included a focus of health equity and integrated the areas of education and economic stability. The public health focus areas of Connect SoCal include the following:

- Access to Essential Services
- Affordable Housing
- Air Quality
- Climate Change
- Economic Opportunity
- Physical Activity
- Transportation Safety

The implementation of Connect SoCal is expected to improve public health outcomes across the region, support the region's economy and improve the quality of life for all. Health care expenditures are a significant burden on the SCAG region. If current trends remain constant, the region is anticipated to spend over \$17 billion in 2045 on health care expenditures related to just three chronic diseases for the adult population. These include, high blood pressure, heart disease and type 2 diabetes. Through implementation of Connect SoCal, the SCAG region is anticipated to save millions in direct and indirect health care expenditures through reducing rates of chronic disease, resulting in a healthier and more productive region. With the implementation of Connect SoCal, the region will save over \$346 million per year on health care expenditures through reducing over 44,000 combined cases of high blood pressure, heart disease and type 2 diabetes. This includes approximately \$104 million saved indirectly through gains in productivity from a healthier workforce.

Through improvements in air quality, the amount of air pollution-related health incidences in the region are expected to decrease by approximately 10,300 incidences annually, while total costs are expected to decrease by over \$180 million annually. Through a combination of land use and multimodal

transportation strategies, CO₂ emissions from transportation are expected to decrease by over 4 percent. PM₁₀ criteria pollutants are expected to decrease 4.1 percent and PM_{2.5} is expected to decrease 3.9 percent from Baseline to Plan, which will result in improved health outcomes and especially improve cases of chronic diseases such as asthma.

In addition to the health care savings, accessibility to jobs is expected to improve, with the average commute time expected to decrease. The Baseline scenario reflects a future assuming already in-the-ground transportation facilities, the implementation of transportation projects currently undergoing construction and right-of-way acquisition, and current land use trends carried forward. Between Baseline and Plan, there is expected to be nearly 10 percent time savings in trips via vehicle and approximately 2 percent time savings in transit trips. By investing in active transportation, mode share in bicycle travel is expected to increase 23.5 percent for all bicycling trips, and over 11.5 percent for all walking trips. Through Plan implementation, 14.3 percent of all commute trips and 41.4 percent of non-commute trips will be less than three miles. With an average walking trip length of about 1.7 miles and bicycling trip length of 2.8 miles, there is significant opportunity to increase active transportation and expand opportunities for physical activity in the region.

Connect SoCal presents many opportunities to enhance our regional transportation system, promote and encourage siting housing in compact, walkable neighborhoods, encourage use of active transportation, improve access to transit, and reduce criteria pollutants and greenhouse gas emissions. By working with local partners and jurisdictions, implementation of Connect SoCal will improve air quality, reduce health care expenditures and increase opportunities for active transportation to improve health outcomes in the region. Through coordinated land use and multimodal transportation strategies, Connect SoCal improves public health outcomes and fosters a greater quality of life for all.

INTRODUCTION

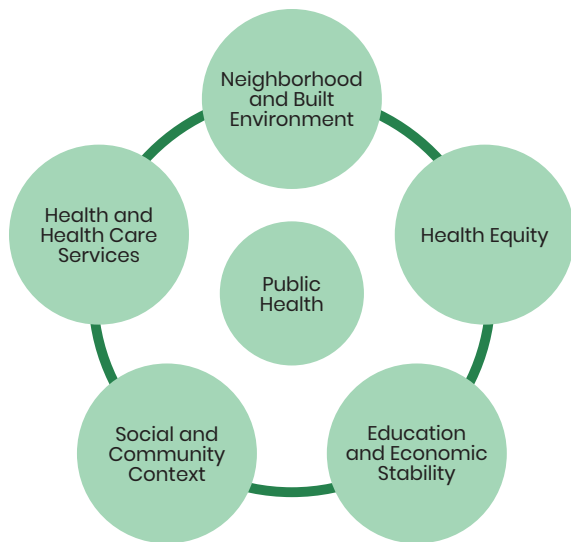
A growing body of research has established a significant link between public health outcomes and built environment characteristics. The way in which

communities are designed impacts the likelihood of active travel, healthy food access, exposure to air pollutants and access to parks and open space, and has a direct impact on opportunities for physical activity and reductions in chronic disease, as illustrated in **FIGURE 2**. Residents of the SCAG region are affected daily by the planning and policy choices that shape their surroundings and influence their opportunities to access essential destinations. Every four years, SCAG develops the RTP/SCS, a long-range transportation plan that provides a vision for transportation investments and land use strategies throughout the region over a 25-year period. The RTP/SCS considers the role of transportation and land use in the broader context of economic, environmental, and quality-of-life goals for the future, identifying regional transportation strategies to address the region's mobility needs.

VISION AND PURPOSE

The impact of transportation and land use on public health outcomes is

FIGURE 1 Social Determinants of Health

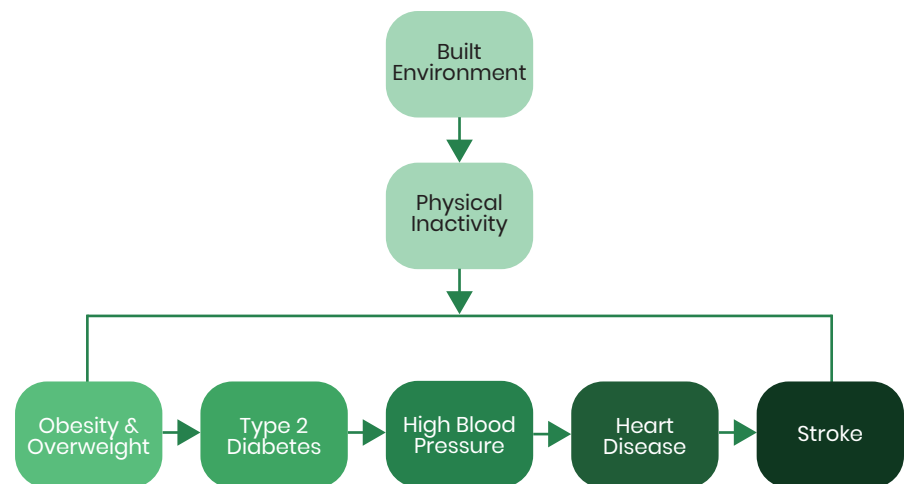


Source: *Social Determinants of Health, Healthy People 2020, Office of Disease Prevention and Health Promotion*

increasingly recognized by health professionals, transportation providers, and planners alike. Transportation providers and land use planning agencies have historically engaged in improving air quality and safety, which have a direct impact on public health outcomes. In the past decade, the understanding of the relationship between transportation, land use and health outcomes has expanded to include a broader acceptance of the impacts these relationships have on community health outcomes, health disparities, and equity considerations to assess a widening gap between different communities. SCAG's public health analysis promotes the integration of health into land use and transportation planning to shift the region towards improving health outcomes by planning for healthier communities. The report analyzes the public health impacts of Connect SoCal with a focus on how the plan affects health outcomes both across the region as a whole and within disadvantaged and vulnerable communities.

For Connect SoCal, SCAG has refined its public health guiding strategies and built upon strategies for local jurisdictions to encourage implementation of the

FIGURE 2 Built Environment and Physical Inactivity Health Outcomes



Source: *California Public Health Assessment Model (CPHAM), SCAG Scenario Planning Model*

Plan and promote best practices for public health. The work plan and strategies are expanded upon in the Plan Performance section of this report. To connect the goals of Connect SoCal, SCAG has identified how each goal supports the seven public health focus areas, as shown in **TABLE 1**.

DEFINING PUBLIC HEALTH

Public health outcomes are understood to be the product of the Social Determinants of Health (SDOH), or the circumstances in which people are

born, live, work, play and age. Economic opportunities, government policies and the built environment all play a role in shaping these circumstances and influencing public health outcomes. Efforts to improve public health seek to prevent disease and injury while promoting health and prolonging life among the population as a whole rather than treating a particular disease. Importantly, many public health outcomes are influenced by agencies that do not have public health as a core mission, such as transportation and land use planning agencies.

TABLE 1 Connect SoCal Goals and Public Health Focus Areas

| | Connect SoCal Goals | Accessibility to Essential Services | Affordable Housing | Air Quality | Climate Adaptation | Economic Opportunity | Physical Activity | Transportation Safety |
|----|---|-------------------------------------|--------------------|-------------|--------------------|----------------------|-------------------|-----------------------|
| 1 | Encourage regional economic prosperity and global competitiveness | | | | | X | | |
| 2 | Improve mobility, accessibility, reliability, and travel safety for people and goods | X | | | | X | X | X |
| 3 | Enhance the preservation, security, and resilience of the regional transportation system | X | | X | X | X | X | X |
| 4 | Increase person and goods throughput and travel choices within the transportation system | X | | X | | | X | X |
| 5 | Reduce greenhouse gas emissions and improve air quality | | | X | X | | | |
| 6 | Support healthy and equitable communities | X | X | X | X | X | X | X |
| 7 | Adapt to a changing climate and support an integrated regional development pattern and transportation network | X | | X | X | | | |
| 8 | Leverage new transportation technologies and data-driven solutions that result in more efficient travel | X | | X | X | X | | |
| 9 | Encourage development of diverse housing types in areas well supported by multiple transportation options | X | X | X | | | | |
| 10 | Promote conservation of natural and agricultural lands and restoration of critical habitats | | | X | X | | | |

Source: SCAG, 2019

SCAG analyzes the health impacts of Connect SoCal in areas where there is significant evidence to support the connection to the built environment and how health outcomes are shaped by regional planning and transportation investments. Within each of these focus areas, SCAG has integrated indicators, SCAG performance measures and Environmental Justice performance measures, to support health equity analysis in order to provide a better understanding of health outcomes and disparities in the region. The SDOH framework helps to clearly define the relationship between SCAG’s regional planning activities and health outcomes. The seven public health focus areas used in Connect SoCal are access to essential services, affordable housing, air quality, climate change, economic opportunity, physical activity and transportation safety.

In addition to SDOH, SCAG will continue its use of the Health in All Policies Framework (HiAP) which provides a strong foundation for working with health stakeholders and ensuring broad participation in the plan’s development. Health in All Policies (HiAP) is a collaborative strategy that aims to improve public health outcomes by including health considerations in the decision-making process across sectors and policy areas. This approach supports inter-agency collaboration and ensures decision makers are informed to advance policies that improve the health of all people. Since the adoption of the 2016 RTP/SCS, SCAG has sought to address HiAP using three strategies:

STRATEGY 1 – LEADERSHIP AND COLLABORATION

Provide leadership to collaborate with regional partners (the county transportation commissions, the county and city departments of public health, sub-regional partners, health industry leaders, local cities and other local stakeholder groups) to measure and improve public health and health equity outcomes by increasing awareness of the relationship between the social determinants of health, health outcomes and the connections to the built environment throughout the region.

STRATEGY 2 – POLICY AND ANALYSIS

Develop and support regional policies through SCAG’s adopted “Health in All Policies” framework to facilitate equitable health outcomes for all residents of the SCAG region related to SCAGs core public health areas. SCAG will continue to provide data analysis focus on planning for healthy communities and improving well-being of individuals in the SCAG region.

STRATEGY 3 – REGIONAL SUPPORT

Provide support to regional partners and assist local agencies on the integration of health and health equity considerations into multimodal transportation, economic development, job creation and land use planning focusing on disadvantaged communities.

DEFINING HEALTH EQUITY

To respond to stakeholder input from the 2016 RTP/SCS, SCAG has developed a health equity framework to integrate equity into the public health analysis and to understand disparities in health outcomes across the region. To advance health equity in the SCAG region it is important to recognize the current and historical systemic factors associated with negative health outcomes and to create strategies aimed at improving these outcomes. This will require increased transportation options, the preservation of open spaces, promotion of equitable and sustainable affordable housing, and the enhancement of economic competitiveness. For Connect SoCal, SCAG has taken a deeper dive into the SDOH to explore health outcomes and how they vary across the region to give policy makers an enhanced understanding of current health disparities in the region.

Promoting health equity is key to addressing health issues that are the result of socioeconomic inequities and historic actions that have created disparities in land use and access to transportation networks.¹ According to the California

¹ Rudolph, L., Caplan, J., Ben-Moshe, K., & Dillon, L. (2013). Health in All Policies: A Guide for State and Local Governments.

Office of Health Equity (OHE), health equity is defined as: “Efforts to ensure that all people have full and equal access to opportunities that enable them to lead healthy lives.”² SCAG has adopted the OHE definition to define health equity at a regional level to provide a clear vision of how Connect SoCal may impact communities across the region.

OHE provides a framework for using the “Determinants of Equity,” which include the social, economic, geographic, political and environmental conditions that lead to the creation of a fair and just society.³ SCAG used this framework as a guide to integrate health equity into the Public Health Technical Report as well as the Environmental Justice analysis performed as part of Connect SoCal. Specifically, SCAG focused on the following areas:

- **Vulnerable Communities:** Including low-income, racial/ethnic groups, children, seniors, immigrants, and other vulnerable populations.
- **Vulnerable Places:** Communities with inequities or insufficient capacity to promote health and well-being of residents.

In developing the health equity components of the plan, SCAG has integrated these equity considerations with Environmental Justice analysis to provide a complete picture of how the plan affects low income, disadvantaged communities, and other environmental justice populations. This included analyzing health impacts of environmental justice communities to assess how health outcomes vary across the region through the implementation of the Plan compared to Baseline conditions. Coordinating these analyses allows SCAG to report on the environmental justice analysis through a health equity lens including the SDOH. The Environmental Justice Areas examined are defined as follows:

- **Environmental Justice Areas**
 - **Transportation Analysis Zones (TAZs)** with higher concentrations of disadvantaged communities populations OR low-income

2 California Department of Public Health Office of Health Equity (2015). Portrait of Promise: The California Statewide Plan to Promote Health and Mental Health Equity.
3 California Department of Public Health (2015). Office of Health Equity.

households as seen in the region as a whole.

- **SB 535 Disadvantaged Communities**
 - **Census tracts** where environmental exposure and sensitive populations are concentrated and show some of the highest vulnerabilities in the state as determined by CalEPA.
- **Communities of Concern**
 - **Census Designated Places (CDPs) and City of Los Angeles Community Planning Areas (CPAs)** with high concentrations of disadvantaged communities populations AND low income households that fall into the upper one-third of all communities in the SCAG region.

STRUCTURE OF THE TECHNICAL REPORT

In 2016, SCAG included for the first time a Public Health Appendix in the RTP/SCS that detailed base year health outcomes and plan performance measures, providing a resource for those interested in the Plan's impacts on public health outcomes. For Connect SoCal, SCAG utilized similar methodologies and policy frameworks, including the SDOH and Health in All Policies (HiAP). SCAG has expanded its analysis into three key areas based on stakeholder input since the last plan, including climate change, affordable housing, and health equity. SCAG has also included new indicators within existing focus areas to expand upon the base year analysis of current SDOH.

The report includes discussion of the regional context and significance of public health including state and national efforts to address the SDOH. To promote the implementation of Connect SoCal, SCAG has detailed a work plan and guiding strategies for actions SCAG and local partners can take to improve health outcomes in the region. SCAG has also highlighted initiatives across the region that are addressing health disparities and the SDOH at the local and regional levels.

During the development of Connect SoCal, SCAG utilized a HiAP framework when conducting outreach and working with partners. This means that SCAG sought out direct engagement with health departments and other

health stakeholders such as health care agencies and community based organizations in addition to its more traditional transportation stakeholders in the development of the plan. Likewise, SCAG took into account recent developments in health related planning and policy from local, state and federal planning contexts.

SCAG has adopted the following framework to present public health analysis in the report:

- Analysis of the public health impacts of Connect SoCal is targeted to focus areas where there is research to support the relationship between public health outcomes and the built environment, including transportation investments and land use strategies.
- SCAG identified seven focus areas and developed a series of indicators to target specific issue areas related to the built environment and reports on the county-level and regional-level to allow for comparison between the Baseline and Plan.
- SCAG compiled the plan performance measures and Environmental Justice performance measures that relate to each focus area. The reporting of the metrics is not weighted or presented in a manner that would prioritize one focus area over another.

REGIONAL SIGNIFICANCE

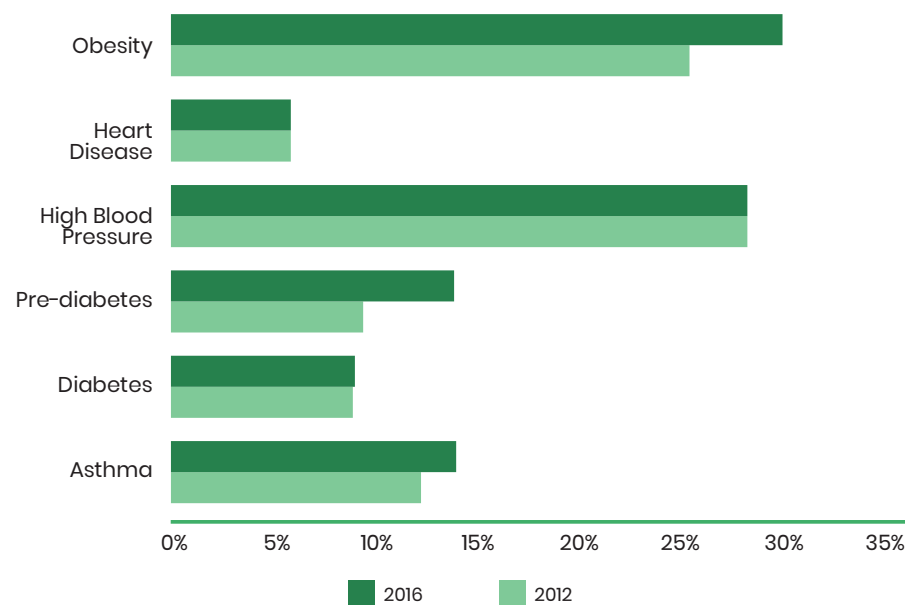
Across the SCAG region, health outcomes continue to vary widely by geography influenced by the SDOH. Public health outcomes in the 4-year period from 2012 to 2016, the base years of the 2016 RTP/SCS and Connect SoCal, have largely worsened or remained constant across the SCAG region, as shown in **FIGURE 3**. Similarly, life expectancy within the region continues to vary widely from 68.8 to 93.3 years depending on where people live, as shown in **EXHIBIT 1**. Health care expenditures continue to be a large burden on the regional economy, with over \$12.8 billion spent in 2016 on health expenditures for just three chronic diseases, including high blood pressure, heart disease and type 2 diabetes for the adult population. Emerging issues in the region, such as shifts in demographics, population growth, affordable housing, climate change, new

technologies, and other mobility challenges, will continue to affect public health outcomes for years to come.

Based on stakeholder input from the 2016 RTP/SCS, one of the most pressing issues related to public health in the region are health inequities and disparities in health outcomes. Research from the Sustainable Communities Learning Network has determined that healthy communities are a result of, “regional patterns of growth, change, and investment and are subject to metropolitan trends in transportation, air and water quality, energy use, business and employment and other factors.”⁴

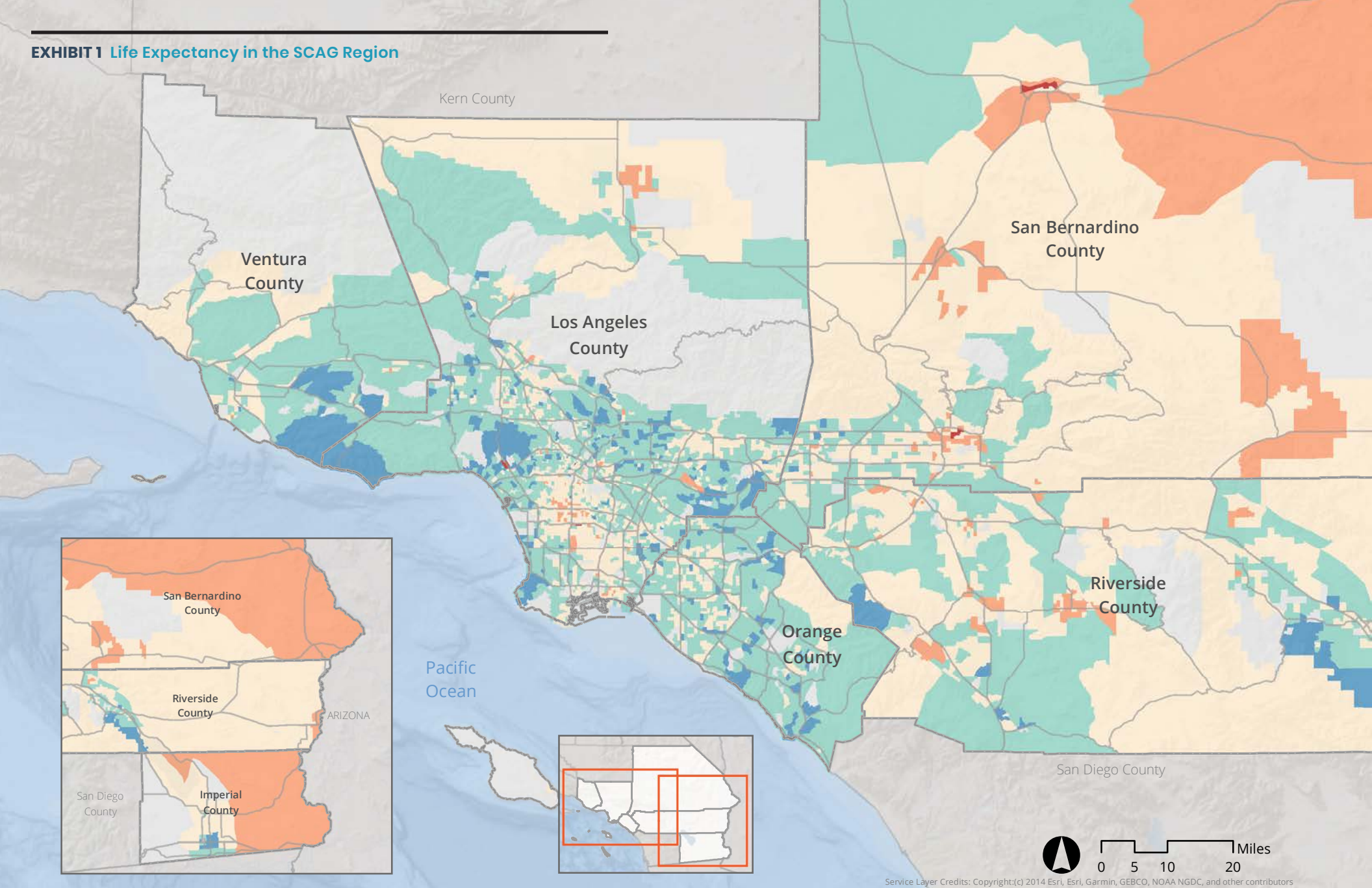
4 Rubin, Victor. PolicyLink. (2015). Sustainable Communities Series Regional Planning for Health Equity.

FIGURE 3 Chronic Diseases in the SCAG Region, 2012–2016



Source: California Health Interview Survey (CHIS) 2012, 2016

EXHIBIT 1 Life Expectancy in the SCAG Region



Life Expectancy at Birth



Source: CDC, USALEEP, 2015

LOCAL CONTEXT

Many local jurisdictions have started to take action by adopting Healthy City resolutions or ordinances to guide health assessment and integration of health into local and regional planning. Based on data from SCAG's Bottom-Up Local Input and Envisioning process, which conducted outreach to all 197 of SCAG's local jurisdictions from October 2017 to July 2018, 25 percent of jurisdictions in the region have adopted a Healthy City resolution or ordinance. Local jurisdictions are also incorporating health in all policies, health equity, and analysis of the social determinants of health into planning practices.

In the region, 19 percent of jurisdictions have adopted a Health in All Policies approach, 17 percent are analyzing health equity and 18 percent are analyzing the social determinants of health. Local jurisdictions have also begun to adopt Climate Action Plans addressing the impacts of health on the effects of climate change, with 52 percent of jurisdictions in the region adopting Climate Action Plans.⁵ As health analysis continues to expand across the region, SCAG has the opportunity to encourage best practices and promote integration of health analysis with the built environment and planning practices. There are several local examples of initiatives at the city and county levels to support adoption of Healthy City Resolutions and incorporating health elements and analysis into General Plans. One example of a local best practice is the work being done by the **Riverside University Health System – Public Health (RUHS-PH) Healthy Cities Network**. RUHS-PH established the initiative to advance the County's efforts of working with local cities to adopt Healthy City resolutions, Healthy Eating and Active Living (H.E.A.L.) resolutions and to encourage the incorporation of health elements in general plans. The Healthy Cities Network has also established community profiles and fact sheets providing city level data summaries. Since the inception of the initiative, over 27 jurisdictions in the county have adopted a health element, established H.E.A.L resolutions or have a health element in progress.⁶ **San Bernardino County Community Vital Signs** is an initiative to support the Wellness Element in the Countywide

Vision Plan. The initiative is guided by the San Bernardino County Community Transformation Plan, a county-wide plan that includes an analysis of the SDOH. The Vital Signs initiative established a community health improvement framework to align resources and improve health outcomes.⁷

As the SCAG region continues to grow the region will face a variety of public health related challenges. Despite an expectation of slower growth than in previous periods, the population of the SCAG region in 2045 will be older and will continue to be among the most diverse in the nation. In 2017, 30 percent of the region's population was born outside of the United States while 50 percent spoke a language other than English at home. The most notable expected change will be in the age distribution of the population. The median age in the SCAG region grew from 32.3 in 2000 to 35.9 in 2016 and is expected to rise to 39.7 by 2045. Meanwhile, a higher share of the population will be adults aged over 65. This share has risen from 9.9 percent in 2000 to 13.3 percent in 2016 and is expected to increase to 20.6 percent in 2045. As a result, the number of individuals aged 16 to 64 per individuals aged 65 and over decreased from 6.5 in 2000 to 5.0 in 2016, and is expected to be 3.0 in 2045. Recent surveys from the American Association of Retired Persons (AARP) have indicated that the vast majority of older adults will prefer to age in place rather than move into a smaller dwelling unit or group housing, which signals an increased need to plan for a walkable and compact urban environment to support healthy aging in place.⁸ Additional detail can be found in the Demographics and Growth Forecast Technical Report.

REGULATORY FRAMEWORK

Considering these challenges, there is a need to address the ways in which local jurisdictions are analyzing public health within planning and the significance of including health in the planning process from a national,

5 SCAG Bottom-Up Local Input and Envisioning Process

6 Riverside University Health System Public Health. (2017) Healthy Cities Network.

7 San Bernardino County. (2013) Community Vital Signs Final Report.

8 Binette, Joanne and Kerri Vasold (2018) 2018 Home and Community Preferences: A National Survey of Adults Age 18-Plus.

state and regional perspective.⁹ This section details the national, state and local context within which SCAG has developed Connect SoCal and provides insights on opportunities and challenges the region is likely to expect over the coming years.

NATIONAL CONTEXT

Overall, when compared to national trends, the SCAG region is generally performing better on the incorporation of health analysis and health tools into planning processes.

Based on a national survey conducted by the American Planning Association (APA), approximately 27 percent of jurisdictions have reported their adopted comprehensive plans address public health. When looking at sustainability plans nationwide, only 3 percent of jurisdictions have reported their adopted sustainability plans address public health. Among jurisdictions who have adopted health into comprehensive plans, the top 10 issues addressed include active living, environmental exposures, emergency preparedness, recreation, public safety, clean water, active transportation, clean air, physical activity and aging.¹⁰ The use of health data collection tools was low among respondents, with approximately 4 percent of respondents reporting they use health tools, such as health impact assessments, to identify public health issues.

Based on the national survey data, trends suggest an increased awareness of the connections among the built environment and public health in comprehensive planning. The issue of active living was the strongest represented and included the highest prevalence of goals and policies across plans, with environmental exposures and emergency preparedness policies as second and third most represented. While the incorporation of public health within the plans varied, those that include a standalone Public Health Element included stronger analysis than those that integrated health throughout the plan.

9 Ricklin, A., et al. (2012). Healthy Planning: an evaluation of comprehensive and sustainability plans addressing public health.
10 APA. Planning and Health Community Research Centers.

The American Public Health Association (APHA) serves as a national resource for public health research on issues such as environmental health, climate change, health equity and other emerging topics. In 2018, APHA adopted national policy statements, which include goals such as advancing health equity and supporting food security. In 2017, APHA released a report which outlines how MPOs, such as SCAG, can partner with public health practitioners to advance healthy communities, which includes a core recommendation to integrate public health data into the scenario planning modeling processes.¹¹

Healthy People 2020 and the **Healthy People 2030 Framework** address issues of health equity across the nation by tracking and providing interactive data tools relating to rates of illness, death, chronic conditions, behaviors and other types of outcomes in relation to demographic factors including race and ethnicity, gender, disability status or special health care needs, and geographic location (rural and urban).

The Federal Highway Administration (FHWA) has embraced the link between transportation and health, and has developed tools to help MPOs and other agencies integrate public health into their planning activities.¹² This framework includes definitions of the social determinants of health and health equity. It also includes a step by step process to guide planners as they move through the implementation process.

The National Parks Service (NPS) released the Healthy Parks Healthy People 2.0 Strategy Plan, serving as a framework for connecting parks to health and well-being. Established in 2011, Healthy Parks Healthy People promotes all parks and public lands as physical, mental, and social health resources for communities.¹³ NPS outlines eleven ways for collaboration, ranging from supporting community engagement, technology tools, and improving local access to parks and urban green spaces.

11 American Public Health Association (APHA)

12 U.S. Department of Transportation. (n.d). Federal Highway Administration. Health in Transportation Corridor Planning Framework.

13 U.S. Department of the Interior. Natural Park Service. (2018). Healthy Parks Healthy People 2018–2023 Strategic Plan.

The **American Heart Association** released the American Heart Association Active Transportation Policy Statement in July, 2017, stating the association's commitment to equitable strategies to promote and improve active transportation for all Americans. The policy includes recommendations, research and resources to embed health within transportation policy to engage a wide range of stakeholders and address community planning, housing, gentrification, street scale–design, health equity, crime, and safety to improve health outcomes.

STATE CONTEXT

There have been several recent initiatives and partnerships since the adoption of the 2016 RTP/SCS at the state level to support and advance public health outcomes. **The Health in All Policies (HiAP) Task Force**, a project of the Strategic Growth Council, brings together over 20 agencies and departments. The HiAP Task Force continues to support collaboration on health related outcomes and move forward a range of health initiatives across the state. The Task Force has published a number of new action plans identifying actions state agencies can take to implement solutions that will improve health across the state, including the, *Equity in Government Practices Action Plan*^{14,15} and the *Land Use, Schools, and Health Work Group 2016–2018 Action Report*.¹⁶

The Office of Health Equity (OHE) has moved forward with the implementation of the, *Portrait of Promise: The California Statewide Plan to Promote Health and Mental Health Equity*.¹⁷ Example action items include advancing climate change and health equity research,¹⁸ supporting the California Building Resilience Against Climate Effects (CalBRACE) Framework through research, and publishing new reports such as, *Safeguarding California: Implementation Action Plan – Public Health Sector Plan*.¹⁹ The goals

of the CalBRACE project are to enhance the California Department of Public Health's (CDPH) capability to plan for and reduce health risks associated with climate change by developing climate change and health indicators to better understand the people and places that are most susceptible to adverse health impacts associated with climate change, specifically extreme heat, wildfire, sea level rise, drought and poor air quality.²⁰

CalEnviroScreen 3.0, released on behalf of the California Environmental Protection Agency (CalEPA), incorporates recent data for nearly all indicators better reflect environmental conditions or a population's vulnerability to environmental pollutants.²¹

The California Healthy Places Index (HPI) is a data visualization tool, developed by the Public Health Alliance of Southern California to assist communities in exploring local factors that measure life expectancy and compares health outcomes across the state. The HPI provides indexed scores (See **EXHIBIT 2**) as well as more detailed data on specific policy action areas that shape health, including housing, transportation and education.²²

The 2017 Regional Transportation Plan Guidelines for Metropolitan Planning Organizations, released by the California Transportation Commission (CTC), provides guidance for MPOs when preparing their RTP/SCSs, including promoting public health and health equity as well as an appendix that details policies and examples from MPOs across the state.

The 2017 State of California General Plan Guidelines, published by the Office of Planning and Research (OPR), provides guidance to local jurisdictions when they are updating their General Plans. The updated guidelines contain new requirements and guidance relating to public health, health equity and the built environment. OPR also provides additional guidance on planning for healthy communities and how to integrate health into the General Plans. This includes incorporating health as a separate element, as an integrated approach

14 Health in All Policies Task Force (2018). Equity in Government Practices Action Plan.

15 California Strategic Growth Council. (2018). HiAP Task Force Action Plans and Reports.

16 Health in All Policies Task Force. (2018). Land Use, Schools and Health Work Group 2016–2018 Action Report.

17 California Department of Public Health. (2015). Portrait of Promise: The California Statewide Plan to Promote Health and Mental Health Equity.

18 California Department of Public Health. (2018). Climate Change & Health Equity Program (CCHPEP).

19 California Natural Resources Agency. (n.d). Safeguarding California: Implementation Action Plans. Public Health Sector Plan.

20 California Department of Public Health. (2017). California Building Resilience Against Climate Effects (CalBRACE). CalBRACE–2017 Climate Change and Health Profile Reports.

21 Office of Environmental Health Hazard Assessment (OEHHA). (2018). CalEnviroScreen 3.0.

22 Public Health Alliance of Southern California. (2018). California Healthy Places Index.

woven across multiple elements, or as a hybrid approach that weaves health throughout the General Plan.²³

California State Assembly Bill 441 (AB 441) requires the California Department of Transportation (Caltrans) Regional Transportation Plan (RTP) Guidelines to identify planning practices that promote health and well-being for Californians. AB 441 provides guidance for MPOs developing regional transportation plans to include programs, policies and practices that promote health and guidelines supporting analysis of aging populations, climate change and health equity.

ANALYTICAL APPROACH

Economic opportunities, government policies and the built environment all play a role in shaping circumstances and influencing public health outcomes. To address these SDOH, SCAG developed seven focus areas where there was significant evidence to establish the relationship between the built environment and public health outcomes. To select the focus areas and indicators, SCAG developed a comprehensive approach to categorize each of the indicators into the seven categories.

Access to Essential Services: Examines how the region's residents' access a variety of essential destinations, including open space, health care, and employment hubs. For residents of the SCAG region, other influences on health related to the built environment include the availability of and access of many essential services that cross sectors and require collaboration. These include:

- High-quality education
- Nutritious food
- Decent, safe, and affordable housing
- Affordable, reliable public transportation
- Culturally sensitive health care providers

- Clean water and clean air

Affordable Housing: Assesses residential infill development in relation to proximity to jobs and essential services in the region.

Air Quality: Analyzes criteria air pollutants such as ozone and fine particulate matter (PM_{2.5}) and greenhouse gas emissions such as carbon dioxide to assess public health impacts. Includes discussion of Vehicle Miles Traveled (VMT) per capita reductions to reduce exposure to air pollutant emissions through strategic land use and transportation decisions.

Climate Change: Examines impacts from climate change and discusses planning efforts to mitigate climate change impacts and create opportunities for regional resiliency to future climate changes with reductions in VMT per capita and greenhouse gas emissions.

Economic Opportunity: Discusses economic impacts on quality of life to support economic activity and vitality by providing regional competitiveness and job creation through the construction of transportation projects and maintenance of the existing regional transportation systems.

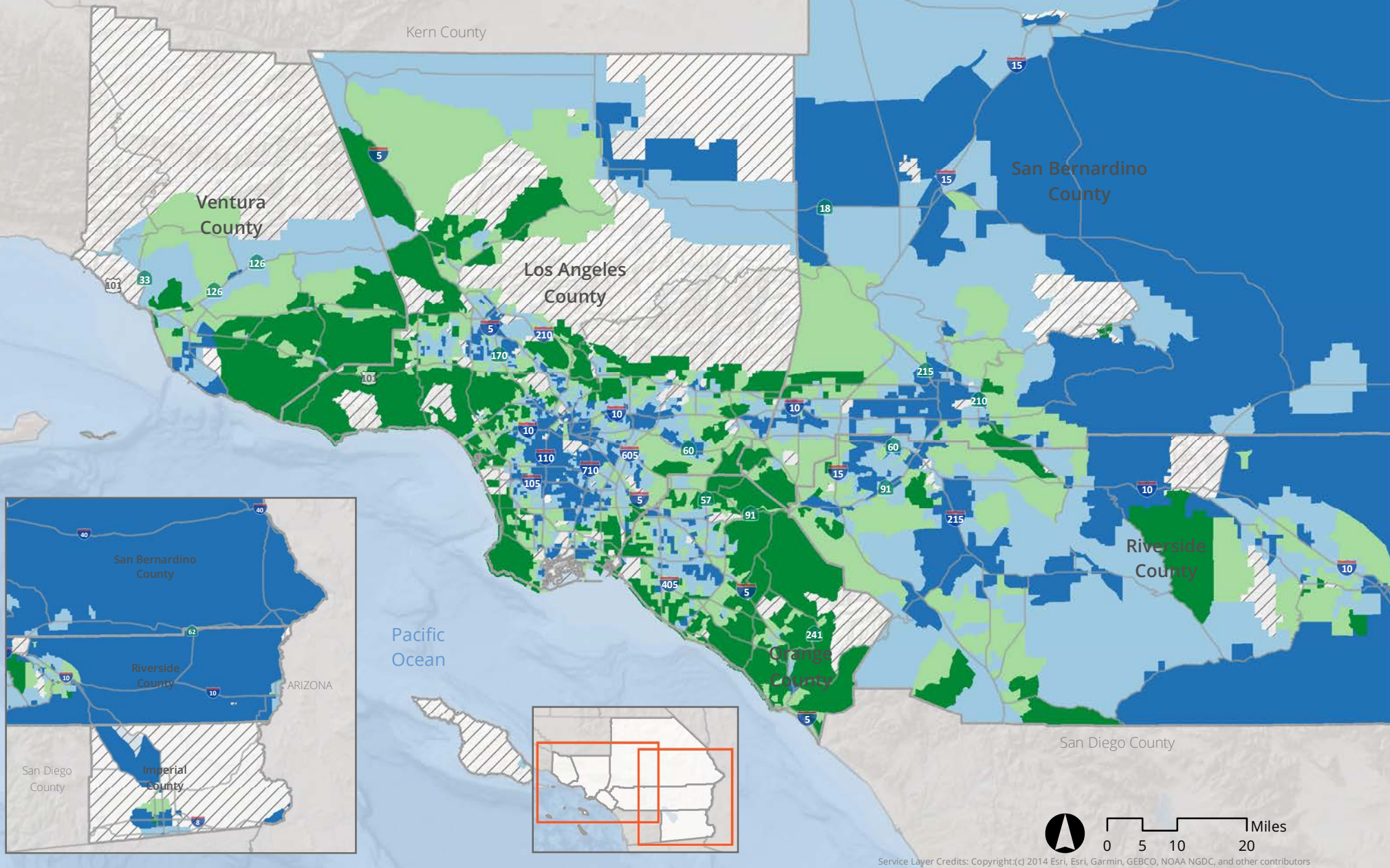
Physical Activity: Examines rates of physical activity in the region and provides discussion of access to transit, improved conditions for walking and bicycling, improved access to parks, and compact development and land use patterns to encouraged increased physical activity.

Transportation Safety: Discusses rates of transportation-related collisions and regional efforts to promote transportation safety with increased rates of transit, walkable and bike-able neighborhoods, and improvements to the regional roadway network to encourage and support safe streets for all ages and abilities.

The seven focus areas selected by SCAG were developed through stakeholder input based on the connection in the research to transportation and land use. On a quarterly basis, SCAG convenes the Public Health Working Group which includes county health departments, regional public health organizations, community partners, city planning staff and the general public. At these meetings, SCAG staff have presented the Public Health Framework, the guiding

²³ Governor's Office of Planning and Research. (2017). *General Plan Guidelines: 2017 Update*.

EXHIBIT 2 Healthy Places Index



| | | | | | |
|-------------------|-----------------|---------|-----------------------------|---------|----------|
| County Boundaries | City Boundaries | Freeway | HPI Score Percentile | 0 - 25 | 50 - 75 |
| | | | No Data Available | 25 - 50 | 75 - 100 |

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Source: Public Healthy Alliance of Southern California, 2017

document for integrating public health into Connect SoCal including public health indicators categorized into the seven SDOH focus areas. In addition to the public health working groups, SCAG has presented the Public Health Framework and focus areas to county working groups and meetings of public health leaders in the region to provide input on the framework and subsequent drafts of Connect SoCal. Based on the input from these stakeholders, SCAG finalized and adopted the framework and focus areas.

Data collected for the indicators was chosen based on the most recent available and reputable sources. Much of the data utilized for the report is from the US Census Bureau's American Community Survey, state and county public health departments, local government agencies, and/or universities; including UCLA's California Health Interview Survey (CHIS). These data sources come together to provide a rich information sources on public health outcomes in the region.

EXPANDED ANALYSIS AREAS FOR CONNECT SOCIAL

SCAG expanded the analysis from the 2016 RTP/SCS and conducted additional research on health equity, affordable housing, and climate change based on input from stakeholders and emerging trends in public health data. SCAG has also included several updated indicators to expand and build upon the focus areas as additional data and resources have become available. These updates can be summarized as follows:

Access to Essential Services: SCAG has renamed this section from "Access to Essential Destinations," to reflect advancements in technology that may make travel obsolete for specific services. The discussion incorporates an acknowledgement that access to technology is not always available and that transportation options will be necessary in situations where such trips are still required.

Affordable Housing: When the cost of housing is high, housing may become out of reach for many residents in the region. When looking at the costs of housing in relation to other expenses such as food, healthcare and other daily needs, many people make tradeoffs in expenditures they can control

which impact their health outcomes. SCAG is expanding the discussion of affordable housing in relation to health to support the framing of the plan's impact on health.

Climate Change: For Connect SoCal, SCAG has included an expanded explanation of the impacts that climate change is expected to have on health outcomes as well as presented expected climate change outcomes for our region that have been analyzed through state modeling efforts such as the CalBRACE county level Climate Change and Health Profile Reports.²⁴

Health Equity: As health disparities continue to exist in the region, SCAG is expanding on health equity analysis by integrating Environmental Justice data to analyze health disparities among Environmental Justice populations. This discussion will further the connection between health disparities and the built environment in disadvantaged communities. In addition, SCAG has identified available tools for local jurisdictions to conduct health equity analysis.

BASE YEAR INDICATORS AND MODELING EFFORTS

Connect SoCal relies on Base Year indicators and modeling outcomes to explore how the plan will influence the SDOH. Base Year Indicators provide context on health issues for which SCAG currently does not have the ability to model. Modeling outcomes discussed in this Technical Report were generated and modeled for the Performance Measure (Chapter 4) and Scenario Planning Process, as part of SCS. The base indicators and model outputs are consolidated in the Public Health Technical Report to provide stakeholders with a more comprehensive, "one-stop shop", for exploring the plan's impacts on SDOH.

Base Year Indicators: Since the development of the last plan, a wealth of new health data platforms have been developed. SCAG has expanded its narrative of

²⁴ California Department of Public Health. (2018). California Building Resilience Against Climate Effects (CalBRACE). CalBRACE-2017 Climate Change and Health Profile Reports.

the SDOH affected by the plan in Connect SoCal. To do this SCAG has provided additional data analysis across the region for a number of indicators. New tools such as the Healthy Places Index (HPI) provide a comprehensive list of additional indicators for the region, providing insights into health disparities caused by the SDOH. SCAG has reported on a variety of these indicators for the region as part of the base year conditions reporting.

Plan Performance Measures and Scenario Planning Outcomes: SCAG modeled the same health outcomes as in the previous cycle and improved the process where possible. Previous variables that were modeled include air quality impacts, using the California Air Resources Board Emissions Factor Model (EMFAC) and the Scenario Planning Model (SPM), physical activity outcomes (using the ABM, SPM, and active transportation off-model tools), chronic disease outcomes related to physical activity using the California Statewide Public Health Assessment Model (C-PHAM), which is integrated into the SPM, and economic outcomes related to health impacts, using the Regional Economic Model Inc. (REMI). In the last plan, the economic analysis did not include the benefits of reduced chronic disease rates from built environment improvements, but in Connect SoCal, SCAG has integrated new analysis methodologies completed after the last plan (see the Health Care Expenditures section for more information).²⁵

Scenario Planning Outreach: SCAG incorporated public health as a discussion topic throughout the scenario development and outreach process. This included providing base year health statistics and information on health disparities across the region.

DATA SOURCES

The Public Health Technical Report utilized data from a variety of data sources. Where possible the most recent data was used to give the most up to date information available on current trends and conditions.

²⁵ Southern California Association of Governments. (2016). Active Transportation Health and Economic Impact Survey.

The American Community Survey (ACS) provides data collected by the federal government through the census. A wide range of topics are discussed as part of this survey, such as housing characteristics, income profiles, and other population characteristics. For SCAG data collection purposes, the American Community Survey was the source of information for automobile access, median household income, insured status, educational attainment and home ownership.

The California Health Interview Survey (CHIS) provided information on chronic disease rates, mental health and lifestyle habits. CHIS is a yearly survey that collects self-reported health information and is a reputable source for county level data.

Comprehensive Housing Affordability Strategy (CHAS) data was collected for severe housing burden and is compiled from a custom composition of census data that pertains to housing aspects from the Department of Housing and Urban Development.

California Building Resilience Against Climate Effects (CalBRACE) climate change indicators are compiled from the data available from California Department of Public Health. Climate vulnerabilities are assessed and used to provide insights on the most pressing climate issues. Also from the California Department of Public Health are the county health profiles that provide information on leading causes of death for counties in California.

California Communities Environmental Health Screening Tool 3.0 (CalEnviroScreen 3.0) is published by the Office of Environmental Health Hazard Assessment. It is an index for the areas that are vulnerable from exposure to pollutants. From CalEnviroScreen SCAG looks at the overall percentile score, PM_{2.5} percentile and pollution burden percentile.

U.S. Small-area Life Expectancy Estimates Project (USALEEP) was used to collect data on life expectancy at birth values. Data comes from the Center for Disease Control and Prevention (CDC) using census tract level estimates.

EXISTING CONDITIONS

The prevalence of chronic diseases in the SCAG region has a significant impact on the daily lives of residents in our communities. Research from the U.S. Department of Health and Human Services shows that over 60 percent of health outcomes are linked to social and environmental factors, meaning that the SDOH are the largest contributors to health outcomes.²⁶ In addition to existing chronic disease rates, changes to the Southern California climate, health inequities and the lack of affordable housing will put more people at risk of poor public health outcomes. Likewise, societal issues such as poverty, access to essential services and transportation safety continue to be major public health drivers across the region. Negative health outcomes directly impact the daily lives of our residents, place a burden on our economy through reduced productivity and increased health care expenditures, and lead to elevated rates of premature death.

Southern California currently suffers from high rates of chronic diseases, as shown in **FIGURE 3**, such as asthma (13.8 percent), diabetes (8.9 percent), pre-diabetes (13.7 percent), high blood pressure (27.9 percent), and obesity (29.6 percent).²⁷ The main chronic diseases accounting for deaths in the region include coronary heart disease, cerebrovascular disease (stroke), chronic lower respiratory disease and diabetes. These diseases create a burden for the region not only for health outcomes, but for the economy as well. For diabetes alone, direct costs for treatment are greater than \$7,700 per case annually.²⁸ Connect SoCal implementation offsets the direct and indirect costs attributed to chronic diseases by reducing the prevalence of chronic disease and losses in productivity.

Across the SCAG region, rates of chronic diseases vary by county. For example, San Bernardino County has the highest age adjusted death rate for coronary heart disease in the region at 106.5 per 100,000 people, which is much higher than the age adjusted death rate of 89.1 per 100,000 people for the state of

California for coronary heart disease. Orange, Ventura, and Imperial Counties have age adjusted death rates below the state's rate, however Riverside and Los Angeles Counties' rates are similar to San Bernardino County and well above the state rate.

To assess the existing conditions of public health in the region, this report provides an overview of how the region fares, and where feasible, how health outcomes in each of the counties compare across SCAG's public health focus areas. The objective is to provide an overview of existing health conditions in the region as it relates to the built environment and SCAGs core planning functions.

ACCESSIBILITY TO ESSENTIAL SERVICES

In order to maintain and improve public health, research has shown that people must be able to access essential services. These include services such as schools and educational institutions, healthy food options, jobs, parks and open space, and primary care, which are all necessary for healthy communities. Connect SoCal has the potential to improve access to these services through the provision of transportation networks and influencing land use patterns.

ACCESS TO EDUCATION

Educational attainment leads to better jobs and higher incomes, and studies show those with greater education have a reduced risk of illness. Reduced acute and chronic illnesses can be seen in more educated populations, particularly those with four years or more of higher education, who are less likely to be overweight or obese.^{29,30} Reliable transportation is essential for individuals to reach their educational facilities. Those without vehicles are reliant on accessing public transportation. In the SCAG Region, 6 percent of households do not have access to vehicles, however, a majority of households have at least one vehicle,

²⁶ Agency for Healthcare Research and Quality. (n.d.). Population Health.

²⁷ California Health Interview Survey. (2016). Chronic Disease Rates in the SCAG Region.

²⁸ American Diabetes Association. (2019). SCAG modeling.

²⁹ Robert Wood Johnson Foundation (2013). Public Health and Prevention. Why Does Education Matter So Much to Health? Health Policy Snapshot.

³⁰ Robert Wood Johnson Foundation (2009). Commission on Health. Education Matters for Health. Commission to Build a Healthier America.

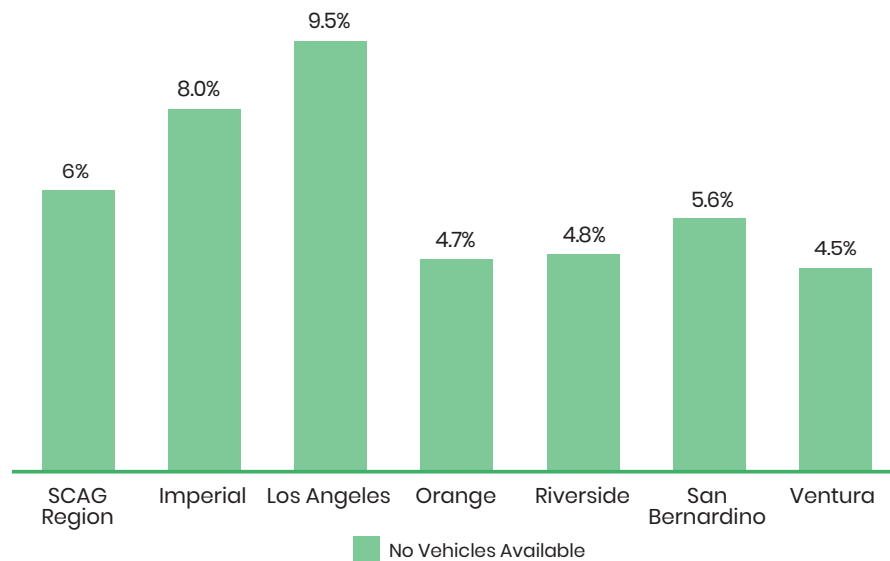
as shown in **FIGURE 4**.

ACCESS TO HEALTH CARE AND HEALTH INFORMATION

Transportation access to health care leads to better health status, more frequent use of preventative services, and lower hospitalization rates.³¹ Utilizing primary care services is important, as more serious and asymptomatic conditions can be detected and addressed at earlier stages and chronic conditions can be better managed to prevent complications. For those who do

31 Bindman, AB., Grumbach, K., Osmond, D. et al. (1995). "Preventable Hospitalizations and Access to Care." *Journal of the American Medical Association* 274 (4), 305–311.

FIGURE 4 Zero Vehicle Households by County



Source: American Community Survey (ACS)

not have access to a vehicle or other form of reliable transportation, accessing health care services and information online remotely has become essential.

Access to the internet and different forms of technology vary between urban and rural populations, among household income levels and among different age groups. For example, based on the National Health Interview Survey (NHIS), access to health information on the internet can promote precautionary care, such as more doctor visits and shorter hospital visits, which help to improve positive health outcomes.³² Broadband internet is now connecting medical providers with their patients removing the need for travel through telemedicine. Telemedicine is the process of using telecommunications to evaluate, diagnose and treat patients³³. Telemedicine allows for the delivery of remote healthcare services in places such as homes, workplaces and assisted living facilities. This has become more accessible with smartphone technology that enables high quality video.

The benefits of telemedicine include decreased time away from work, zero travel time, reduced greenhouse gas emissions, reduced expenses and reduced exposures to potentially contagious individuals. Telemedicine also reduces mortality rates, complications and hospital stays.³³ Uses of telemedicine can range from primary care services to medical education. Telemedicine allows more flexibility for the patient and the provider. Patients are able to access their records and share them with other providers with a simple application.³⁴

Rural areas that lack transportation access or areas that are heavily congested and difficult to navigate benefit from telemedicine. It allows for connections previously hindered due to physical land and/or transportation barriers. Incorporation of telemedicine also allows for more timely diagnosis and treatment which leads to less costly treatments. According to a SCAG study, 1 in 5 in-person medical trips will be replaced by telemedicine by 2035.

32 Macher, Jeffrey and Mayo, John W. and Ukhaneva, Olga. Does the Internet Improve Health Behaviors and Health Outcomes? National Health Interview Survey (2016). TPRC 44: The 44th Research Conference on Communication, Information and Internet Policy 2016.

33 California Telehealth Resource Center. Why are Telemedicine and Telehealth so important in Our Healthcare System?

34 American Telemedicine Association. (2018) About Telemedicine.

ACCESS TO HEALTHY FOODS

Access to essential services entails individuals having access to the needs that will help them thrive, including healthy foods and grocery stores. The Modified Retail Food Environment Index (MRFEI) is a value that provides data on the accessibility of healthy food retailers. This value is calculated by the number of healthy food retailers compared to the total number of all retailers to produce an index value, which shows the number of healthy food retailers per census tract. This value can then be used to compare different census tracts using the same metric.

Access to supermarkets is essential to maintaining a healthy diet. Supermarkets provide sources of produce, fresh foods and other healthy items. A census tract is defined as a food desert if it meets both low income and low access criteria. Low access to supermarkets in urban areas is defined as one mile from a supermarket, while in rural areas, low access is defined as ten miles from a supermarket. Low income households are households that fall below 200 percent of the federal poverty threshold.³⁵ Food deserts are strong predictors of obesity and disproportionality burden low-income communities across in the SCAG region. In Imperial County, 34.4 percent of census tracts are classified as food deserts, representing the largest share of food deserts among the counties in the region. In San Bernardino County, 19.2 percent of census tracts are designated as food deserts, 13.7 percent in Riverside County and 8.6 percent of census tracts in Ventura County. In Los Angeles County, 2.9 percent of census tracts are designated as food deserts, and 0.5 percent of census tracts in Orange County. Regionally, an average of 13.2 percent of all census tracts are designated as a food desert.

Additionally, food swamps, defined as areas where fast food and junk food retailers outnumber supermarkets and grocery stores, are also associated with increased public health risks. Food swamps are also correlated with obesity, which is a rising issue across the region, especially in disadvantaged and low

³⁵ Cookksey-Stowers, Kristen, Schwartz, Marlene and Brownell, Kelly. (2017). International Journal of Environmental Research and Public Health. Food Swamps Predict Obesity Better Than Food Deserts.

income communities.³⁶ Promoting healthy food environments and encouraging land use strategies to help shape positive health behaviors and outcomes are an integral part of the obesity epidemic solution.³⁷

ACCESS TO PARKS AND OPEN SPACE

The SCAG region is home to many parks, including protected open space, national parks, local parks, national forests and, state and federal open spaces. Parks and open space in the SCAG region help improve health outcomes by promoting physical activity, stress reduction and improved mental health. Promoting physical activity through improved access to parks. Increasing distance to parks is associated with declining mental health.³⁸ Locating parks within walking distance to residents can have benefits for not only physical health, but for mental health. Experiences in nature, even brief encounters, help to restore the mind from fatigue and can contribute to increased productivity in the workplace, fewer illnesses and reports of higher job satisfaction.³⁹

Although studies show access to parks and green space promote healthy behaviors and contribute to improved mental health, access to parks is not distributed equitably across the region, as shown in **EXHIBIT 3**. 48.2 percent of Riverside County, and 40.8 percent of the San Bernardino County population live further than a half mile from a park, beach, or open space that is larger than one acre. 28.6 percent of the Los Angeles County population, and 25 percent of the Imperial County population lives further than a half mile of a park, beach, or open space that is larger than one acre. A larger share of Ventura County and Orange County residents live within a half mile of a park, beach, or open space that is larger than one acre, with 16.9 percent and 12.5 percent, respectively. Regionally, 29 percent of people live further than a half mile from a park, beach, or open space. Based on a 2019 study, people with higher incomes and more education tend to have better access to parks and green

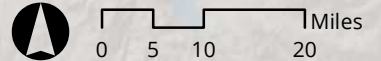
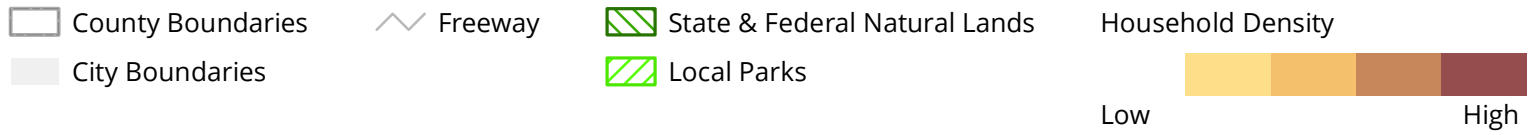
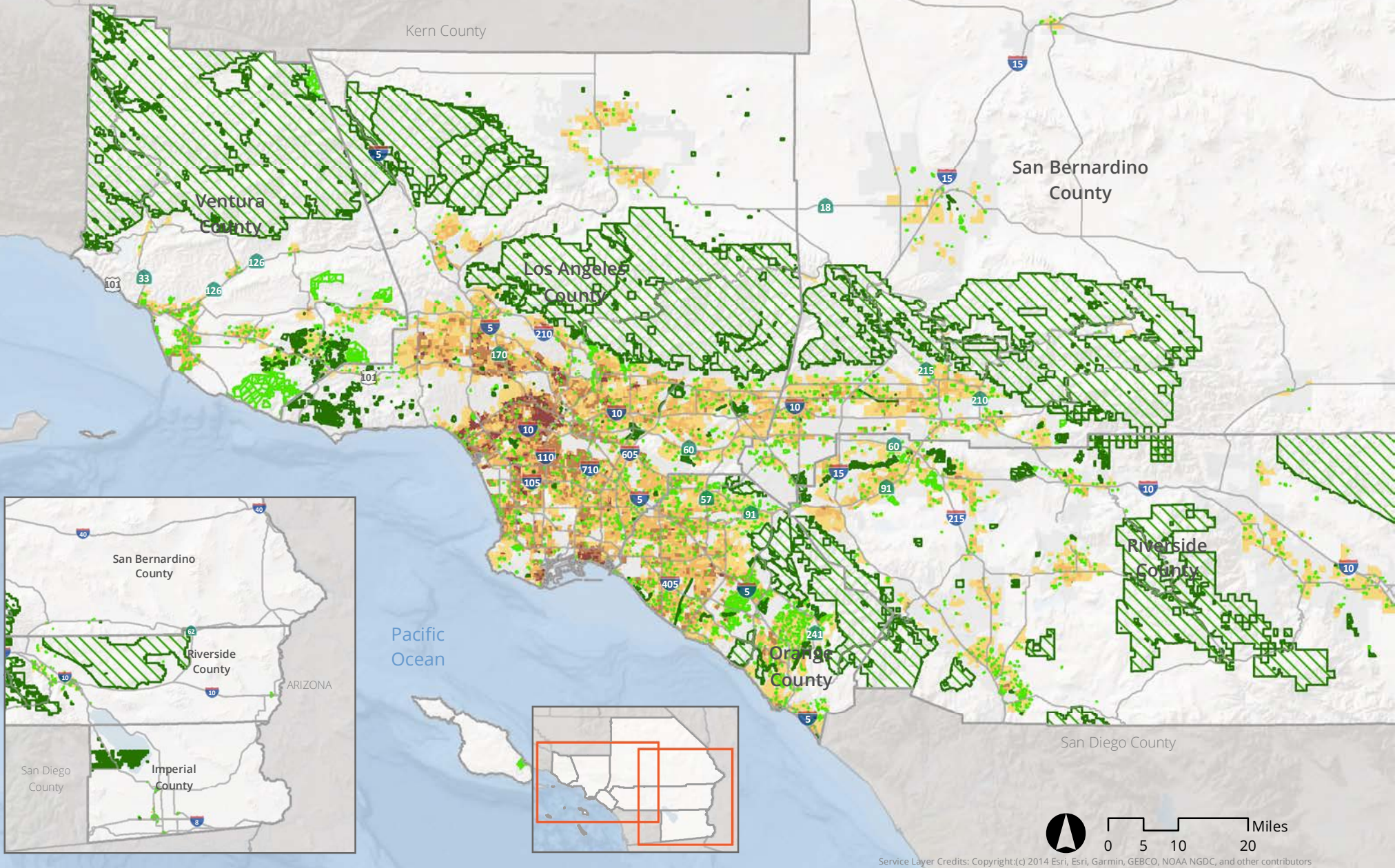
³⁶ Cookksey-Stowers, Kristen, Schwartz, Marlene and Brownell, Kelly. (2017). International Journal of Environmental Research and Public Health. Food Swamps Predict Obesity Better Than Food Deserts.

³⁷ Ibid.

³⁸ Sturm R. and Cohen D. (2014). Proximity to Urban Parks and Mental Health. The Journal of Mental Health Policy and Economics, 17 (1), 19-24.

³⁹ National Recreation and Park Association. (2017). The Health Benefits of Small Parks and Green Spaces.

EXHIBIT 3 Access to Parks and Open Space in the SCAG Region



Service Layer Credits: Copyright:(c) 2014 Esri, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

space than those who are less educated and lower income.⁴⁰ As climate change increasingly affects our urban environments, there is a greater need for urban green spaces and trees to cool and offset warming temperatures from the impacts of climate change.

ACCESS TO NEW MOBILITY

Transportation Network Companies (TNCs) are increasingly popular modes of transportation, with 24 percent of adults nationally using ride-hailing service on a weekly or daily basis and 21 percent of adults generally use or have used a TNC service such as Uber or Lyft. TNCs are making it easier and more convenient to access essential services, and serving as a First/Last Mile solution. Research has shown that the impact of ride-hailing services has resulted in a 6 percent decrease in transit use nationally. However, this change is not the same for all forms of transit. Buses and light rail have seen a reduction in ridership by 6 percent and 3 percent, respectively, while commuter rail has seen a 3 percent increase in ridership in our region.⁴¹

While TNCs work to promote First/Last Mile connectivity to transit, they do not provide this solution to all individuals equitably. College educated, wealthier populations are using these services disproportionately higher than their less educated, lower income counterparts. The heavy reliance on technology by these services can be isolating to some populations who are not as comfortable using app-based technology. Only 4 percent of individuals aged 65 and over use a ride-hailing service compared to 36 percent of 18–29 year old individuals.⁴¹ Through strategies such as public/private partnerships and providing subsidies for equitable services in disadvantaged neighborhoods and for vulnerable groups, TNCs can provide a more equitable way to provide access to services.

In addition to TNCs, the rise of e-scooters, bike share, including e-bikes, and other micro-mobility options provide convenient access to transit, transportation to and from work, recreation and other destinations. Based on

40 Science Daily. (2019). Lack of Fair Access to Urban Green Spaces.

41 Clewlow, R.R., and Mishra, G.S. (2017) "Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-hailing in the United States."

a national survey conducted by the National Association of City Transportation Officials (NACTO), there were over 84 million shared micro-mobility trips taken in 2018.⁴² Of these trips, 38.5 million were e-scooter trips, 36.5 million were station-based bike share trips, 9 million were dockless bike share trips and 6.5 million were e-bike trips. While not all micro-mobility options provide physical activity benefits, the rise of e-scooters, bike share and other micro-mobility options provide First/Last Mile solutions and more transportation choices to reduce single-occupancy vehicles, therefore reducing emissions and improving air quality.

ACCESS TO TECHNOLOGY

Access to broadband internet and new technologies vary across our region depending on the urban and rural context, household income levels, age cohorts and private/public investment. An individual's access to these technologies can have direct effects on their economic opportunities, travel behaviors, health behaviors and health outcomes. Individuals with disabilities and the elderly may also rely heavily on technology in order to navigate the transportation network and infrastructure. Their uses can vary from requesting paper maps in alternative languages or braille and audible announcements on transit to the use of mobile handheld technologies. Simple technologies greatly impact mobility for individuals with disabilities. Some of the technological applications are push buttons or pull cords to signal a requested stop and buses equipped with hydraulic technologies allowing for the bus to lower its entrance.⁴³

In addition to telemedicine, broadband telecommunications incorporates aspects of technology related to work, shopping and even education. Telecommunications impacts transportation demand, quality of performance and user characteristics.⁴⁴ Telecommunications provide the opportunity

42 National Association of City Transportation Officials (NACTO). Shared Micromobility in the U.S.: 2018.

43 Beyerle R., Dupree J.E. (2016) Bridging the Gap: Increasing Transportation Access Through Training and Technology. In: Hunter R., Anderson L., Belza B. (eds) Community Wayfinding: Pathways to Understanding. Springer, Cham.

44 Niles, J. (2001) Discovery Institute. Inquiry. Vol. X No. II. "Technology & Transportation: The Dynamic Relationship."

for telework, which is important because work trips tend to be longer trips. Teleworking can be a healthy solution to long commutes, congestion, and provides equitable opportunities for individuals with chronic illnesses and/or disabilities. Physical and psychological benefits of telecommuting include less stress, increased well-being, health and increased rates of reported happiness. Stress is reduced as workers are free from office stressors such as noisy environments and commuting. Increased well-being, health and happiness can be attributed to the home environment. Teleworking can have a positive benefit on both the employee and the employer, as increased health outcomes of employees reduces absenteeism due to illness and promotes greater productivity among workers.⁴⁵

AFFORDABLE HOUSING

Access to affordable housing is critical for reducing the amount of cost burdened households and improving health outcomes in the SCAG region. When individuals have access to safe and affordable housing they are able to spend more on healthcare, healthy food and other preventative health related costs, resulting in improved health outcomes. Throughout the SCAG region, there continue to be challenges with housing affordability.

HOUSING COSTS AND INCOME

The cost of housing is out of reach to many SCAG region residents. In 2016, for an individual earning minimum wage, the average cost of rent consumed more than 60 percent of their income. Additionally, the cost of housing should be considered together with other household costs, such as transportation, when determining the true financial burden placed on households. The cost of housing and transportation are generally considered non-elastic portions of a household's budget that cannot be cut, and as such can be significant financial burdens for many in the region.

⁴⁵ Steward B. (2000) Fit to Telework- The Changing Meaning of Fitness in New Forms of Employment.

According to the United States Department of Housing and Urban Development, housing is considered affordable if people pay less than 30 percent of their income on rent or mortgage payments. Households who pay over this amount are considered to have a high housing burden, and it's more likely they will not have enough money to meet other needs such as food and medical care.⁴⁶ The following percentages indicate the rates at which SCAG region households are burdened by paying more than 30 percent of their income on housing, these include:

- 31 percent of all households with homes that are owner-occupied
- 43 percent of households with a mortgage
- 57 percent of renters⁴⁷

As the costs of housing and transportation rise, households begin to make tradeoffs in the expenditures they can control. Two of the most common areas that are cut include monthly expenditures on food and healthcare. These cuts can lead to food insecurity, buying cheaper and less nutritious food, and reduce the opportunity for early detection of preventable chronic diseases. Finally, when housing becomes too expensive, homelessness results. People without a home have a greater likelihood of poorer health outcomes due to a lack of access to health care and increased exposure to other social determinants that negatively impact health. For example, people without a home are unable to properly store medication, maintain a healthy diet or basic hygiene.

HOUSING AFFORDABILITY IN PERSPECTIVE

In the SCAG region, the majority of households with a high housing cost burden are those that have a household income of less than \$35,000. Among these households, 63 percent pay more than 50 percent of their income to housing.⁴⁸ To put affordability in perspective, the minimum wage for most of the SCAG

⁴⁶ Housing and Health in Los Angeles County. (2015) Social Determinants of Health, Issue no.2. Los Angeles: Los Angeles County Department of Public Health.

⁴⁷ Southern California Association of Governments, California Housing Summit: The Cost of Not Housing (2016) Mission Impossible? Meeting California's Housing Challenge.

⁴⁸ Southern California Association of Governments, California Housing Summit: The Cost of Not Housing (2016) Mission Impossible? Meeting California's Housing Challenge.

region is \$11.00 an hour (except Los Angeles County, where the minimum wage is \$13.25) when there are 26 or more employees. The median gross rental price for the SCAG region is \$1,321, meaning that an individual earning minimum wage will pay over 60 percent of their income to housing costs. To unburden the cost of housing for individuals earning minimum wage, the minimum wage would have to be doubled. Minimum wage is expected to rise in California to \$15.00 by 2023, presenting a step towards unburdening individuals earning minimum wage assuming increases in the cost of housing do not outpace this wage growth. **FIGURE 5** shows how much workers in different professions earn compared to the income needed to afford a one or two bedroom apartment.⁴⁹

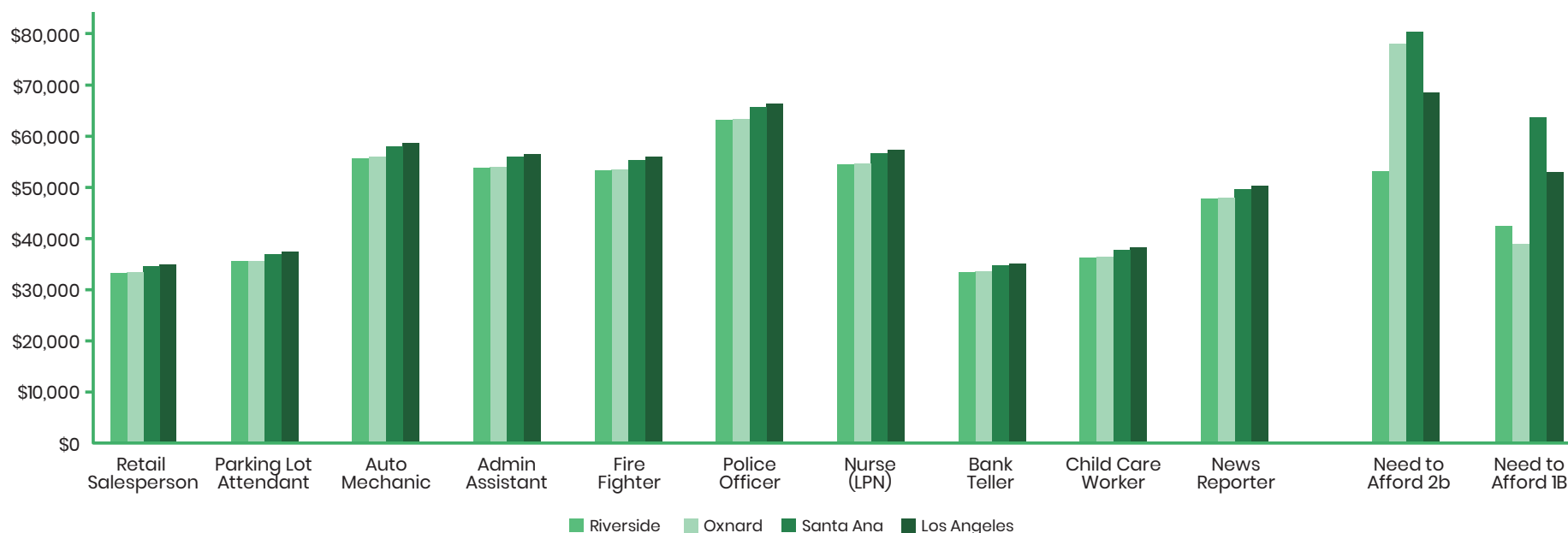
49 National Housing Conference. (2016). Housing Landscape Portal.

HOME OWNERSHIP

Generally in the SCAG region, there are more home owners than renters. The only county that has more renters than owners is Los Angeles County. As shown in **FIGURE 6**, the renter to owner ratio remains dominated by owners across the region.

The proportion of owner occupied housing units that are economically burdened shows in part how the region fares in regards to economic opportunity. Economically burdened households fall into two categories: cost burdened households and severe cost burdened households. Cost burdened households include those that spend more than 30 percent but less than 50 percent of the Housing Urban Development Area Median Family Income (HAMFI) on housing expenses. Severe cost burdened households are those others that spend more than 50 percent but less than or equal to 80 percent

FIGURE 5 Rental Market by Major City in the SCAG Region



Source: National Housing Conference (NHC)

of the HAMFI. This means that cost burdened households are spending between 30–50 percent of their income on housing, and severe cost burdened households are spending between 50–80 percent of their income on housing. The state’s determination of housing needs in the SCAG region, per the Regional Housing Needs Assessment (RHNA) process uses a similar measure to assess cost burdened households based on data from the American Community Survey. RHNA uses a rent to income ratio to assess cost burdens at the household level, regardless of the median income of the area.

As shown in **FIGURE 7** and **FIGURE 8**, renters and owners alike in the SCAG region are having difficulties paying for the costs of housing. Across both cost burdened categories, renters are more cost burdened by housing costs than homeowners, with over 38 percent of renters exceeding 30 percent of their income on housing costs. Homeowners also have a higher proportion of both cost burdened and severe cost burdened households, as 25 percent of

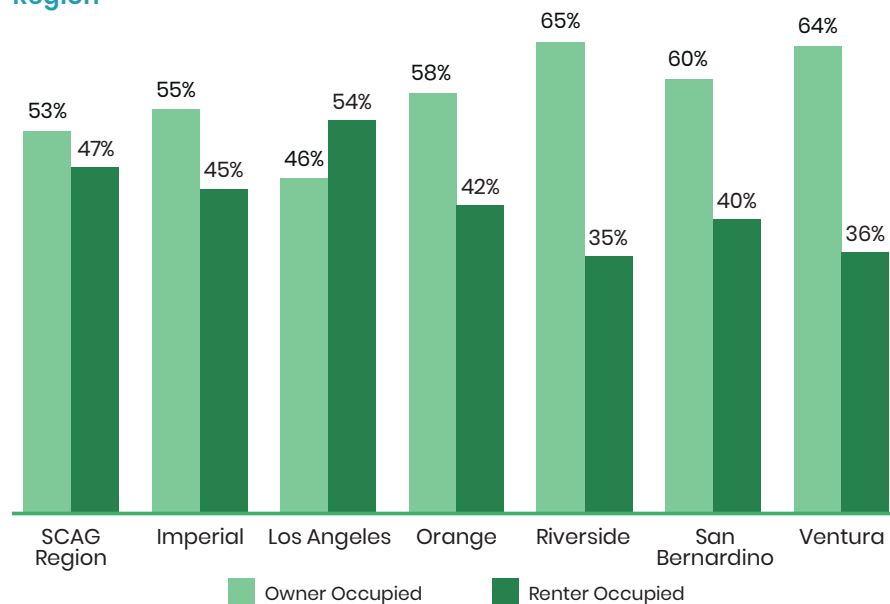
homeowners are exceeding 30 percent of their income on housing costs.

HOUSING AND OTHER EXPENDITURES

Low income households that are housing burdened often spend less on food and healthcare costs, which can result in increased negative health outcomes. Housing burdened households also tend to choose housing in areas that may be lower cost but have longer commute times to jobs and urban centers with job opportunities. This causes increased expenditures in vehicle related costs, resulting in households having less to spend on healthcare and food related costs.

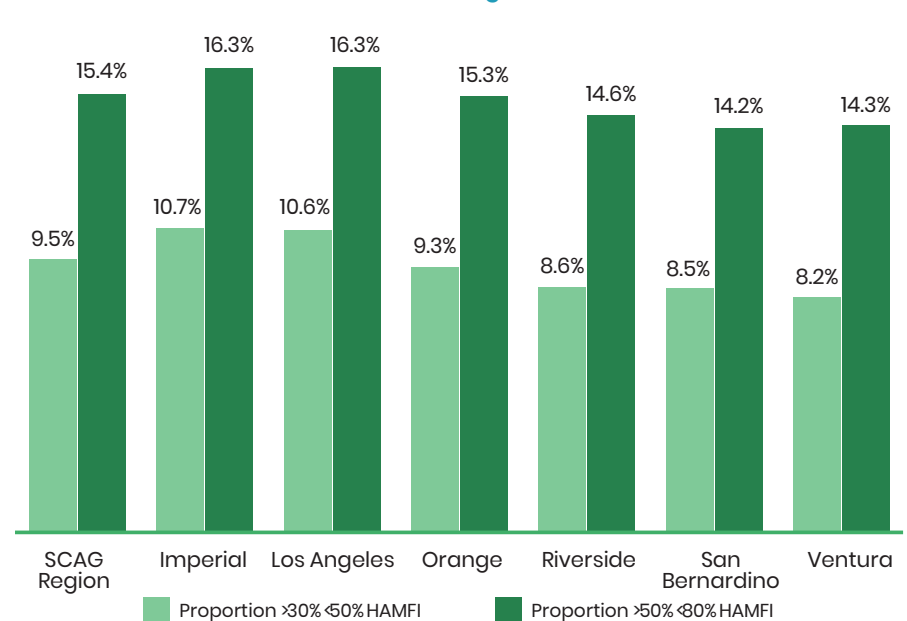
When adding the cost of transportation to a household’s overall budget it can induce additional hardship. If an individual or family moves to an area with more affordable housing options, but may be farther from their workplace,

FIGURE 6 Renter Occupied vs. Owner Occupied Housing in the SCAG Region



Source: American Community Survey (ACS)

FIGURE 7 Home Owner Severe Housing Cost Burden



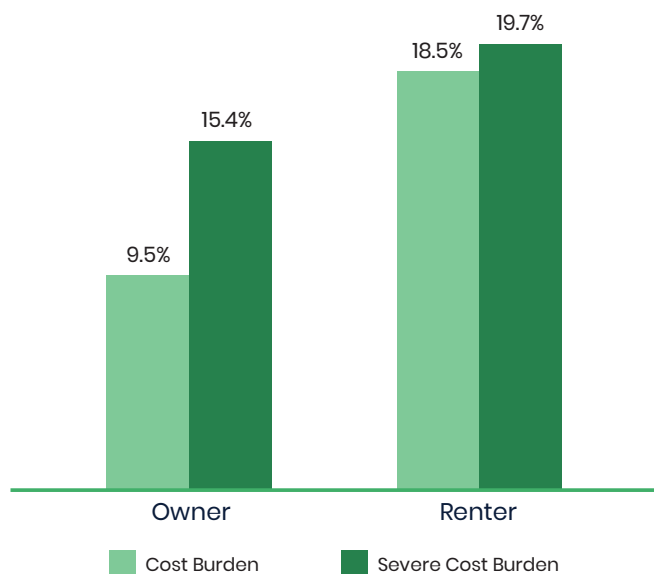
Source: Department of Housing and Urban Development (HUD): Comprehensive Housing Affordability Strategy (CHAS)

this consequently increases commute time and adds vehicle expenses such as fuel and maintenance.⁵⁰ Households that face these problems may also decide or have no other option to live in housing that is overcrowded, greater than 1.0 persons per room, and or lacking basic safety needs. People living in these conditions are at higher risk of suffering from depression, anxiety, slips and falls, accidents, exposure to hazardous material, and fires.

When combining the cost of transportation and housing, moderate to low income households are further burdened. For households earning 50 to 100 percent of the median income of their metropolitan area (\$31,642–\$63,843 in 2012), 59 percent of their income goes to housing and transportation costs. For

50 The Center for Neighborhood Technology (2010). Penny Wise, Pound Fuelish: New Measures of Housing +Transportation Affordability.

FIGURE 8 Renter/Owner Housing Cost Burden



Source: Housing and Urban Development (HUD): Comprehensive Housing Affordability Strategy (CHAS)

these households, the growing costs of housing are particularly burdensome, leaving little left over for expenses such as food, education, and health care or savings.⁵¹ Transportation costs add \$11,407 on average for a single driver annually to the total household budget.⁵² Combined housing and transportation costs create a significant burden on households, even when a household is earning the median area income.

The rising cost of housing near job centers continues to be a burden for many households, often forcing households to move away from job centers and extend their commute time. The relationship between commute times and affordable housing is complex with multiple factors such as public transportation, city infrastructure, geography, and distance between job centers and housing. When all factors are taken into account, metro areas with unaffordable housing still have longer commute times. This can be due to households moving farther away from city centers in search of affordable housing.⁵³ When isolating the effect of housing costs on commute times, a 10 percent increase in a city's median rent is associated with a 4.5 percent increase in individual commute times due to the lack of affordable housing near jobs.⁸

If households decide to move further from unaffordable areas in search for cheaper housing there can often be additional incurred costs. These unexpected costs can exceed financial savings that were sought by the move. Households can pay an additional \$5,000 for their car and \$2,000 for gas if they decide to move to a more affordable area, since those areas are often farther from job centers.⁵⁴ These additional costs can often offset the savings households expected from moving and can further burden households that already face financial hardship.

Another often unforeseen factor that results from longer commute times is the

51 Center for Neighborhood Technology and Center for Housing Policy. (2012) Losing Ground: The Struggle of Moderate-Income Households to Afford the Rising Costs of Housing and Transportation.

52 Southern California Association of Governments (2016), Active Transportation Health and Economic Impact Study.

53 Alamo, C., Uhler, B., & OMalley, M. (2015). California's high housing costs: Causes and Consequences Legislative Analyst's Office.

54 The Center for Neighborhood Technology (2010). Penny Wise, Pound Fuelish: New Measures of Housing +Transportation Affordability.

negative impact on the commuter’s health. When commuting times are above average, time spent on health-related activities decreases. This trend suggests that the farther a household moves from their workplace, the more time they will spend in the car, reducing the time a commuter can engage in health-related activities such as physical activity, cooking and sleeping. As households reduce their time engaging in physical activities and food preparation, they may chose faster and less nutritious food options. These choices may lead to poorer health outcomes by resulting in obesity or other chronic diseases. Additionally, research shows that of the four major health-related activities mentioned above, the largest percentage of time is taken from sleeping time.⁵⁵

HOUSING QUALITY

Households that are housing burdened are also at an increased risk of living in poor quality housing, overcrowded housing and living in housing located near high-volume roadways, as these options are typically less expensive. All of these situations increase the risk of negative health outcomes. The cost of housing can lead to choices to live in unsafe or poor quality housing that can expose residents to toxins or other harmful conditions.

Overcrowded housing can also lead to unsafe living conditions. Housing is considered overcrowded when there are more than one persons per room in a given household (PPR).⁵⁶ Severe overcrowding is defined as more than 1.5 PPR in a given household. In the SCAG Region, more renters than owners live in housing that is considered overcrowded, as shown in **FIGURE 9**. The graph shows a combination of overcrowding and severe overcrowding to illustrate the severity of housing overcrowding in the region, especially among renters. Overcrowded housing is a dangerous public health issue, as it increases risk of infection from communicable diseases, prevalence of respiratory issues and vulnerability to homelessness.⁵⁷

55 Christian, T. J. (2012). Trade-Offs Between Commuting Time and Health-Related Activities. *Journal of Urban Health*, 89(5), 746-757.

56 California Department of Public Health. Office of Health Equity (2017). *Housing Crowding Narrative*.

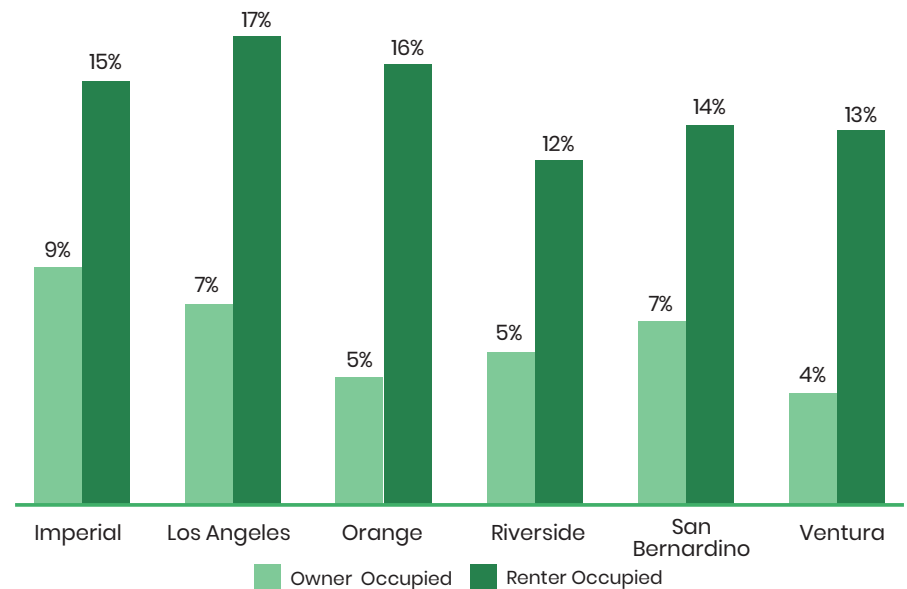
57 Ibid.

AIR QUALITY

Air quality continues to be a major public health concern in the Southern California region, as air pollutants exacerbate chronic conditions and disproportionately affect vulnerable populations (children, pregnant women, older adults, outdoor workers and disabled populations). In general, rates of chronic diseases related to air quality in the region have been on the rise or remained constant since the 2016 RTP/SCS. In addition, impacts from climate change further exacerbate air quality issues and affect the well-being of our residents.

Exposure to air pollutants such as O₃ and PM_{2.5} can have negative health outcomes related to the respiratory and cardiovascular systems. Increased CO₂ can also have an effect on health through increased exposure to pollen. Increased heat also intensifies the photochemical reactions that produce smog

FIGURE 9 Housing Overcrowding by County



Source: American Community Survey (ACS) 2016

and ground level ozone and fine particulates (PM_{2.5}). These pollutants contribute to and exacerbate respiratory disease in adults and especially children. Increased heat and carbon dioxide enhance the growth of plants that produce pollen, which are associated with allergies.⁵⁸

The impacts of climate change increase the likelihood that more people will be exposed to these pollutants.⁵⁹ Climate change affects weather events such as wind patterns, temperature, precipitation and frequency of wildfires. These changes in weather have an influence on air quality through the formation and location of air pollutants such as carbon dioxide (CO₂), fine particulate matter including PM_{2.5} and ground level ozone (O₃).^{20,60} See the Plan Performance section for improvements in air quality from Baseline to Plan.

ASTHMA

Asthma can be aggravated by pollution and other air contaminants. Rates of asthma are directly related to poor air quality and those who suffer from asthma are more acutely affected by poor air quality. In 2012, 12.1 percent of residents in the SCAG region were diagnosed with asthma, compared to 2016, where 13.8 percent of adults were diagnosed with asthma, representing a 1.7 percent increase. Asthma rates have increased since 2012 in all counties in the region with the exception of San Bernardino, where rates have slightly decreased. In 2016, the highest rate of asthma was in Riverside County at 15.9 percent, 2.1 percent above the 2016 rate for the SCAG region. The change in asthma rates between 2012 and 2016 can be seen in **FIGURE 10**.

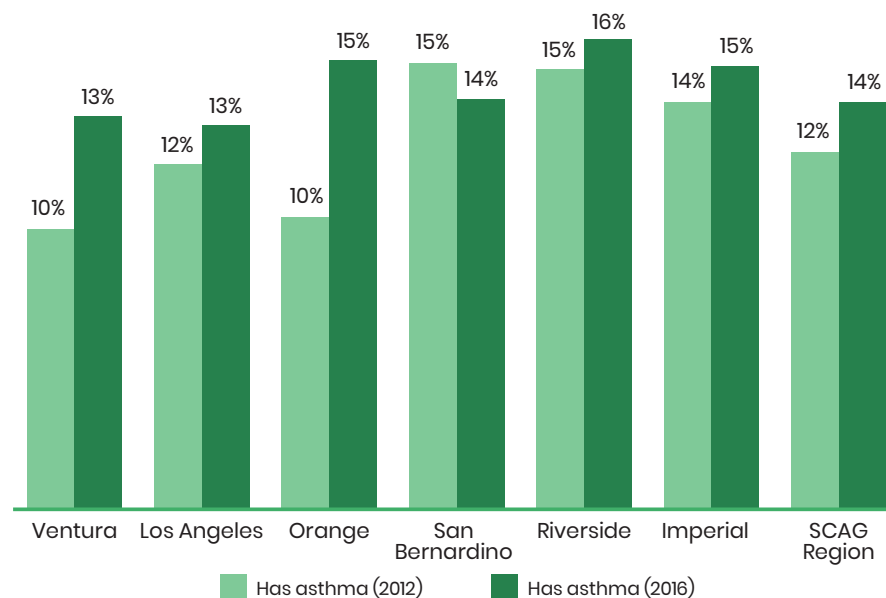
Rates of asthma-related emergency rooms visits remain high across Environmental Justice Areas. In the SCAG region, Hispanics represent 46 percent of the population at the base year, but represent 63 percent of the population

that experience the highest rates of asthma-related emergency room visits. Compared to the SCAG region, Communities of Concern experience 46 percent more asthma-related emergency room visits at the base year. For more information on populations in the highest exposure areas by race/ethnicity and by income quintile, please refer to the Environmental Justice Technical Report.

OZONE (O₃)

A particular concern in the SCAG region is smog, of which a key component is Ozone, or O₃. O₃ is formed by a chemical reaction between nitrogen oxide, volatile organic compounds and sunlight. The source of the chemical can be anthropogenic (cars, electrical power plants) or from natural sources such as

FIGURE 10 Rates of Asthma by County (2012, 2016)



Source: California Health Interview Survey (CHIS)

58 Maizlish N, English D, Chan J, Dervin K, English P. Climate Change and Health Profile Report: Los Angeles County, San Bernardino County, Orange County, Ventura County, Riverside County, Imperial County. Sacramento, CA: Office of Health Equity, California Department of Public Health; 2017.

59 Bernard, S. M., Samet, J. M., Grambsch, A., Ebi, K. L., & Romieu, I. (2001). The Potential Impacts of Climate Variability and Change on Air Pollution-Related Health Effects in the United States. *Environmental Health Perspectives*, 109, 199.

60 Tagaris, E., Liao, K., Delucia, A. J., Deck, L., Amar, P., & Russell, A. G. (2009). Potential Impact of Climate Change on Air Pollution-Related Human Health Effects. *Environmental Science & Technology*, 43(13), 4979-4988.

wildfires.⁶¹ Exposure to O₃ can cause inflammation of the lungs which can cause shortness of breath, coughing, respiratory tract infection and decreased lung function.^{62,63} Research shows that populations exposed to ozone air pollution are at greater risk of dying prematurely, being admitted to the hospital for respiratory hospital admissions, being admitted to the emergency department and suffering from aggravated asthma. Current levels of ground-level ozone are estimated to have contributed to tens of thousands of hospital and emergency room visits, millions of cases of acute respiratory symptoms and school absences and thousands of premature deaths in the United States each year.⁶⁴

Levels of O₃ will increase with the rising temperature brought on by climate change.⁶⁵ Cities are more susceptible to smog and other air pollutants because of stalled high pressures systems. This weather event traps heat under a high pressure “heat dome” which creates the ideal situation for forming O₃. This event concentrates O₃ closer to the ground, which increases and intensifies the exposure to the public. Southern California is particularly susceptible to the effects of heat dome occurrences, especially as higher temperatures become more frequent. **EXHIBIT 4** illustrates the concentration of ground level ozone in the region, with clear acute concentrations in inland areas.

With the increasing effects of O₃ due to climate change, studies predict an increase of over 8 to 12 percent in hospital admissions due to respiratory health outcomes nationally. The percentage of mortalities due to O₃ is also predicted to increase 4.5 percent to 13.7 percent. Some of the most vulnerable populations to O₃ are the elderly and people that chronic conditions such as asthma, chronic obstructive pulmonary disease (COPD) and cardiovascular disease. Individuals that do not have access to air conditioning are more susceptible due to poorly

ventilated households.⁶⁶ Other vulnerable populations include outdoor workers, children, athletes and other people who are physical active outdoors.⁶⁷

CARBON DIOXIDE (CO₂)

Built environment conditions will promote increases in CO₂, which will cause climate change. CO₂ promotes the growth of plants such as ragweed which releases pollens, and airborne allergens or aeroallergens. CO₂ influences the production of and timing of airborne allergens which increases the severity and prevalence of negative health outcomes associated with allergies and asthma.⁶⁸

PARTICULATE MATTER

Particulate matter pollutants will also increase with rising temperatures due to climate change. Fine particulate matter (PM_{2.5}) is a mixture of solid matters that come from human and natural sources.⁶⁹ A major human source of PM_{2.5} is from the use of fossil fuel for transportation and energy production, while a natural source comes from wildfires.⁷⁰ Exposure to PM_{2.5} can worsen asthma symptoms, chronic obstructive pulmonary disease (COPD), and respiratory infections and is associated with premature mortality.^{71,80,72} Similar to O₃, PM_{2.5} exposure is particularly harmful to children, the elderly, and people with chronic conditions such as cardiac and respiratory diseases. Impacts on health due to PM_{2.5} exposure are greater than those attributed to ozone. Changes in air pollution-

61 USGCRP, 2016: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp.

62 Tibbetts, J. H. (2015). Air Quality and Climate Change: A Delicate Balance. *Environmental Health Perspectives*, 123(6). doi:10.1289/ehp.123-a148

63 Kinney, P. L., ScD. (2008). Climate change, air quality, and human health. *American Journal of Preventative Medicine*. 459-467.

64 Fisk, W. J. (2015). Review of some effects of climate change on indoor environmental quality and health and associated no-regrets mitigation measures. *Building and Environment*, 86, 70-80.

65 Fisk, W. J. (2015). Review of some effects of climate change on indoor environmental quality and health and associated no-regrets mitigation measures. *Building and Environment*, 86, 70-80.

66 Fisk, W. J. (2015). Review of some effects of climate change on indoor environmental quality and health and associated no-regrets mitigation measures. *Building and Environment*, 86, 70-80.

67 Kinney, P. L., ScD. (2008). Climate change, air quality, and human health. *American Journal of Preventative Medicine*. 459-467.

68 USGCRP. (2016): The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312.

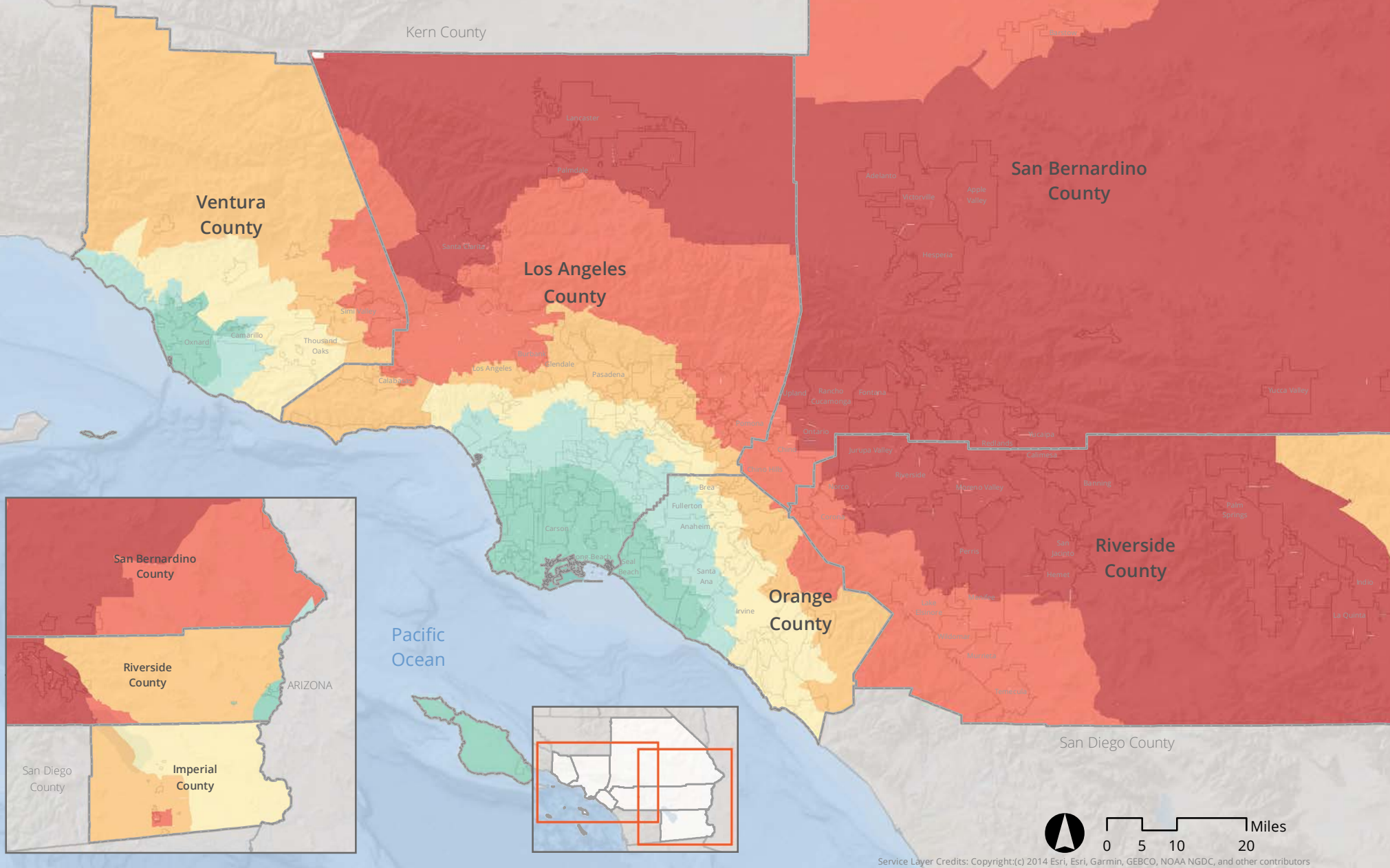
69 Maizlish N, English D, Chan J, Dervin K, English P. (2017). Climate Change and Health Profile Report: Los Angeles County, San Bernardino County, Orange County, Ventura County, Riverside County, Imperial County. Sacramento, CA: Office of Health Equity, California Department of Public Health.

70 Patz, J. A., Grabow, M. L., & Limaye, V. S. (2014). When It Rains, It Pours: Future Climate Extremes and Health. *Annals of Global Health*, 80(4), 332-344.

71 Fisk, W. J. (2015). Review of some effects of climate change on indoor environmental quality and health and associated no-regrets mitigation measures. *Building and Environment*, 86, 70-80.

72 Tagaris, E., Liao, K., Delucia, A. J., Deck, L., Amar, P., & Russell, A. G. (2009). Potential Impact of Climate Change on Air Pollution-Related Human Health Effects. *Environmental Science & Technology*, 43(13), 4979-4988.

EXHIBIT 4 Ground Level Ozone



Service Layer Credits: Copyright:(c) 2014 Esri, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Ozone Concentration Percentiles

- No Data
- Less than 46
- 46 - 55
- 56 - 65
- 66 - 75
- 76 - 85
- More than 85

Source: CalEPA, OEHHA, CalEnviroScreen 3.0, 2017

related premature mortality due to PM_{2.5} increases are 15 times higher than those related to ozone increases.⁷³ **EXHIBIT 5** illustrates the concentration of PM_{2.5} in the region, with pollutant concentrations more severe in densely populated areas and in areas near freeways and highly traveled corridors.

SMOKE AND WILDFIRES

As weather changes in Southern California, the climate will become more hospitable to wildfires. Smoke from wildfires can contain over 10,000 substances (particulate matter and gaseous products of combustion) and expose the population to PM_{2.5} for months at a time. PM_{2.5} from wildfires increases the amount of hospital visits and the risk of mortality. Air pollution from wildfires are estimated to cause 339,000 deaths per year worldwide.^{74,75}

Higher temperatures, decreased soil moisture, and extended periods of drought enhance the risk of wildfire initiation and spread, therefore climate change has the potential to increase the impact of wild fires both in frequency and area affected. Fine particulate air pollution in the immediate vicinity of fires and in areas downwind of source regions are among the many health and economic impacts associated with larger and more frequent fires.³³ According to the California Department of Public Health there are around 1.5 million people that live in fire hazard zones. This population is at higher risk of being exposed to the effects of PM_{2.5}.^{76,77,78}

73 Stanke C, Kerac M, Prudhomme C, Medlock J, Murray V. Health Effects of Drought: a Systematic Review of the Evidence. PLOS Currents Disasters. 2013 Jun 5 . Edition 1.

74 Tagaris, E., Liao, K., Delucia, A. J., Deck, L., Amar, P., & Russell, A. G. (2009). Potential Impact of Climate Change on Air Pollution-Related Human Health Effects. *Environmental Science & Technology*, 43(13), 4979–4988. doi:10.1021/es803650w

75 Tibbetts, J. H. (2015). Air Quality and Climate Change: A Delicate Balance. *Environmental Health Perspectives*, 123(6).

76 Tagaris, E., Liao, K., Delucia, A. J., Deck, L., Amar, P., & Russell, A. G. (2009). Potential Impact of Climate Change on Air Pollution-Related Human Health Effects. *Environmental Science & Technology*, 43(13), 4979–4988.

77 Maizlish N, English D, Chan J, Dervin K, English P. Climate Change and Health Profile Report: Los Angeles County, San Bernardino County, Orange County, Ventura County, Riverside County, Imperial County. Sacramento, CA: Office of Health Equity, California Department of Public Health; 2017.

78 Fisk, W. J. (2015). Review of some effects of climate change on indoor environmental quality and health and associated no-regrets mitigation measures. *Building and Environment*, 86, 70–80.

CLIMATE CHANGE

The changing climate's effect on temperature, air quality, wildfires, droughts, and the spread of disease including West Nile Virus will threaten the health and well-being of everyone within the SCAG region, including greater numbers of incidences and premature deaths related to hyperthermia, cardiovascular, respiratory, and renal diseases, diabetes, chronic depression and stress, decreased lung function, asthma, allergies, burns and neuro-invasive disorders. The populations that will be most affected by these outcomes are the elderly, children, chronically ill and disadvantaged communities. Low income and disadvantaged communities often have higher rates of chronic diseases, which increases their susceptibility to climate threats.⁷⁹

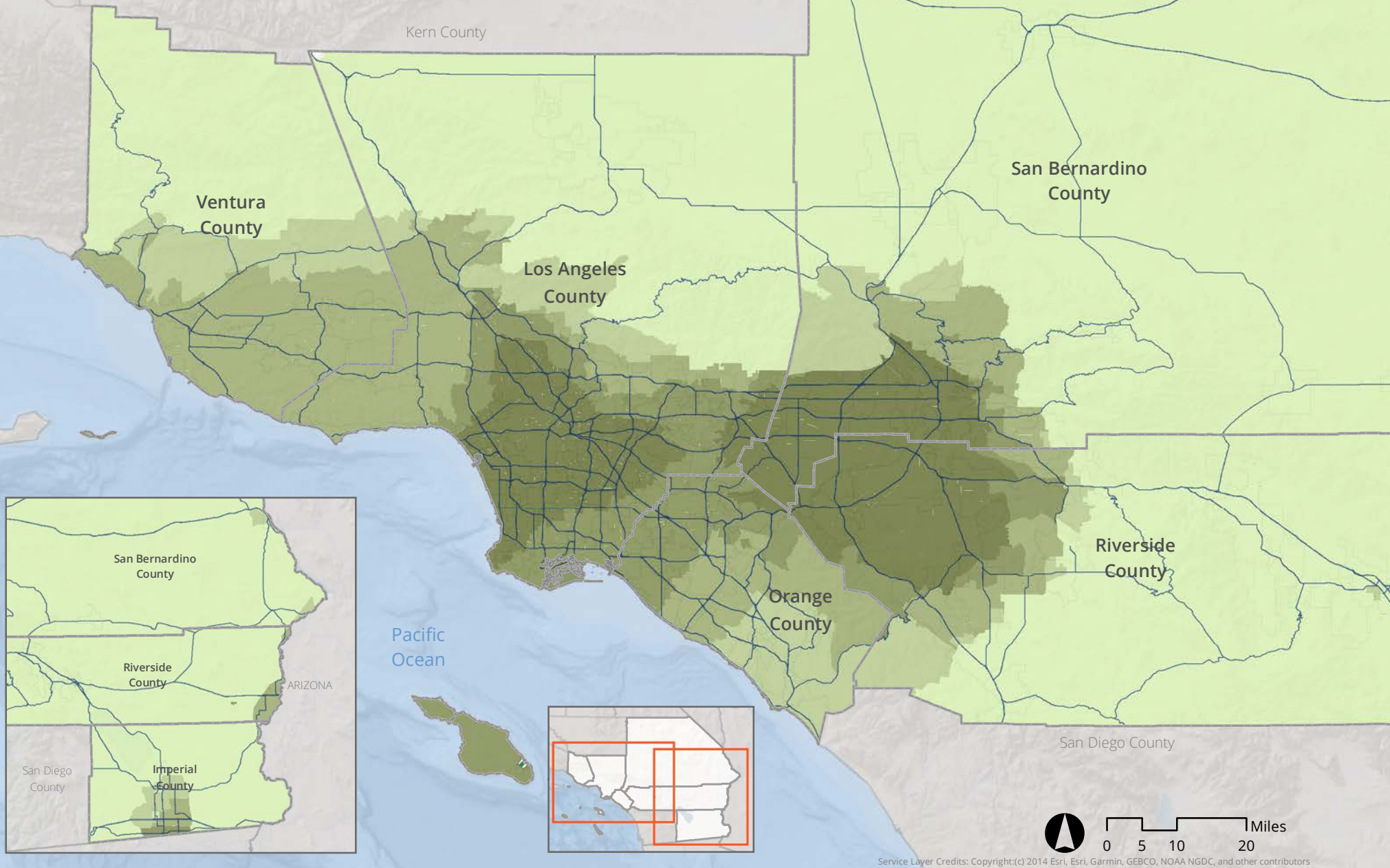
It is projected that over the next century everyone within the SCAG region will feel the effects of one or more of the results of climate change, but the magnitude of the effects on health can be mitigated by the ability to adapt to these changes. The ability to adapt to climate change will lead to disparities in health outcomes across different communities. Disadvantaged communities and Environmental Justice Areas are at a greater risk due to lack of resources to respond and cope with changes in the climate and will shoulder a larger portion of the burden. Climate change threatens the water supply, food security, air quality and shelter, and empowering communities to fight climate change will help to reduce health inequities by providing opportunities for collaboration on climate resiliency strategies.

EXTREME HEAT DAYS

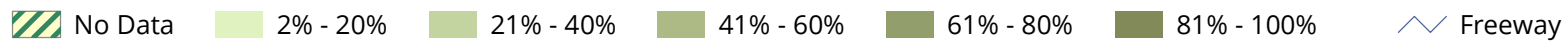
Extreme heat days are days in which the temperature exceeds the 98th percentile of maximum temperature for a given location. By looking at projected heat days, we can see how the region will fare over time. Extreme weather conditions, particularly extreme heat days, result in adverse outcomes for human health. Many illnesses stem from heat exposure that are serious and

79 Rudolph, L., Harrison, C., Buckley, L. & North, S. (2018). Climate Change, Health, and Equity: A Guide for Local Health Departments. Public Health Institute and American Public Health Association.

EXHIBIT 5 CalEnviroScreen 3.0 PM_{2.5} Percentile



PM 2.5 Percentiles



Source: CalEPA, OEHHA, CalEnviroScreen 3.0, 2017

in vulnerable populations, even life threatening. Heat stroke, heat exhaustion, dehydration and premature deaths resulting from cardiovascular or respiratory diseases are all heat-induced illnesses. As extreme heat days increase it is likely increases in these serious diseases will also occur. Extreme heat conditions will also likely impact resident's decisions on whether or not to utilize modes of active transportation and participate in outdoor physical activity.

Extreme heat can be further exacerbated by the urban heat island effect, which is caused by dense urban areas that have more buildings, pavement, and dark surfaces, and fewer trees and green spaces, which can intensify temperatures.⁸⁰ Areas affected by urban heat islands can have night time temperatures that are up to 22 degrees Fahrenheit greater than surrounding areas that have a lower concentration of impervious surface cover, tall buildings and greater amounts of trees and greening.⁸¹ **EXHIBIT 6** shows the amount of impervious surface cover in the region, with clear trends indicating a large amount of impervious surfaces concentrated in urban areas. Implementation of urban greening and urban cooling strategies, particularly on pedestrian and bicycling routes and those that connect to transit stops, is an important measure cities can take to mitigate extreme heat conditions and reduce the urban heat island effect.

In the future, warmer temperatures and extreme heat days will increase in frequency, intensity and duration as a result of climate change. There is estimated to be an increase in annual average temperature by 2030 of 5 degrees Fahrenheit and up to 10 degrees Fahrenheit in California by the end of the century.⁸² On a county level, it is projected that there will be over 43 extreme heat days per year in Imperial County from 2040 to 2060, representing the highest projections among counties in the SCAG region. Riverside and San Bernardino Counties are projected to have 42 and 41 extreme heat days, respectively, per year. Los Angeles County is expected to have 37 extreme heat days per year, and Ventura County is projected to have 32 extreme heat days. Orange County has the fewest projected extreme heat days, at 15 days per year.

80 California Healthy Places Index (HPI) 2016.

81 Rudolph, L., Harrison, C., Buckley, L. & North, S. (2018). Climate Change, Health, and Equity: A Guide for Local Health Departments. Public Health Institute and American Public Health Association.

82 Office of Health Equity (2016). CalBRACE Vulnerability Indicators. Extreme Heat Narrative.

On average, the SCAG region is projected to have an increase in 35 extreme heat days from 2040–2060. After 2085, these numbers are projected to more than double across the entire region.

DROUGHT

As a result of extreme heat days, there may be longer and more severe droughts. Consequences of extreme heat even in non-drought conditions include unusual and excessive drying of soil and vegetation. Additionally, extreme heat waves are responsible for the melting of the Sierra snowpack in California. Projections estimate that by 2050 California will lose approximately 25 percent of the snowpack, which is a primary source of water for urban, agriculture and the environment.⁸³

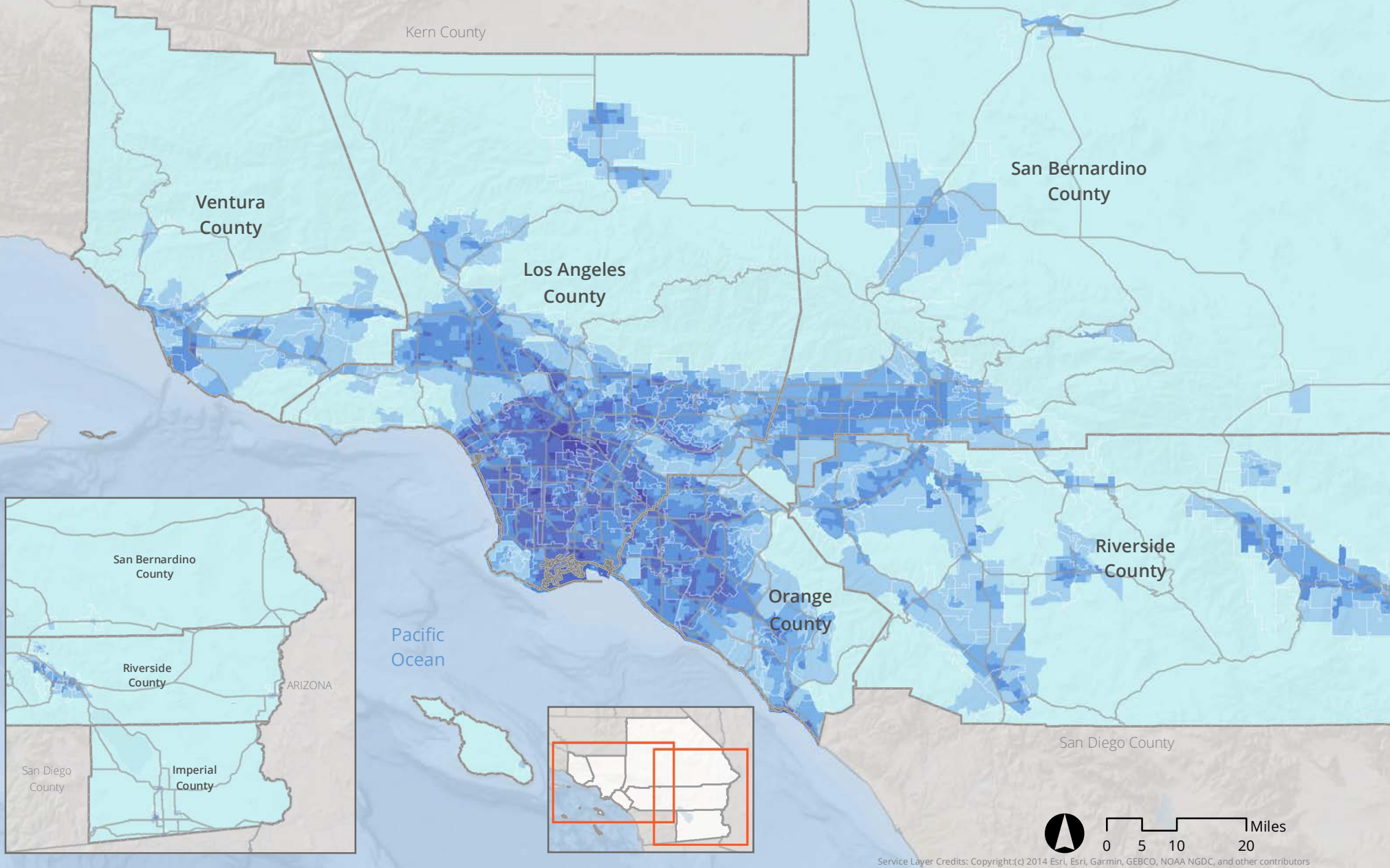
Drought not only has environmental impact, but it also results in economic hardships. Excessive drying of the soil and vegetation lead to a decrease in crop yields which have direct impacts on the community such as food shortages and price increases for both food and water. As an added stressor for under-resourced communities these economic changes result in food insecurity, obesity and malnutrition. Lack of crops reduce the economic productivity of the region and threaten to take away the sources of nutrition for many in the SCAG region.

Droughts are expected to be longer and more severe as the number of extreme heat days increase across the region. Projections estimate that by 2050 California will lose approximately 25 percent of the snowpack, which is a primary source of water for urban, agriculture, and the environment.⁸⁴ This will have an impact on the availability of water in the SCAG region. As natural sources of water becomes increasingly scarce, the region must look elsewhere to fulfill the growing need for water. This can have adverse effects related to the lack of available water, increasing reliance on goods movement and increased risk of wildfires due to longer and more severe drought.

83 California Department of Public Health. (2016). Drought Narrative.

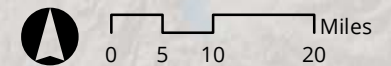
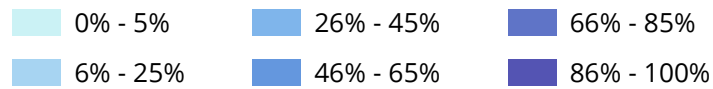
84 Office of Health Equity (2016). CalBRACE Vulnerability Indicators. Drought Narrative.

EXHIBIT 6 Impervious Surface Cover



- County Boundaries
- City Boundaries
- Freeway

Percent of the Land Area Covered by Impervious Surfaces



Service Layer Credits: Copyright:(c) 2014 Esri, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Source: CalBRACE, 2011

SEA LEVEL RISE

Sea level rise has important consequences for health. Sea level rise can contaminate drinking water which leads to gastrointestinal illness. It can cause respiratory or wound infections result from flood waters contaminated with sewage overflow and hazardous substances. Sea level rise can result in respiratory issues from mold in flood-damaged homes, and even create mental health issues arising from displacement from home and sources of employment, trauma or changes to known surroundings.⁸⁵ Food insecurity from sea level rise can also lead to malnutrition or obesity.

Flooding from sea level rise can be detrimental to infrastructure and can potentially be deadly for vulnerable populations that are homebound. **EXHIBIT 7** shows the coastal areas within the SCAG region that are in danger of flooding due to sea level rise. Of the coastal counties, 0.17 percent of the Los Angeles population is located in inundation zones. Orange County has the greatest risk for inundation, with 3.6 percent of the population in Orange County is an inundation zone. Ventura County has 1.6 percent of the population in possible inundation zones. Households below the poverty level in the SCAG region account for 9 percent of all households in sea level rise areas. 30 percent of high income households, those with a combined household income of \$118,000 or more, are within sea level rise areas, meaning that sea level rise related to climate change is a greater risk for affluent communities compared to lower-income communities.

HOUSEHOLDS WITH AIR CONDITIONING

Air conditioning (AC) is a protective factor from heat related morbidity and mortality.⁸⁶ Individuals that have access to AC have better outcomes from heat related illnesses during extreme heat events. However, within the SCAG region, not all residents have access to air conditioning. Disadvantaged communities and low income households are less likely to have AC, and are at a greater risk

during extreme heat. In Ventura County, 43 percent of the population does not have access to air conditioning while in Riverside County, only 5 percent of the population does not have access to air conditioning. In Imperial County, 32.1 percent of the population does not have access to air conditioning, similar to Los Angeles County where 33.9 percent does not have access. In Orange County, 28.1 percent of the population does not have access, and in San Bernardino County, 9.5 percent of the population does not have access to air conditioning. As temperatures rise, even in coastal communities, more homes will need to be equipped with air conditioning in order to reduce heat related illness and provide for a more habitable home during extreme heat. However, as more homes become equipped with air conditioning, this can lead to exacerbation of climate change impacts as homes consume more energy and contribute to regional emissions.

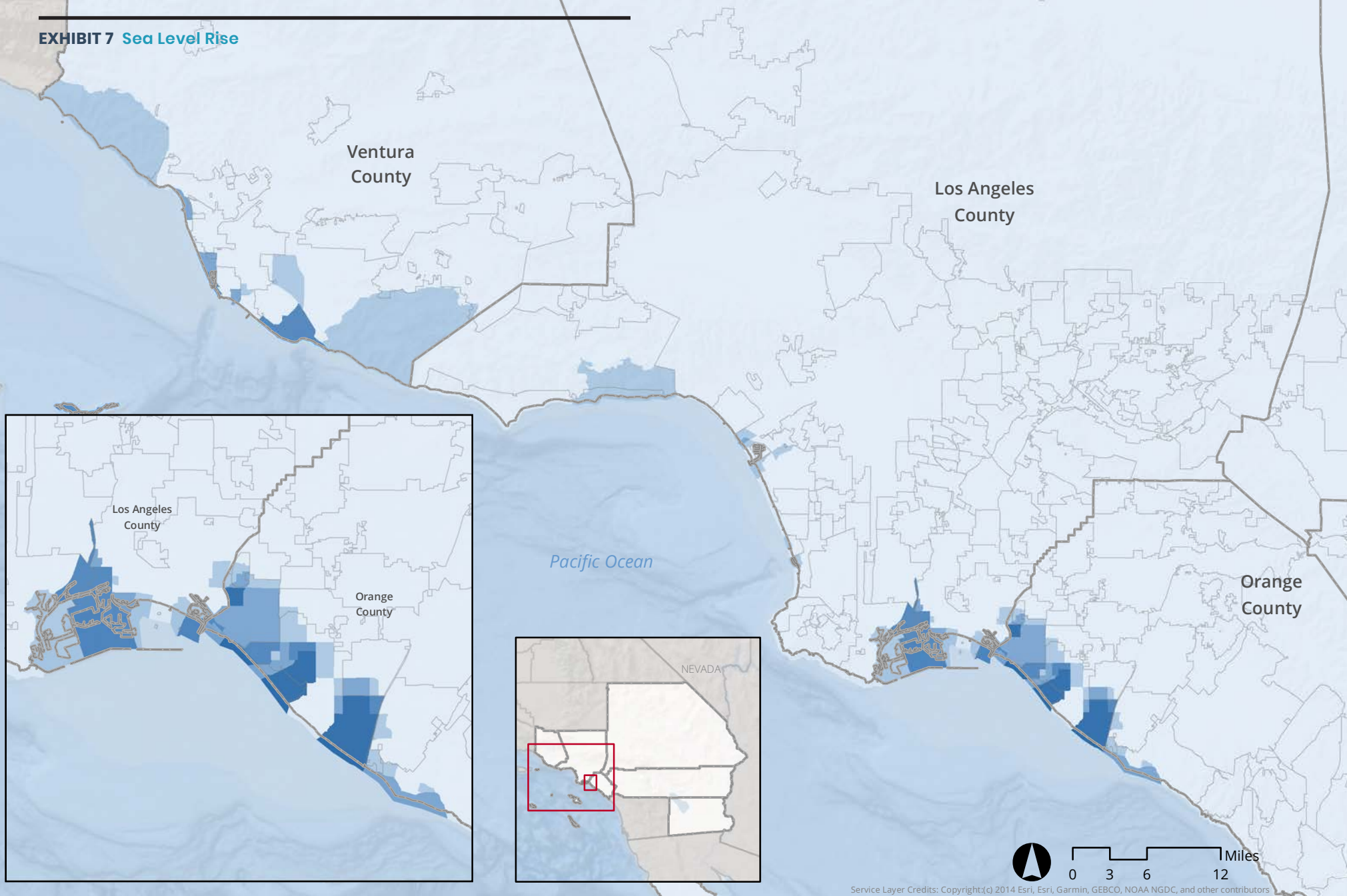
TREE CANOPY

The urban heat island effect, or the phenomenon that urban areas are warmer than surrounding nonurban areas, is intensified by increasing temperatures. Urban greening can be used to mitigate this effect. Urban green space consists of parks and trees which have cooling properties to the environment. Additionally, green spaces are known to reduce flood risk, increase community safety and promote active lifestyles.⁸⁷ Tree canopy coverage in densely populated urban areas is scarce throughout the region. For example, in the City of Los Angeles, about one fifth of the tree canopy grows where only 1 percent of the population lives.⁸⁸ This shows that much of the region lacks tree canopy coverage in densely populated areas. This indicates a need to increase urban greening to reduce the urban heat island effect and help promote active transportation. Increasing urban greening is one strategy for climate resiliency, as it can reduce temperatures from 0.5 to 0.7 degrees Celsius and can result in a 50 percent decrease in heat related mortality.⁸⁹

⁸⁵ California Department of Public Health. (2016). Sea Level Rise Narrative.
⁸⁶ California Department of Public Health. (2016). Air Conditioning Narrative.

⁸⁷ California Department of Public Health. (2016). Tree Canopy Narrative.
⁸⁸ Tree People. (2019). Green Priorities in Los Angeles County.
⁸⁹ Rudolph, L., Harrison, C., Buckley, L. & North, S. (2018). Climate Change, Health, and Equity: A Guide for Local Health Departments. Public Health Institute and American Public Health Association.

EXHIBIT 7 Sea Level Rise



Percent of Population Living in Sea Level Rise Inundation Areas



Source: SCAG, CalBRACE, 2019

ECONOMIC OPPORTUNITY

Household income levels and access to jobs have a significant impact on the quality of life, educational attainment and financial stability for households. These measures help to define the quality of life of the region and have a direct connection to public health outcomes. Public health outcomes are proven to improve when income and educational attainment rise, as increased income and educational attainment yield greater ability to make healthy choices, which in turn result in improved overall health. Additionally, the economy can be impacted by various factors. One such factor is child poverty, which negatively impacts the economy and costs the United States total of \$500 billion annually, or the equivalent of 4 percent gross domestic product (GDP).⁹⁰ Costs of child poverty include increased cost of crime, reduced productivity and increased health expenditures, while also disproportionately affecting the quality of life and health outcomes of children experiencing poverty.⁹¹

EDUCATIONAL ATTAINMENT AND MEDIAN INCOME

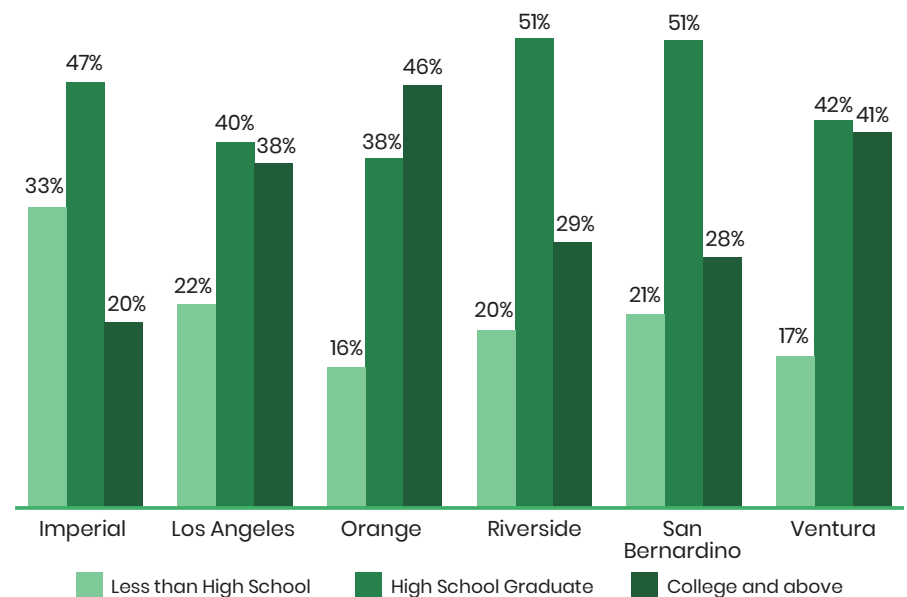
Educational attainment is an important marker of economic success in the region, as individuals with higher education have higher earning potentials. Throughout the SCAG region, there are varied levels of educational attainment, as shown in **FIGURE 11**. Compared to other counties, Imperial County has the highest proportion of individuals with less than a high school education, while Orange County has the highest proportion of individuals with an associate degree or higher. Trends show that large portions of the population in all counties are attaining a high school (HS) diploma, with at least 40 percent of the population in each of the six counties attaining a HS diploma. Overall, fewer people are attaining less than a high school education, however, trends also show lower attainment for a college education, with the exception of Orange County, which has more college graduates than any other county in educational

90 Harry J. Holzer, Diane Whitmore Schanzenbach, Greg J. Duncan & Jens Ludwig (2008) The economic costs of childhood poverty in the United States
91 Ibid.

attainment level. Riverside County has more high school graduates than college graduates, and over 50 percent of individuals in Riverside and San Bernardino Counties have attained only a high school diploma.

Attaining higher levels of education is correlated to securing higher paying jobs, and higher salaries reflect higher household incomes levels, which are directly related to improved health outcomes. In 2016, median household income for the SCAG region was \$62,000. Imperial County had the lowest median household income at \$42,560 and Ventura had the highest at \$78,593. Household income can be a marker of quality of life, and with a higher median household income, families have greater flexibility in economic opportunities and flexibility in health care and prevention spending. **FIGURE 12** shows the distribution of median household income in the region. Additional details about the income distribution in the region can be found in the Economic and Job Creation Technical Report.

FIGURE 11 Educational Attainment by County



Source: American Community Survey (ACS)

PHYSICAL ACTIVITY

With chronic disease rates worsening or remaining constant across the SCAG region, there continues to be opportunities to increase rates of physical activity and reduce the prevalence of chronic diseases. The built environment has a direct effect on opportunities for people to live active lifestyles. Community design factors such as mixed land uses, retail within close proximity, and other essential services help to increase the likelihood for people to engage in physical activity by walking or bicycling to their destinations.

PHYSICAL ACTIVITY BENEFITS

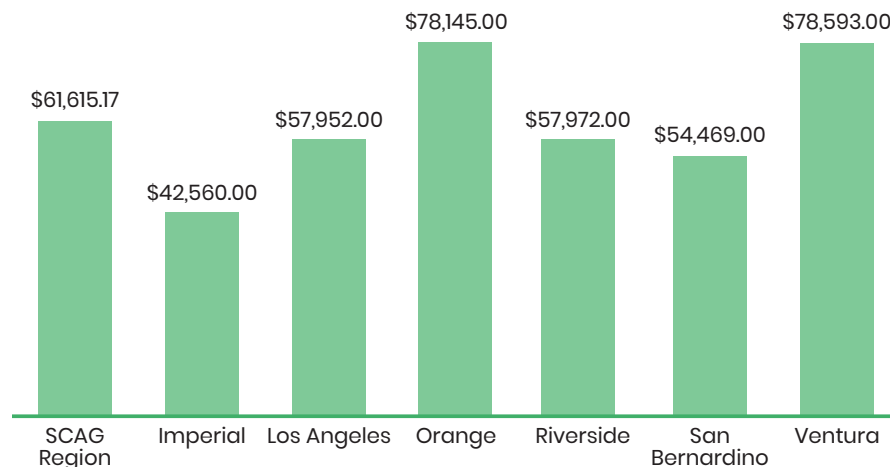
Physical activity has many benefits, including reduced risks of chronic diseases

such as cardiovascular disease, type 2 diabetes and several types of cancer.⁹² The benefits of physical activity also increase as intensity and duration of activities increase. The U.S. Department of Health and Human Services released *Physical Activity Guidelines for Americans*, 2nd edition in November of 2018, recommending adults to engage in moderate intensity cardio for at least 150 minutes a week or at least 75 minutes of vigorous intensity cardio weekly.⁹³ The guidelines also highlight the many benefits of physical activity and include tested strategies that can be used to provide guidance for increasing physical activity.

To encourage physical activity, it is important to provide opportunities within the built environment to be active that intersect with everyday life. The U.S. Department of Health Guidelines emphasize interventions in the built environment that can make being physically active the easy choice in all the places where people live, learn, work, play and age. Design interventions in the built environment make it easier for people to be active, particularly for transportation, and can have a significant impact on public health. This includes locating destinations such as schools, stores, or public transportation options near homes or workplaces so that people can easily walk, bike, or use a wheelchair to access. It includes making routes to destinations more accommodating for people walking and biking or wheelchair users by making them safer and seamlessly connected.

Most adults in the SCAG region are not meeting the recommended physical activity levels. Less than 50 percent of individuals in the SCAG region are regularly walking for transportation, fun, and/or exercise, with only 38 percent of people in the region reporting they walk regularly, as shown in **FIGURE 13**. Ventura County ranked slightly above the region average with 44 percent of respondents reporting that they walked regularly for transportation, fun, and/or exercise.⁹⁴ In most counties, only 1/3 of the respondents were walking regularly. In the SCAG region, 20 percent of surveyed adults responded being active for at

FIGURE 12 Median Household Income by County



Source: American Community Survey (ACS)

92 U.S. Department of Health and Human Services (2018). *Physical Activity Guidelines for Americans*, 2nd edition. Washington, DC: U.S. Department of Health and Human Services.

93 Ibid.

94 California Health Interview Survey. (2016). "Regularly walked for transportation, fun, exercise."

least 20 minutes a day, 7 days a week, as shown in **TABLE 2**. In addition, about 20 percent of people in the region responded not being active at all. Individuals are most likely to be active between 3 to 4 days per week, with about 25 percent of individuals reporting they are active 3–4 days a week.⁹⁵

ACTIVE TRANSPORTATION AND PHYSICAL ACTIVITY

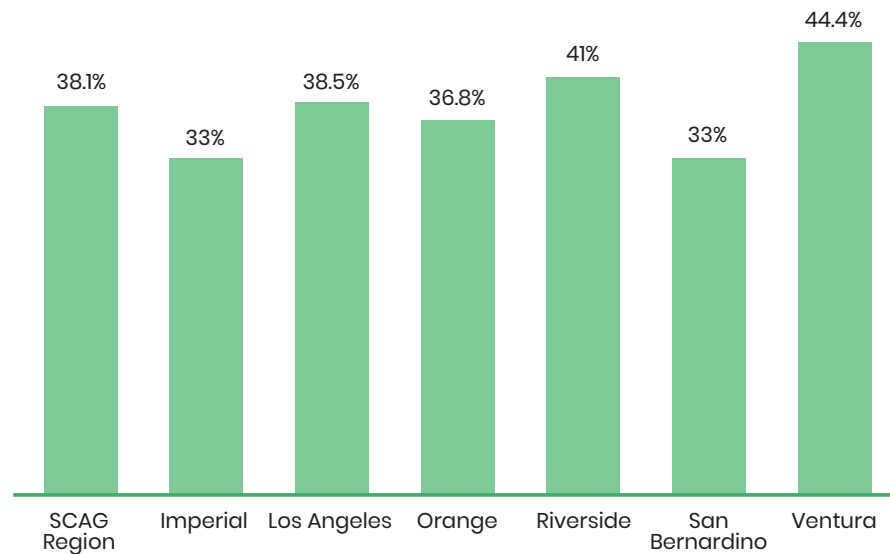
Increasing mode share of biking and walking and promoting active transportation is one strategy to increase physical activity and reach the recommended levels. Encouraging active transportation for travel to and from

school for children and teens is an effective way to build healthy habits from a young age. **FIGURE 14** shows the percent of school aged children who use active transportation to get to school at the county level. As infrastructure improves and becomes increasingly accessible and safe for active transportation, more residents will have the opportunity to take part in these activities, which will help to improve their overall health.

Investment in active transportation infrastructure will help to increase mode share of walking and biking. This can improve rates of obesity, hypertension and other chronic diseases. One resource for communities to access statewide funding for improved active transportation infrastructure is the California Active Transportation Program (ATP). To learn more about the ATP at the State level, see the Active Transportation Technical Report.

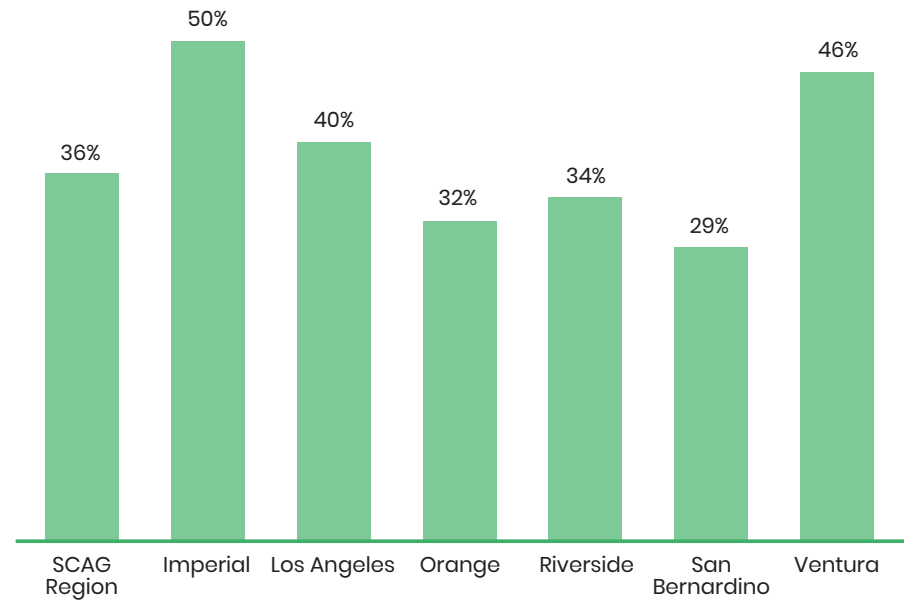
⁹⁵ California Health Interview Survey. (2017). "Number of days physically active at least 20 minutes (at a time)."

FIGURE 13 Regularly Walking for Transportation, Fun, and/or Exercise by County



Source: California Health Interview Survey (CHIS)

FIGURE 14 Children and Teens that Bike, Walk, Skate from School



Source: California Health Interview Survey (CHIS)

TRAFFIC AND NEIGHBORHOOD SAFETY

Traffic and neighborhood safety are major public health concerns for the region. They affect the way people move about their neighborhoods and how they interact with their environment, all of which affect the propensity for physical activity and active travel. As bicycle and pedestrian collisions rise in the region, there is a need to focus safety efforts to prevent collisions and traffic fatalities, especially within the High Injury Network (HIN).

TRAFFIC SAFETY

Bicycle and pedestrian fatalities are a significant public health challenge for the region. In 2012, pedestrian fatalities in the region averaged 329.8, and increased to an average of 420.4 in 2016. Similarly, bicycle fatalities averaged 56.4 per 100 Vehicle Miles Traveled (VMT) in 2012 and increased to an average of 67.4 100 VMT in 2016. An average of 1918.2 non-motorized fatalities and serious injuries were reported for 2012 and increased to an average of 2046.4 in 2016, as shown in **TABLE 3**. People walking and biking are disproportionately impacted by traffic fatalities, as only about 12 percent of all daily trips are made by walking and biking, but over 27 percent of fatalities involve bicyclists and pedestrians.

Research suggests there is a multiplier effect when streets are designed to safely accommodate walking and biking. As more people walk and bike the

rate of collisions goes down as pedestrians and bicyclists become more visible to motorists.⁹⁶ Recent research from the Safe Routes to School National Partnership has shown that people who live in neighborhoods with less traffic and higher rates of walking, bicycling, and transit use know more of their neighbors, visit their neighbor’s homes more often, and are less fearful of neighbors.⁹⁷ When streets are inhospitable to pedestrians and bicyclists, residents don’t feel safe walking or biking to nearby transit and their ability to access regional educational and employment opportunities is hindered. Improving transportation infrastructure to encourage walking and cycling is one of several effective ways to improve physical activity, decrease traffic collisions, and improve health. Improving traffic safety results in better public health outcomes, beyond simply reduced injuries and fatalities.

To assess the proportions of collisions occurring in Environmental Justice areas, SCAG analyzed bicycle and pedestrian collisions in specific EJ areas, as shown in **FIGURE 15**. Households at the poverty level have higher pedestrian-involved and bicycle-involved collisions at double their regional share. Similarly, households in income quintile one, or households living below poverty level, experience pedestrian-involved and bicycle-involved collisions at twice their

⁹⁶ CalTrans. (2017) Transportation Planning. RTP Guidelines for MPOs.

⁹⁷ At the Intersection of Active Transportation and Equity.” Safe Routes to School National Partnership. 2015.

TABLE 2 Number of Days Active for at Least 20 Minutes per Day (Adults)

| Days | Imperial | Los Angeles | Orange | Riverside | San Bernardino | Ventura | SCAG Region |
|--------|----------|-------------|--------|-----------|----------------|---------|-------------|
| 0 | 24.9% | 18.9% | 18.8% | 25.8% | 21.9% | 14.5% | 19.9% |
| 1 to 2 | 16.90% | 16.80% | 13.90% | 11.90% | 10.60% | 21.20% | 15.30% |
| 3 to 4 | 20.10% | 26.20% | 27.20% | 22.00% | 26.30% | 25.10% | 25.80% |
| 5 to 6 | 16.00% | 17.10% | 20.40% | 19.90% | 23.40% | 19.80% | 18.80% |
| 7 | 22.20% | 21.20% | 19.60% | 20.30% | 17.80% | 19.60% | 20.40% |

Source: California Health Interview Survey (CHIS)

regional share. Increasing safety and access for all users improves access to essential destinations and is especially critical for disadvantaged and underserved communities. Coordinated planning of transportation and land use can promote public health through the development of safe, livable, walkable and accessible communities. Transportation and public health providers can work together to address these factors to improve health outcomes. For more information on strategies to improve transportation safety, please visit the Active Transportation and Transportation Safety and Security Technical Reports.

NEIGHBORHOOD SAFETY

The safer people feel in their neighborhood, the more likely they are to take advantage of their environment by engaging in active transportation and outdoor physical activity. For example, people in neighborhoods with less crime are more likely to enjoy outdoor workouts, leisure activities and use active transportation. In the region, Los Angeles County has the highest crime rate, with 5.55 violent crimes per 1,000 residents. San Bernardino County follows with 4.90 violent crimes per 1,000 residents, as shown in **FIGURE 16**. Working to improve public safety to decrease crime rates can be step to increasing neighborhood mobility and promoting opportunities for physical activity.

TABLE 3 Active Transportation Collisions/Fatalities/Injuries by County

| County | Imperial | Los Angeles | Orange | Ventura | Riverside | San Bernardino | SCAG Region |
|---|----------|-------------|--------|---------|-----------|----------------|-------------|
| NUMBER OF FATALITIES BY MODE (5-YEAR ROLLING AVERAGE) | | | | | | | |
| Walk | 4.20 | 239.60 | 58.60 | 9.80 | 49.20 | 59.00 | 420.40 |
| Bike | 0.40 | 32.40 | 13.20 | 3.80 | 10.40 | 7.20 | 67.40 |
| Vehicle | 33.00 | 653.80 | 171.20 | 54.40 | 232.80 | 258.00 | 1403.20 |
| NUMBER OF SERIOUS INJURIES BY MODE (5-YEAR ROLLING AVERAGE, 2012-2016) | | | | | | | |
| Walk | 4.60 | 779.80 | 150.20 | 37.00 | 86.40 | 85.00 | 1143.00 |
| Bike | 3.00 | 240.80 | 82.80 | 24.40 | 37.40 | 27.80 | 415.60 |
| Vehicle | 65 | 2719.4 | 731.2 | 223.6 | 655 | 650.2 | 5044.4 |
| Transportation Fatality Rate per 100M VMT | 1.44 | 0.82 | 0.63 | 0.79 | 1.12 | 1.16 | 0.88 |
| Transportation Serious Injury Rate per 100M VMT | 2.88 | 3.40 | 2.69 | 3.26 | 3.14 | 2.91 | 3.16 |
| Number of Non-motorized Fatalities and Non-motorized Serious Injuries | 11.6 | 1296.2 | 304.8 | 75 | 183.4 | 179 | 2046.4 |

Source: Statewide Integrated Traffic Records System (SWITRS), 2016

ADDITIONAL HEALTH OUTCOMES

SCAG analyzed additional health indicators at the county level including life expectancy at birth, leading cause of death, insured adults, mental health and analyzed indicators included in CalEnviroScreen 3.0. As each of these indicators cross multiple public health focus areas, SCAG has analyzed each of them in a separate category.

LIFE EXPECTANCY AT BIRTH

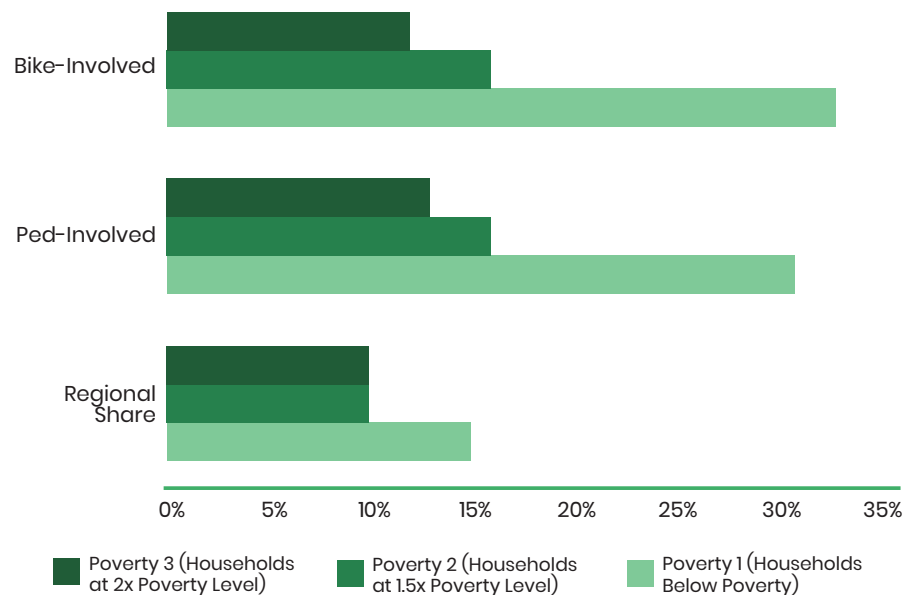
Across the SCAG region, there are differences in life expectancy among populations depending on where they live. While one number cannot give a full picture of the disparities, life expectancy at birth is often used to highlight how health can vary between communities. Life expectancy at birth estimates

range from a low 68.8 and a high of 93.3 across the region. **EXHIBIT 1** shows the variation of life expectancy across the region. The lowest and highest life expectancy estimates can be found within Los Angeles County. Variation within counties shows how the built environment can be a strong predictor in health outcomes.

LEADING CAUSE OF DEATH

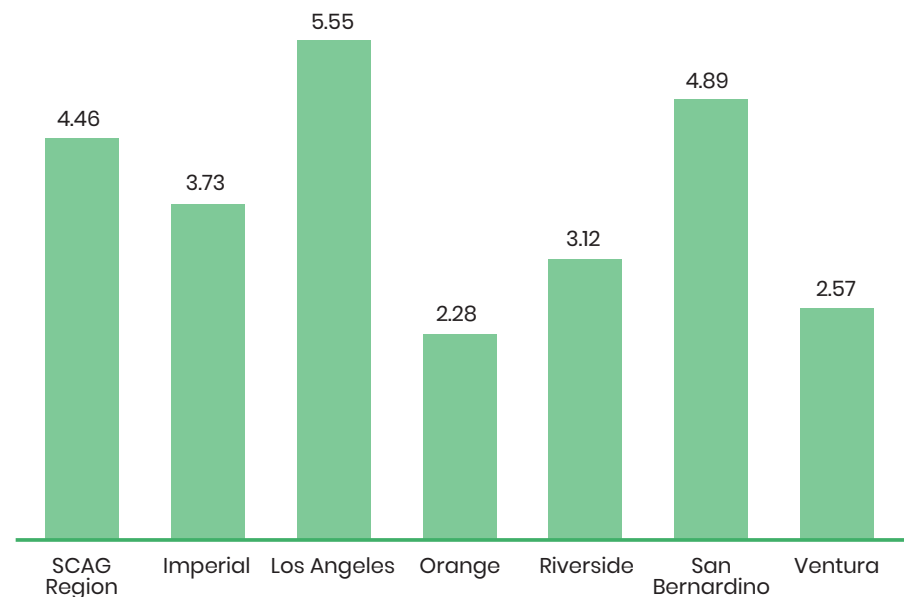
Among chronic diseases, stroke is the leading cause of death in the region, accounting for over 26 percent of all deaths, as shown in **FIGURE 17**. Chronic diseases, including stroke, diseases of the heart, lower respiratory diseases, and diabetes, and injuries make up over 69 percent of all causes of death in the region, and are directly related to built environment factors. Tracking the leading causes of death can help to highlight areas of concern in the region and

FIGURE 15 Active Transportation Collisions for Households in Poverty, 2016



Source: SCAG, 2019

FIGURE 16 Violent Crime Rates Per 1,000 People by County



Source: California Department of Justice (DOJ)/ACS

identify where improvements to the built environment can be focused.

INSURED ADULTS

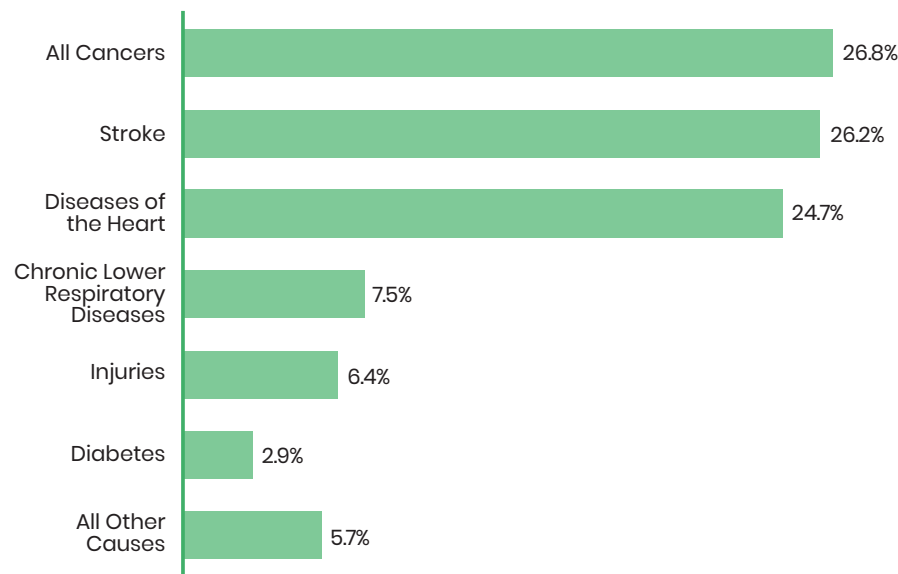
The majority of adults in the region were insured in 2016, with 85.2 percent of the total population insured and 79.5 percent of 18–64 year olds insured. Each county in the region is below a 16 percent uninsured rate for the entire population, and among 18–64 year olds, the uninsured rate is higher by approximately 4 percent. For example, while Ventura County had 12.3 percent uninsured among the total population, within the 18–64 year old population 17.5 percent were uninsured. **FIGURE 18** shows the percent of uninsured populations in each county. Insured individuals have better health outcomes as they have more access to health services and a greater variety of health services available to them. Insured individuals are less likely to use emergency services

for routine procedures or conditions. Without access to primary care services, uninsured individuals are likely to utilize emergency services for more routine procedures. Overutilization of emergency services can lead to an increase in overall health care spending.

MENTAL HEALTH

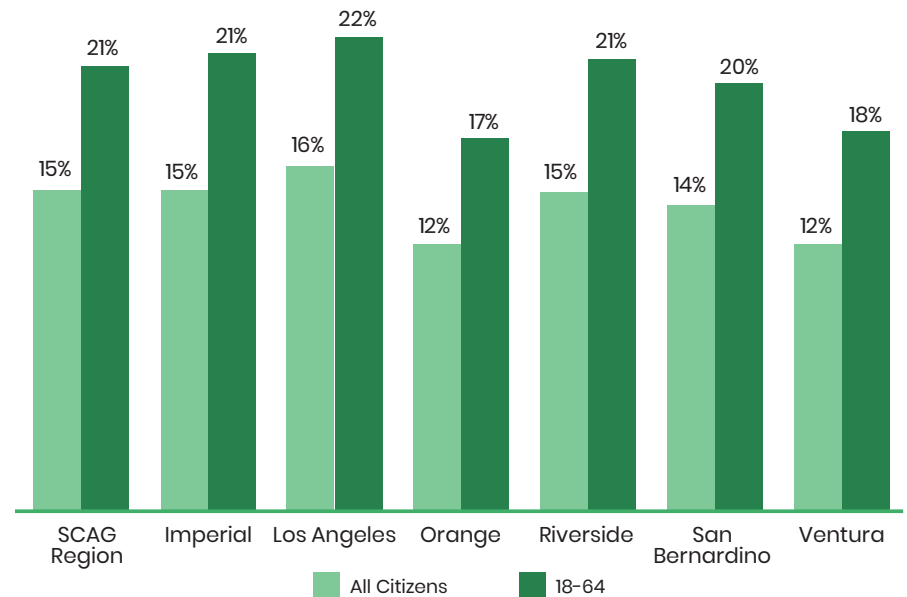
The California Health Interview Survey (CHIS) has self-reported information on individuals' state of mental health. In 2016, 4.8 percent of individuals in the SCAG region reported having severe work impairment within the last 12 months. Orange County had the highest prevalence rate at 5.6 percent, and San Bernardino had the lowest rate at 3.2 percent. **FIGURE 19** shows the severe work impairment prevalence within the counties in the region. CHIS also provides data on the utilization of mental health services. Surveyed individuals

FIGURE 17 Leading Cause of Death in the SCAG Region



Source: California Department of Public Health (CDPH) County Profiles

FIGURE 18 Uninsured Adults by County



Source: American Community Survey (ACS)

were asked if they had seen any health care provider for emotional-mental and/or alcohol-drug issues in the past. Approximately 13.1 percent of individuals in the region responded yes to this question, as shown in **FIGURE 20**. According to the National Institute of Mental Health, nearly 1 in 5 adults live with a mental illness.⁹⁸ Improving walkability and access to green spaces and parks can help with stress reduction at work and improve mental health.

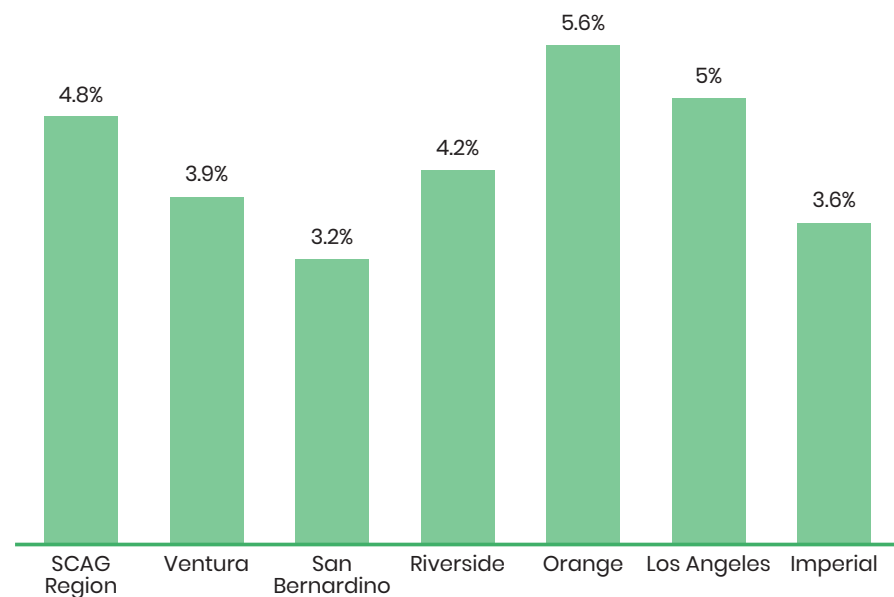
CALENVIROSCREEN 3.0

EXHIBIT 8 shows the CalEnviroScreen (CES) 3.0 percentile score by census tract for the region. The map illustrates the disproportionate pollution burdens in

the region and shows census tracts that are vulnerable to multiple sources of pollution. The CES score provides a weighted value that takes into account a series of pollution burden indicators and population characteristics to calculate a score based on the average of exposures and environmental effects and the average of sensitive populations and socioeconomic factors. Higher percentile values represent a greater pollution burden and a higher vulnerability to pollution burden due to sensitive populations and socioeconomic factors. As the map illustrates, urban areas in the region typically have higher CES scores, while less populated areas have lower CES scores. For example, the Los Angeles area has among the highest percentile values in the region. For more information on the CalEnviroScreen 3.0 tool, see the Environmental Justice Technical Report.

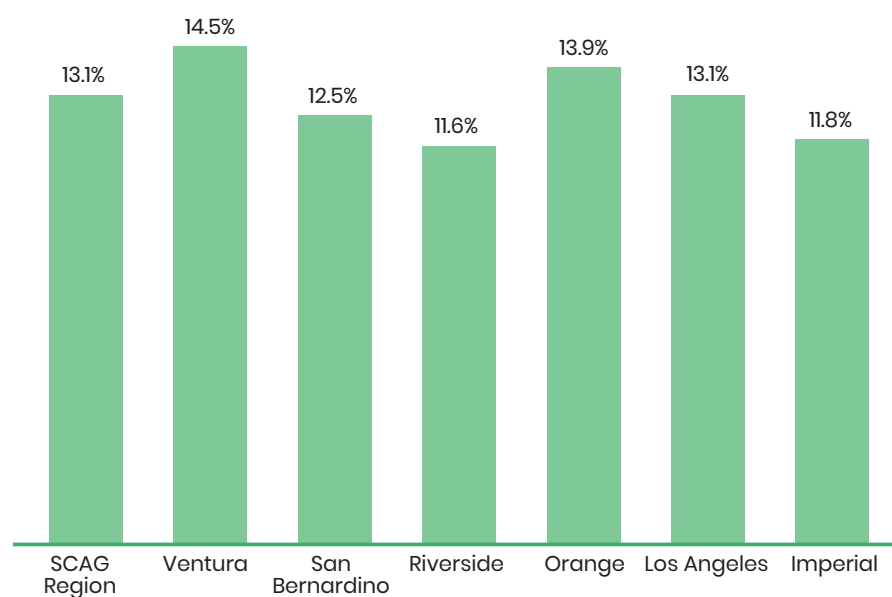
98 (2019). National Institute of Mental Health. Mental Illness.

FIGURE 19 Work Impairment due to Mental Health by County



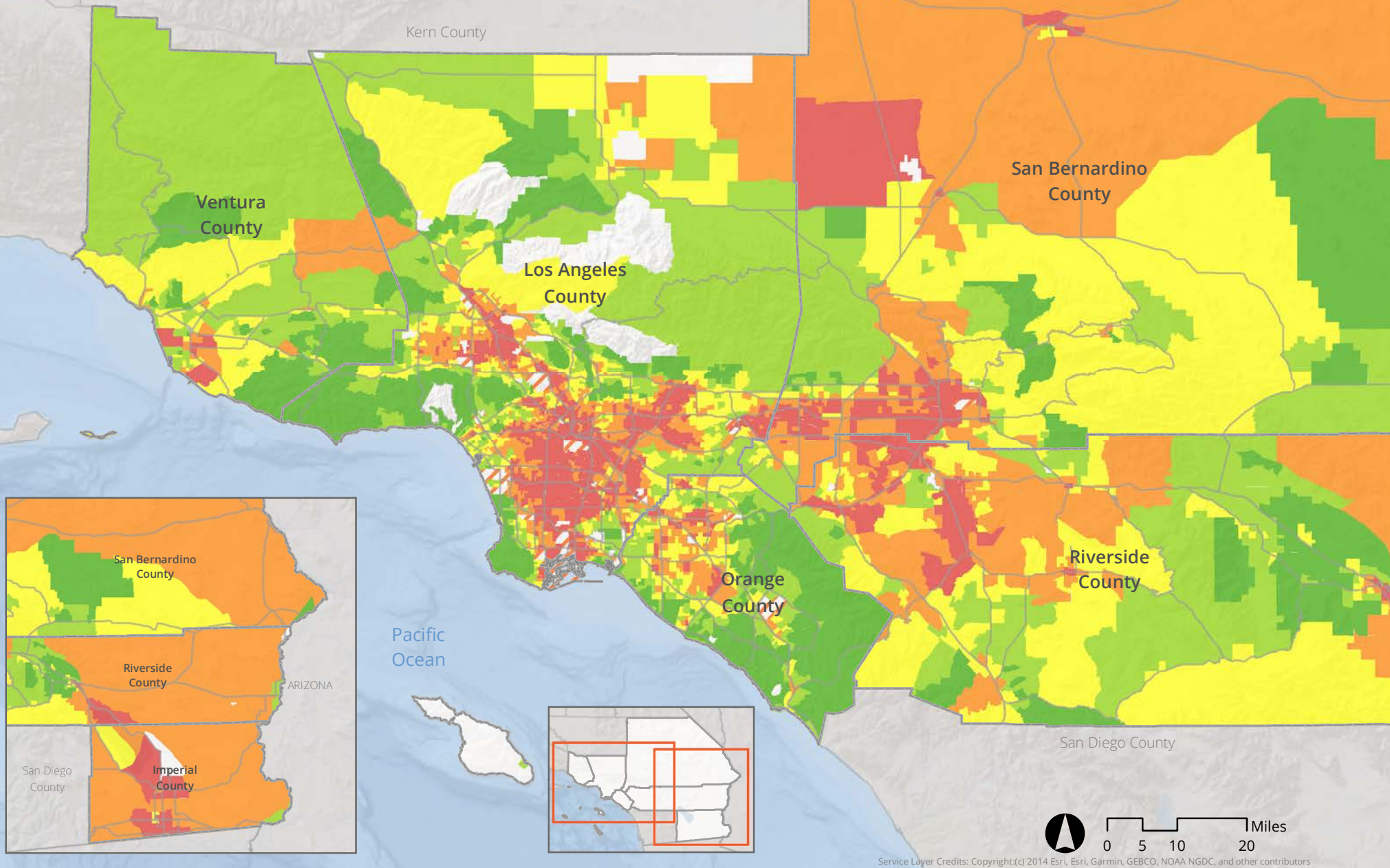
Source: California Health Interview Survey (CHIS)

FIGURE 20 Visited Mental Health Provider in Past 12 Months By County





Source: California Health Interview Survey (CHIS)






EXHIBIT 8 CalEnviroScreen 3.0 Percentile



High Pollution, Low Population

-  Insufficient Data
-  High Pollution, Low Population

CalEnviroScreen 3.0 Percentile

-  1 - 20%
-  21 - 40%
-  41 - 60%
-  61 - 80%
-  81 - 100%

Source: CalEPA, OEHHA, CalEnviroScreen 3.0, 2017

CalEnviroScreen is a screening tool that evaluates the burden and potential vulnerability to pollution. Communities with "High Pollution, Low Population" scored 90% or higher with the pollution burden percentile metric, but does not have an assigned CalEnviroScreen 3.0 Percentile.

PLAN PERFORMANCE

Implementation of Connect SoCal is expected to improve public health outcomes through transportation and land use strategies that address each of the seven public health focus areas. SCAG has consolidated data for each priority area based on the performance measures of Connect SoCal and other analyses conducted through the development of the Environmental Justice Technical Report as shown in **TABLE 4**, **TABLE 5** and **TABLE 6**. The implementation of Connect SoCal will support improvements in community connectivity and healthy places for people to live, work, play and age. For more information on the performance measures discussed below, see the Performance Measures Technical Report and the Environmental Justice Technical Report.

ACCESSIBILITY TO ESSENTIAL SERVICES

The investments of Connect SoCal are expected to improve and maintain accessibility and efficiency across the region to essential services and support improved public health outcomes. Connect SoCal identifies strategies that work together to optimize the performance and efficiency of the transportation system to allow for improved access to essential services such as schools, healthy food, jobs, affordable housing, parks and open space, health care facilities and others to support improved health outcomes.

The transportation investments of Connect SoCal are supported by a growth strategy that aims to locate more housing and jobs in High Quality Transit Areas (HQTAs), Transit Priority Areas (TPAs) and Neighborhood Mobility Areas (NMAs). Infill development in HQTAs increases the number of destinations that are easily accessible via transit and creates more compact communities where many goods and services can be reached by walking or biking. Connect SoCal is expected to reduce the total number of single occupancy vehicle trips, while increasing the number of trips taken by bus, rail, and active transportation, therefore reducing vehicle miles traveled (VMT) and greenhouse gas emissions.

TABLE 7 highlights outcomes of the plan that will influence the ability of residents across our region to access essential services. These outcomes are

directly related to public health improvements and aim to extend the access to destinations and services that support healthy living. While Connect SoCal provides a wider variety of transportation options and encourages mode shift through multimodal transportation investments, 84.5 percent of Southern Californians will still use automobiles, either single occupancy vehicles or carpool, to complete a majority of trips, especially trips over three miles. The highway and arterial investments included in Connect SoCal aim to optimize the efficiency of the existing system to ensure that the mobility needs for all in the region are met. In addition, SCAG and its partners will strengthen efforts to encourage ridesharing, carpooling, vanpooling, and other Transportation Demand Management (TDM) strategies that reduce vehicle trips and greenhouse gas emissions. These strategies help to improve air quality while increasing efficiency and access to jobs, schools, and other destinations and services. Other strategies such as congestion pricing with considerations to equity have also been studied for feasibility.

Connect SoCal calls for improvements in transit and if implemented, will result in improved accessibility to employment, shopping and open space destinations for households in poverty. The average commute time via auto is expected to decrease by about 10 percent, and by about 2 percent for transit. The percent of work trips and non-work trips less than 3 miles is expected to slightly increase by about 2 percent respectively, resulting in opportunity for short trips to be taken via walking and biking and expand opportunities for physical activity.

NEIGHBORHOOD CHANGE AND DISPLACEMENT

Connect SoCal also promotes residential infill development in areas that are not yet well served by transit, but where jobs, schools and other amenities are in close proximity and transit is planned. This strategy reduces the distance and time required to reach essential services and destinations. However, as new households, jobs and transportation investments are added to existing communities, there is potential for neighborhood change, or the displacement of lower-income and communities of color. Renters are more likely to be displaced when neighborhood change happens, which is of significant concern within the SCAG region where 48 percent of people rent. Displacement of low income residents to less accessible locations can place significant burdens on

TABLE 4 Connect SoCal Performance and Public Health Outcomes Summary

| Public Health Focus Area | Performance Measure | Result of Plan | | |
|--|--|---|-----------|---------------------------------------|
| | | 2045 BASELINE | 2045 PLAN | PERCENT DIFFERENCE (BASELINE TO PLAN) |
| ACCESSIBILITY TO ESSENTIAL SERVICES | Households in High Quality Transit Areas (HQTAs) | 46% | 47% | 2% |
| | Employment in High Quality Transit Areas (HQTAs) | 53% | 56% | 6% |
| | Households in Transit Priority Areas | 23% | 24% | 4% |
| | Employment in Transit Priority Areas | 29% | 31% | 7% |
| | Households in Growth Priority Areas | 58% | 60% | 3% |
| | Employment in Growth Priority Areas | 70% | 72% | 3% |
| | Average distance traveled for work trips (miles) | 17.9 | 17.7 | -1.1% |
| | Average distance for non-work trips (miles) | 5.8 | 5.7 | -1.7% |
| | Percent of work trips less than 3 miles | 14.0% | 14.3% | 2.1% |
| | Percent of non-work trips less than 3 miles | 40.5% | 41.4% | 2.2% |
| | Average time for work trips (minutes)-Vehicle | 30.60 | 27.70 | -9.5% |
| | Average time for work trips (minutes)-Transit | 70.90 | 69.60 | -1.8% |
| | Average time for work trips (minutes)-Walk/Bike | 23.3 | 23.85 | 2.4% |
| | Percentage of PM peak transit trips | 29.00% | 28.80% | -0.69% |
| | Percentage of PM peak HOV trips | 29.60% | 29.50% | -0.34% |
| | AFFORDABLE HOUSING | Household savings: transportation costs | \$11,461 | \$10,844 |
| Household savings: utilities costs (energy and water) | | \$2,492 | \$2,424 | -2.7% |
| Household total savings (transportation and utilities) | | \$13,953 | \$13,268 | -4.9% |
| Multifamily homes as percentage of all new home construction | | 39.00% | 69.00% | 76.92% |
| Percent of multi-family household mix | | 44.00% | 50.00% | 13.64% |
| Percent of single-family household mix | | 56.00% | 50.00% | -10.71% |

TABLE 4 Connect SoCal Performance and Public Health Outcomes Summary – Continued

| Public Health Focus Area | Performance Measure | Result of Plan | | |
|--------------------------|--|-----------------|-----------------|---------------------------------------|
| | | 2045 BASELINE | 2045 PLAN | PERCENT DIFFERENCE (BASELINE TO PLAN) |
| AIR QUALITY | Air pollution-related health incidences, annual | 192,400 | 182,100 | -5.4% |
| | Air pollution-related health costs, annual | \$3.34 billion | \$3.16 billion | -5.4% |
| | Share of households within 500 feet of freeways and high-traffic roads | 5% | 5% | 0% |
| | Share of employment within 500 feet of freeways and high-traffic roads | 9% | 9% | 0% |
| | Greenhouse gas emissions from transportation (CO2) | 189,230.30 | 181,478.20 | -4.1% |
| | Criteria pollutants PM _{2.5} (tons per day) | 12.9 tons | 12.4 tons | -3.9% |
| | Criteria pollutants: PM ₁₀ (tons per day) | 31.7 tons | 30.4 tons | -4.1% |
| | Criteria pollutants: NOx (tons per day) | 83 tons | 79 tons | -4.8% |
| | Criteria pollutants: Carbon Monoxide (CO) (tons per day) | 326 tons | 307 tons | -5.7% |
| | Total annual Vehicle Miles Traveled (VMT) | 483.5 million | 459.1 million | -5.0% |
| | Share of households in the lowest income quintile within 500 feet of freeways and high-traffic roads | 22% | 22% | 0% |
| | Share of households below poverty level within 500 feet of freeways and high-traffic roads | 15% | 15% | 0% |
| CLIMATE CHANGE | Greenhouse gas emissions reductions from 2005 levels | N/A | N/A | 2020: -8% 2035: -19% |
| | Building water use: residential and commercial (cumulative 2016-2045) (acre feet) | 89.7 million | 88.1 million | -1.8% |
| | Building water costs: residential and commercial (cumulative 2016-2045) | \$122.5 billion | \$120.3 billion | -1.8% |
| | Greenfield land consumption (square miles) | 100 sq miles | 71 sq miles | -29.0% |
| ECONOMIC OPPORTUNITY | Additional annual jobs supported by improving competitiveness | N/A | 264,500 | N/A |
| | Additional annual jobs supported by transportation investments | N/A | 168,400 | N/A |
| | Share of development in High Quality Transit Areas (HQTAs) - Employment | 53% | 56% | 6% |
| | Share of development in Transit Priority Areas- Employment | 29% | 31% | 7% |
| | Percent of work trips less than 3 miles | 14.00% | 14.30% | 2.1% |
| | Percent of non-work trips less than 3 miles | 40.50% | 41.40% | 2.2% |
| | Household savings: transportation costs | \$11,461 | \$10,844 | -5.4% |
| | Household savings: utilities costs | \$2,492 | \$2,424 | -2.7% |

TABLE 4 Connect SoCal Performance and Public Health Outcomes Summary – Continued

| Public Health Focus Area | Performance Measure | Result of Plan | | |
|--------------------------|---|----------------|-----------|---------------------------------------|
| | | 2045 BASELINE | 2045 PLAN | PERCENT DIFFERENCE (BASELINE TO PLAN) |
| PHYSICAL ACTIVITY | Percent of non-work trips less than 3 miles | 40.50% | 41.40% | 2.2% |
| | Mode share of walking (all trips) | 7.80% | 8.70% | 11.5% |
| | Mode share of bicycling (all trips) | 1.70% | 2.10% | 23.5% |
| | Combined active transportation mode share | 9.50% | 10.80% | 13.7% |
| | Obese population (Adults 18-65) | 30.3% | 30.1% | -0.80% |
| | High blood pressure (Adults 18-65) | 26.4% | 26.2% | -0.41% |
| | Heart disease (Adults 18-65) | 4.37% | 4.35% | -0.31% |
| | Diabetes type 2 (Adults 18-65) | 8.1% | 7.9% | -2.91% |
| | Daily per capita walking (minutes daily)* | 5.8 min | 6.7 min | 16.5% |
| | Daily per capita biking (minutes daily)* | 0.5 min | 0.7 min | 32.0% |
| | Daily per capita auto (minutes daily)* | 48.4 min | 43.2 min | -10.7% |

Source: SCAG, 2019

Acronyms:

CHP: California Highway Patrol

EMFAC: Emissions Factors

SHOPP: State Highway Operation & Protection Program

household finances and contribute to poor health outcomes. Displacement can also impact community cohesion and disrupt social capital that contributes to cultural traditions that support an individual's overall well-being.

When looking specifically at Environmental Justice Areas, SCAG analyzed accessibility indicators for vulnerable populations who have faced both historical and contemporary health equity concerns. The analysis shows the vulnerability for neighborhood change and displacement and the relationship between neighborhood changes in the region. Out of the six counties in the region, Los Angeles County has experienced the largest share of census tracts that have changed more than three times or more in the last four decades. These 30 census tracts in Los Angeles County have shifted to have a higher share of college educated population, higher income households, causing

an increase in rental prices and vulnerability for neighborhood change and displacement. Additionally, the second highest group of movers in the region are moving from areas well-served by transit to areas that are not well served by transit. This can cause an increase in commute travel time and distance, allowing less time for other activities such as exercise, and an increase in household spending on transportation costs related to fuel and auto. For a more detailed analysis on neighborhood change and displacement, please see the Environmental Justice Technical Report.

ACCESSIBILITY TO PARKS AND NATURAL LANDS

Access to parks and natural lands is essential for quality of life and provides opportunities for physical activity. The analysis shows accessibility to parks and

natural lands for Environmental Justice Areas and allows for a comparison to county and regional level accessibility to understand how access for populations vary. For households living below the poverty level, only 7.1 percent are able to access parks by auto within 30 minutes of travel at the base year. When looking at the same group for access to parks via transit, only 0.28 percent can access parks via transit within 45 minutes of travel during this same time period.

ACCESSIBILITY TO EMPLOYMENT AND SERVICES

With Connect SoCal implementation, total travel time for destinations for Environmental Justice Areas is not improving at the same rate as the SCAG region. When looking at accessibility improvements to jobs, only 6.8 percent of Communities of Concern have access to jobs by transit within 45 minutes, compared to 19.8 percent of the region. When looking at accessibility

improvements to shopping, only 3.3 percent of Communities of Concern have access to shopping by transit within 45 minutes, compared to 6.5 percent of the region.

SHARE OF GROWTH IN HIGH QUALITY TRANSIT AREAS (HQTAS)

Siting housing and job growth within HQTAs is a key strategy of Connect SoCal. Compared to the Baseline, Connect SoCal will increase the share of housing and job growth in HQTAs by 3 and 5 percent, respectively. This will result in improved access to a wider variety of destinations by locating households, jobs and destinations near transit.

TABLE 5 Connect SoCal Performance – Environmental Justice Analysis

| Public Health Focus Area | Performance Measure | Greater SCAG Region | Communities of Concern | SB 35 Disadvantaged Areas | Environmental Justice Areas |
|------------------------------|--|---------------------|------------------------|---------------------------|-----------------------------|
| Air Quality | Emissions Reductions CO | 6% | 6% | 6% | 6% |
| | Emission Reductions PM _{2.5} | 4.3% | 4.1% | 4.5% | 4.3% |
| ACCESS TO ESSENTIAL SERVICES | Travel Time Reductions (Person Hour Travel) | 5% | 4% | 3% | 0% |
| | Travel Distance Reductions (Person Mile Travel) | 1% | 2% | 0% | -1% |
| | Average Weighted Local Park Accessibility by All Transit within 45 Minutes (Measured as the Share of the Regions Local Park AVERAGE) | 4.10% | 25.20% | 1.90% | 2.30% |
| | Average Weighted Job Accessibility by All Transit within 45 Minutes (Measured as the Percent of Regional Employment Accessibility) | 19.80% | 40.70% | 0.30% | 6.80% |

Source: SCAG, 2019

Note: The percentages above indicate percentage changes between 2045 Baseline and Plan. For detailed analysis and methodology, refer to the Environmental Justice Technical Report

TRIP LENGTH

Shorter trip lengths can improve regional accessibility by reducing the time and increasing travel options for reaching essential destinations. Roughly 14 percent of all work trips and 41 percent of all non-work trips are expected to be under three miles as a result of the Plan. With a larger proportion of trips under three miles there is greater opportunity for trips to be taken via active transportation and align with the short trips strategies outlined in the Active Transportation Technical Report.

COMMUTE TRAVEL TIME

The average trip time for work trips is expected to decrease for transit and auto modes, as seen in **TABLE 7**. By reducing the time that it takes to access jobs, residents will have improved opportunities for securing economic stability. Decreasing the duration of work trips also helps to expand opportunities for active travel and transit trips and increasing options for healthier transportation choices. Between Baseline and Plan, average commute travel time by auto improves by nearly 10 percent and 2 percent for transit for the region.

TABLE 6 Connect SoCal Environmental Justice Analysis: Criterion Exposure Relative to all Census Tracts in the State

| Public Health Focus Area | Performance Measure | Greater SCAG Region | Communities of Concern | SB 35 Disadvantaged Areas | Environmental Justice Areas |
|----------------------------|---|---------------------|------------------------|---------------------------|-----------------------------|
| AIR QUALITY | Asthma Emergency Room Visits | 22 | 22.1 | 23 | 32 |
| | PM _{2.5} Concentrations in Air | 19 | 18 | 18 | 25 |
| | Traffic Density | 25 | 24 | 25 | 36 |
| | Diesel PM Emissions | 25 | 24 | 26 | 34 |
| | Ozone Concentrations in Air | 18 | 17 | 17 | 23 |
| | Toxic Release from Facilities | 62 | 60 | 62 | 68 |
| ADDITIONAL HEALTH OUTCOMES | Solid Waste Sites | 68 | 67 | 69 | 75 |
| | High-Hazard, High-Volatility Pesticides | 95 | 95 | 95 | 95 |
| | Low Birth-Weight Infants | 20 | 20 | 20 | 27 |
| | Cardiovascular Disease | 20 | 19 | 19 | 25 |
| | Drinking Water Contaminants | 25 | 24 | 24 | 33 |
| | Ground Water Threats | 46 | 45 | 48 | 53 |
| | Toxic Cleanup Sites | 56 | 55 | 58 | 66 |
| | Impaired Water Bodies | 57 | 55 | 56 | 60 |
| | Hazardous Waste Facilities and Generators | 66 | 66 | 71 | 78 |

Source: SCAG, 2019

Note: The percentages above indicate percentage changes between 2045 Baseline and Plan. For detailed analysis and methodology, refer to the Environmental Justice Technical Report

TABLE 7 Connect SoCal Performance - Accessibility to Essential Services

| Metric | Result of Plan | | Percent Change from Baseline to Plan |
|--|----------------|-----------|--------------------------------------|
| | 2045 BASE LINE | 2045 PLAN | |
| Average distance for home-based work trips (miles) | 17.9 | 17.7 | -1% |
| Average distance for non-work trips (miles) | 5.8 | 5.7 | -2% |
| Percentage of PM peak transit trips <45 min | 46.70% | 47.00% | 1% |
| Percentage of PM peak HOV trips <45 min | 78.30% | 83.80% | 7% |
| Percentage of PM peak SOV trips <45 min | 80.10% | 85.40% | 7% |
| AVERAGE COMMUTE TRIP LENGTH (MILES) | | | |
| Walk | 1.7 | 1.7 | 0.0% |
| Bike | 2.7 | 2.8 | 3.7% |
| Transit | 14.4 | 14.8 | 2.8% |
| Auto | 18.6 | 18.6 | 0.0% |
| MODE SHARE OF WORK TRIPS | | | |
| Walk | 2.70% | 3.00% | 11.1% |
| Bike | 1.00% | 1.20% | 20.0% |
| Transit | 4.00% | 6.10% | 52.5% |
| Auto | 92.40% | 89.60% | -3.0% |
| MODE SHARE OF ALL TRIPS | | | |
| Walk | 7.80% | 8.70% | 11.5% |
| Bike | 1.70% | 2.10% | 23.5% |
| Transit | 3.60% | 4.90% | 36.1% |
| Auto | 87.00% | 84.50% | -2.9% |
| AVERAGE COMMUTE TRIP TIME (MINUTES) | | | |
| Walk | 33.1 | 33.5 | 1.2% |
| Bike | 13.5 | 14.2 | 5.2% |
| Transit | 70.9 | 69.6 | -1.8% |
| Auto | 30.6 | 27.7 | -9.5% |

Source: SCAG, 2019

AFFORDABLE HOUSING

Access to affordable housing continues to be a challenge despite an improving economy. Wages have not kept pace with rising housing costs, transportation costs, and issues with access to health care. As discussed in the Existing Conditions section, when affordable housing is difficult to obtain, the ability to pay for healthy food or preventative care is restricted and access is often hindered. People will resort to living farther from work and having longer commutes to manage housing costs, taking time away from other important needs. However, longer commutes not only come at a cost for an individual's health, they also come at a financial cost with a larger share of household income spent on vehicle operating costs and transportation related costs. When households are able to spend less on these types of costs, there is more available for health-related spending. State legislation, such as California Senate Bill 628 (Beall) and California Assembly Bill 2 (Alejo), provide jurisdictions with an opportunity to establish funding sources to develop affordable housing, supportive infrastructure, and amenities.

PER HOUSEHOLD TRANSPORTATION COSTS

With the implementation of Connect SoCal there will be a 5.4 percent reduction, or \$617 savings annually, in transportation and fuel costs for the SCAG region, as shown in **TABLE 8**. More compact and strategic land use patterns, combined with transportation network improvements, will result in improved pedestrian and bicycle access to community amenities, shorter average trip lengths and reduced vehicle miles traveled. A reduction in transportation costs for families has a direct impact on quality of living and housing opportunities.

PER HOUSEHOLD UTILITY COSTS

With the implementation of Connect SoCal there will be a 2.7 percent reduction, or \$68 savings annually, in utility costs for households. As growth in the region is more concentrated in HQTAs and denser communities, efficiencies in energy and water consumption per person will reduce demand on natural resources. The savings from utility costs will provide opportunities for households to spend on health services and preventative care. Combined with savings

from transportation costs, households are expected to save a total of 5 percent or \$685 annually.

SINGLE-FAMILY AND MULTIFAMILY HOUSEHOLDS

The concentration of new housing development in HQTAs means denser communities that can more effectively utilize transportation options besides driving. The current housing mix in the SCAG region is 55 percent single family households and 45 percent multifamily households. With Connect SoCal implementation, 31 percent of new growth will be single-family housing, while 69 percent of new growth will be multifamily housing, compared to 61 percent of new single-family housing at baseline, and 39 percent of multifamily housing at baseline.

TABLE 8 Connect SoCal Performance - Affordable Housing Outcomes

| Performance Measure | Result of Plan | | Percent Change from Baseline to Plan |
|--|----------------|-----------|--------------------------------------|
| | 2045 BASE LINE | 2045 PLAN | |
| Household savings: transportation costs (fuel and auto) | \$11,461 | \$10,844 | -5.4% |
| Household savings: utilities (energy and water) | \$2,492 | \$2,424 | -2.7% |
| Combined household savings (transportation and utilities) | \$13,953 | \$13,268 | -4.9% |
| Multifamily homes as percentage of all new home construction | 39.0% | 69.0% | 76.9% |

Source: SCAG, 2019

AIR QUALITY

The federal Clean Air Act (CAA) establishes air quality standards and planning requirements for certain air pollutants. To comply with the CAA in achieving the National Ambient Air Quality Standards (NAAQS), the California Air Resources Board (ARB) develops State Implementation Plans (SIPs) for federal non-attainment and maintenance areas. In California, SIP development is a joint effort of the local air agencies and ARB working with federal, state and local agencies (including MPOs). Local Air Quality Management Plans (AQMPs) are prepared in response to federal and state requirements.

Connect SoCal will improve air quality in the region from reductions in mobile source emissions. The Plan will reduce the volumes of criteria pollutants through improvements in vehicle technology (including goods movement) and by increasing the number of trips by transit, walking and biking through land use changes and transportation investments. Reducing air pollution will have a direct effect on public health, reducing exposure to pollutants that are generated from mobile sources, and improve the economic burden of poor health by reducing the number of sick days, lost productivity and cutting air pollution-related health costs. **TABLE 9** highlights air quality related outcomes of Connect SoCal that will contribute to improved public health outcomes.

Connect SoCal encourages limiting the siting of sensitive land uses, including older adult populations, children, and people with existing health conditions, within 500 feet of freeways and high traffic roads carrying more than 100,000 vehicles per day. This is consistent with the guidelines provide by the Air Resources Board Air Quality Manual. However, many existing developments occur within 500 feet of a freeway. To provide mitigation strategies on this issue, the California Air Resources Board released a Technical Advisory in 2017 to help supplement CARB's Land Use Handbook, identifies ways to reduce exposure in existing and future infill areas.⁹⁹ The Advisory includes mitigation strategies that reduce traffic emissions, reduce the concentration of pollutants and strategies that help clear indoor air and improve the quality of indoor air we

⁹⁹ California Air Resources Board. (2017). Strategies to Reduce Air Pollution Exposure Near High-Volume Roadways.

TABLE 9 Connect SoCal Performance – Air Quality

| Performance Measure | Result of Plan | | Percent Change from Baseline to Plan |
|--|----------------|----------------|--------------------------------------|
| | 2045 BASE LINE | 2045 PLAN | |
| Air pollution-related health incidences, annual | 192,400 | 182,100 | -5.4% |
| Air pollution-related health costs, annual | \$3.34 billion | \$3.16 billion | -5.4% |
| Share of households within 500 feet of freeways and high-traffic roads | 5% | 5% | 0% |
| Share of employment within 500 feet of freeways and high-traffic roads | 9% | 9% | 0% |
| Share of households in the lowest income quintile within 500 feet of freeways and high-traffic roads | 22% | 22% | 0% |
| Share of households below poverty level within 500 feet of freeways and high-traffic roads | 15% | 15% | 0% |
| Greenhouse gas emissions from transportation (CO2) | 189,230.30 | 181,478.20 | -4.1% |
| Criteria pollutants PM _{2.5} (tons per day) | 12.9 tons | 12.4 tons | -3.9% |
| Criteria pollutants: PM ₁₀ (tons per day) | 31.7 tons | 30.4 tons | -4.1% |
| Criteria pollutants: NOx (tons per day) | 83 tons | 79 tons | -4.8% |
| Criteria pollutants: Carbon Monoxide (CO) (tons per day) | 326 tons | 307 tons | -5.7% |
| Greenhouse gas emissions from 2005 levels: SB 375 | N/A | N/A | 2020: -8% 2035: -19% |

Source: SCAG, 2019

breathe. Strategies include speed reduction, signal management, urban design, vegetation, and indoor air filtration systems are proposed where appropriate. County health departments, include County of Los Angeles Department of Public Health, have released guidance on air quality recommendations for local jurisdictions and requirements for air filtration for new homes within 1,000 feet of a freeway.¹⁰⁰ The guidance includes recommendations for local jurisdictions to limit the siting of sensitive land uses at least 500 feet from freeways, including residences, schools and others.

Neighborhoods where HQTAs overlap with areas within 500 feet of freeways and high-traffic roads accommodate about 3 percent of all regional households and about 5 percent of regional employment both in Base Year 2016 and Plan Year 2045. To balance regional policy goals, Connect SoCal accommodates the vast majority of growth within HQTAs beyond 500 feet of freeways and high traffic roads, per the guidance provided by the California Air Resources Board (ARB) air quality manual. With Connect SoCal, 46 percent of all households will be located within HQTAs, 97 percent of which will be located beyond 500 feet of freeways and high traffic roads.

CRITERIA POLLUTANT AND GREENHOUSE GAS EMISSIONS

Criteria pollutants and greenhouse gas emissions are expected to reduce across the board through implementation of Connect SoCal. Greenhouse gas emissions will be reduced from 2005 levels by 8 percent in 2020 and 19 percent in 2035. As shown in **TABLE 9**, PM₁₀ pollutants are expected to decrease by 4.1 percent, PM_{2.5} pollutants are expected to decrease by over 3.9 percent, and greenhouse gases from transportation-related sources are expected to decrease by 4.1 percent. Reductions in greenhouse gas emissions and criteria pollutants will improve health outcomes in the region. With reductions in VMT due to increased active transportation and transit use and a cleaner fleet, health impacts related to respiratory and pollution-related disease

¹⁰⁰ County of Los Angeles Public Health. (2013). *Air Quality Recommendations for Local Jurisdictions*.

incidences are expected to decrease 5.4 percent by 2045, or by over 10,300 cases annually. It is expected that this will save the SCAG region approximately \$180 million annually.

CLIMATE CHANGE

Under SB 375, the primary goal of the SCS is to provide a vision for future growth in Southern California that decreases per capita greenhouse gas emissions from automobiles and light trucks. A more detailed analysis of the air quality impacts of the plan evaluated in accordance the State California Environmental Quality Act (CEQA) Guidelines can be found in the Programmatic Environmental Impact Report (PEIR) for Connect SoCal.

By meeting the region's reduction targets for greenhouse gas emissions under SB 375, Connect SoCal will support the mitigation of climate change impacts on the region. Other than air quality improvements, these outcomes will

TABLE 10 Connect SoCal Performance - Climate Change

| Performance Measure | Result of Plan | | Percent Change from Baseline to Plan |
|---|-----------------|-----------------|--------------------------------------|
| | 2045 BASE LINE | 2045 PLAN | |
| Greenhouse gas emissions reductions from 2005 levels | N/A | N/A | 2020: -8% 2035: -19% |
| Building water use: residential and commercial (cumulative 2016-2045) (acre feet) | 89.7 million | 88.1 million | -1.8% |
| Building water costs residential and commercial (cumulative 2016-2045) | \$122.5 billion | \$120.3 billion | -1.8% |
| Greenfield land consumption (square miles) | 100 sq miles | 71 sq miles | -29.2% |

Source: SCAG, 2019

help to address public health concerns, such as providing reliable drinking water and securing concentrated and adequate housing in areas that are less vulnerable to rising sea levels, wildfires or floods. Impacts from climate change are anticipated to be more severe and have a larger impact on vulnerable populations including the elderly, children, chronically ill, disadvantaged communities, and outdoor workers. Areas of concern include extreme heat, substandard housing, coastal flooding, drought and sea level rise. For additional analysis on Climate Change and Health, and visit the Existing Conditions section of this report.

ECONOMIC OPPORTUNITY

Encouraging economic growth and expanding the economy of the region is a significant challenge as our region grows and shifts over the next 25 years. One important area SCAG is continuing to expand upon is the economic burden of health care expenditures in the region. The costs of poor public health, rising chronic disease rates, and treating those diseases, pose a serious challenge to the region's economic well-being. In 2016, health care spending in the U.S. totaled over \$3.3 trillion, or about \$10,348 per capita. This represents an increased per capita spending on 3.5 percent. Overall, health care spending in the U.S. represents about 18 percent of gross domestic product (GDP) and chronic diseases account for 75 percent of total healthcare expenditures.¹⁰¹ National spending overall increased 4.3 percent in 2016, down from 5.8 percent growth rate in 2015. However, despite this somewhat slowed rate of increase, health spending in the U.S grew 1.5 percent faster than the overall growth rate of the GDP.¹⁰²

HEALTH CARE EXPENDITURES

The State of California as a whole spends vast resources on health care, with

over a third of the state's budget going toward health care services.¹⁰³ In 2014, the state spent over \$7,549 per capita on health care expenditures.¹⁰⁴ However, spending more on health care does not necessarily translate into improved health outcomes for Californians and residents of the SCAG region, or improve access to health care. Gaining access to health services can also be a complicated process. This process includes gaining access to health insurance, having the ability to access care in a nearby location, and developing a relationship with a provider the individual trusts and whom is culturally appropriate and accessible.¹⁰⁵

With the implementation of Connect SoCal, health care expenditures across the region are expected to decline due to reductions in cases of chronic diseases through increased investments in built environment improvements, such as active transportation. Spending less on health care costs due to projected improvements results in less spending in the healthcare industry. Federal, state and local government, private business, and consumer dollars that would have otherwise been spent on healthcare can be redirected to spending in other economic sectors and goods and services that increase economic activity and the quality of life. In addition, labor productivity is would increase due to less time lost to illness, providing indirect benefits of averted healthcare costs. When the workforce is healthier, people are able to be more productive with the same amount of workers, effectively adding to the economic impact of reduced healthcare spending. Improvements in productivity of the workforce can also help to increase competitiveness and attractiveness of the SCAG region for business development and economic growth.¹⁰⁶ The economic benefits of Connect SoCal are shown in **TABLE 11**.

Investing in active transportation is not only beneficial for promoting physical activity and improving health outcomes, it also stimulates the regional economy through job creation. Over the planning period of Connect SoCal, from 2020 through 2045, an average of 32,200 jobs are created per year through

101 U.S. Department of the Interior National Park Service. (2018). Health Parks Healthy People 2018–2023 Strategic Plan.

102 California Health Care Foundation. (2018). 2018 Edition—Health Care Costs 101: A continuing economic threat.

103 Public Policy Institute of California. (2017). California's State Budget: The Enacted 2017–18 Budget.

104 California Health Care Foundation. (2017). California Health Care Spending.

105 Healthy People 2020. (n.d.) Access to Health Services.

106 Southern California Association of Governments. (2016). Active Transportation Health and Economic Impact Study.

TABLE 11 Connect SoCal Performance – Economic Outcomes

| Performance Measure | Result of Plan | | Change from Baseline to Plan |
|--|-----------------|-----------------|------------------------------|
| | 2045 BASE LINE | 2045 PLAN | |
| Additional annual jobs supported by improving competitiveness | N/A | 264,500 | N/A |
| Additional annual jobs supported by transportation Investments | N/A | 168,400 | N/A |
| Share of development in High Quality Transit Areas (HQTAs) - Employment | 53% | 56% | 6% |
| Share of development in Transit Priority Areas (TPAs) - Employment | 29% | 31% | 6% |
| Percent of work trips less than 3 miles | 14.00% | 14.30% | 2.1% |
| Percent of non-work trips less than 3 miles | 40.50% | 41.40% | 2.2% |
| Household savings: transportation costs | \$11,461 | \$10,844 | -5.4% |
| Household savings: utilities costs | \$2,492 | \$2,424 | -2.8% |
| Health care expenditures: high blood pressure, heart disease and type 2 diabetes | \$17.29 billion | \$16.94 billion | \$346 million |

Source: SCAG, 2019

investments in active transportation. Employment impacts are driven by investment in construction, operation and maintenance of active transportation infrastructure and programs, as well as through labor productivity improvements resulting from use of the planned active transportation network, reallocation of savings in health care from reduced cases of chronic disease and enhancing network efficiency.

In 2016, SCAG completed an Active Transportation Health and Economic Impact Study, which showed that the investments in the 2016 RTP/SCS would result in an additional \$113 billion in economic outcome for the region over the life of the plan, 70 percent of which would be from reduced health care costs and improved worker productivity. The 2016 RTP/SCS projected the annual economic burden of disease for the region would total over \$12.8 billion, including annual regional costs of diabetes, heart disease, and high blood pressure among adults. Through full RTP/SCS implementation, the region was anticipated to save over \$337 million in health care costs for adults aged 18-64 through physical activity benefits from the RTP/SCS.

SCAG has conducted a similar analysis for Connect SoCal and found that the annual economic burden of annual regional costs of diabetes, heart disease and high blood pressure are projected to total over \$16 billion in 2045. Compared to the Baseline, the implementation of Connect SoCal would provide over \$346 million in health care savings per year for adults associated with reductions in just three chronic diseases, and bring significant benefits for the regional economy. By reducing rates of chronic diseases, as shown in **TABLE 12**, Connect SoCal will improve quality of life while reducing health care expenditures.

ECONOMIC EQUITY

To understand economic opportunities and the share of investments in Connect SoCal from an equity perspective, SCAG analyzed the share of investment by income level using Environmental Justice data. The lowest income quintile contributes a slightly higher proportion of investment for Connect SoCal compared to the rest of income groups. When analyzing the share of investments in the plan, the four higher income quintiles have similar investment proportions at approximately 20 percent, while the lowest quintile

TABLE 12 Connect SoCal Performance: Chronic Disease Rates in the SCAG Region

| Chronic Disease | Result of Plan | | Percent Change from Baseline to Plan | Number of Averted Cases |
|-------------------------|----------------|-----------|--------------------------------------|-------------------------|
| | 2045 BASE LINE | 2045 PLAN | | |
| Obesity (%) | 30.31% | 30.07% | -0.8% | 29,347 |
| High Blood Pressure (%) | 26.35% | 26.24% | -0.4% | 13,571 |
| Heart Disease (%) | 4.37% | 4.35% | -0.3% | 1,699 |
| Diabetes - Type 2 (%) | 8.10% | 7.87% | -2.9% | 29,992 |

Source: SCAG, 2019

has 24 percent of the investment share. For more information on the share of investments in Connect SoCal, see the Environmental Justice Technical Report.

PHYSICAL ACTIVITY

Through the implementation of Connect SoCal, rates of active transportation are expected to increase. The active transportation mode share performance measure reports the share of work trips and all trips that use active transportation (walking, bicycling, and other human-powered transportation) using the SCAG Activity-Based Model (ABM). Due to the general lack of data collected regarding active transportation infrastructure, SCAG conducted an additional “off-model” analysis for Connect SoCal. This analysis takes into account Safe Routes to School safety enhancements, first-last mile improvements, pedestrian infrastructure improvements, and bike share and micro-mobility. While the ABM shows active transportation mode share of 8.7 percent for walking (all trips) and 2.1 percent for bicycling (all trips), the most accurate Connect SoCal mode share estimate includes an addition of 1.3 percent for walking (all trips) and 0.4 percent for bicycling (all trips) for a total of 10.0 percent walking mode share (all trips) and 2.5 percent bicycling

mode share (all trips). Additional details on the active transportation off-model analysis can be found in the Active Transportation Technical Report.

TRANSPORTATION SAFETY

Low-income and disadvantaged communities are at a greater risk for bicycle and pedestrian crashes. The majority of fatalities and serious injuries are occurring in disadvantaged communities (DACs) or Communities of Concern (CoC), with 66 percent of the High Injury Network (HIN) located in disadvantaged communities.

Households below poverty have higher pedestrian-involved and bicycle-involved collisions at double their regional share. Similarly, households in income quintile one, the lowest income category, have pedestrian-involved and bicycle-involved collisions at twice their regional shares. Households at the lowest income quintile are burdened by a disproportionate share of collisions. While SCAG does not have capacity to model the safety benefits of the plan, the Active Transportation and Transportation Safety and Security Technical Reports highlight the issues of disproportionate collision impacts in Environmental Justice Areas and recommends strategies to address these issues, one of which includes a focus on the HIN and addressing traffic safety in disadvantaged communities.

PLAN IMPLEMENTATION

SCAG has established guiding principles and implementation strategies to support improved public health outcomes, facilitate information exchange and guide the integration of public health considerations into the implementation of Connect SoCal. SCAG recognizes that public health goals have not always aligned with regional planning discourse and practice, which has hindered implementation of public health goals in the past. To improve public health outcomes and engage non-traditional partners, SCAG will serve as a regional convening body to align public health goals with regional transportation and land use strategies.

In order to facilitate stakeholder engagement and continued collaboration with

stakeholders, SCAG has adopted the following principles based on stakeholder input into the plan:

- SCAG shall provide robust public health data and information, as feasible, to provide information on the ways in which the strategies and investments of Connect SoCal provide opportunities to improve public health and health equity outcomes across the region to advance the goals of Connect SoCal.
- Recognizing that public health outcomes are influenced by multiple policy elements of Connect SoCal's land use and transportation strategies and investments, SCAG will utilize a "Health in All Policies" approach to engage a wide range of stakeholders, support and encourage inter-agency coordination and conduct analysis across relevant plan elements, as feasible.
- SCAG will continue to provide support and assistance to local jurisdictions interested in using the public health analysis, policy support and data from Connect SoCal to increase competitiveness for grants and promote information sharing.

SCAG will continue to conduct additional research and analysis in the areas of health equity, climate change, affordable housing and other regional planning areas that affect public health outcomes to expand the connection between the built environment and public health in a changing region.

In the 2016 RTP/SCS, SCAG developed three key strategies that have been implemented since the Plan's adoption through stakeholder engagement, continued research and data analysis. For Connect SoCal, SCAG will continue to commit to these areas with the addition of key updates to reflect stakeholder input. SCAG is also providing recommended strategies for actions local agencies and jurisdictions can take to support public health and improved health outcomes in their communities. Below are SCAG's proposed approaches for integrating health into the different planning components. Stakeholders are encouraged to provide suggestions and technical input to improve upon these strategies as we move forward with implementation of Connect SoCal. SCAG has adopted the following strategies to support local jurisdictions efforts to implement and support health outcomes.

STRATEGY 1: REGIONAL COLLABORATION AND ENGAGEMENT

Provide leadership for collaboration with regional partners including county transportation commissions, the county and city departments of public health, sub-regional health partners, health industry leaders, local cities including planning, public works, and recreation staff, stakeholder groups, community-based organizations and others to measure and improve public health and health equity outcomes by expanding the relationship between the social determinants of health and the built environment throughout the region and promoting action through the implementation of Connect SoCal.

- **Action A:** Increase regional knowledge, information sharing and collaboration on the issue of public health, as related to the built environment and SCAG core planning functions, by defining the issues, conducting analysis and establishing policy frameworks to raise awareness among leaders, agency staff, businesses and the public. Educate policy makers on the health costs of planning decisions and advocate for transparency on the health impacts of transport and land use decisions. SCAG will, where feasible, produce policy white papers on key issues and emerging topics in public health as it relates to the built environment.
- **Action B:** Facilitate engagement and region-wide collaboration through SCAG Committees, health forums, and issue integration within other SCAG-led forums (Go Human campaign, active transportation, homelessness, affordable housing, sustainability, economy, etc.). SCAG will incorporate public health education into Go Human engagement modules to expand awareness between health and the built environment. SCAG will make efforts to highlight the public health costs of regional planning decisions.
- **Action C:** Provide enhanced opportunities for stakeholder involvement on public health issues, priorities and decision making by establishing an online forum for collaboration, feedback and continued engagement of public health topics.
- **Action D:** Expand stakeholder engagement and sustain partnerships

with governmental agencies, local non-profit organizations, health care agencies, hospitals and medical providers, colleges and universities, private foundations, and other stakeholder groups to identify, coordinate and leverage existing and planned public health activities. Identify areas of cross-collaboration with regional partners to expand opportunities for public health analysis, engagement and coordination of regional efforts.

STRATEGY 2: POLICY SUPPORT AND DATA ANALYSIS

Support balanced regional policies through SCAGs adopted “Health in All Policies” approach to facilitate equitable health outcomes for all residents of the SCAG region related to SCAGs core public health focus areas: accessibility (to healthy food, parks and open space, and other services), air quality, affordable housing, health equity, climate resiliency, economic well-being, physical activity and safety. These areas provide a focus on enhancing community connection and improving well-being of individuals in the SCAG region.

- **Action A:** Integrate public health considerations as related to the built environment throughout SCAG’s decision making processes, funding programs and planning activities. Include criteria, where feasible, on SCAG-funded grant opportunities for assessing baseline public health conditions and measuring public health outcomes throughout the project and encourage active transportation projects that address regional issues and involve multi-jurisdictional partners.
- **Action B:** Collaborate with regional partners such as universities and regional public health entities, to develop information on a broad spectrum of health issues through data collection, modeling enhancements, research and innovative data visualization.
- **Action C:** Promote and expand the Public Health Fellowship program to support regional public health data analysis, data sharing and education for students across the region.
- **Action D:** Provide enhanced online access to public health data, geospatial analysis, region-wide analysis and data tools used in

Connect SoCal to serve as a resource for regional policy and decision making. SCAG will, where feasible, integrate public health analysis into regional modeling and forecasting and continually refine public health modeling processes.

- **Action E:** Collaborate with County Transportation Commissions to integrate public health related analyses and planning projects related to the built environment into SCAGs Overall Work Program (OWP) and support updates to the county Joint Work Programs.
- **Action F:** In collaboration with regional partners, identify policies and examples of existing conditions that may create barriers to improving public health outcomes and identify solutions.
- **Action G:** Support opportunities for cooperative multi-agency/multi-municipality data systems, data sharing and resource pooling. These may include the California Public Health Assessment Model (CPHAM), Integrated Transport and Health Impacts Model (ITHIM), and others.
- **Action H:** Promote, develop and where feasible, accelerate the adoption of policies that support public health considerations across the region in planning activities that relate to the built environment.

STRATEGY 3: REGIONAL RESOURCES AND SUPPORT

Provide support to regional partners to assist local agencies on integration of public health and health equity considerations into multimodal transportation, economic development, job creation and land use planning processes that focus on disadvantaged communities and environmental justice areas.

- **Action A:** Provide technical assistance to local agencies to support implementation of Connect SoCal, such as continued support through the Sustainable Communities Program (SCP) for transportation and providing support and assistance to local agencies seeking grant funding for projects that align with the public health strategies of Connect SoCal.
- **Action B:** Eliminate knowledge gaps by exploring opportunities to

develop resources such as a healthy cities toolkit to contain fact sheets, documentation of best practices, policy and ordinance examples, white papers and website resources to support local jurisdictions and unincorporated areas to incorporate public health considerations into their planning processes.

- **Action C:** Explore opportunities for securing sustained resources to fund local and regional public health analysis as it relates to land use and transportation planning to support positive public health outcomes. SCAG shall consider implementing regional demonstration programs aimed at integrating public health considerations into planning efforts.
- **Action D:** Provide examples of sustainability and equity considerations in transportation and land use policy efforts from a public health perspective.

STRATEGIES FOR LOCAL JURISDICTIONS AND PARTNERS

There are several action steps that local jurisdictions, agencies and partners can do to help advance the public health goals and strategies of Connect SoCal. In developing these strategies, SCAG engaged and sought feedback from local and regional stakeholders from each county and SCAGs Public Health Working Group to understand regional needs and challenges and how SCAG can provide guidance through recommended strategies. To engage and guide local partners in improving public health outcomes, integrating health into local planning processes and encourage implementation of Connect SoCal, SCAG provides the following strategies as guidance:¹⁰⁷

STRATEGY 1

Establish health and health equity as a shared value in your agency or

organization to increase organizational support and community capacity to improve health outcomes, especially for vulnerable populations such as low income and historically disadvantaged communities.

- **Action A:** Encourage cross departmental collaboration to build organizational capacity and adopt a Health in All Policies (HiAP) framework.¹⁰⁸
- **Action B:** Promote integration of a health equity lens into existing transportation and land use planning by conducting Health Impact Assessments (HIAs) as a decision support tool to address public health impacts and health inequities associated with transportation and development projects in your community.
- **Action C:** Facilitate integration health into the General Plan process by including a Health Element or integrate health throughout all plan elements.¹⁰⁹
- **Action D:** Define health equity for your community and utilize available tools to better understand and measure specific indicators associated with health equity and the built environment.

STRATEGY 2

Develop strategic cross-sector partnerships with public health organizations, local and county health departments, health care services, such as hospitals and clinic groups, and others to collaborate and engage with the public through community planning processes and shared resources.

- **Action A:** Engage and partner with local residents to learn from populations facing health inequities to ensure land use and transportation planning projects include and encourage opportunities for input from diverse voices.

¹⁰⁷ Prevention Institute. (n.d.). *Advancing Healthy, Equitable, and Active Land Use in Los Angeles*.

¹⁰⁸ Centers for Disease Control and Prevention. (2018). *A Practitioner's Guide for Advancing Health Equity: Community Strategies for Preventing Chronic Disease*.

¹⁰⁹ Change Lab Solutions. (2012). *How to Create and Implement Healthy General Plans: A toolkit for building healthy, vibrant communities*.

- **Action B:** Develop partnerships and coalitions with local stakeholders and organizations working in the community to facilitate accessible opportunities for community input and better understand the community context.

STRATEGY 3

Identify, assess, measure, evaluate and standardize public health data and health equity indicators to identify and understand existing public health conditions, trends and health inequities in your community and community-level outcomes.¹¹⁰

- **Action A:** Identify key areas of concern within the community, collect data to develop baseline conditions and measure trends over time to evaluate improvements.
- **Action B:** Develop policy frameworks to define areas of focus, support data collection, and establish support for evidence-based connections between health outcomes and the built environment.
- **Action C:** Collaborate with stakeholders to refine communication strategies to share and promote the findings and outcomes of the analysis.

STRATEGY 4

Support implementation of transit oriented communities, mixed land uses, green streets strategies, and safe streets for all ages and abilities to maximize opportunities for active lifestyles and access to essential services, and promote increased rates of transit and active transportation to improve air quality.

- **Action A:** Work with local transit agencies to improve access, including first/last mile connections, to high quality transportation options including first/last mile connections, especially for vulnerable users, such as low-income and disadvantaged communities.

- **Action B:** Support safe and walkable communities through implementation of infrastructure improvements, green streets and urban cooling strategies, and the siting of affordable housing within proximity to essential services and destinations such as grocery stores, parks, shopping, etc.
- **Action C:** Support the implementation of park improvement and development projects that will increase opportunities for physical activity.

CONCLUSION

As our region continues to grow and change, it is increasingly important to prioritize public health, health equity and integrate health into regional policies and planning to improve outcomes and increase the well-being of our residents. Through the implementation of Connect SoCal, public health outcomes for the region are expected to improve across the seven focus areas. SCAG is committed to implementing strategies to support improved public health and further integrate public health, where feasible, into agency decision making, grant programs and other areas related to regional land use and transportation planning. Through working with our local partners and jurisdictions, SCAG has the opportunity to enhance collaboration, data analysis and policy development through promoting best practices and encouraging implementation of Connect SoCal by providing tools, resources and support to engage local partners.

¹¹⁰ Communities in Action: Pathways to Health Equity. (2017). Community Tools to Promote Health Equity.

APPENDIX 1 OF 2

SCAG Region County Initiatives

Cities and counties in the SCAG region have begun implementing strategies to prioritize and improve public health outcomes related to transportation and land use. This section provides brief examples of initiatives taking place throughout the SCAG region. SCAG is currently working with the public health departments from all six counties to identify the extent of healthy city resolutions and public health element adoption by local jurisdictions across the SCAG region.

County of Imperial: The Imperial County Public Health Department is successfully implementing its Nutrition Education and Obesity Prevention (NEOP) Program. NEOP is funded by the California Department of Public Health and addresses physical inactivity/walkability through support of Safe Routes to School Programs and health policy initiatives. For example, NEOP has helped coordinate the Westmorland Walk to School Day as well as developing a school wellness policy that supports Safe Routes to School programs. Lastly, NEOP has worked with partners to host events that promote active lifestyles and increase access to physical activity opportunities.

County of Los Angeles: In Los Angeles County, the Department of Public Health is supporting several new initiatives including a Vision Zero Action Plan and Safety Study for unincorporated areas of the county as well as their “Life is Better with Trees” initiative that will help provide shade, clean air, cooler temperatures and a better quality of life for residents in urban neighborhoods.

In addition, the Department of Public Health is seeking to create a broad awareness and understanding of the social determinants of health and the policies that have created health inequities in order to move towards racial

equity, social justice and healthier communities. In order to support this goal, the PLACE program developed two GIS Story Maps: *Hidden Health Hazards: How Our Environments Shape Us*¹ and *Let's Walk!*² In addition, the county has developed health profiles for its cities and communities.³

SCAG is working in partnership to support the City of Los Angeles' Vision Zero campaign by sharing data, tracking efforts, assisting in the pursuit of funding, and including supportive language in the RTP. This is an example of one way 2017 RTP Guidelines for MPOs 290 in which an MPO could support local jurisdictions efforts in this area. The goal of Vision Zero Campaigns are to reduce the number of pedestrian deaths to zero. It involves a culture change to reclaim streets for people rather than cars, and relies on significant collaboration across agencies, organizations, and community residents to work towards improving street safety. Vision Zero campaigns are an emerging non-infrastructure strategy where SCAG is collaborating with local partners.

County of Orange: The Orange County Health Care Agency partners with schools and community groups through its Safe Routes to School (SRTS) Program to create safe, convenient, and fun opportunities for children to walk and bicycle to school. Through walkability audits, the project engages youth to identify barriers and facilitators to walking safely to school, then connects them to jurisdictional partners and other stakeholders who can help make changes to their walking environment. The SRTS Program also provides resources and training to schools to encourage and celebrate walking through a Walking School Bus Program and Walk to School Day.

In addition, the agency administers its Fifteen in Twenty (FIT) Cities program which aims to reduce childhood obesity as well as reduce pedestrian and biking injuries while creating healthy and sustainable communities. FIT Cities partners with jurisdictions, community members, and community organizations to conduct community assessments and connect partners to create environmental

changes. Providing data, assisting in community engagement, and empowering residents to advocate for themselves. FIT has worked with cities on street and bike lane improvements, increased active transportation opportunities, and environmental changes around open space and parks.

The Alliance for a Healthy Orange County is an example of a successful partnership among various stakeholders to leverage resources and funding to promote positive public health outcomes and collaboration with non-transportation agencies.

County of Riverside: The Riverside University Health System – Public Health has released a Healthy Development Checklist⁴ in combination with the San Bernardino Public Health Department, WRCOG, and SBCOG. The Toolkit seeks to encourage developers, city officials, and decision makers to guide the development of neighborhoods that promote physical and mental health, encourage community engagement, and improve quality of life for all. Community members may also find this tool as a useful resource to better understand healthy development practices.

In addition, the Healthy Cities Network has continued to advance their efforts of working with local cities to adopt Healthy City Resolutions, H.E.A.L. resolutions and health elements in general plans. **EXHIBIT 11** shows their progress to date.

County of San Bernardino: The County of San Bernardino has continued its Healthy Communities Program which was created as a central point of contact for health-related issues throughout the County. The program provides technical assistance to communities throughout the County, giving specific recommendations for policy and environmental strategies to improve residents' health. In addition, the program collaborates on multiple projects throughout the region, partnering with schools, community and faith-based organizations, public and private agencies, and city governments. These partnerships are effective tools for improving health in local communities.⁵ One example is Vision 2B Active, campaign which aims to improve health and wellness in San

1 Los Angeles County Department of Public Health. [GIS Story Map] Hidden Health Hazards: How Our Environments Shape Us.

2 Los Angeles County Department of Public Health. [GIS Story Map]. Let's Walk.

3 Los Angeles County Department of Public Health. (2018). Office of Health Assessment & Epidemiology. Our Cities. Our Communities. City and Community Health Profiles.

4 Riverside University Health System – Public Health (2017). Healthy Development Checklist.

5 San Bernardino County Department of Public Health. (2017). Healthy Communities.

Bernardino County by encouraging residents to increase their physical activity and connecting them to existing recreational programs, amenities and activities in their communities.

The San Bernardino County Department of Public Health has recently completed a Healthy Communities Strategic Plan & Policy Playbook.⁶ The aim of the Healthy Communities Strategic Plan is to serve as a resource and a set of action steps for the SB CDPH to use when engaging and collaborating with communities during the policy development and implementation process. The plan provides an overview of potential policy strategies and action steps for SB CDPH to partner with local governments and create healthy environments. The policy strategies chosen will depend on local readiness, political and financial feasibility and policy effectiveness.

As previously mentioned, San Bernardino Community Vital Signs Initiative is an example of a best practice coalition involving multiple stakeholders from different focus area to support the Wellness Element in the Countywide Vision Plan. The initiative is guided by the San Bernardino County Community Transformation Plan, a county-wide plan that includes an analysis of the SDOH. The Vital Signs initiative established a community health improvement framework to align resources and improve health outcomes. The initiative focuses on four core areas, including education, economy, health and wellness and safety to improve the lives and health outcomes of County residents.⁷

County of Ventura: The Ventura County Public Health Department released the 2017 Community Health Assessment⁸ for the county as well as the 2018 Community Health Improvement Plan.⁹ The 2017 Community Health Assessment identifies 15 priority health issues that were used for the framework of the Community Health improvement Plan and includes conditions of the physical environment where people live, learn, work and play as factors for consideration. The 2018 Community Health Improvement Plan defines

five goals for the county to improve the health of all its residents, including creating healthy communities by providing access to affordable housing and clean safe communities.

As part of the 2018 Community Health Improvement Plan, Ventura County Public Health Department (VCPH) is participating in the Communities Lifting Communities Initiative (CLC). CLC is collaborative effort of VCPH, the Hospital Association of Southern California (HASC) and the Public Health Alliance of Southern California. It is a partnership intended to reduce health disparities and improve community health across Southern California and support existing and future collaborative with regional hospitals, public health departments and other partners. VCPH is working to align its existing priorities with CLC focus areas of diabetes prevention, improved birth outcomes and homelessness¹⁰.

REGIONAL HEALTH EQUITY INITIATIVES

With the increasing awareness of healthy places and the need to create conceptual and organizational bridges between planning and public health, contemporary efforts have been made at the local and regional level throughout the SCAG region. When health equity principles are incorporated into regional strategic plans, there is a recognized connection to sustainable communities and health outcomes creating more livable, walkable, healthier, and environmentally sustainable neighborhoods.¹¹ Below are some examples of local initiatives in the SCAG region aimed to achieving health equity and sustainable areas.

Metro Equity Platform Framework: As of February 2018, the Los Angeles Metropolitan Transportation Authority (Metro) approved a multi-point equity platform focused on addressing four main pillars surrounding inequity seen throughout the region:

- Pillar 1: Define and Measure – It is important to begin the process of developing an equity agenda by creating a common foundation at

6 San Bernardino County Department of Public Health. (2017). County Healthy Communities Strategic Plan & Policy Process Playbook.

7 San Bernardino County. (2013). Our Community Vital Signs 2013 Report.

8 Ventura County Department of Public Health. (2017). Community Health Assessment.

9 Ventura County Department of Public Health. (2018). Community Health Improvement Plan.

10 Ventura County Public Health. (2018). Community Health Improvement Plan 2018–2020.

11 Rubin, V. (2015). Regional Planning for Health Equity.

Metro by defining the term equity. This will allow the perspectives of the varying causes of inequities and fundamental differences to align. Metrics will be defined allowing equity-based performance and outcomes to be further evaluated.

- Pillar 2: Listen and Learn – Metro will be establishing comprehensive forums to allow community members and stakeholders to engage and actively pursue diverse perspectives of equity in broad terms as well as more specifically in terms of transportation.
- Pillar 3: Focus and Deliver – A concentrated focus will be critical for the Long Range Transportation Plan (LRTP) as it unifies two main equity areas for Metro; where they lead and where they partner.
- Pillar 4: Train and Grow – To pursue equity training throughout Metro, a “top-to-bottom” approach should be implemented. With training distributed agency-wide, methods to evaluate and analyze equity can be efficiently communicated and prioritized.

Health Matters in Ventura County: A strategic plan sponsored by Ventura County Public Health, a division of the Ventura County Health Care Agency. The plan emphasizes Health Equity as a priority area and aims to “support each person in Ventura County in attaining his or her full health potential regardless of socially determined circumstances.” The main goals of the plan are:

- Goal 1.1: Strengthen organizational and staff capacity to implement health equity initiatives.
- Goal 1.2: Advocate for new, flexible and sustainable funding to address social determinants of health.
- Goal 1.3: Partner public and private sector organizations to achieve policy, system and environmental changes to promote health where people live, work, study and visit.

San Bernardino County Strategic Plan 2015–2020: Created by the San Bernardino County Department of Public Health (DPH). The DPH has also made Health Equity a priority for their region through two main goals stated below.

- Goal 1: Improve access and availability to health services for both preventative care and treatment.

- Goal 2: Support equal access to healthy options and environments.

The progress of these goals and objectives, found in more detail in the full report, can be tracked through the metrics that have been determined by the DPH as they aim to achieve these goals by 2020.

To integrate public health considerations into Connect SoCal, SCAG will continuously engage with our stakeholders, technical working groups, partner agencies, and the public to collect and provide comprehensive and detailed information on how the plan will impact health outcomes across the region. To do this we will incorporate discussions of public health across outreach activities and planning discussions.

INITIATIVES BY OTHER CALIFORNIA MPOS

San Diego Association of Governments: The San Diego Association of Governments (SANDAG) recently released a white paper on how their next RTP, San Diego Forward: The Regional Plan, will incorporate public health.¹² The white paper outlines how SANDAG understanding of the public health benefits and the impact the plan investments will support the agency’s efforts to create a safe, viable and efficient transportation system for the San Diego region. In addition, it outlines a number of policy considerations for the plan. In addition, SANDAG also has an Active Transportation Grant Program (ATGP). The goal of the ATGP is to encourage local jurisdictions to plan and build facilities that promote multiple travel choices for residents and connectivity to transit, schools, retail centers, parks, work and other community gathering places. It also encourages local jurisdictions to provide bicycle parking, education, encouragement, awareness programs that support pedestrian and bicycle infrastructure.

Metropolitan Transportation Commission: The Metropolitan Transportation Commission (MTC) used the Integrated Transportation and Health Impact Modeling Tool (ITHIM) as well as the World Health Organization’s Health

¹² San Diego Association of Governments. (2018). Public Health White Paper.

Economic Tool (HEAT) to assess the health and economic benefits of active transportation in its previous RTP/SCS (Plan Bay Area 2040). MTC expects to continue to use similar modeling techniques in its next RTP/SCS, possibly using an updated version of ITHIM to generate health benefits at the project level.

APPENDIX 2 OF 2

Other National and State Initiatives

SMALL/MEDIUM/RURAL MPO EXAMPLES

Linking Tahoe Active Transportation Plan (ATP): The ATP is a toolbox for planning, designing, constructing and maintaining a safe, comfortable and efficient roadway for users, of all ages and abilities such as pedestrians, bicyclists, transit riders, motorists, commercial and emergency vehicles. This ATP helps plan a network that provides connectivity, improves safety, supports consistent project implementation and increases awareness.

StanCOG Bicycle/Pedestrian Advisory Committee (BPAC): The BPAC is one of the StanCOG Standing Committees. This committee, created in 2009, advises the Policy Board on bicycle and pedestrian-related issues. It reviews transportation projects and recommends planning efforts that enhance non-motorized transportation opportunities in the Stanislaus region.

Health & Well Being in Regional Planning – Nashville, Tennessee: Developed in 2015, the Nashville MPO Regional Transportation Plan (RTP) increased its commitment to prioritizing transportation projects that improve health. Through the endorsed goals and objectives for the RTP, the MPO is committed to helping local communities grow in healthy and sustainable way by:

- Aligning transportation decisions with economic development initiatives, land use planning and open space conservation efforts.
- Integrating healthy community design strategies and promote active transportation to improve the public health outcomes of the built environment.
- Encouraging the deployment of context-sensitive solutions to ensure

that community values are not sacrificed for a mobility improvement.

- Incorporating the arts and creative place-making into planning and public works projects to foster innovative solutions and to enhance the sense of place and belonging.
- Pursuing solutions that promote social equity and contain costs for transportation and housing.
- Minimizing the vulnerability of transportation assets to extreme weather events.

3 major strategies to achieve these outcomes are:

- Fund and implement the regional vision for mass transit
- Develop active transportation options for walkable communities
- Reinvest in strategic roadway corridors

Health in Transportation Planning – Puget Sound, Washington Regional Council: Vision 2040 the region’s long-range growth management, economic and transportation strategy, calls for a transportation system that creates more travel choices while preserving environmental quality and open space. Health is featured prominently in VISION 2040’s multicounty planning policies. PSRC works with regional partners to discover how health outcomes in VISION 2040 can better be achieved. VISION 2040’s triple bottom line (people, prosperity and planet) is viewed by the public health partners as recognizing the link between a healthy environment, healthy economy and healthy people. In addition to continuing PSRC’s interest in safety, VISION 2040 calls out other health-related topics, including the built environment and health, air and water pollution from vehicles, and chronic diseases related to exposure to pollutants, physical inactivity and lack of access to healthy foods. In addition, the plan calls for ensuring mobility choices and minimizing negative impacts for disadvantaged populations and people with special needs.

LARGE/URBAN MPO EXAMPLES

MTC One Bay Area Grant Program: The MTC One Bay Area Grant (OBAG2) Program provides specific funding opportunities for jurisdictions in the nine-

county Bay Area region to invest in Safe Routes to School projects. Under OBAG2, MTC provides \$5 million per year, distributed to each of the nine counties based on school enrollment for Safe Routes to School infrastructure projects and Non-Infrastructure programs. Each County CMA determines the details on how the SRTS funds are spent. It should be noted that this example is unique to a large urbanized MPO with substantial discretionary funding sources. Not all regions have the fiscal resources to undertake this type of program.

SANDAG Complete Streets Policies: The SANDAG Board of Directors adopted a Regional Complete Streets Policy in December 2014. The policy defines complete streets as it will be used to guide SANDAG in its role as an implementer of regional transportation projects. The policy includes implementation action items to provide the tools, training and procedures necessary to ensure all projects implemented by SANDAG consider local complete streets initiatives and accommodate the needs of all travel modes:

Taking Back the Streets and Sidewalks Report: Many aspects of Complete Streets policies also contribute to achieving the tenets of community violence prevention through infrastructure design. Taking Back the Streets and Sidewalks Report can serve as a reference for those in the planning community working on violence prevention. The report examines ways in which Safe Routes to School and community safety efforts overlap and complement each other. The report primarily focuses on approaches to support personal safety for children and teens during the trip to and from school, but broader community strategies are also discussed in the course of providing background and exploring more comprehensive solutions to violence in communities. The report’s overall goal is to increase the safety and health of children and youth, and ensure that communities become more equitable places.



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