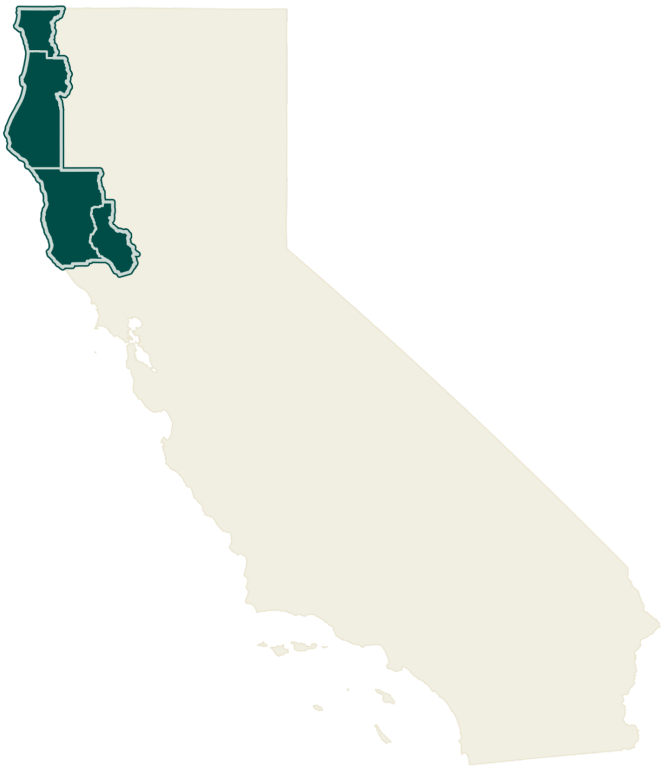
California's Redwood Coast: Exploring the Roots of Health Disparities



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November 2023
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RANCHO
Rural Association of Northern California Health Officers

Cal Poly Humboldt.

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Acknowledgements

This report was made possible by funding from the California Department of Public Health and in-kind support from Cal Poly Humboldt.

The California Center for Rural Policy would specifically like to thank:

- CCRP Staff: Sydney Lyons, Nick Ortiz, Alisha Hammer, Nino Dzotsenidze, and Dawn Arledge
- Dr. Tom Jackson, Jr. Ph.D., President, Cal Poly Humboldt
- Connie Stewart, Executive Direct of Initiatives, Cal Poly Humboldt
- Cal Poly Humboldt Sponsored Programs Foundation
- Redwood Region RISE participants and reviewers

Suggested Citation:
Kirsch, S. (2023). *Roots of Disparity: Public Health Challenges on California's Redwood Coast*. California Center for Rural Policy at Cal Poly Humboldt.

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The California Center for Rural Policy at Cal Poly Humboldt is a research and policy center committed to informing policy, building community, and promoting the health and well-being of rural people and environments.

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EXECUTIVE SUMMARY

The population of the Redwood Coast (comprising Del Norte, Humboldt, Mendocino, and Lake counties) faces many challenges including striking health disparities compared to the whole of California. These health disparities include elevated premature death, rates of disability, and behavioral risk factors. This report aims to identify high-impact health determinants contributing to these health disparities between the Redwood Coast and the state, and to provide targeted policy recommendations for closing these gaps.

Multiple data sources suggest that these disparities in health outcomes primarily stem from elevated tobacco use, substance use, and mental health challenges. The consequences of these disparities include elevated lung cancer, respiratory diseases, motor vehicle deaths, drug-induced and liver diseases, and suicides.

The region has a higher proportion of populations at risk for tobacco use, substance use and mental health challenges, including those living in poverty, homeless individuals, people with lower levels of educational attainment, people living alone, and those who have experienced multiple adverse childhood experiences (ACEs). While these challenges are experienced broadly in the region, people of color, disabled groups, and lesbian, gay, and bisexual individuals face particularly pronounced health and socioeconomic challenges.

The region also experiences adverse disparities in access to healthcare, which appears to disproportionately impact those with lower incomes and people with mental health challenges. Moreover, Redwood Coast adults who have mental health challenges are at far higher risk of experiencing delayed care.

In light of these findings, this report underscores three **policy focus areas**, with a particular focus on serving the at-risk populations:

1. Smoking Prevention, Education, and Cessation
2. Substance Use Prevention and Treatment
3. Suicide Prevention and Access to Mental Health Care

Addressing these concerns in the Redwood Coast is imperative to bridge healthcare disparities and enhance the overall well-being of its residents.

DATA SOURCES AND METHODS

This report draws from a wide array of data sources, as detailed below. In this section, we offer a brief overview of the primary data methods and constraints, while a more extensive examination can be found in Appendix A.

Data Sources

- U.S. Census Bureau American Community Survey (ACS)
- California Department of Finance (DOF)
- The California Health Information Survey (CHIS)
- County Health Rankings & Roadmaps (CHRR)
- U.S. Health Resources & Services Administration (HRSA)
- Center for Disease Control (CDC) PLACES Data
- California School Climate, Health, and Learning Surveys (CalSCHLS)
- Kidsdata.org
- California Department of Public Health (CDPH), County Health Status Profiles
- CDPH, Overdose Surveillance Dashboard
- CDPH, Chronic Hepatitis C California Surveillance Report
- CDPH, California Blood Lead Data, 2021

- Cal Fire Wildfire Perimeters and Prescribed Burns (Cal Fire)
- California Office of Traffic Safety (OTS)
- UC Berkeley Transportation Injury Mapping System (TIMS)
- CalEnviroScreen 4.0

Key Data Methods and Limitations

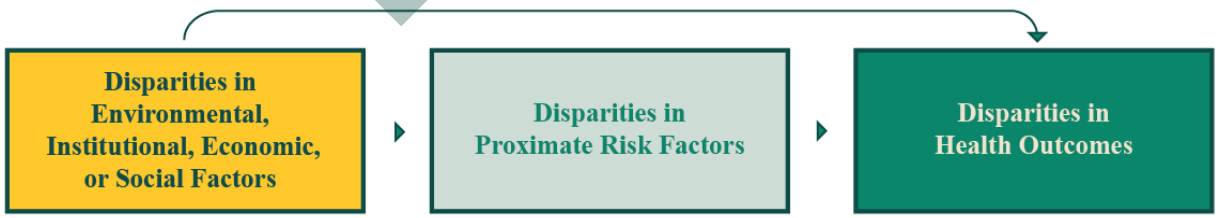
- 95% confidence intervals are presented wherever the necessary information is available. Generally, these are illustrated with horizontal bars. Wide confidence intervals indicate a greater level of uncertainty.
- Some data points are not shown either because they have been suppressed by the data provider or because of high levels of statistical uncertainty.[1]
- Data that are generated using statistical modeling (i.e. small area estimation techniques) are denoted as SAE. SAE data is limited and should not be used to measure impacts of local area policy interventions.
- California Health Information Survey (CHIS) data include only Humboldt, Mendocino, and Lake counties, referred to in these visualizations as HML. Del Norte is aggregated with a broader seven county California region, therefore including Del Norte would substantially skew the data for the region.
- The word "significant" is used deliberately throughout this report to indicate a statistically significant difference.

Section 1. CONCEPTUAL FRAMEWORK

The conceptual framework of this report takes inspiration from the Bay Area Regional Health Inequities Initiative (BARHII) framework, which posits a flow from upstream factors such as social, living environment, and institutional inequities to downstream factors such as health behaviors, diseases, and ultimately mortality rates (BARHII).

Figure 1.1

Conceptual Framework



[1] Usually because of extremely wide confidence intervals (e.g. a sample proportion that includes 0 or 100%) or because the data provider denotes the estimate as statistically unstable.

To maintain focus on the most salient health determinants, this report works backwards from these upstream disparities in health outcomes, looking first at regional disparities in mortality rates, diseases, and disabilities to identify where disparities exist between the region and state averages, such as for example disparities in lung cancer rates (see "Overview of Health Outcomes"). This analysis produces a set of health outcomes where there is significant and adverse disparity between the region and the state to provide a focused approach to identify immediate or 'proximate' downstream factors contributing to these disparities, such as health behaviors including tobacco use (see "Proximate Risk Factors").

Subsequently, the report looks further upstream to identify the institutional, economic, and/or social factors that may contribute to these disparities in proximate risk factors, such as the role of poverty in tobacco use, as well as considering the potential for direct relationships with these deeper factors on health such as the link between poverty and chronic stress (see "Economic, Social, Institutional, and Environmental Factors"). Because of the potentially vast array of such factors, focus is maintained on those factors commonly raised in the region's community health assessments.

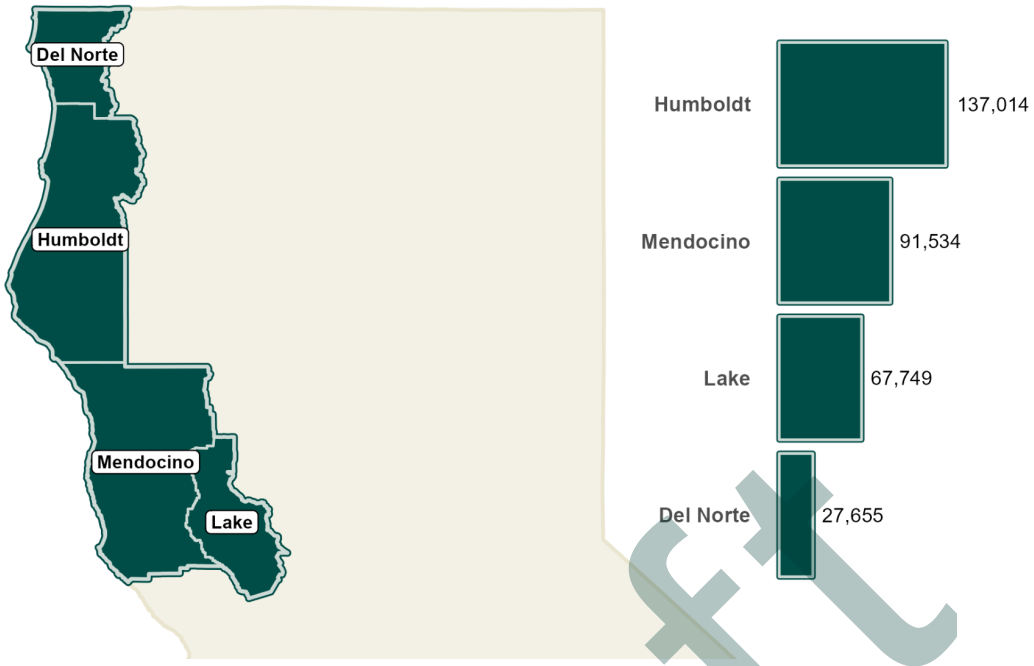
The report further examines the health consequences from environmental factors, such as wildfires (see "Environmental Factors").

By identifying health factors displaying substantial and adverse disparities between the Redwood Coast region and the state, the aim of this report is to uncover opportunities for directing focus and allocating resources towards high-priority and impactful health determinants. The report concludes by presenting a list of policy focus areas and corresponding resources based on the most compelling and high-impact disparities in health factors.

Section 2. OVERVIEW OF THE REGION

The Redwood Coast, situated in the northwesternmost region of California comprises four of the state's most remote and rural counties (see Appendix B). The total population of the region is 323,952….

Figure 2.1
Redwood Coast Region and Population (2017 - 2021)



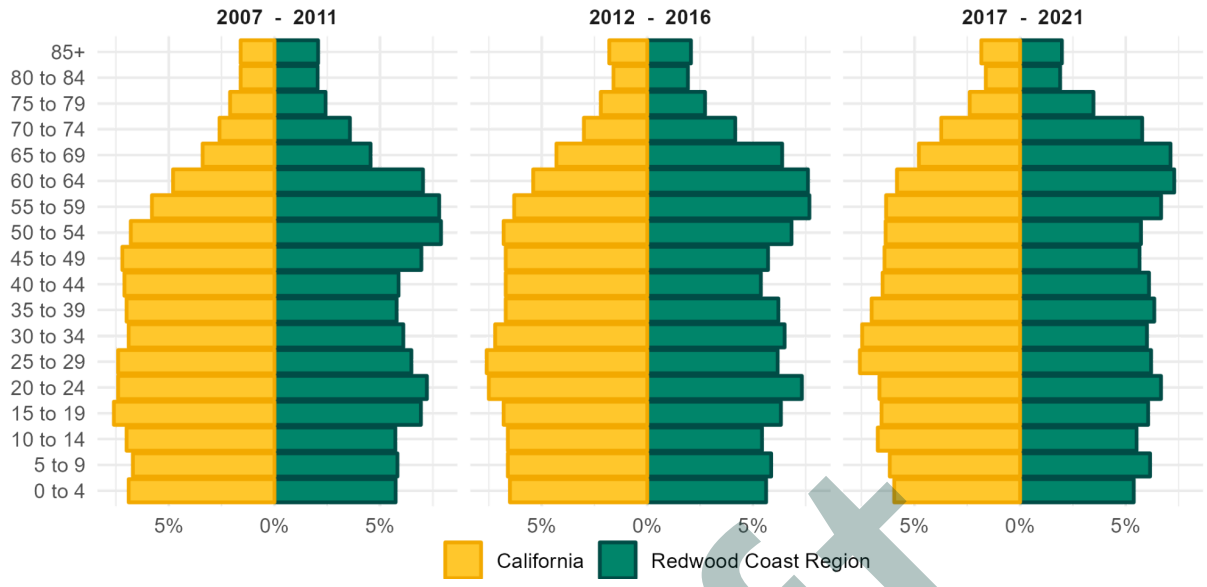
Note. Data sourced from the ACS.

Population Dynamics

The Redwood Coast population is considerably older compared to the state average. Across the region the median age is significantly higher than the state median (see Appendix B). The higher median age in the region is influenced by a significant and sizable group of older residents advancing in age. From 2007 to 2011, this cohort ranged from 45 to 64 years old, and more recently, between 2017 and 2021, their age range shifted to 55 to 74 years old. Such a population distribution exerts downward pressure on population growth among other implications such as additional strain on healthcare resources. As shown in Appendix B, the population has declined in recent years, driven in large part by higher deaths, and recent California Department of Finance (DOF) projections predict future decline in the Redwood Coast population.

Figure 2.2

Age Distribution (2007 - 2021)

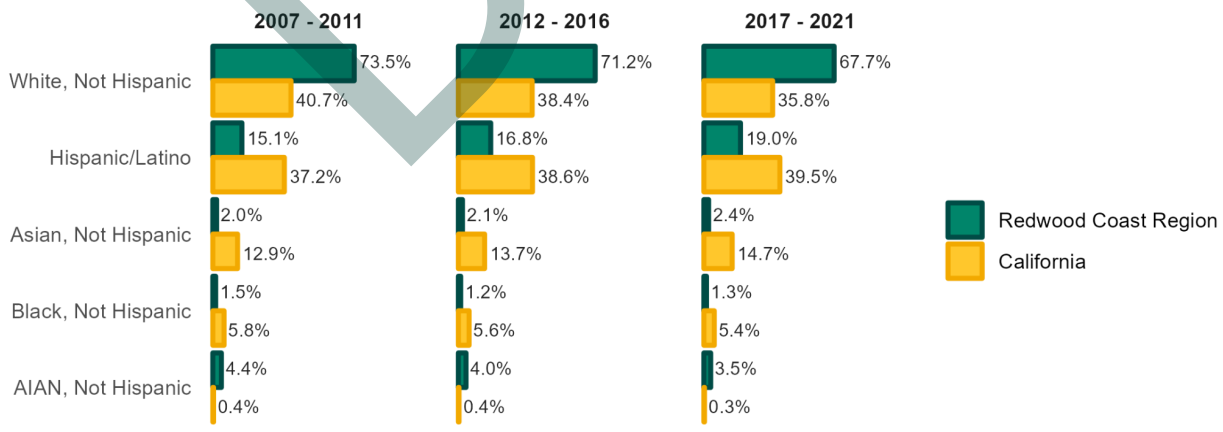


Note. Data sourced from the ACS.

As shown below, the region is primarily populated by white, non-Hispanic individuals, who constitute 67.7% of the total regional population— almost double the statewide proportion of 35.8% for this group. Hispanic or Latino individuals constitute a further 19.0% of the population, a share that is growing but small relative to the state population. While other minority groups are underrepresented compared to the state population, the American Indian and Alaskan Native (AIAN) population is proportionately higher than the state population, representing 2.4% of the Redwood Coast population as opposed to only 0.3% of the statewide population.

Figure 2.3

Race and Ethnicity (2007 - 2021)



Note. Data sourced from the ACS.

Takeaways

1. The region's population is significantly older compared to the state. The region's aging population structure has important implications for future population change and healthcare needs.
2. The population is primarily white, non-Hispanic. The population is composed of a relatively small population of people of color or Hispanic populations; however, the AIAN population is larger in the Redwood Coast relative to the state population.

Section 3. OVERVIEW OF HEALTH OUTCOMES

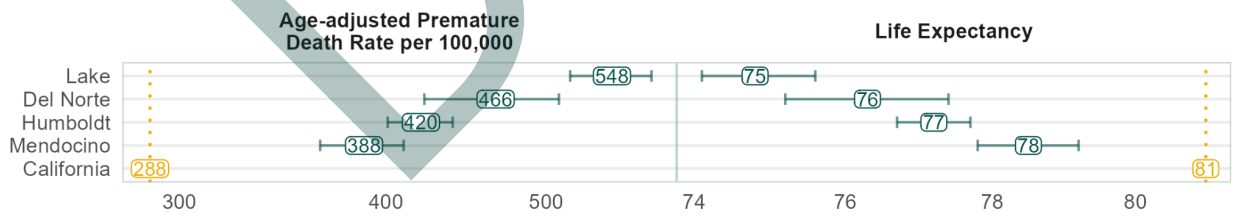
Life Expectancy and Mortality Rates

Life expectancy is a fundamental metric that reflects a broad spectrum of health factors, indicating the cumulative influence of wide-ranging health determinants. Disparities in life expectancy, therefore, serve as a good starting point for uncovering signals of disparities in health determinants between geographies and populations.

As shown below, life expectancy at birth is significantly lower than the statewide average, and age-adjusted premature deaths per 100,000 are significantly higher across the region.[2] Additional data presented in Appendix C indicate that premature death is elevated among AIAN and Black communities in the Redwood Coast region. These data also show that premature death is on a long-term downward trajectory in all but Lake County.

Figure 3.1

Premature Death and Life Expectancy (2018 - 2020)



Note. Data sourced from CHRR.

Disaggregating mortality rates by cause of death allows for a targeted examination of the determinants of health that specifically contribute to the elevated causes of premature death and lower life expectancy within the region.

[2] Defined as the number of deaths occurring before age 75 per 100,000 population. This is in distinction to the Years of Potential Life (YPLL) indicator which is presented in Appendix C. YPLL is defined as the number of years of life lost due to deaths prior to age 75. For instance, the death of a 40 year old would amount to 35 YPLL.

As shown below, the region experiences higher age-adjusted mortalities across most causes of death. However, these data show a clear regional pattern of substantially higher death rates in several categories, including **unintentional injuries, all cancers, drug-induced deaths, chronic lower respiratory disease, lung cancer, chronic liver disease and cirrhosis, suicide, motor vehicle traffic crashes, coronary heart disease, prostate cancer,[3] and firearm-related deaths**.

There is also an alarmingly high rate of stroke mortalities in Humboldt County. This phenomenon is persistent over time and does not appear to be a statistical aberration. See Appendix C for a discussion of Humboldt's elevated stroke mortality rate.

Figure 3.2

Age-Adjusted Mortality Rates per 100,000 (2019 - 2021)

	Lake	Del Norte	Humboldt	Mendocino	CA
Accidents (Unintentional Injuries)	135*	78*	74*	106*	43
All Cancers	170*	182*	173*	160*	125
Drug Induced Deaths	78*	30	37*	56*	21
Chronic Lower Respiratory Disease	49*	57*	45*	32	26
Lung Cancer	41*	48*	33*	31*	22
Chronic Liver Disease and Cirrhosis	54*	31*	25*	17	14
Suicide	24*	26*	20*	24*	10
Motor Vehicle Traffic Crashes	30*	19	16*	29*	11
Coronary Heart Disease	112*	66	98*	98*	79
Prostate Cancer	19	35*	29*	24	18
Firearm Related Deaths	12	17*	14*	14*	8
Female Breast Cancer	20	21	26*	19	18
Colorectal Cancer	14	15	13	16*	12
Cerebrovascular Disease (Stroke)	32	41	98*	35	37
Homicide	7	7	8	9	6
Influenza and Pneumonia	11	22*	8*	12	12
Diabetes	15*	43*	22	20	23
Alzheimer's Disease	15*	14*	14*	13*	37

Difference from State (X)

- 90 < X
- 60 < X ≤ 90
- 30 < X ≤ 60
- 5 < X ≤ 30
- 0 < X ≤ 5
- X ≤0

Note. Data sourced from the California Department of Public Health and the California Conference of Local Health's *County Health Status Profiles* report data. The color scale denotes differences (X) between the region's mortality rate and the corresponding state rate. Gold and yellow indicate higher mortality rates compared to the state. Asterisks (*) denote a statistically significant difference compared to the state rate. None of these causes include deaths where COVID-19 is the underlying cause of death.[4]

[3] Per 100,000 males.

[4] According to CDPH, "Deaths where COVID-19 was coded as the underlying cause of death are only included for all causes of death and are not included in any of the specific mortality health indicators. However, deaths where COVID-19 was listed as a significant condition contributing to death but not the underlying cause of death may be included for these health indicators" (2022).

An analysis of trends in these mortality rates is available in Appendix C. These data indicate rising unintentionally injury deaths, drug-induced deaths, chronic liver disease, prostate cancer, all cancers, motor vehicle deaths, and breast cancer.

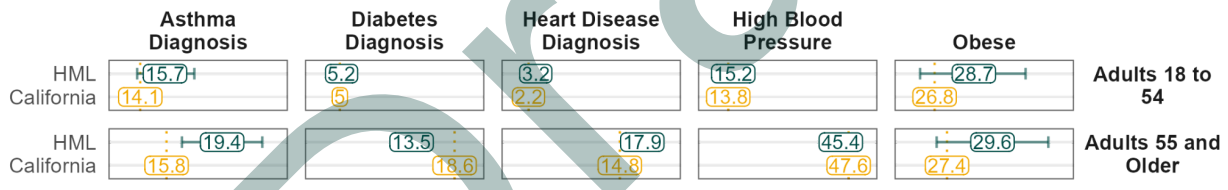
Health Conditions

County-level morbidity data are more limited when compared to mortality data, highlighting data gaps in understanding health disparities in rural areas. To address these limitations, both CHIS and CDC PLACES datasets are employed to identify signals of health disparity.

As shown below, CHIS data reveals moderately elevated rates of asthma, heart disease, and obesity, although these data do not include Del Norte.[5] Conversely, rates of diabetes and high blood pressure are similar to or lower than the state averages. CDC PLACES data presented in Appendix C, although limited to small area estimation (SAE) techniques,[6] suggests elevated age-adjusted rates across almost all estimated health conditions including chronic obstructive pulmonary disease (COPD), tooth loss, depression, coronary heart disease, and multiple other conditions.

Figure 3.3

Morbidities, Percent of Population (High Blood Pressure 2019-2022, All Other 2011-2022)[7]



Note. Data sourced from the CHIS. Humboldt, Mendocino, and Lake (HML) counties only.

Both approaches point to a higher prevalence of respiratory diseases, heart disease, obesity, and a relatively low prevalence of diabetes and high blood pressure regionally.

Disability Rates

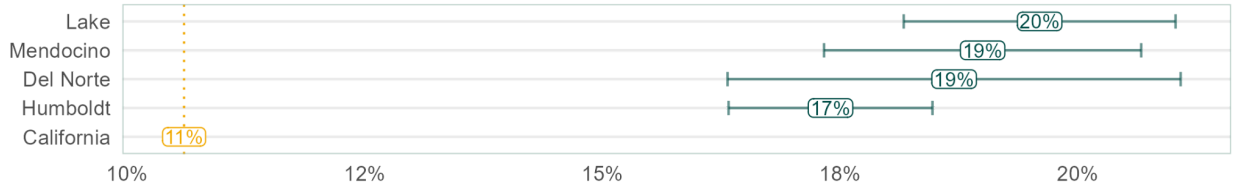
As shown in the figures below, disability[8] rates are higher than the state rate across the region. While the aging population is a contributing factor, it is noteworthy that even among individuals

[5] All CHIS data include only Humboldt, Mendocino, and Lake (HML) counties.
[6] See Appendix A for a discussion on the limitations of these techniques.
[7] See Appendix C for an alternative data source on health conditions produced using Small Area Estimation (SAE) techniques. Though limited, these data suggest elevated levels of all morbidities presented, including those above, except diabetes and high cholesterol.
[8] Including both physical and mental health disabilities

aged 18 to 34, disability rates are significantly higher than the state average (see Appendix C). This suggests that factors beyond the aging population play a role in the region's elevated disability rates. Potential contributing factors are explored further in the next section.[9]

Figure 3.4

Disability Rates (2017 - 2021)



Note. Data sourced from the ACS.

Takeaways

1. The most substantial adverse health disparities between the region and the state are evident in rates of unintentional injuries deaths, all cancers, drug-induced deaths, chronic lower respiratory disease, chronic liver disease and cirrhosis, lung cancer, coronary heart disease, suicide, motor vehicle traffic crash, prostate cancer, and firearm-related deaths.
2. Rates of disability are much higher than state averages in the region, even among young adults.

Section 4. PROXIMATE RISK FACTORS

This section explores the potential factors contributing to the health disparities between the Redwood Coast region and the state, as identified in the previous section. The aim is to identify and quantify the proximate risk factors, which are directly linked to these health outcomes, such as the role of smoking in lung cancer. A more comprehensive analysis of the underlying factors (e.g. poverty) potentially related to these proximate risk factors will be explored in the subsequent section. Identifying proximate factors allows for a more focused approach to exploration of deeper factors as well as a more focused approach to policy solutions.

Smoking

As shown in the previous section, evidence demonstrates higher mortality rates from cancer, lung cancer, chronic lower respiratory disease, and heart disease compared to state averages.

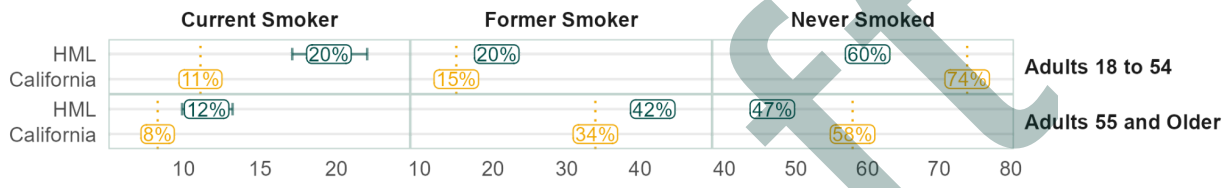
[9] Disability rates by race and ethnicity are presented in Appendix C.

Lung Cancer and Chronic Lower Respiratory Disease

Cigarette smoking is the main cause of lung cancer and COPD— a leading respiratory disease— and a risk factor for asthma (Mayo Clinic: "Lung Cancer;" Mayo Clinic: "COPD;" American Lung Association, "Asthma Causes and Risk Factors"). The data presented below from various sources reveals significantly and substantially higher smoking rates across the region. Notably, the proportion of current smokers among adults aged 18 to 54 in the Redwood Coast region is nearly double the state average. This striking disparity indicates that smoking may play a crucial role in explaining and addressing the region's elevated rates of cancer, lung cancer, and respiratory illnesses.

Figure 4.1

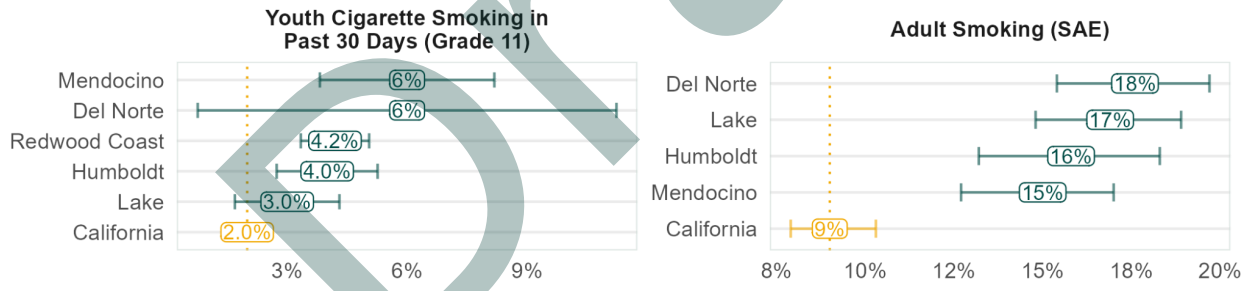
Smoking Rates (2011 - 2022)



Note. Data sourced from the CHIS.

Figure 4.2

Smoking, Percent of Population (Youth Data 2019 - 2021, Adult Estimates 2020)



Note. Estimate adult data sourced from CHRR. Estimated adult smoking data are model-based predictions. Youth smoking data were sourced from CalSCHLS "Secondary Student: Substance Use" data portal.[10]

Heart Disease

According to the CDC, the primary risk factors for heart disease include high blood pressure, high LDL cholesterol, diabetes, unhealthy diet, physical inactivity, obesity, smoking, and

[10] Youth smoking data are based on surveys of 11th grade students in participating school districts within each county. Youth smoking is defined as students who responded that they had consumed cigarettes in the past 30 days. Confidence intervals were calculated by the author.

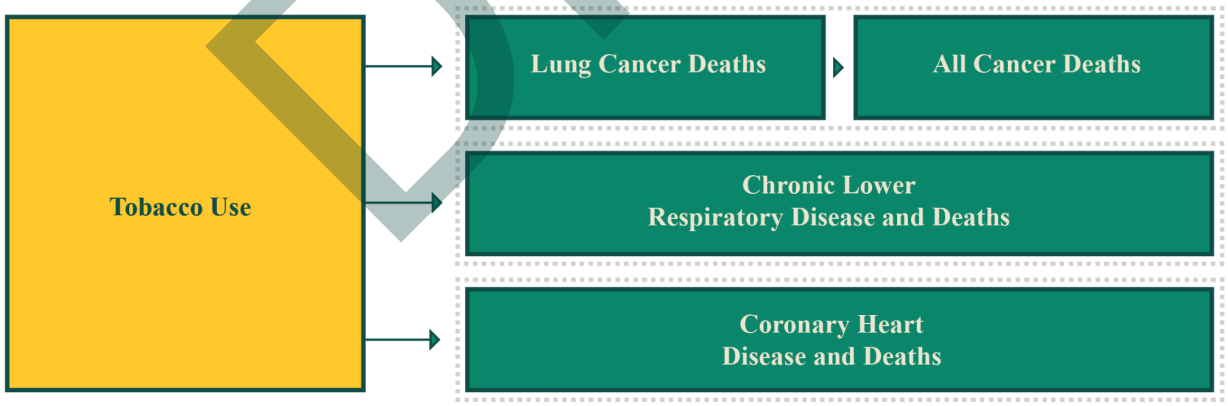
exposure to secondhand smoke ("Heart Disease and Stroke"). As previously shown, the available evidence indicates that rates of high blood pressure, high cholesterol, and diabetes in the region are comparable or superior to state averages (see Appendix C and "Health Conditions"). Additionally, although limited in scope, CHIS data suggest that diets in Humboldt, Mendocino, and Lake (HML) counties are on par with or, in some cases, better than the statewide average, and indicators of physical activity in these counties are similar or superior to statewide averages across these counties (see Appendix D)[11]. While the data for Del Norte are more limited, these data suggest that food access in Del Norte is more limited and rates of physical inactivity are somewhat higher. However, while diet and exercise may be contributing factors for Del Norte county, this evidence highlights obesity and smoking as key concerns for heart disease regionwide.

Studies reveal that smoking poses a greater risk for heart disease compared to obesity (Benis, et al., 2016). Furthermore, estimated differences between the region and the state in terms of obesity rates reach a maximum of approximately 1.13 times higher than the state average. In contrast, smoking rates are 1.5 to 1.8 times higher, strongly indicating that smoking is a critical factor contributing to the region's elevated rates of coronary heart disease.

The following diagram depicts these health disparities and the proximate risk factors potentially associated with them. Among these health outcomes, tobacco use stands out as a widely recognized and prominent risk factor and data strongly indicate that rates of smoking are significantly and substantially higher in the region.

Figure 4.3

Proximate Risk Factors for Disparities in Health Outcomes



[11] Data for Del Norte are more limited, but the available data do not rule out diet and physical inactivity as contributing factors to the disparity in heart disease between Del Norte and the state.

Mental Health and Substance Use

As previously identified, the region exhibits elevated rates of accidental (unintentional injuries), drug-induced deaths, motor vehicle accidents, liver disease, suicides, and firearm-related deaths. Further analysis below reveals that these disparities in health outcomes align closely with the heightened prevalence of mental health challenges and substance use-related issues within the region, challenges that may also help to explain the elevated rates of disability observed in the region.

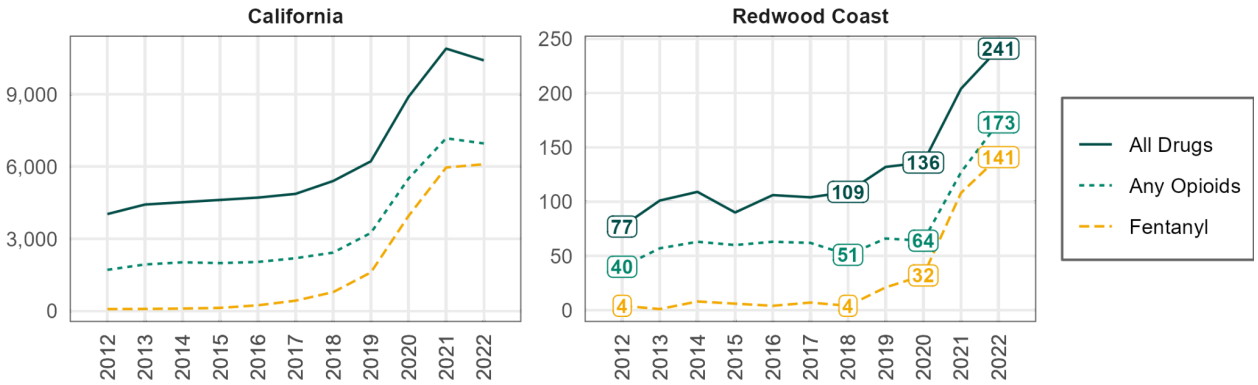
Drug-Induced Deaths

The category of unintentional injuries includes unintentional poisoning or drug overdose, alcohol poisoning, motor vehicle accidents, and other unintentional injuries. Nationally, unintentional poisoning, including drug overdose, has emerged as the leading cause of death within the unintentional injury category, a trend that began in the mid-1990s. However, since the mid-1990s and continuing to the present, unintentional poisoning deaths, particularly from drug overdoses, have risen sharply. As of 2021, nationwide data indicates that poisoning, such as drug overdoses, accounted for more than half of all unintentional injury deaths, followed by motor vehicle accidents (CDC)[12]. Consequently, the region's elevated rates of drug-induced and motor vehicle deaths likely contribute substantially to the higher prevalence of unintentional injury deaths within the region.

As shown in the figures below, drug-induced deaths have risen sharply in the Redwood Coast region starting around 2018. This rise in overdose deaths has been sharply exacerbated by the fentanyl epidemic in recent years. Statewide, fentanyl deaths have risen exponentially starting around 2017 and now account for over half of statewide overdose deaths. Similarly, fentanyl deaths have also risen exponentially in the Redwood Coast region and now account for roughly half of all drug overdose deaths.

Figure 4.4
Fentanyl Overdose Deaths (2012 - 2022)

[12] A 2019 report for Humboldt County found findings that indicate a similar trend, with the largest component being overdose, followed by motor vehicle crash injury deaths (source). This report also found that the majority of the disparity between unintentional injury mortality rate and the state is attributable to these two causes of death.

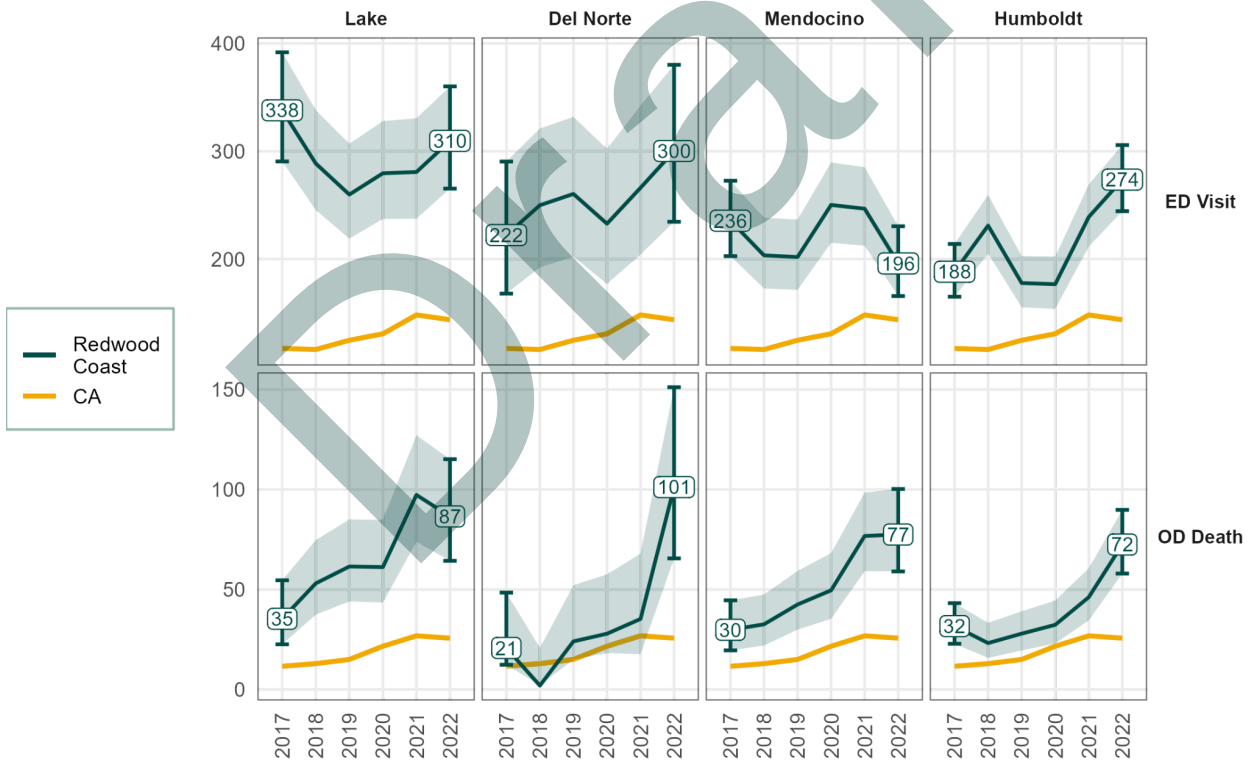


Note. Data sourced from the CDPH's "California Overdose Surveillance Dashboard."

The crisis appears to be significantly and substantially worse in the Redwood Coast region compared to the state. As shown below, drug overdose emergency department (ED) and overdose (OD) death rates are significantly higher than the state rate across the region.

Figure 4.5

Age-Adjusted Drug Overdose Rate per 100,000 (2017 - 2022)



Note. Data sourced from the CDPH's "California Overdose Surveillance Dashboard." Shaded regions and bars represent confidence intervals. Confidence intervals were provided by the data source.

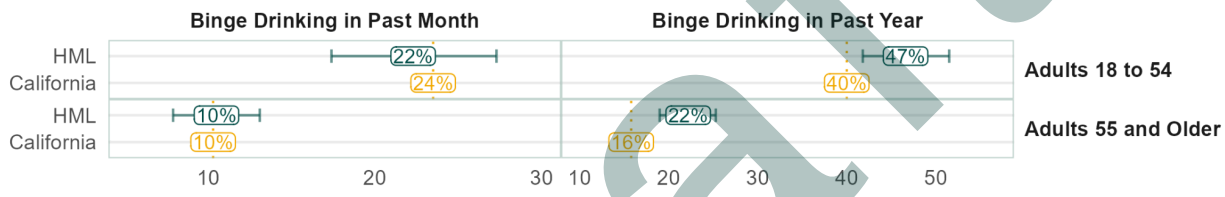
Liver Disease and Cirrhosis

Rates of liver disease deaths are elevated across the region. Moreover, as shown in Appendix C, rates of liver disease mortality have increased in recent years statewide; in the Redwood Coast region, this increase is occurring faster than the state in all but Humboldt, highlighting the urgency of addressing this worsening trend.[13]

According to the Mayo Clinic, heavy alcohol consumption is a leading risk factor for liver disease ("Liver Disease"). As shown below, multiple data sources collectively signal higher rates of excessive drinking. CHIS binge drinking data is somewhat limited, however at least one CHIS heavy drinking variable indicates higher rates of binge drinking.[14] Additional data sources show binge drinking among youth is sharply and significantly higher than the state average while SAE estimation techniques suggest substantially higher rates of binge drinking among adults.

Figure 4.6

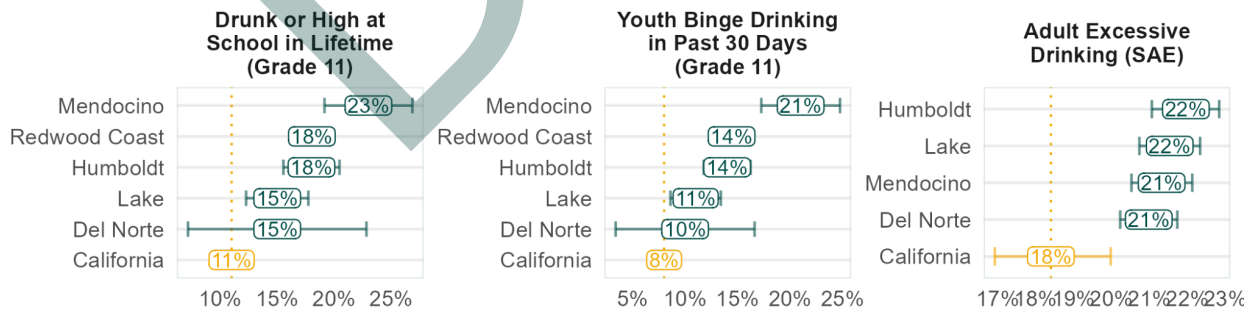
Binge Drinking in Past Year (Left 2021 - 2022, Right 2011 - 2015)



Note. Data sourced from the CHIS. The proportion of adults who had at least one episode of binge drinking in the past year. Binge drinking is defined as five or more drinks for males and four or more for females within two hours.

Figure 4.7

Alcohol Use Indicators (Adult Excessive Drinking 2020, Youth Data 2017 - 2019)



[13] The 2019-2021 CDPH data release compared to the 2017-2019.

[14] Adult binge drinking data from CHIS is limited to only a few years. Data collected between 2021 and 2022 on recent binge drinking show rates consistent with state averages but with wide confidence intervals reflecting the limited duration of data collection. CHIS data collected between 2011 and 2015 show higher rates of binge drinking in the past year.

Note. Estimate adult data sourced from CHRR. Estimated adult binge drinking data are model-based predictions. Youth binge drinking data were sourced from CalSCHLS "Secondary Student: Substance Use" data portal.[15]

Another critical risk factor for liver disease results from hepatic infections from injection drug use (Mayo Clinic: "Liver Disease"). Hepatitis C is primarily transmitted through sharing needles, and a 2018 report from the CDPH reveals that rates of hepatitis C in the Redwood Coast region are the highest in the state (see Appendix C).

Substance Use and Motor Vehicle Deaths

As shown previously, motor vehicle mortality rates are sharply elevated across the region. Traffic safety ranking data from the California Office of Traffic Safety (OTS) reveal factors potentially contributing to the region's elevated rates of motor vehicle traffic fatalities (2023). These data reveal a clear trend toward a higher risk of pedestrian, hit-and-run, nighttime, and alcohol-involved fatal and injury traffic accidents in the Redwood Coast.

Figure 4.8

OTS Crash Risk Rankings, 2017 - 2020 Average

	Lake	Del Norte	Humboldt	Mendocino	Redwood Coast Avg.
Total Fatal and Injury	28.2	28.8	37.8	38.5	33.3
Pedestrians	22.8	26.5	2.0	17.2	17.1
Hit and Run	25.0	17.2	12.0	20.2	18.6
Alcohol Involved	14.2	34.2	21.2	8.8	19.6
Nighttime	25.0	25.5	16.5	20.8	21.9
Motorcycles	26.5	27.8	23.8	30.5	27.1
Bicyclists	46.5	18.8	15.5	44.0	31.2
Speed Related	39.0	22.5	52.8	35.8	37.5

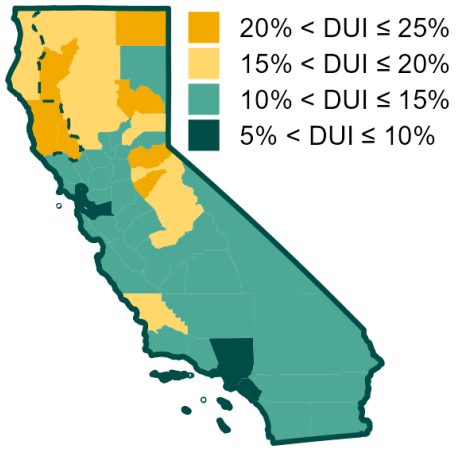
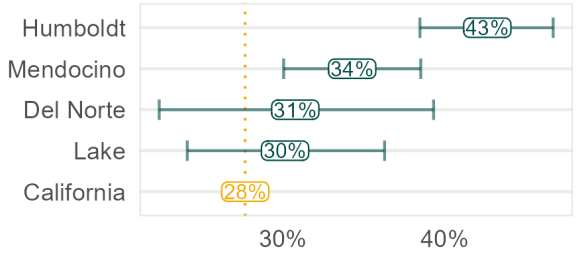
Top 10 (Worst)
10 < OTS ≤ 20
20 < OTS ≤ 30
30 < OTS ≤ 40
40 < OTS ≤ 50
50 < OTS ≤ 58 (Best)

Note. Data sourced from the OTS. The OTS ranks each California county from 1 (worst) to 58 (best) for each criteria above. Gold and yellow indicate higher risk. These rankings are averaged over the four years of data available from the OTS from 2017 through 2020. Nighttime is defined as occurring between 9pm and 2:59am.

Two additional data sources highlight the role of substance use in traffic safety in the Redwood Coast. As shown below, driving under the influence (DUI) crashes account for a greater proportion of all vehicle crashes (including those without injury) compared to the majority of the state. Furthermore, alcohol-involved driving deaths are higher across the region.

[15] Youth binge drinking data are based on surveys of 11th grade students in participating school districts within each county. Youth binge drinking is defined as five or more drinks during a period of "few hours". Confidence intervals were calculated by the author.

Figure 4.9

Drug and/or Alcohol DUI as a Percent of All Crashes (2012 - 2021)	*Percent of Driving Deaths Involving Alcohol (2016 - 2020)*
	
Note. Data sourced from TIMS. Includes both alcohol and drug DUIs.	*Note. Data sourced from CHRR.*

A national study suggests a clustering of pedestrian, hit-and-run, and nighttime accidents around a common risk factor: late night alcohol use. This study also reveals that nearly one-fifth of pedestrian traffic fatalities in the United States are the result of a hit-and-run, and that fatal pedestrian hit-and-runs are far more likely to occur during the evening and involve alcohol use (Arnold et al., 2010).

While there are certainly other factors contributing to the region's elevated motor vehicle crash fatalities, substance use appears to play a critical role in the region's elevated motor vehicle deaths and— along with drug-induced deaths— unintentional injuries deaths as well.[16,17]

Suicide Ideation, Suicides, and Firearm-Related Deaths:

The previous section revealed higher rates of both suicides and firearm-related deaths in the region. On a national scale, suicides constitute more than half of firearm deaths, followed by homicide, whereas less than three percent of firearm deaths are unintentional (Gramlich, 2023).

[16] Another factor not captured above, but particularly salient in the rural Redwood Coast context, is emergency medical service (EMS) response times. EMS response times are significantly associated with motor vehicle mortality rates (Byrne et al., 2019). Research indicates a 1.46 times greater risk of mortality for an EMS response time of 12 or more minutes compared to seven or fewer. A national study found that the median EMS response time is six minutes in urban or suburban regions and 13 minutes in rural areas. This study also found that 10% of EMS response times were 26 minutes or longer in rural areas (Carr et al., 2017).

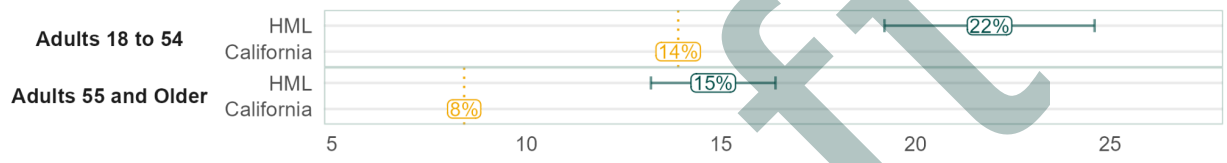
[17] Motor vehicle deaths are included in unintentional injury deaths.

Furthermore, a 2022 report found that roughly half of Humboldt County suicides occurring between 2005 and 2021 were by firearm (source). Consequently, the region's heightened firearm-related deaths may be largely influenced by its elevated suicide rate.

As shown below, multiple data sources also strongly signal higher risk factors for suicide. Both youth and adults are more likely to report having considered suicide, and youth in the region are more likely to have reported feelings of sadness across the Redwood Coast. Studies have shown a strong link between suicide ideation and completion (Dekkers, et al., 2018); therefore, suicide ideation provides a proximate explanation for both the region's elevated suicide rate and elevated firearm-related deaths.

Figure 4.10

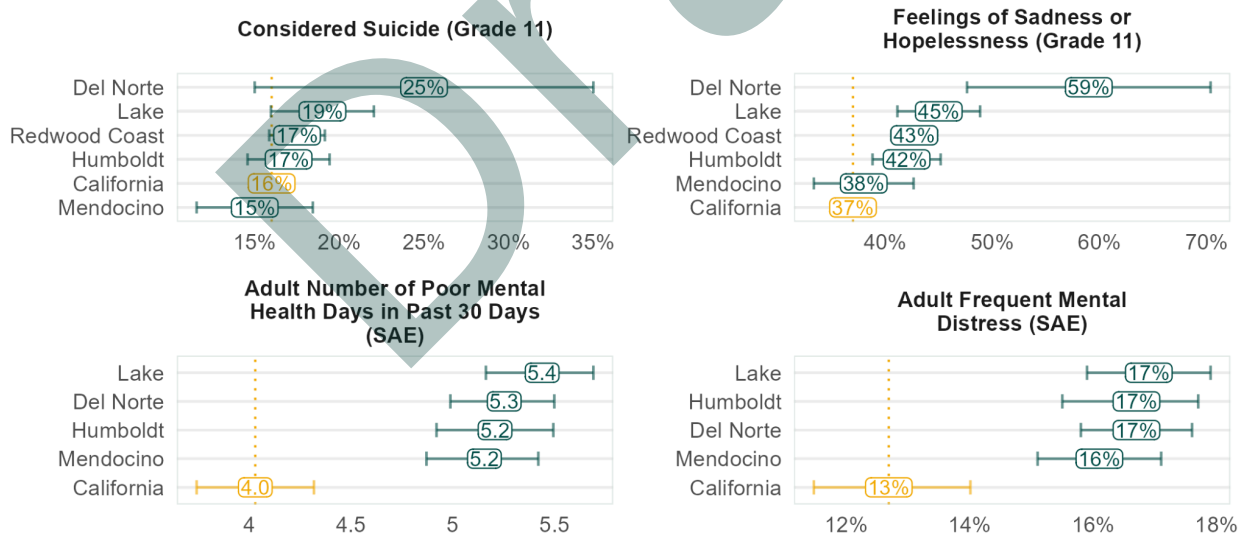
Have you ever seriously thought about committing suicide? (2011 - 2022)



Note. Data sourced from the CHIS.

Figure 4.11

Mental Health Indicators (Adult Estimates 2020, Youth Data 2017 - 2019)



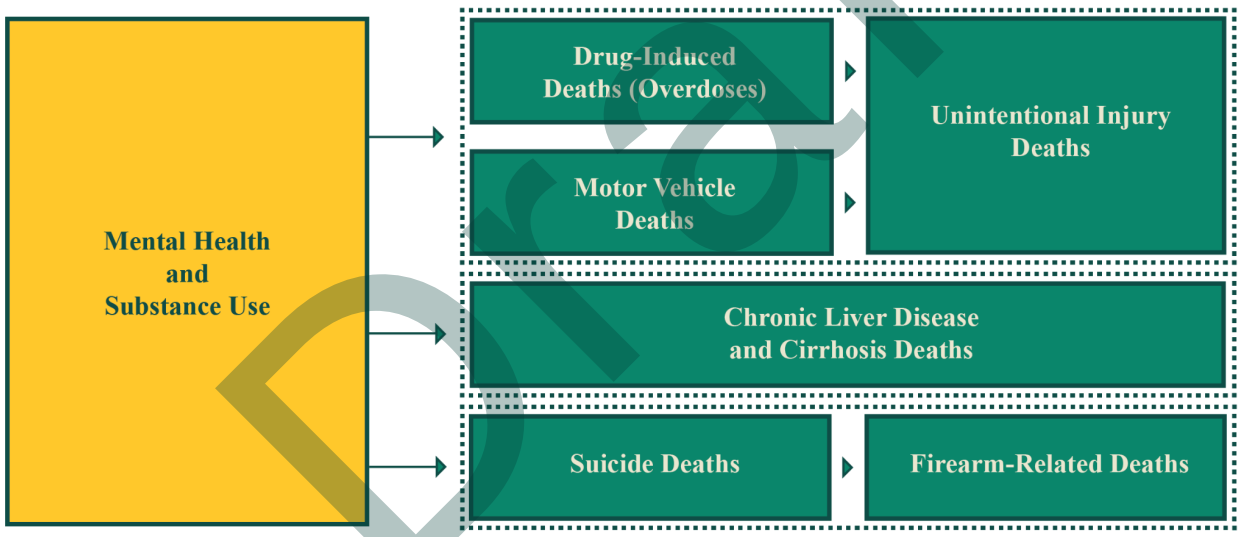
Note. Estimate adult data sourced from CHRR. Youth data were sourced from CalSCHLS "Secondary Student: Substance Use" data portal.

It may be that mental health and substance use are also factors contributing to the region's elevated rates of disability, particularly among adults 18 to 34. Both mental health and substance use disorders are leading causes of disability and *the* dominant causes of disability among adults younger than 35, accounting for over 35% of years lived with disability nationwide (National Center for Complementary and Integrative Health). See Appendix C for further analysis of disability rates.

The figure below illustrates the health outcomes, proximate factors, and relationships explored in relation to mental health and substance use. Amongst the leading causes of illness and death, mental health and substance use appear to play either a direct or indirect role in contributing to many of the disparities in health outcomes in the region. Along with the analysis of tobacco use illustrated previously, those health outcomes with the strongest disparity between the Redwood Coast and the state appear to be strongly influenced by tobacco use, substance use, and mental health factors.

Figure 4.12

Mental Health and Substance Use are Contributing Factors to Disparities in Health Outcomes



Takeaways

1. The evidence indicates that rates of mental illness, substance use, and tobacco use are elevated relative to the state.
2. Health outcome disparities between the region and the state are largely consistent with these elevated mental and behavioral health challenges.

Section 5. ECONOMIC, SOCIAL, INSTITUTIONAL, AND ENVIRONMENTAL FACTORS

The Social Determinants of Health (SDOH) is a popular framework for conceptualizing non-medical factors that influence health outcomes. This framework typically encompasses five key themes: economic stability, educational access, health access, neighborhood environment, and the social context (Healthy People 2030). The following section analyzes factors drawn from this framework and also considers related factors that are broadly discussed in the region's community health assessments.

A review of the region's community health planning documents reveals several emergent health factors within the context of the social determinants of health summarized below.

Figure 5.1

Public Health Planning Document Themes

Socioeconomic Factors	Social Factors	Healthcare Barriers
• **Poverty** and/or **Employment** (Del Norte, Mendocino, Lake) • **Housing issues** (Humboldt, Mendocino, Lake) • **Food issues** (Humboldt, Del Norte, Lake)	• **Adverse childhood experiences, child abuse** (Del Norte, Mendocino) • **Domestic violence** (Del Norte)	• **Lack of providers, access to care** (all) • **Lack of mental or behavioral health providers** (Humboldt, Del Norte) • **Lack of dental care providers** (Del Norte)

While this study does not attempt to establish direct cause-and-effect relationships between these factors and the proximate risk factors or health outcomes discussed earlier, it does investigate the connections between these factors and the proximate determinants and health outcomes. This inquiry serves a dual purpose: firstly, to ascertain whether substantial disparities exist between the state and the region for each factor addressed below, and secondly, where data allows, quantify the strength of the association between these risk factors and the health behaviors and outcomes previously examined. This serves the overarching goal of not only identifying potential adverse disparities but also, by assessing the strength of these relationships, determining populations that are most at risk.

Socioeconomic Factors

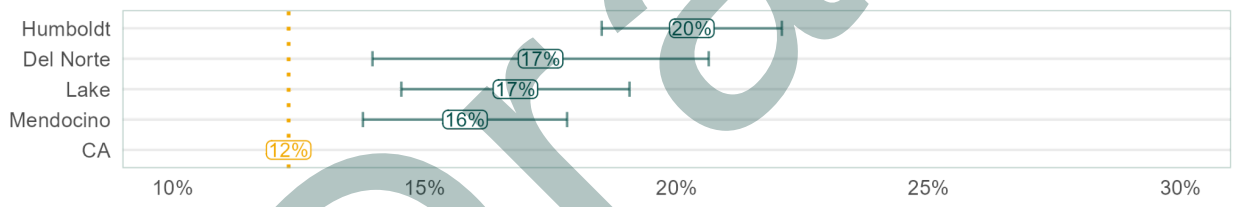
Poverty

Economic conditions strongly influence health disparities. Poverty is linked to lower life expectancy and increased health risks related to obesity, smoking, substance use, and chronic stress (Healthy People 2030). Child poverty is particularly detrimental to health and well-being. Children raised in low-income households face multiple adverse conditions that harm their health and contribute to a cycle of economic disadvantage. These conditions include impaired early childhood brain development, obstacles to learning and social functioning, and increased behavioral problems (Damon). Children in poverty are also more likely to suffer from lead poisoning, experience abuse, neglect, hunger, drop out of high school, or become teenage parents (Aber et al., 2012).

As shown below, poverty rates are sharply higher in the Redwood Coast compared to the state rate. Furthermore, data presented in Appendix E show that poverty rates are particularly high among children and youth as well as people of color and Hispanic populations.

Figure 5.2

Poverty Rates (2017 - 2021)



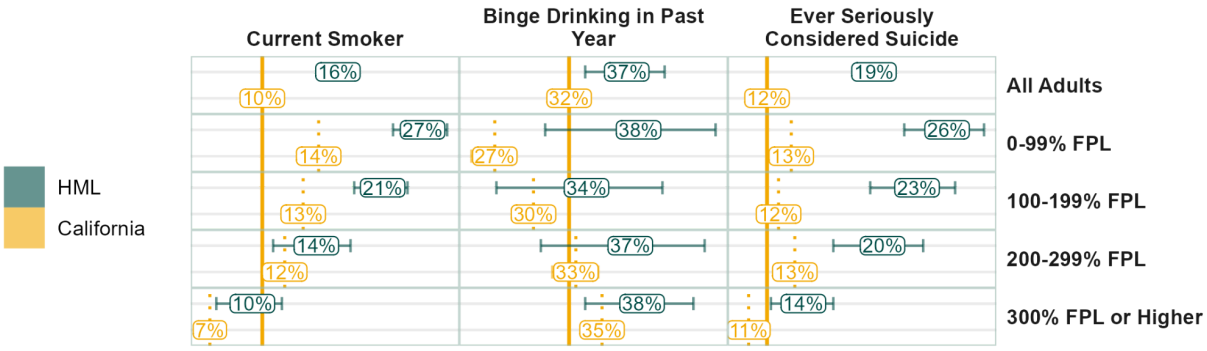
Note. Data sourced from the ACS.

As shown below, poverty in the Redwood Coast appears to be strongly connected with two proximate risk factors including smoking and suicide ideation. Nearly 27% people living below the poverty line in the region are current smokers compared to just 15% statewide. Similarly, 26% of people living below the federal poverty level (FPL) have seriously considered suicide.

Statewide, recent binge drinking is *positively* associated with income, a finding that is not uncommon of studies linking socioeconomic status to heavy drinking (Collins, 2016). Regionally, those with incomes above the poverty line have rates of binge drinking consistent with state rates. However, among those below the poverty line have rates of binge drinking that are significantly higher compared to those in the same income bracket statewide.

Figure 5.3

Proximate Risk Factors by Income Range (2011 - 2021, Binge Drinking 2011 - 2015)



Note. Data sourced from the CHIS. FPL refers to the federal poverty line.

While a causal mechanism, if any, between smoking, suicide ideation, and poverty is unclear, those with low or moderate incomes are at much greater risk of these risk factors in the Redwood Coast. Therefore, policies intended to address these risk factors should have a focus on these income groups.

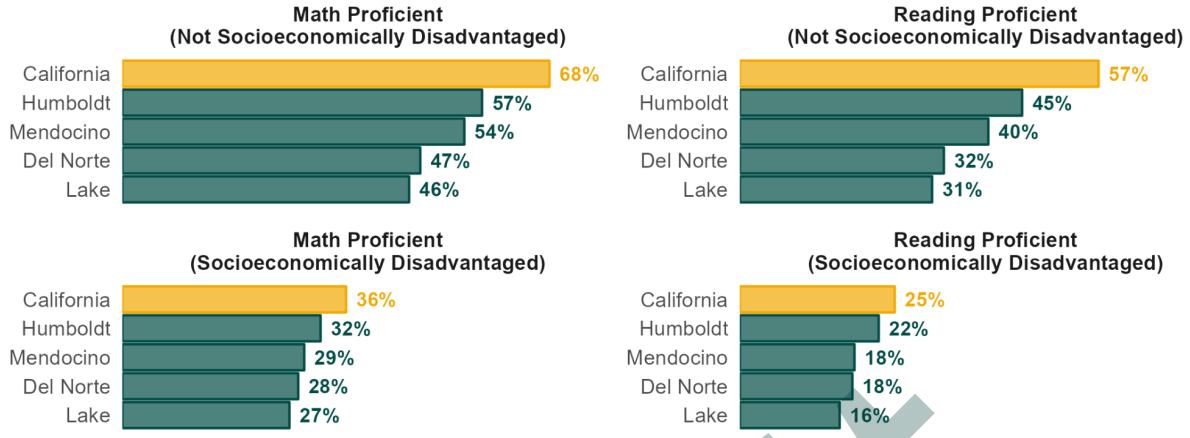
Educational Access and Outcomes

Statistically, people with higher levels of education live longer and have lower all-cause mortality rates. While the link between health and education is debated, research suggests that individuals with higher education levels are less prone to certain *preventable* illnesses/mortalities and tend to live longer (Braveman et al., 2010; Goldman & Smith, 2011; Montez, Hummer, & Hayward, 2012; Olshansky et al., 2012). Education is strongly linked to mortalities from lung cancer, respiratory diseases, homicides, and certain accidents, whereas the link is less strong for causes of death that are less preventable such as cancers other than lung cancer (Hernandez and Hummer, 2013). In recent decades, smoking has become strongly associated with education levels. In the late 1960s, approximately 40% of college-educated people smoked compared to 45% of people without a college education, but the proportion of college graduates who smoke has fallen faster than that of those without a college degree. More recently, just 6.5% of college graduates smoke compared to 23.1% for those with a high school diploma or less (Cahn et al., 2018). Therefore, factors tied to preventable and behavioral risk appear to influence the relationship between health and education.

According to Healthy People 2030, target objectives for improving educational access include improving high school graduation rates, increasing college enrollment, and improving math and reading proficiencies in K-12 students (“Education Access and Quality”). As shown below, in the Redwood Coast, gaps in educational attainment start early, with K-12 students lagging behind their statewide peers on reading and math proficiency.

Figure 5.4

K-12 Math and Reading Proficiency by Socioeconomic Status (2017 - 2019)

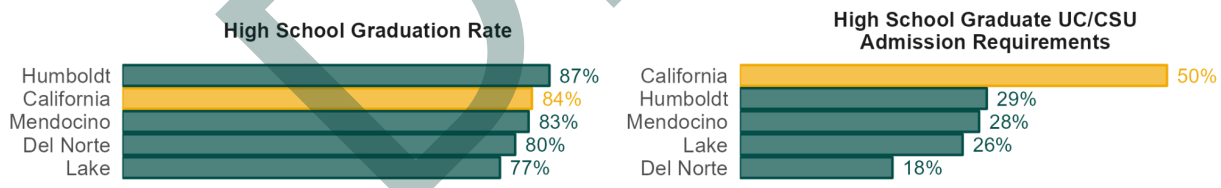


Note. Data sourced from Kidsdata.org. Includes grades 3, 4, 5, 6, 7, 8, and 11. Based on California Assessment of Student Performance and Progress's 'Smarter Balanced Summative Assessment'.

In the Redwood Coast, high school graduation rates are on par with the state rate, but high school graduates in the region are much less prepared for college admission compared to the state average. Across the region, high school graduates complete the course requirements for admission to the University of California (UC) or California State University (CSU) systems (i.e. "A–G courses") at roughly half the rate of their statewide counterparts.

Figure 5.5

High School Graduation Rates and College Preparedness (2017 - 2021)



Note. Data sourced from Kidsdata.org[18].

Correspondingly, except for Del Norte,[19] the adult population has achieved high school graduation rates that are on par with or even exceed the state average. However, all Redwood

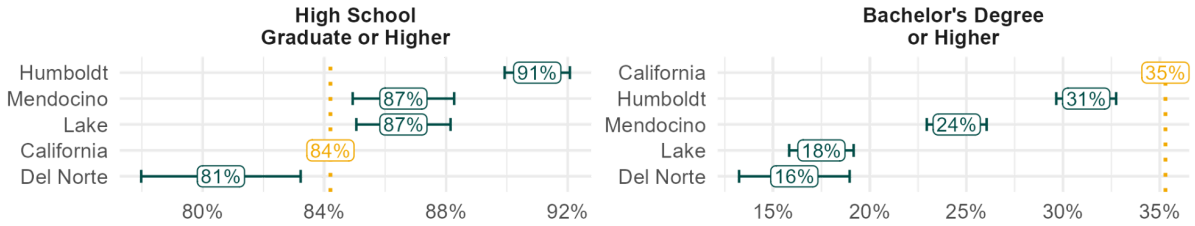
[18] Admission requirements data including only 2017-2019. Percents are annual averages. High school graduation rate is defined as the percentage of public school students from the graduating class who receive a high school diploma. Admission requirements is defined as the percentage of high school graduates who complete all courses required for UC/CSU admission with a grade of "C" or better

[19] Del Norte's figure is likely substantially skewed by the Pelican Bay State Prison population.

Coast counties lag behind in four-year degree attainment. Therefore, while the region fairs relatively well in terms of high school graduation, it appears that the educational system faces challenges in preparing high school graduates for college.[20]

Figure 5.6

Educational Attainment, Population 25 Years or Older (2017 - 2021)

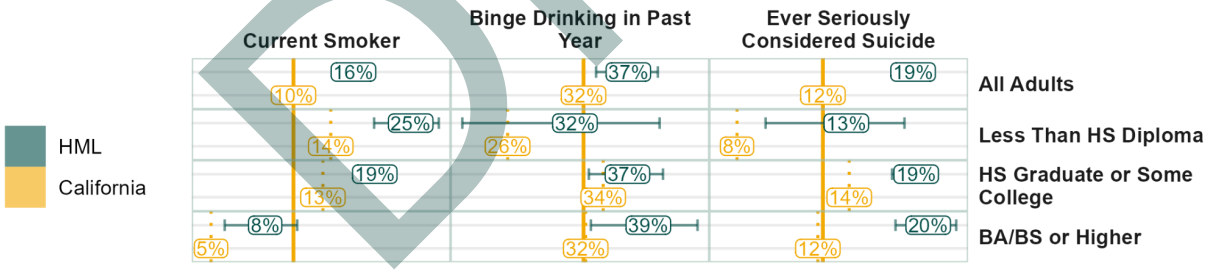


Note. Data sourced from the ACS.

With respect to the health challenges for the region, educational attainment appears to be strongly associated with tobacco use.[21] Both in the region and across the state, smoking rates decrease significantly as educational attainment increases— however, this relationship is particularly strong in the Redwood Coast. One in four individuals with less than a four-year college degree is a current smoker in the Redwood Coast, compared to just 14% statewide. Therefore, to combat tobacco use effectively in the region, it is crucial to focus efforts on adults with lower levels of education and on young people who may be facing academic difficulties.

Figure 5.7

Proximate Risk Factors by Education (2011 - 2022, Binge Drinking 2011 - 2015)



Note. Data sourced from the CHIS.

[20] Another contributing factor for the gap in higher educational attainment may be a comparative lack of four-year colleges and universities that are geographically accessible for much of the population in the region. Only Humboldt County is home to a public four-year university.

[21] Alcohol use and suicide ideation do not exhibit clear relationships with educational attainment. Rates of both appear to be *lower* among those with less than a high school education.

Social Factors

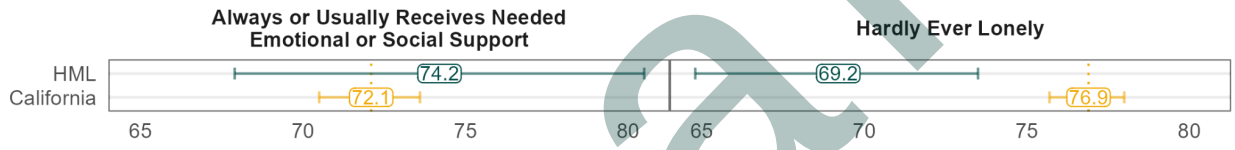
Social Isolation

A recent Surgeon General report brought national attention to health impacts of social isolation and loneliness, raising the issue as urgent and requiring 'immediate awareness and action'. The report documents the health risks of social isolation and loneliness including a wide range of physical and mental health outcomes including cardiovascular disease, hypertension, diabetes, infectious disease, cognitive decline, depression, and anxiety (U.S. Surgeon General, 2023).[22,23]

Data on loneliness at the local level is scarce. However, as shown below, data from CHIS indicate that loneliness among adults 65 and over significantly fewer indicates hardly ever feeling lonely, suggesting that the experience of loneliness among the elderly population is more prevalent in HML.

Figure 5.8

Loneliness, 65+ (2019 - 2020)



Note. Data sourced from the CHIS.

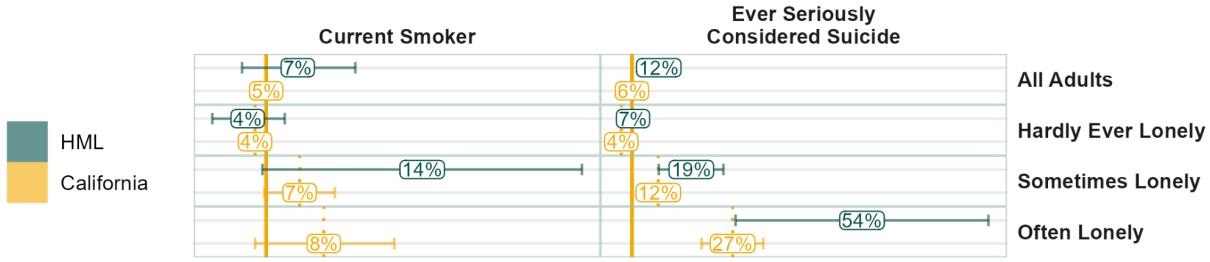
As shown below, older adults who experience loneliness are at higher risk of smoking and suicide ideation. In particular, over half of Redwood Coast seniors who report often feeling lonely have seriously considered suicide, significantly and substantially higher than those who report sometimes feeling lonely or hardly ever feeling lonely. Therefore, older Redwood Coast residents who indicate that they often feel lonely appear to be at high risk for one of the region's most elevated causes of death.

Figure 5.9

Proximate Risk Factors by Loneliness, Age 65+ (2019 - 2020)

[22] The Surgeon General defines **social isolation** as "Objectively having few social relationships, social roles, group memberships, and infrequent social interaction. (2023)".

[23] The Surgeon General defines **loneliness** as "A subjective distressing experience that results from perceived isolation or inadequate meaningful connections, where inadequate refers to the discrepancy or unmet need between an individual's preferred and actual experience (2023)".



Note. Data sourced from the CHIS. Smoking data not available for the "Often Lonely" category.

As shown in the figures below, significantly more householders live alone in the Redwood Coast, indicating greater levels of social isolation within the household context. Isolation is a critical risk factor for suicide, particularly among men who are are about four times more likely to commit suicide compared to women (CDC, 2023). Men who live alone are at elevated risk for suicide, and middle aged men living alone are two times more likely to die by suicide than men not living alone (U.S. Surgeon General). As shown in Appendix H, significantly and substantially more men in the HML region live alone, including middle aged men.

Figure 5.10

Householders Living Alone, Percent of Households (2017 - 2021)

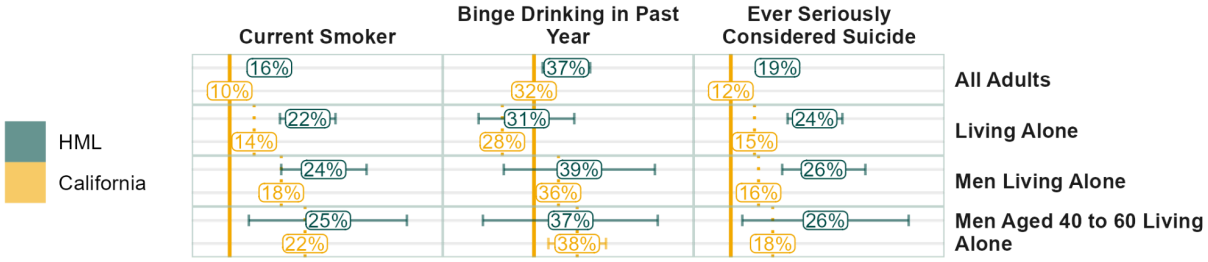
Note. Data sourced from the ACS.

As shown below, living alone appears to be positively associated with smoking and suicide ideation, with 22% of adults living alone being a current smoker, and nearly a quarter of adults living alone having considered suicide. Conversely, living alone does not appear to be related to recent binge drinking.

While there is only a slightly higher rate of suicide *ideation* among men who live alone, studies show that men tend to be more likely to die from a suicide attempt compared to women, as men tend to choose more lethal means of suicide such as firearms (National Institute of Mental Health). Therefore, while living alone does not appear to have a larger impact on the probability of suicide *ideation* on men compared to women, the impact that it has may be more likely to result in a completed suicide.

Figure 5.11

Proximate Risk Factors by Isolation, Gender, and Age (2011 - 2021)



Note. Data sourced from the CHIS.

Social isolation and loneliness appear to be potential risk factors for the health challenges in the region. Monitoring isolation and loneliness and promoting quality social connection may therefore be effective approaches to improving the health of the region.

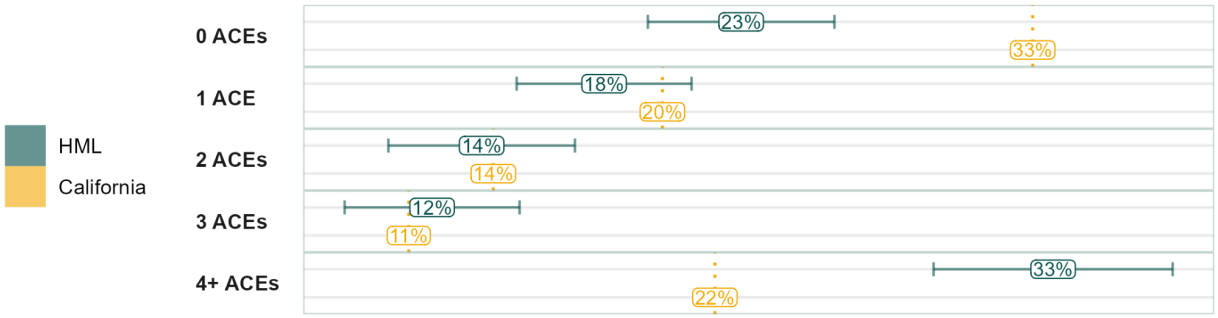
Adverse Childhood Experiences

Research has shown that childhood experiences have profound and lasting effects on health behaviors and outcomes later in life. People who have multiple adverse childhood experiences (ACEs) are at far greater risk of poor health outcomes or behaviors including depression, substance use, and tobacco use (Center on the Developing Child). ACEs include abuse and neglect as well as dysfunction in the household including mental illness, problematic substance use, violence against mothers, or imprisonment of a household member (Anda et al., 1998).

The probability of poor health outcomes increases with the number of ACEs in childhood in a dose-dependent fashion (see Appendix F). For example, an individual with one ACE is approximately 1.3 times more likely to have ever injected drugs compared to an individual with no ACEs. For an individual with four or more ACEs, however, this likelihood profoundly rises to 10.3 times. Studies show that ACEs are strongly associated with a higher prevalence of all proximate risk factors identified in this report including tobacco use, substance abuse, and mental health challenges.

The proportion of adults with four or more ACEs is significantly and substantially higher in the Redwood Coast compared to the state average, while the percentage of adults with zero ACEs is significantly lower. Furthermore, as shown in Appendix F, recent data reveals that rates of domestic violence and child abuse are elevated across the region, indicating that the region's youth are at risk for ACEs.

Figure 5.12
Number of ACEs Among Adults, Percent of Population (2021 - 2022)

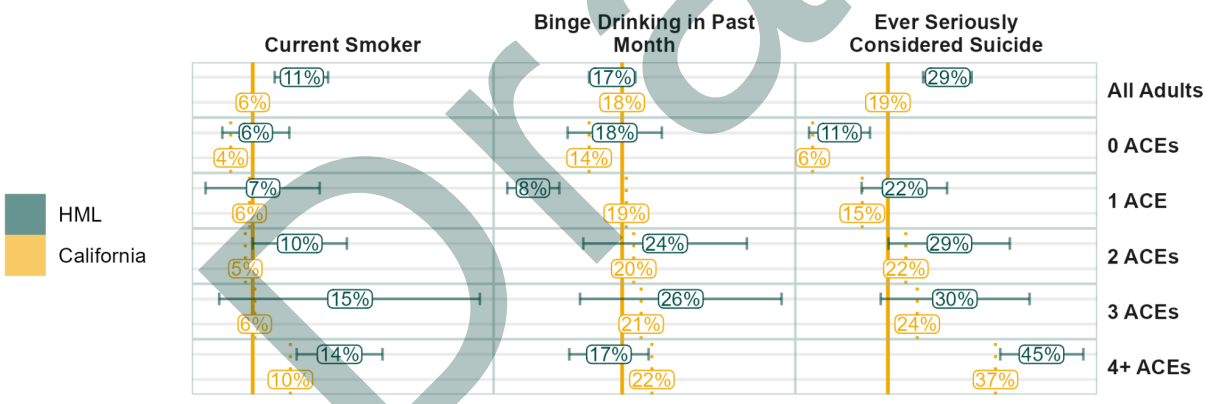


Note. Data sourced from the CHIS.

Statewide, smoking, recent binge drinking, and suicide ideation are positively associated with ACEs. Regional estimates, while subject to more statistical variation, indicate a similar trend. In particular, 45% of Redwood Coast adults with four or more ACEs have seriously contemplated suicide during their lives compared to just 11% of Redwood Coast adults with no ACEs and 6% of California adults with no ACEs. Therefore, Redwood Coast residents indicating multiple ACEs are at high risk for one of the region's most elevated causes of death.

Figure 5.13

Proximate Risk Factors by Number of ACEs (2021 - 2022)



Note. Data sourced from the CHIS. ACEs data are available only for 2021. To make cross variable comparisons, the data must share a year in common. Binge Drinking in the Past Month is available for the 2021 year whereas Binge Drinking in the Past Year is not. Current Smoker with 1 ACE is statistically unreliable.

Due to the relationship between ACEs and future health behavior and outcomes endemic in Redwood Coast, these findings present a potential root factor that may explain some of the region's elevated tobacco use, substance use, and suicide risk. Therefore, interrupting the cycle of ACEs and subsequent health consequences may present a powerful opportunity for improving the long-term health of the region. In particular, the CDC estimates that prevention of ACEs has

the potential to reduce depression by 44%, smoking rates by 33%, heavy alcohol use by 24% as well as making substantial improvements in corresponding health outcomes such as COPD and improvement in economic well-being (2021).

The Centers for Disease Control (CDC) has identified strategies and approaches to help prevent or reduce the impact of ACEs. These approaches are discussed further in "Policy Focus Areas and Recommendations".

Community and Institutional Factors

Homelessness

People experiencing homelessness face a significantly higher risk of premature death, chronic disease, depression, and substance use (Collins 2016).[24] While the data presented below indicate an elevated level of homelessness in the Redwood Coast, it is important to acknowledge that tracking and measuring homelessness is a complex task, leading to limitations and uncertainties in these figures. Nevertheless, these indicators suggest an elevated homelessness rate across the region compared to the rest of California.

As shown below, homeless point-in-time (PIT) data from the Department of Housing and Urban Development (HUD) reveal that homelessness on a per capita basis in the region exceeds the state average across the region.[25] These data do not include Del Norte, however, a 2023 report from the NorCal CoC region found 694 homeless in Del Norte amounting to a rate of 2,525 per 100,000 population (source).

Figure 5.14
Total Counted Homeless per 100,000 Population by Continuum of Care (2016 - 2020)[26]

[24] By some estimates 9 to 10 times higher than the general population.
[25] HUD compiles reported homeless counts gathered by regional participants of the Continuum of Care (CoC) program throughout the U.S. During a 24-hour period in the first ten days of January each year, CoC participants conduct a Point-in-Time (PIT) count of homeless people in their respective regions. These counts include both sheltered homeless as well as people living in areas not meant for habitation.
See Appendix I for a comparison of all Continuums of Care in California. Humboldt and Mendocino CoCs have the highest rates in the state.
[26] The 2021 data, which shows a dubious decline in measured homelessness, are deliberately excluded. These data are not comparable to prior year estimates due the the effects of COVID restrictions. Many shelters, for example, reduced capacity in response to CDC COVID-19 guidelines, reducing the headcount of sheltered homeless (U.S. Department of Housing and Urban Development).

Note. Data sourced from the U.S. Department of Housing and Urban Development's datasets on Point-in-Time (PIT) estimates, a count of sheltered and unsheltered individuals experiencing homelessness. Data are 5-year averages from 2016 to 2020. Rates calculated by the author using population data are 5-year estimates from the ACS from 2016 to 2020. Population estimates are summed for each CoC service area by county.

Similarly, as shown below, an alternative data source indicates a greater proportion of youth homelessness among public school students across the region.

Figure 5.15

Homeless Public School Children (2011 - 2014 and 2016 - 2018)

Note. Data sourced from Kidsdata.org. Defined as the percentage of public school students recorded as being homeless at any point during the school year. Data for 2015 are not available.

While local data on the connection between homelessness and health is limited, state-level data reveals that homeless public school students have substantially higher rates of cigarette smoking, substance use, and suicidal thoughts compared to their non-homeless peers (CalSchls). Given the established health risks associated with homelessness, addressing smoking, substance use, and suicide prevention in the homeless population is crucial. Such efforts not only benefit individuals experiencing homelessness but also play a vital role in enhancing the overall health of the community.

See Appendix J for an assessment of housing affordability and availability. These data suggest a scarcity of housing as indicated by lower rental vacancy rates. However, except for Humboldt County, rental affordability (taking both rent and income into account) is consistent with the state average.[27]

[27] Humboldt County's affordability, as indicated by the percentage of the population paying 35% or more of their income on rent, is likely strongly influenced by the student population who statistically would have little or no income.

Food Environment and Nutrition

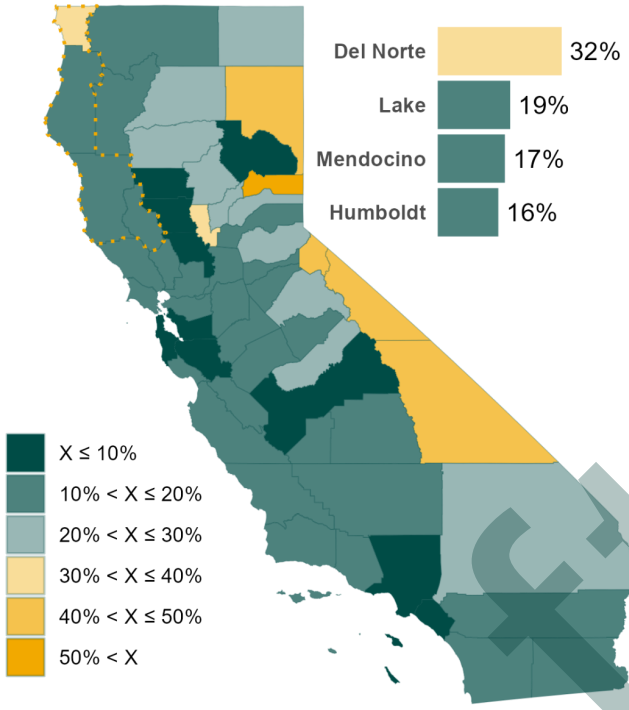
A healthy diet composed of limited portions of vegetables, fruits, whole grains, low fat dairy, proteins, and healthy oils is associated with lower all-cause mortality, cardiovascular disease, obesity, diabetes, breast and colorectal cancer (Healthy People 2030). Thus, barriers that prevent access to a healthy diet such as poverty, high prices, or transportation, may have an adverse influence on these health outcomes.

Rates of heart disease are elevated across the region along with somewhat elevated rates of obesity, breast cancer, and colorectal cancer.[28] Conversely, however, evidence suggested rates of diabetes consistent with or lower than state averages across the region. Food related health issues are raised in Humboldt, Del Norte, and Lake county health planning documents. In particular, a 2019 Del Norte Community Health Assessment found high rates of food insecurity in Del Norte, disproportionately impacting children (source).

As shown below, nearly one-third of the Del Norte population lives more than 10 miles from a grocery store. Although proximity in and of itself has been found to only have a moderate impact on diet, in the region's more extreme rural environments, distance and scarcity of options may compound with other factors such as poverty to create barriers to healthy food options that ultimately contribute to disease outcomes (Ploeg and Rahkovsky, 2016). Such barriers may be contributing factors to adverse food related health outcomes above.

Figure 5.16
Percent of Population Living More than 10 Miles from a Grocery Store (2015)[29]

[28] The most recent CDPH data release shows a lower rate of age-adjusted heart disease mortality in Del Norte County, however, the 2017-2019 data release shows higher rates in Del Norte. Moreover, CDC PLACES data suggest higher rates of heart disease in Del Norte County.
[29] USDA defines this as the "Percentage of people in a county living more than 1 mile from a supermarket or large grocery store if in an urban area, or more than 10 miles from a supermarket or large grocery store if in a rural area."

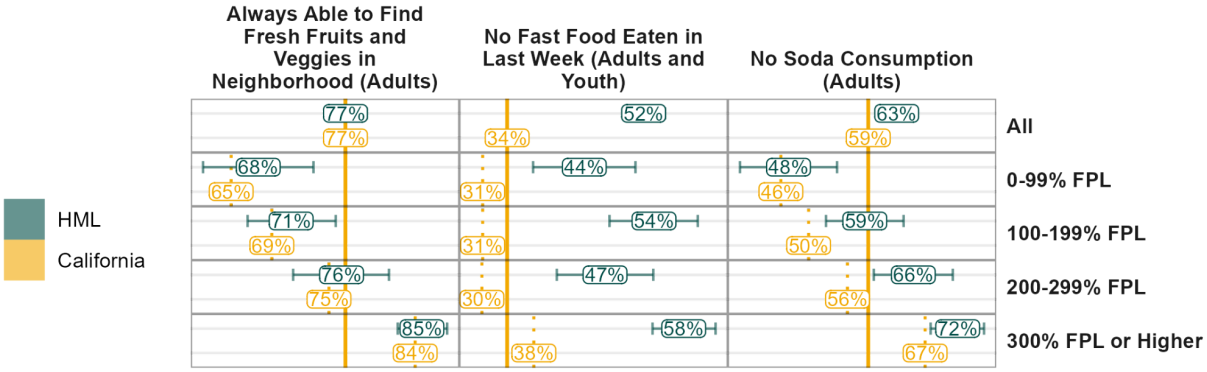


Note. Data sourced from the USDA Food Environment Atlas.

Unfortunately, what data are available strongly suggest that Del Norte is most impacted by food insecurity in the Redwood Coast, yet, CHIS data are not available for Del Norte County to further assess this county's most vulnerable populations. What data are available, for HML, indicate that dietary factors in the region appear to be strongly influenced by household income (see below). Consistent with statewide trends, higher income households are more likely to have local access to fresh produce and less likely to have recently consumed soda and fast-food.

For the HML counties, CHIS data suggest dietary outcomes are consistent with or superior to state averages across income strata, at least within the limited contexts of fast-food, soda, and fresh produce (see Appendix D for youth dietary outcomes).

Figure 5.17
Dietary Factors by Income Level (2011-2018)



Note. Data sourced from the CHIS. Fast Food data only include 2011-2016. Soda consumption data include only 2011-2017. FPL = federal poverty line.

Therefore, the available data suggest that food insecurity and dietary risks are greatest in Del Norte county and among low income households regionwide.

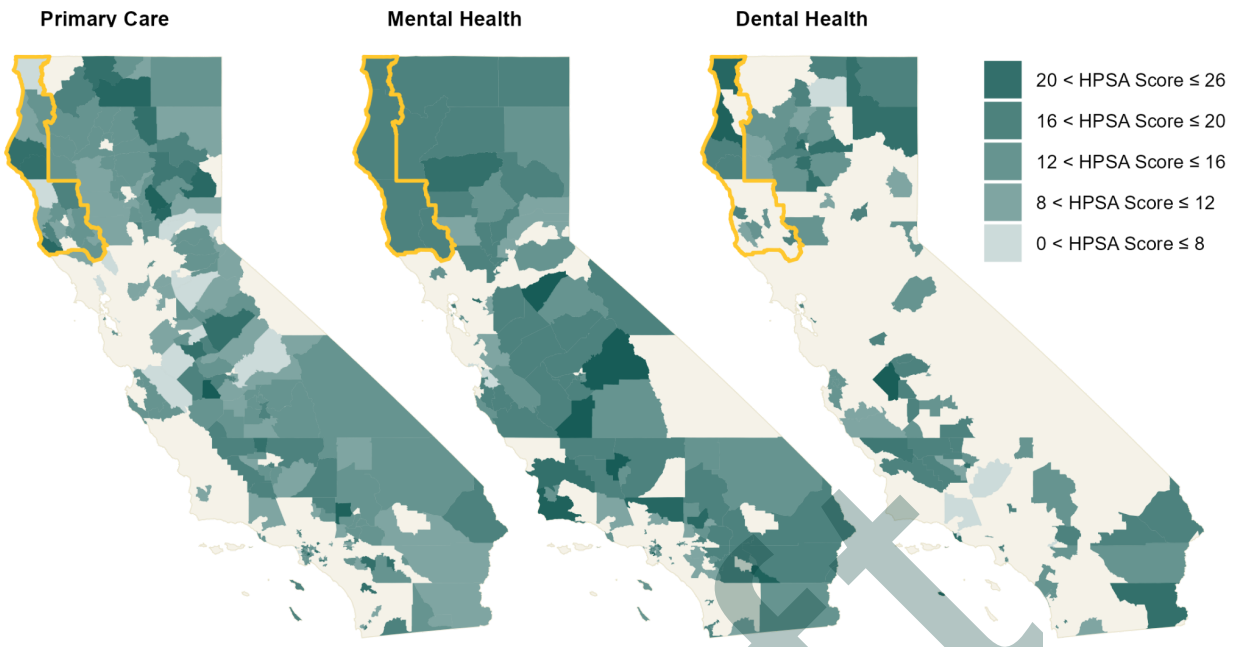
Healthcare Access and Barriers

The majority of the Redwood Coast is a designated Health Provider Shortage Area (HPSA): regions or populations identified by the U.S. Department of Health and Human Services (HHS) as having a shortage of primary care, mental health, or dental health providers.[30] As shown below, almost all of the region is a Primary Care HPSA, the entirety of the region is a Mental Health HPSA, and a substantial share is a Dental Health HPSA.

Figure 5.18
Health Professional Shortage Areas and Scores (2023)[31]

[30] These HPSAs are assigned a score, with scores ranging from 0 to 25 for Primary Care and Mental Health and from 0 to 26 for Dental Health, with higher scores indicating greater need. Factors considered in determining the score include the provider-to-population ratio, poverty rate, travel time to the nearest point of care outside of the region, and other factors relevant to the health field (Health Resources & Services Administration). HPSA scores for Primary Care also take into account indicators of infant health. Dental Health scores take into account water fluoridation status. Mental Health scores take into account the percentages of the population over 65 and under 18, alcohol abuse prevalence, and substance abuse prevalence.

[31] See national level maps made by the data provider located here: https://data.hrsa.gov/maps/map-gallery.



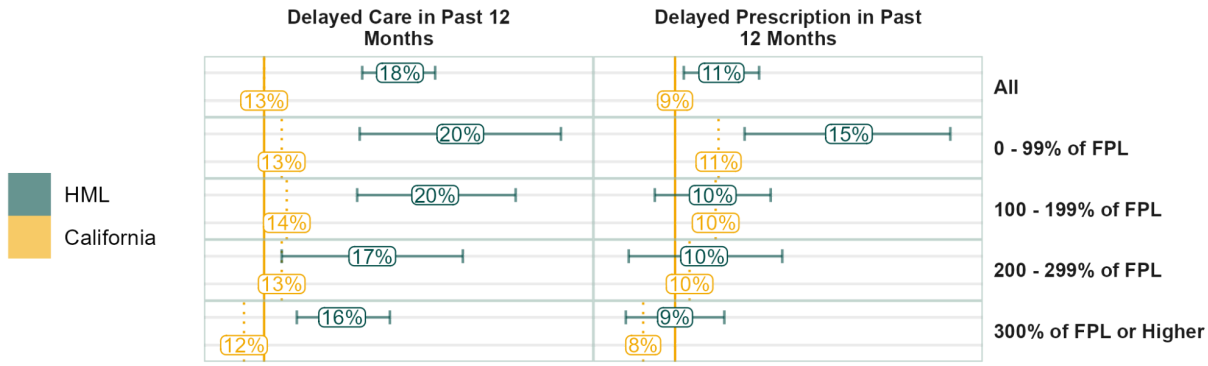
Note. Beige areas are not HPSAs. Blue areas are HPSAs, with darker hues indicating higher HPSA scores (or greater need). The Redwood Coast region is outlined in gold. Data sourced from the Health Resources and Service Administration's data on shortage areas, measuring HPSA areas in primary care, dental health, and mental health.

Access to timely care can prevent occurrence or exacerbation of disease through the prevention of modifiable risk factors, early detection of illness, and management of existing illness to prevent worsening symptoms (Olsen et al., 2010). Improved access to preventive services, including screenings for tobacco, alcohol, depression, and cancer, can lower mortality rates (Centers for Medicare & Medicaid Services, 2010). Conversely, however, delays in healthcare access have been linked to increased mortality (Pizer and Prentice, 2007).

As shown below, a significantly larger proportion of the Redwood Coast population has recently experienced delays in accessing primary healthcare in contrast to the state population. All income brackets experience higher rates of delayed care compared to the corresponding income groups statewide, however, there is a clear trend toward more delays among those with lower incomes. This trend indicates that the scarcity of healthcare impacts all socioeconomic strata, but disproportionately affects those with lower incomes. Moreover, those with incomes below the federal poverty line (FPL) are significantly more likely to have delayed a prescription compared to the same income category statewide, while those with higher income levels do not share this experience. Similar data in Appendix G show that all income strata report more 'difficulty' accessing care at rates significantly higher than the state rate

Figure 5.19

Delayed Healthcare, Percent of Total Population (Left 2011 - 2022, Right 2013 - 2022)



Note. Data sourced from the CHIS.

Delayed care may also be a factor in the region's elevated age-adjusted mortalities due to prostate cancer, breast cancer, and colorectal cancers. For all three, delayed care is associated with higher mortality (prostate_source, source_colon and breast).

Furthermore, CHIS data reveal a stark unmet need for care for those with mental health challenges. Among adults who have seriously considered suicide at some point in their lives, 42.5% (± 5.0%) have delayed care in the past 12 months compared to just 16.4% (± 2.4%) of HML adults who have never considered suicide.

See Appendix G for further analysis of the factors contributing to delayed care. These data and analysis suggest that factors such as transportation in addition to cost and insurance issues may be critical.

See Appendix C for an analysis of Humboldt County's elevated stroke mortality rate as it relates to the healthcare resources in the county.

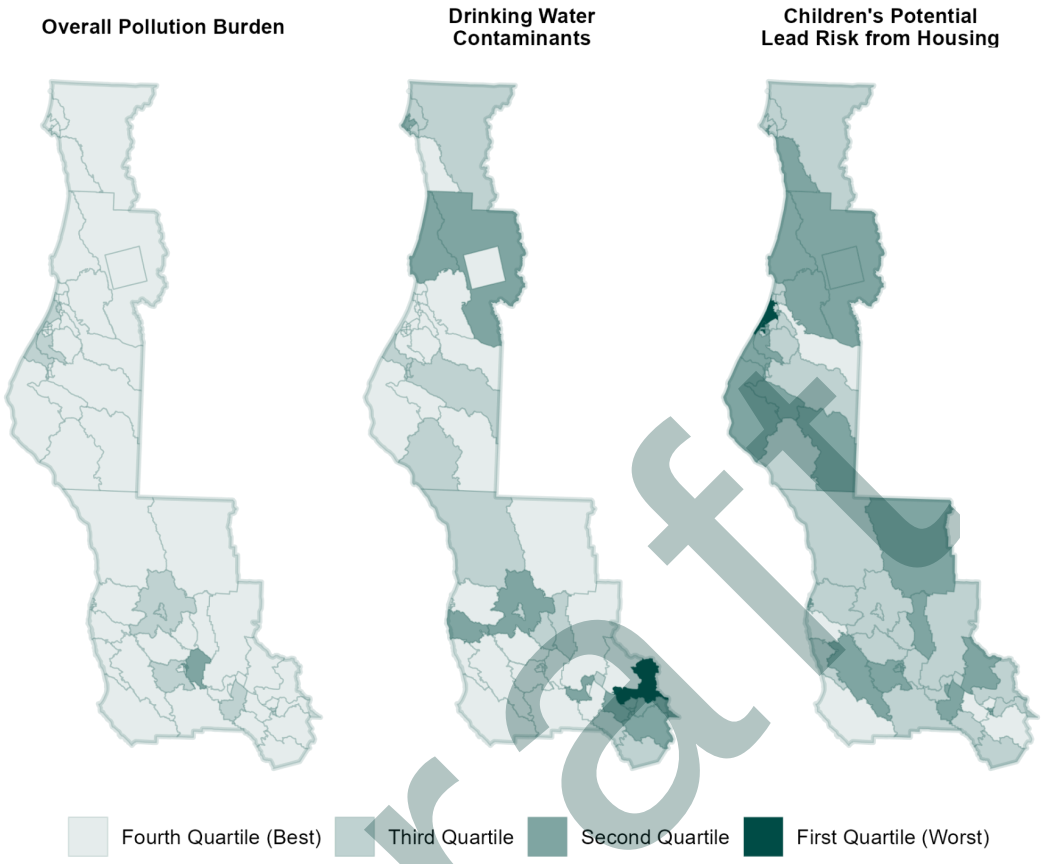
Environmental Factors

Environmental Quality Indicators

Environmental pollutants can contribute to respiratory disease, heart disease, and some cancers (Healthy People 2030, "Environmental Health"). As shown below, CalEnviroScreen 4.0 data indicate that overall the region's pollution burden is lower than the statewide estimates (see "Overall Pollution Burden" below). However, certain environmental risks are elevated in some areas of the region, including children's lead risk as well as drinking water contaminants. See Appendix K for all CalEnviroScreen 4.0 indicators.

Figure 5.20

CalEnviroScreen 4.0 Risk Factors



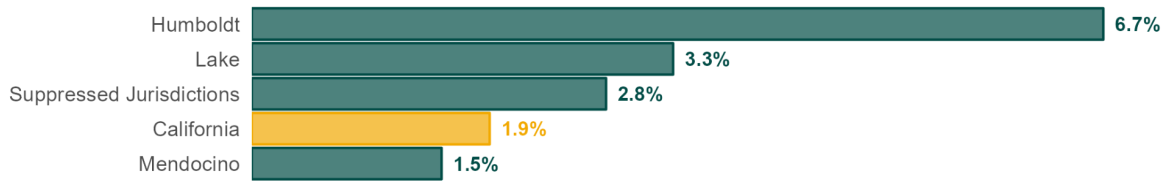
Note. Data sourced from CalEnviroScreen 4.0.

The data above suggest that children in the region may be more likely to be exposed to lead. However, it is critical to note that the CalEnviroScreen 4.0 "Children's Lead Risk from Housing" variable does not directly measure lead exposure, and instead infers a level of risk based on the incidence of child poverty and the age of housing structures.[32] An additional data source shown below, shows that children's blood lead levels (BLL) among children age 5 and under are elevated in Humboldt and Lake counties. Moreover, Humboldt's BLL levels are the second highest in the state.[33] CalEnviroScreen 4.0 data above suggest that the epicenter of lead risk in Humboldt County is in the Arcata-Eureka-Fortuna region.

Figure 5.21

Blood Lead Levels, Children 5 and Under

[32] Exposure to lead-based paint in older homes is the most significant source of lead poisoning in children (source).
[33] Second to Nevada County.



Note. Data sourced from CDPH. Suppressed jurisdictions include Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lassen, Mariposa, Modoc, Mono, Plumas, Sierra, Siskiyou, Trinity, Tuolumne, and Yuba.

Wildfires

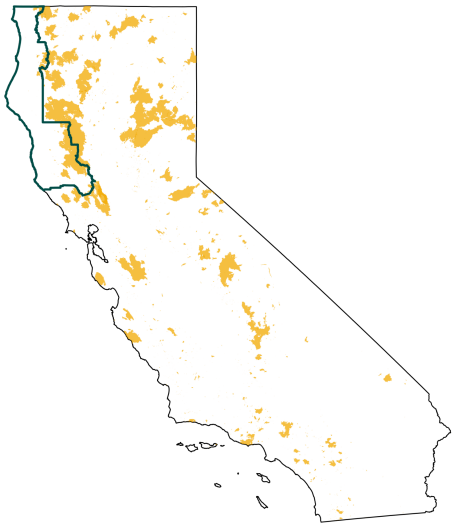
In contrast to man-made pollutants, wildfires and corresponding health risks have in recent years been far more severe in the northern region of the state (as shown below). Smoke from wildfires can impair lung function, contribute to bronchitis, asthma, and heart failure; the region's substantial elderly population are particularly vulnerable to these effects (United States Environmental Agency, 2023). These fires may exacerbate the region's disproportionately high levels of asthma and respiratory illness.

Although not necessarily specific to wildfires, weather-related events do appear to have had an outsized impact on the health of the region compared to the state. Approximately 78% of Redwood Coast residents experienced extreme weather events between 2019 and 2022 compared to just 42% of California residents. As shown below significantly and substantially more residents in the region experience adverse mental and physical health impacts due to recent extreme weather-related events compared to the state as a whole.

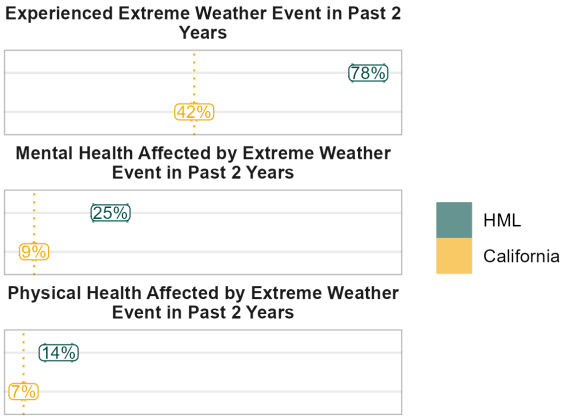
Figure 5.22

Wildfires, Burned Area (2018 - 2022)	*Health Effects of Extreme Weather Events, Percent of Population (2021-2022)*[34]

[34] The data collection period includes 2021 and 2022, but the survey question asks respondents to respond based upon their experiences in the past two years. Thus, these data reflect events that may have occurred between 2019 through 2022.



Note. Data sourced from the California Department of Forestry and Fire Protection



Note. Data sourced from the CHIS.

Takeaways

1. Compared to state averages, the region experiences adverse disparities in rates of poverty, homelessness, educational attainment, household isolation, adverse childhood experiences, and access to healthcare.
2. Populations affected by these disparities are more likely to show two key risk factors linked to the health outcomes examined earlier: current smoking and suicide ideation. Although there is research supporting the connections between these disparities and substance use, the limited available local data on substance use do not provide clear links to these disparities specifically within the Redwood Coast.
3. The region faces healthcare shortages and low income households and people with mental health challenges disproportionately experience delays in accessing care.
4. Wildfire health risks and lead poisoning are two critical environmental risk factors for the region.

Section 6. EQUITY ANALYSIS AND AT-RISK POPULATIONS

The following presents a comparative analysis of health factors across different demographic groups within the HML region, emphasizing the identification of at-risk populations.

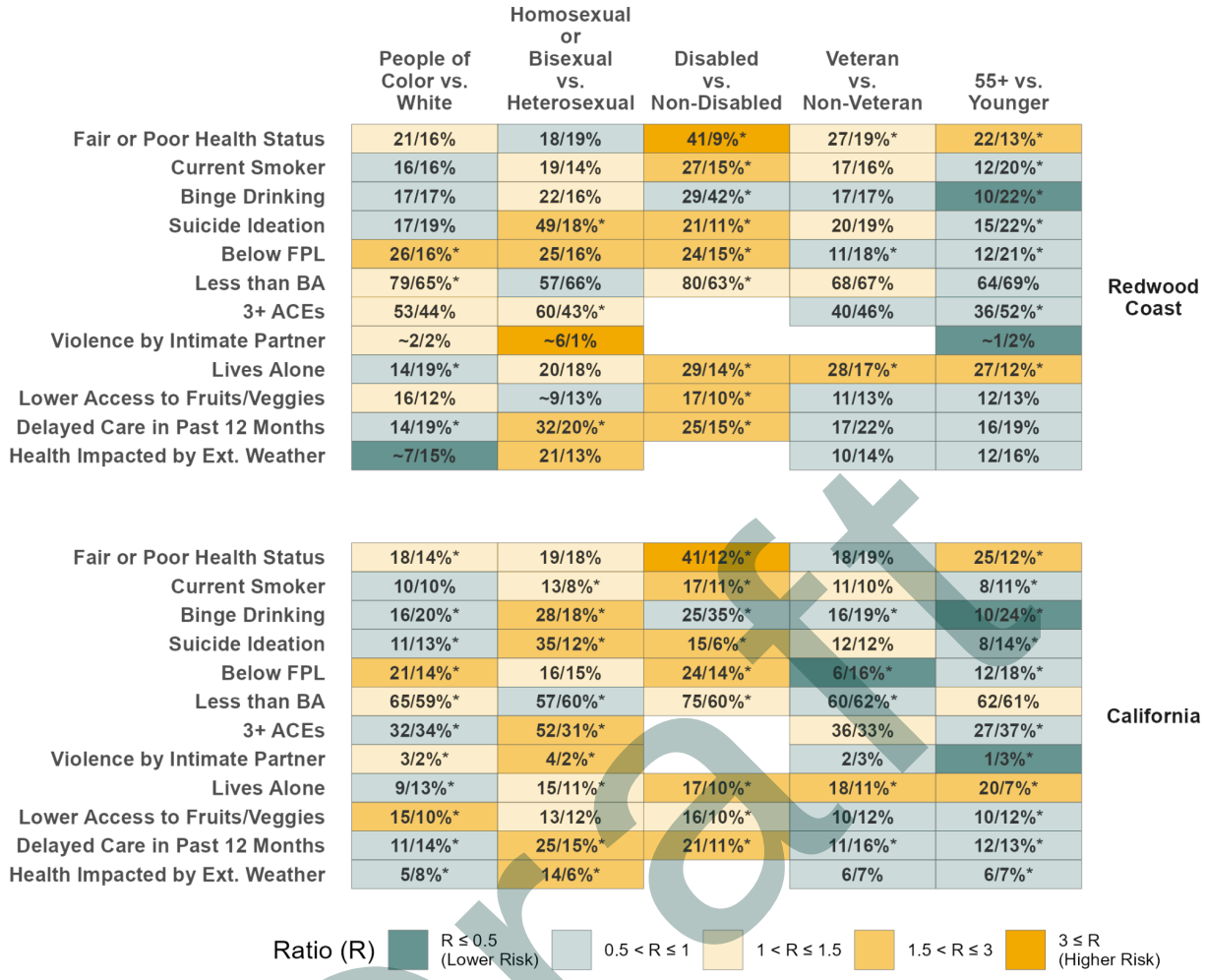
The figure below offers a visual comparison of health outcomes and factors across demographics. Each column illustrates the differences between two populations. As an example,

the first column contrasts the health factors of people of color to the white population. Gold shades denote adverse disparities for the primary population relative to the reference group. A specific observation reveals that, in the HML region, 26% of people of color live below the poverty line, in contrast to 16% of the white population.[35] From these data, several notable trends emerge further highlighting populations at risk in the HML region:

- People of color show higher rates of fair or poor health, higher poverty levels, lower educational attainment, higher ACEs, and more limited access to nutritious foods. Data presented in Appendix E show that people of color in Del Norte County experience higher rates of poverty and higher rates of lack of health insurance.
- Lesbian, gay, and bisexual communities within the HML region face numerous disparities: increased smoking and heavy alcohol consumption, suicidal thoughts, higher poverty rates, elevated ACEs rates, domestic violence, deferred medical care, and adverse weather-related health impacts. Alarmingly, half of this community has seriously contemplated suicide.
- People with disabilities in the region experience higher rates of poor health, increased smoking, suicidal thoughts, poverty, lower educational attainment, living alone, restricted access to healthy food, and deferred medical care.
- The 55+ demographic in the region tends to live solitarily. As expected, a higher percentage report fair or poor health, but this group generally has fewer risk factors. The health trends of the veteran population resemble these patterns, possibly due to a significant age overlap in these two groups within the region.[36]

Figure 7.1
Comparative Analysis of Demographic Disparities in Health Factors (2011 - 2022)

[35] Non-white Hispanics are included in people of color category and white Hispanics are included in the white group.
[36] In the HML region 16.8% of adults 55 and older have served in the military compared to just 4.4% for adults 18 to 54 (2011 - 2022 CHIS data).



Note. Data sourced from the CHIS. (*) denote statistically significant differences and (~) denote unstable estimates. It is possible that an estimate can be unstable and simultaneously significantly different. Missing values not shown. Years are selected based on all available years from 2011 on. Binge drinking is either "Binge Drinking in Past Month" or "Binge Drinking in Past Year" depending on data availability.

Section 7. POLICY FOCUS AREAS AND RECOMMENDATIONS

By uncovering health outcomes and risk factors that exhibit adverse disparity with state averages, the report's intention is to promote a clear understanding of the region's shared health challenges and at-risk populations, which, in turn, can guide prioritization and collaborative efforts to address these challenges. The following categorizes the report's findings into three policy areas. The focus is not to detail every challenge and potential solution but to emphasize and prioritize those that emerge as central and high-priority challenges.

Policy Focus Area 1: Smoking Prevention, Education, and Cessation

Key Findings	• Youth and adult smoking is substantially and significantly higher in the region. • Tobacco-related health outcomes are adversely impacted in the region.
At-Risk Populations	Regional data indicate that the following Redwood Coast populations are at elevated risk for tobacco use: • Both youth and adults • People with low income or moderate income • People with lower educational attainment • Youth with academic challenges • People experiencing loneliness or social isolation • People with multiple ACEs • Lesbian, gay, and bisexual individuals • Individuals with disabilities National SAMHSA data indicate that the AIAN may also be at high risk for tobacco use ("2021 NSDUH Detailed Tables").
Recommendations and Resources	• Make use of evidence-based models for tobacco cessation such as Rural Health Information Hub's *Rural Tobacco Control and Prevention Toolkit*, focusing on at-risk populations and addressing the perceived risk of tobacco use.
Suggested Indicators of Success	• A reduction of Grade 11 smoking rates to rates similar to the state rate as indicated by CalSCHLs data.[37] • A reduction in the proportion of 'current smokers' to a rate similar to the state rate as indicated by CHIS data. • Do **not** use smoking data from CHRR, CDC PLACES, or any other SAE data to measure success.[38]

Policy Focus Area 2: Substance Use Prevention and Treatment

Key Findings	• Substance use among youth and adults as well as adverse substance use related health outcomes are elevated in the region. • Redwood Coast rates of Hepatitis C are the highest in the state. • DUIs and alcohol-involved driving deaths are elevated across the region.
At-Risk Populations	Data limitations prevent a comprehensive analysis of the regional at-risk populations; however, local data indicate that the following populations

[37] For each toolkit, see "Program Clearinghouse" for examples of promising programs.
[38] See Appendix A for data limitations.

	are at elevated risk for binge drinking: ● Both youth and adults ● Lesbian, gay, and bisexual individuals National SAMHSA data indicate that the following populations may also be at high risk for substance use disorder ("2021 NSDUH Detailed Tables"): ● AIAN ● People of two or more races ● People with low or moderate income Research also indicates that people with multiple ACEs are at high risk for substance use (Anda et al., 1998).
Recommendations and Resources	● Make use of evidence-based models for substance use prevention and treatment such as Rural Health Information Hub's *Prevention & Treatment of Substance Use Disorders Toolkit*, focusing on at-risk populations and addressing the perceived risks of substance use. ● To address motor vehicle traffic facilities, consider using the UC Berkeley Transportation Injury Mapping System (TIMS) to monitor and respond to DUI, pedestrian, and bicycle injury hotspots in your service area.[39]
Suggested Indicators of Success	● A reduction of Grade 11 students who have been "drunk or high at school" to rates similar to the state rate as indicated by CalSCHLs data.[40] ● A reduction in the proportion of DUI crashes to a rate similar to the state rate as indicated by TIMS data.[41] ● A reduction in "All Drugs" overdose deaths to rates similar to the state rate as indicated by the California Overdose Surveillance Dashboard from CDPH. ● Do **not** use alcohol use data from CHRR, CDC PLACES, or any other SAE data to measure alcohol intervention success.[42]

Policy Focus Area 3: Suicide Prevention and Access to Mental Health Care

Key Findings	● Suicides, suicidal ideation, and firearm-related deaths are

[39] This tool, for instance, identifies the intersection of 11th Street and H Street in Arcata, CA in Humboldt County as a hotspot. An account is required, but setup is free, easy, and quick.
[40] Binge drinking in the past 30 days may also be a useful indicator.
[41] Alternatively, alcohol involved OTS Crash Rankings or the proportion of alcohol-involved driving deaths from CHRR may be used.
[42] CHRR alcohol driving deaths does not use SAE data so this could function as an indicator of success.

	elevated in the region. ● The entire region is a mental health provider shortage area. ● Approximately 42.5% of Redwood Coast adults who have seriously considered suicide in their lives have delayed care in the past 12 months, compared to 16.4% of Redwood Coast adults who have not considered suicide. ● People with disabilities and lesbian, gay, and bisexual individuals are more likely to have contemplated suicide and more likely to have recently delayed health care.
At-Risk Populations	Regional data indicate that the following Redwood Coast populations are at elevated risk for suicide ideation: ● Both youth and adults ● People living alone, particularly men ● People with low or moderate income ● People experiencing loneliness or living alone ● People with multiple ACEs ● People experiencing suicidal ideation who have access to a firearm ● Lesbian, gay, and bisexual individuals ● Individuals with disabilities National SAMHSA data indicate that the following populations may also be at high risk for suicide ideation ("2021 NSDUH Detailed Tables"): ● AIAN ● People of two or more races ● Unemployed The CDC indicates that the following populations are at elevated risk of suicide completion ("Preventing Suicide Requires a Comprehensive Approach"): ● Veterans ● AIAN ● Individuals with disabilities ● Middle aged adults (35-64 years of age) ● Lesbian, gay, or bisexual youth ● Men working in high risk occupations
Recommendations and Resources	● Make use of evidence-based models for suicide prevention and health access such as Rural Health Information Hub's *Suicide Prevention Toolkit*, *Rural Care Coordination Toolkit*, *Rural Transportation Toolkit*, and Rural Telehealth Toolkit focusing on at-risk populations. ● Work to address underlying risk factors such as child abuse, domestic violence, and ACEs. For instance CDC has prepared a short handbook of tangible evidence-based strategies and approaches to preventing ACEs. Specific recommendations

	include approaches such as early childhood home visitation, recruiting men and boys as allies in prevention, and mentoring programs.
Suggested Indicators of Success	• A reduction in the suicide mortality rate to rates similar to the state rate as indicated by County Health Status Profiles from the CDPH. • A regionwide reduction of Grade 11 students who have "considered suicide" to rates similar to the state rate as indicated by CalSCHLs data. • A regionwide reduction of rates of child abuse and domestic violence to rates similar to the state rates as indicated by kidsdata.org. • A significant reduction in the proportion of the population with a history of suicide ideation who have recently "delayed care" as indicated by CHIS data. • Do **not** use mental health SAE data from CHRR, CDC PLACES, or any other SAE data to measure success.

APPENDICES

Appendix A: Data Limitations and Methodology

Data Limitations

Several data limitations are evident within this report. First, some data points have suppressed data. In order to protect anonymity/confidentiality, data sources (e.g. CHRR) will omit county-level data when sample sizes are inadequate (e.g. $n < 12$). In the data visualizations throughout this report, missing data will either be suppressed from the visualization with notation, or the missing variable (e.g. county name) will be included in the visualization but without a corresponding value. Frustratingly, this often eliminates the ability to provide estimates for minority populations for counties with low populations.

Wherever feasible, data points include confidence intervals provided by the data source. Unless otherwise stated, all confidence intervals use a 95% level of confidence. In some cases, when necessary variables are available and confidence intervals are not provided by the data source, confidence intervals are calculated with 95% confidence. Because the Redwood Coast counties have small populations, the resulting small sample sizes often produce point estimates with wide confidence intervals.[43] This is a particular challenge quantifying a condition or event among a small subset of a population. This further narrowing of an already small population increases the statistical uncertainty of the estimate, widening confidence intervals.

Data from the Centers for Disease Control (CDC) and Robert Wood Johnson Foundation PLACES project uses regression techniques to estimate health outcomes and behaviors at the county level based on data from the CDC's Behavioral Risk Factor Surveillance System (BRFSS) and the Census Bureau's ACS and Decennial Census population estimates. While these data are model based predictions, they have been shown to be consistent with BRFSS survey estimates at the county level. In light of these limitations, the data provider cautions against using the estimates to detect effects due to local area interventions, as such effects would not necessarily be reflected in the data used to construct the PLACES data (Centers for Disease Control and Prevention). These limitations also apply to some data from CHRR, as this source includes data derived from the PLACES project data. All data sources that use small area estimation techniques (SAE) are indicated as such throughout the report.

[43] As an example, a point estimate for the poverty rate would be the estimated poverty rate (e.g. 20%), and the confidence interval would be a range of values that indicate the reliability of that point estimate. A wide confidence interval indicates that the point estimate is less reliable, whereas the narrow confidence interval indicates that the point estimate is likely close to reality.

The California Health Information Survey (CHIS) is a rich dataset both in breadth and depth, providing direct survey evidence that in many cases are not available or comparable to other datasets. However, a limitation of these data is the aggregation of small population counties into larger statistical units. Because of this limitation, it is not possible to represent Del Norte County in these data as this county has been aggregated with seven other counties outside the Redwood Coast region. Therefore, CHIS data only includes Humboldt, Mendocino, and Lake counties, referred to as HML throughout this report.

Because of these disparate statistical challenges including limited population sizes, imperfect statistical representation of the geographic area, and small area estimation (SAE) techniques, wherever possible multiple data sources will be used to bolster the weight of evidence, enabling the identification of trends that emerge from the collective signals conveyed by the data.

Where necessary, a more detailed discussion of data limitations particular to certain data sources is discussed further in their corresponding sections.

Terminology and Technical Methodology

The word "significant" is used deliberately and precisely throughout this report to mean that the difference between a variable and the state average is statistically significant at the level of confidence associated with the confidence interval provided by the data source. A difference between two variables is determined to be statistically significant when their confidence intervals do not intersect. Wide and overlapping confidence intervals should be interpreted as an absence of compelling evidence of difference rather than evidence of similarity between variables. Because of the data limitations above, the data sources used throughout this report may fail to indicate significant differences, when in fact true differences exist.

To facilitate interpretation and comparison of findings, we include the observational period during which the data was gathered in the title of each data visualization. Data publication dates are included in the References section.[44]

All data analysis and visualization in this report was conducted using the R programming language. In this environment, we primarily made use of the Tidyverse suite of R packages. U.S. Census data was drawn from the Census Bureau's application programming interface (API) via the TidyCensus R package. Unless otherwise stated, all maps in this report were made using data drawn from the Census Bureau via the TidyCensus library for R.

[44] When multiple data sources or variables are included, we include the total observational window. For example, if one variable has an observational window of 2015 to 2018 and another has an observational window of 2016 to 2019, 2015 to 2019 will be given in the title.

International Classification of Diseases (ICD-10) Codes for CDPH Data

Figure A.1

International Classification of Diseases (ICD-10) Codes

All Cancer Deaths	C00–C97
Colorectal Cancer	C18–C21, C260
Lung Cancer	C34
Female Breast Cancer	C50
Prostate Cancer	C61
Diabetes	E10–E14
Alzheimer's Disease	G30
Coronary Heart Disease	I20–I25
Cerebrovascular Disease (Stroke)	I60–I69
Influenza and Pneumonia	J09–J18
Chronic Lower Respiratory Disease	J40–J47
Chronic Liver Disease and Cirrhosis	K70, K73–K74
Accidents (Unintentional Injuries)	V01–X59, Y85–Y86
Motor Vehicle Traffic Crashes	V02–V04(1, 9), V092, V12–V14(3–9), V19(4–6), V20–V28(3–9), V29–V79(4–9), V80(3–5), V811, V821, V83–V86(0–3), V87(0–8), V892
Suicide	U03, X60–X84, Y870
Homicide	U01–U02, X85–Y09, Y871
Firearm-related Deaths	U014, W32–W34, X72–X74, X93–X95, Y22–Y24, Y350

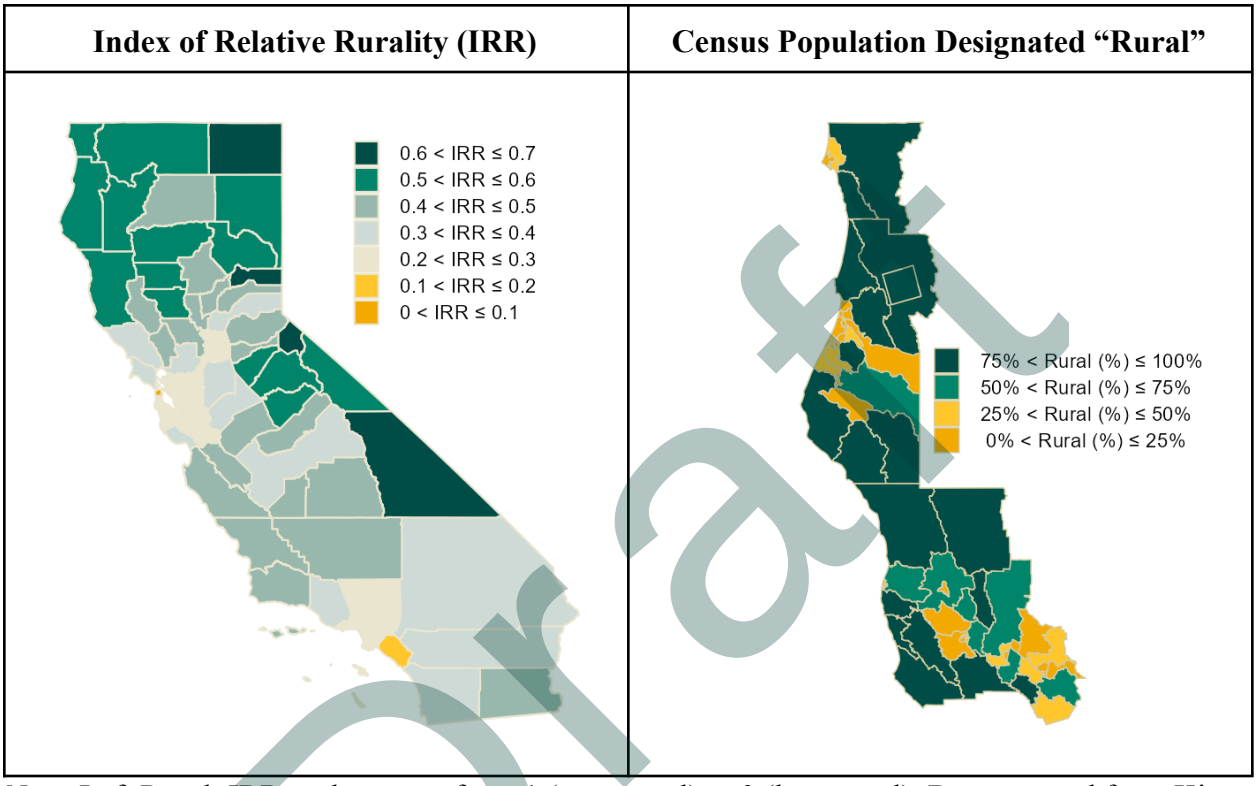
Drug Overdose Deaths	X40–X44, X60–X64, X85, Y10–Y14

Note. Codes sourced from CDPH County Health Status Profiles 2023 (source).

Appendix B: Further Demographic Analysis

Figure B.1

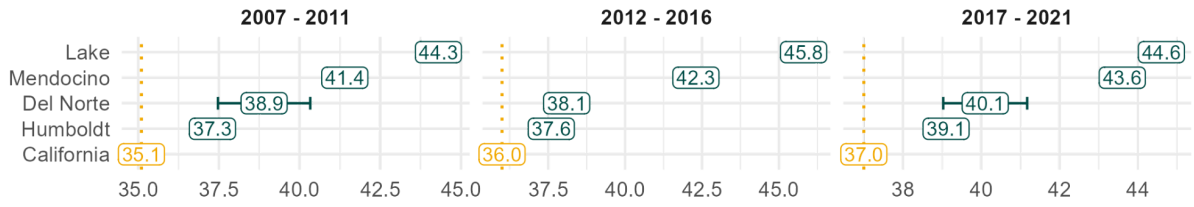
Measures of Rurality (2010)



Note. Left Panel: IRR scale ranges from 1 (most rural) to 0 (least rural). Data sourced from Kim and Waldorf's 2018 data set titled "The Index of Relative Rurality (IRR): US County Data for 2000 and 2010." Right Panel: Data sourced from 2010 Decennial Census variables P002001 - P002006.

Figure B.2

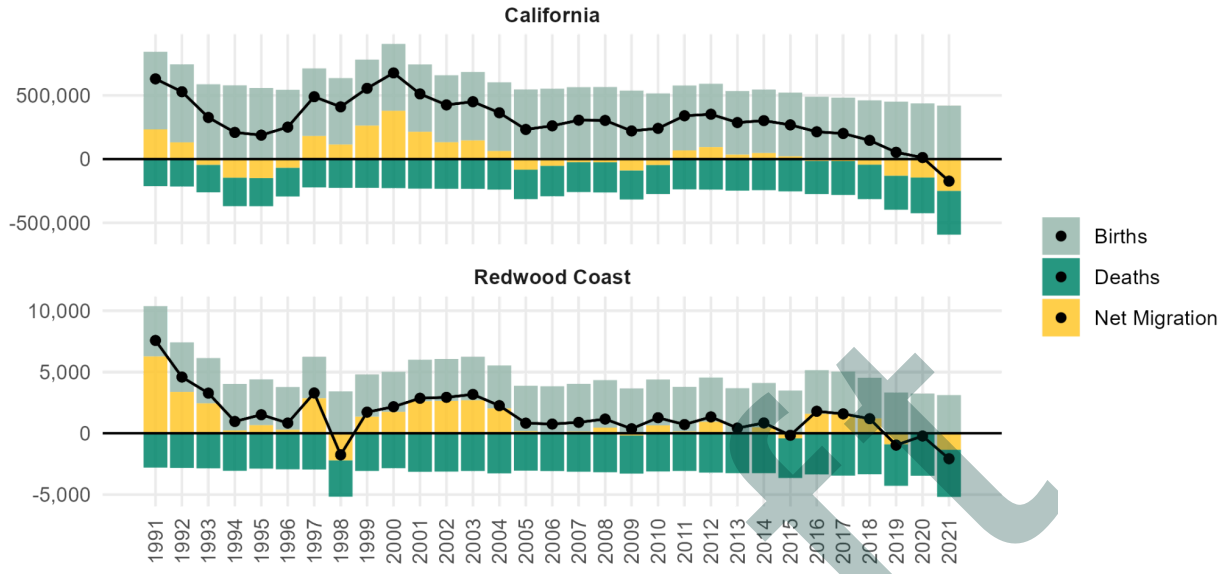
Median Age



Note. Data Source sourced from ACS 5 year estimates. Bars indicate 95% confidence intervals.

Figure B.3

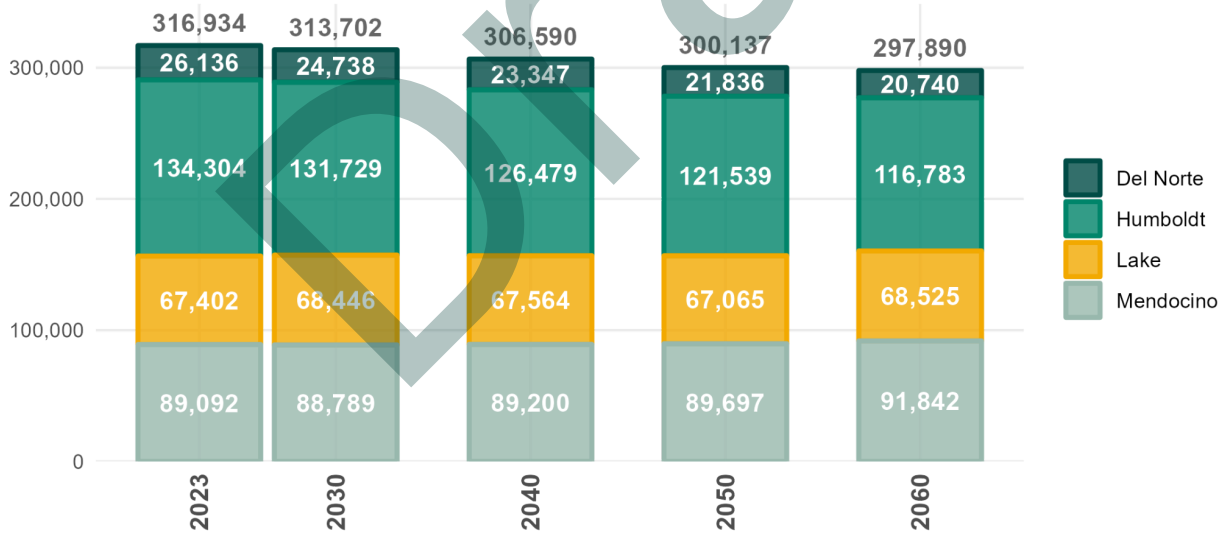
Population Growth and Components of Change



Note. Data sourced from the California Department of Finance

Figure B.4

California Department of Finance Population and Projections



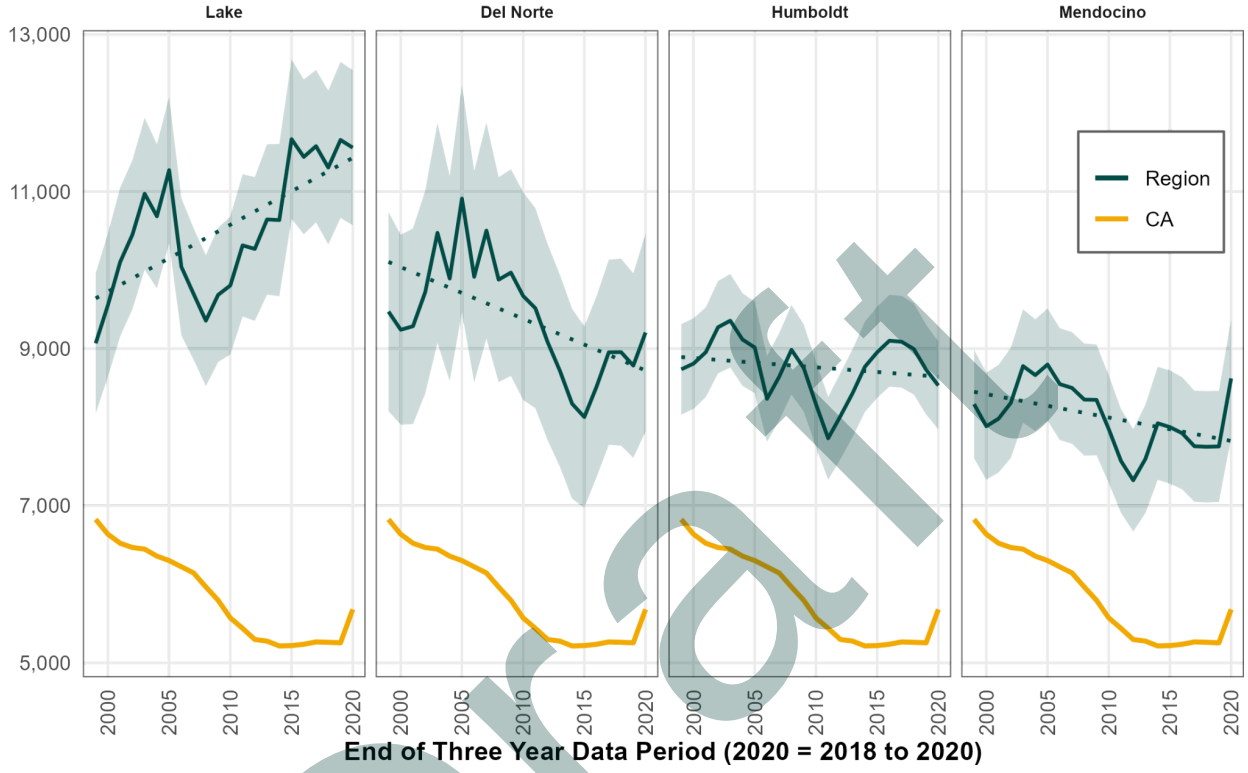
Note. Data sourced from the California Department of Finance.

Appendix C: Further Analysis of Health Outcomes

Trends in Mortality Rates and Premature Death

Figure C.1

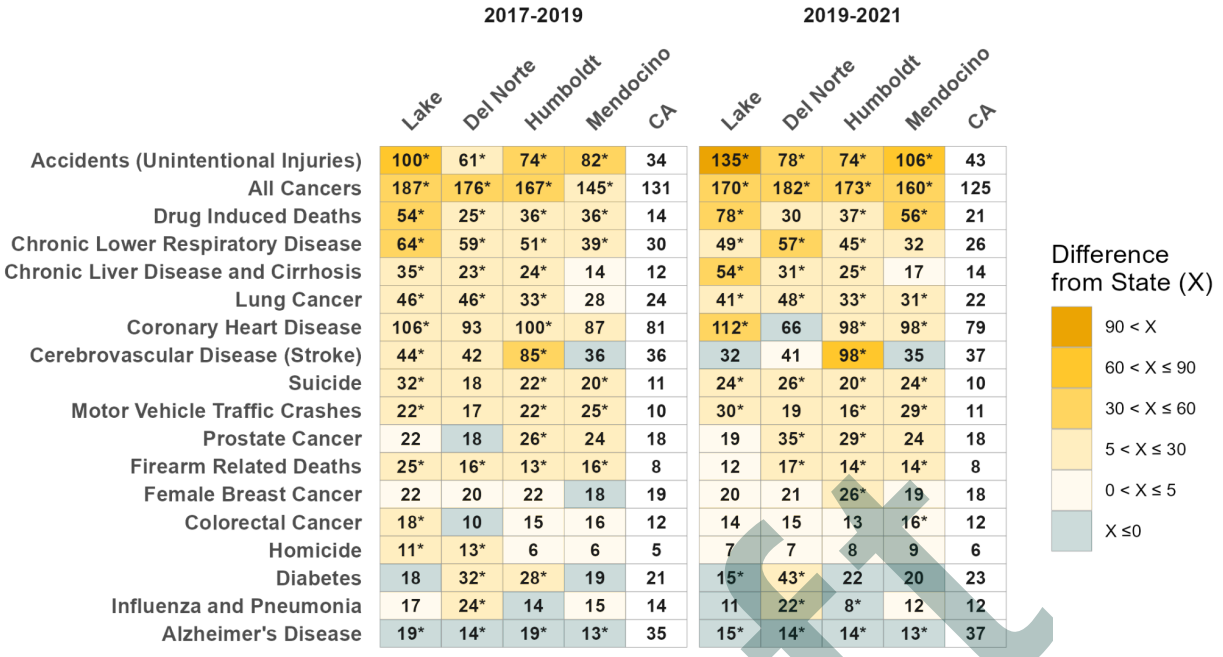
Years of Potential Life Lost (YPLL) per 100,000 Population (1997 - 2020)



Note. Data sourced from CHRR. YPLL is defined as the number of years of life lost due to deaths prior to age 75. For instance, the death of a 40 year old would amount to 35 YPLL.

Figure C.2

Age-Adjusted Mortality Rates per 100,000 (2019 - 2021)

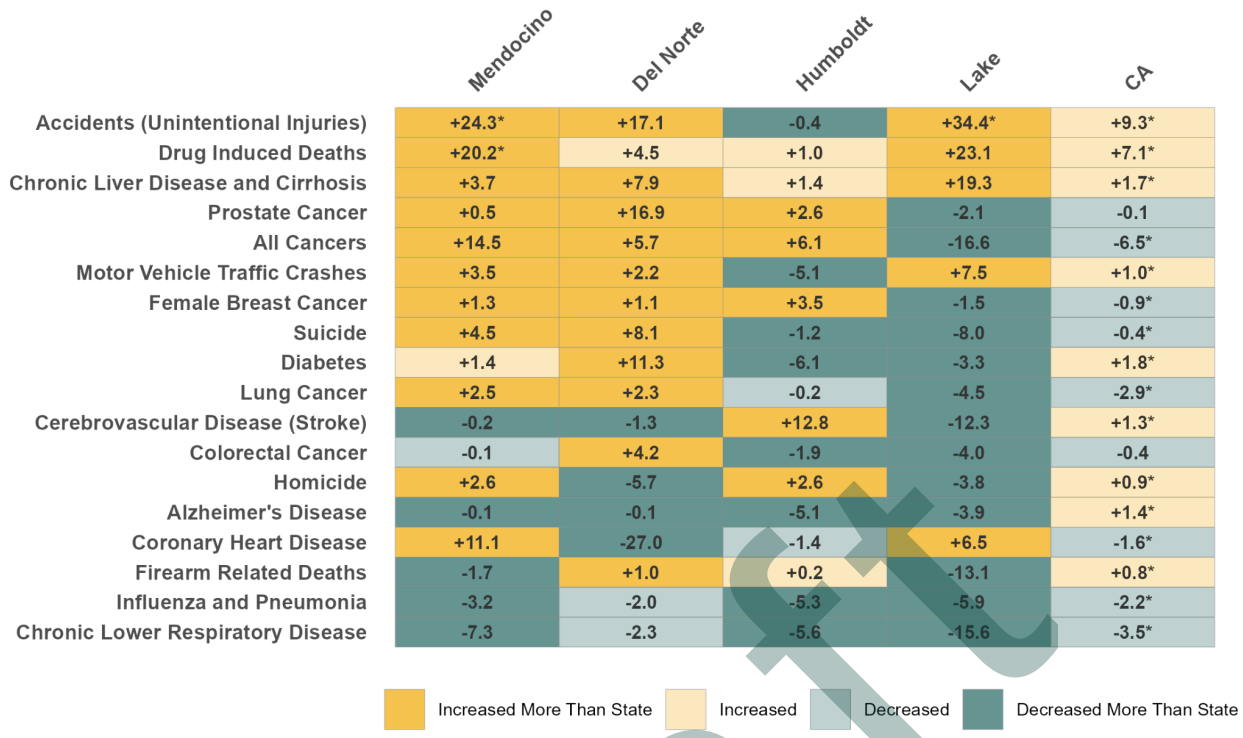


Note. Data sourced from the California Department of Public Health and the California Conference of Local Health's *County Health Status Profiles* report data. The color scale denotes differences (X) between the region's mortality rate and the corresponding state rate. Gold and yellow indicate higher mortality rates compared to the state. Asterisks (*) denote a statistically significant difference compared to the state rate. None of these causes include deaths where COVID-19 is the underlying cause of death.[45]

Figure C.3

Change in Age-Adjusted Mortality Rate per 100,000 from 2017-2019 Period to 2019-2021 Period

[45] According to CDPH, "Deaths where COVID-19 was coded as the underlying cause of death are only included for all causes of death and are not included in any of the specific mortality health indicators. However, deaths where COVID-19 was listed as a significant condition contributing to death but not the underlying cause of death may be included for these health indicators" (2022).



Note. Data sourced from the California Department of Public Health and the California Conference of Local Health's *County Health Status Profiles* report data. Numerical values indicate change in age-adjusted mortality rates. Asterisks (*) denote a statistically significant change over time.

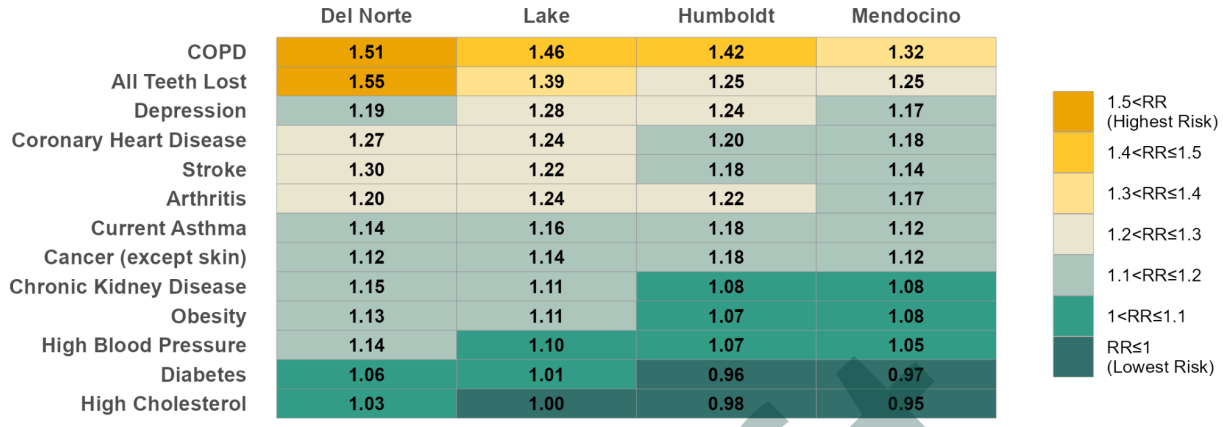
Health Conditions, SAE Estimation Techniques

A broader understanding of health conditions in the region is derived from data obtained from the Centers for Disease Control (CDC) and the Robert Wood Johnson Foundation PLACES project. However, it is important to note that these data have a critical limitation as they have been generated using small area estimation (SAE) techniques, rather than direct estimation such as surveys.[46] It is possible that the models used to predict these values may omit important local variables such as a local health intervention program and therefore fail to accurately predict health outcomes. Although direct estimates are preferred, SAE techniques can nevertheless offer helpful insights into health outcomes for areas with small populations where directly estimated data is unavailable. As shown below, this SAE model suggests health outcomes similar to state averages for diabetes and high cholesterol, whereas other conditions are predicted to be higher.

[46] SAE uses multivariate regression techniques to predict values for small geographic areas using the available data such as American Community Survey Data. These data on health outcomes at the county level are based on data from the CDC's Behavioral Risk Factor Surveillance System (BRFSS) and the Census Bureau's ACS and Decennial Census population estimates.

Figure C.4

Estimated Age-Adjusted Illness Risk Ratios (RR), SAE Technique (2019 - 2020)



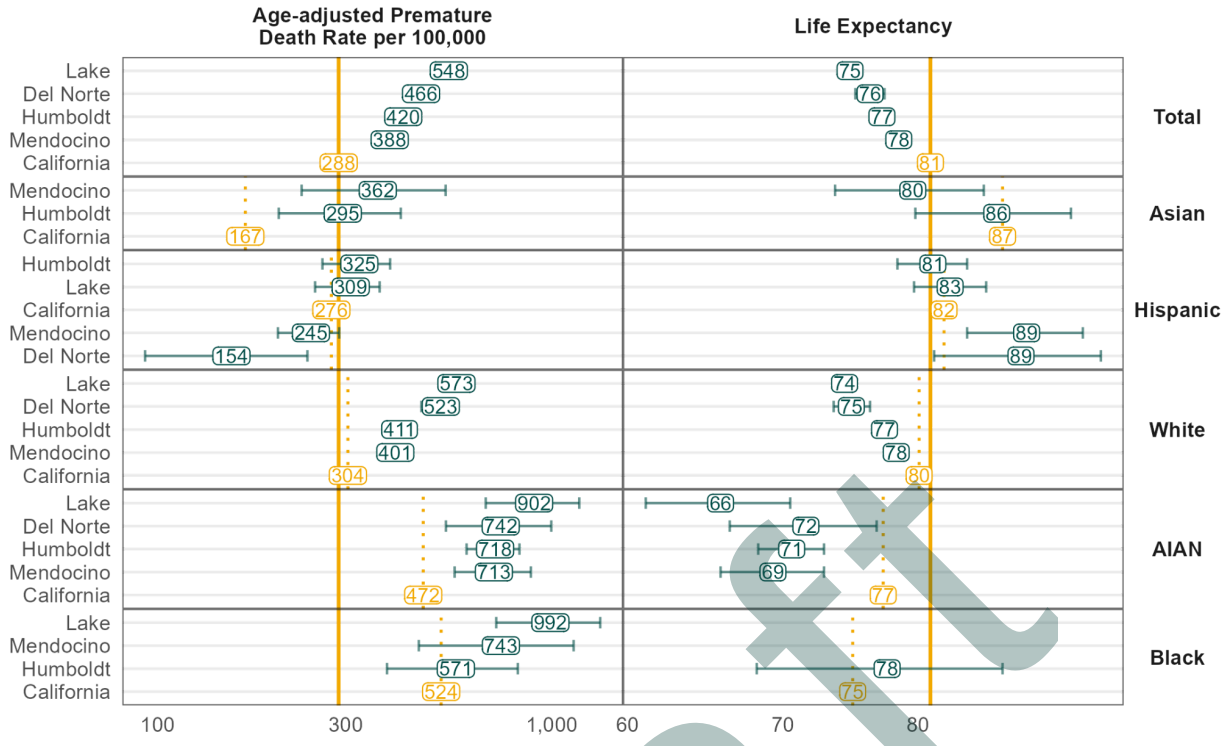
Note. Data sourced from the Centers for Disease Control and Prevention's 2022 release of the PLACES data set, *PLACES: Local Data for Better Health, County Data*. California estimates and not provided by the data source. California estimates were calculated by the author by taking a population-weighted average of all California counties using the population estimates provided in the dataset. Risk ratios (RR) calculated by taking the ratio of the local rate divided by the state rate. RR > 1 indicates higher risk relative to the state.

Health Outcomes by Race and Ethnicity

As shown below, the available data signal significantly and substantially higher age-adjusted premature death among white, American Indian and Black populations (see *AIAN* and *Black* rows, compared with dotted vertical lines). For the available data, Asian populations experience rates of premature death largely consistent with the overall state average but significantly higher than the state averages for their respective populations. On the other hand, the region's Hispanic population experiences rates of premature death and life expectancy consistent with or superior to both the state average for this population and the overall state population.

Figure C.5

Premature Death and Life Expectancy by Race and Ethnicity (2018 - 2020)

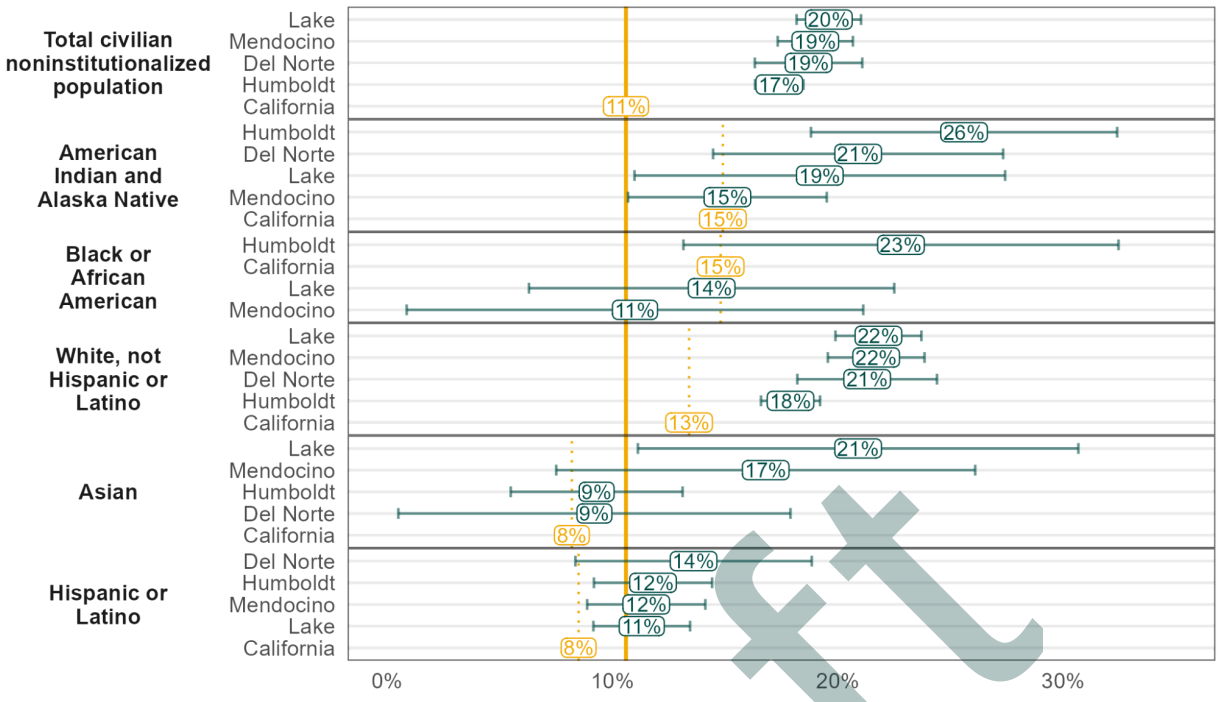


Note. Data sourced from the CHIS.

It is important to consider differences in disability rates and other health factors by race or ethnicity in the context of age, as differences in disability rates between populations can be strongly influenced by differences in the age structure of the population. Consistent with national and state trends, Latino households are substantially younger compared to the general population. On the other hand, the non-Hispanic, white community is substantially older compared to the general population (CHIS). Therefore, we should expect to see a greater level of age-related disparities in health outcomes for the non-Hispanic white population and a lower level of such disparities in the Hispanic population.

Figure C.6

Disability Rates by Race or Ethnicity (2017 - 2021)



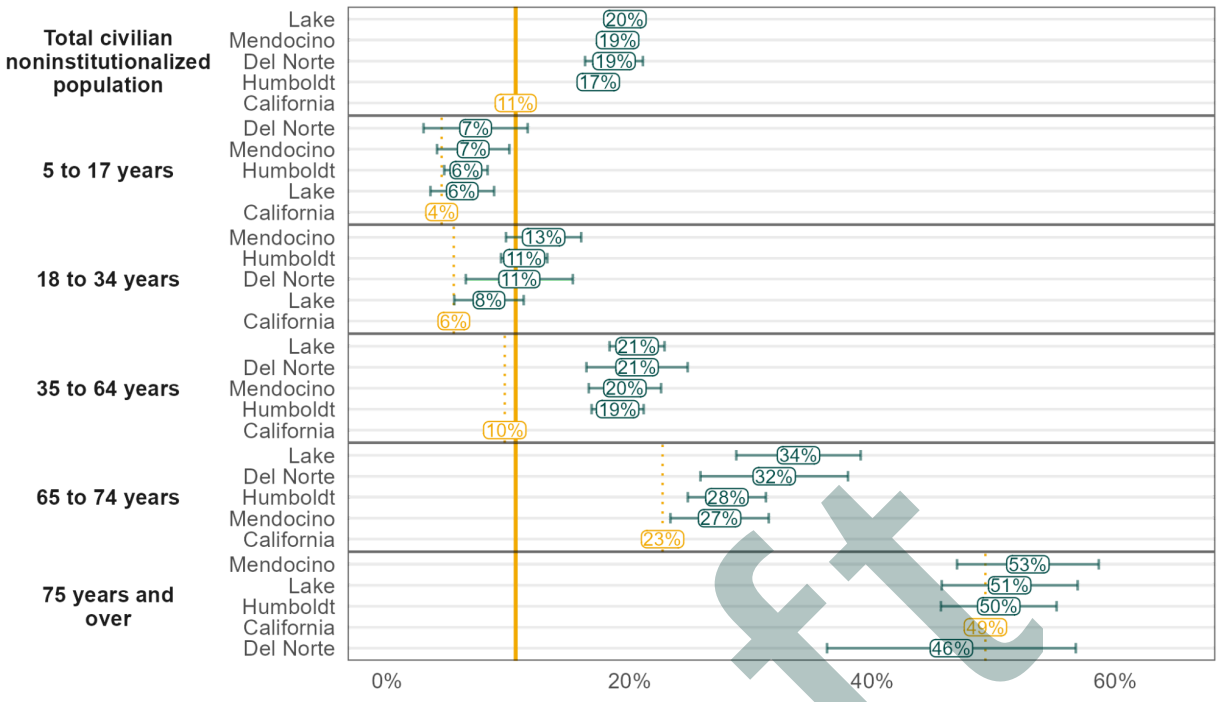
Note. Data sourced from the ACS. Missing data or estimates with confidence intervals that include zero are excluded from the visualization.

Disability Rates by Type and Age

Disability rates are higher in the region, including among those aged 18 to 34 and 35 to 64. Disability rates among this latter cohort are almost certainly impacted by a skewing of the age distribution, as in the Redwood Coast, proportionately more adults in this age range are closer to age 64. However, among 18 to 34 year olds, there is less room variation in age, and this population skews younger than the state population, indicating that age-related disability onset is not likely a factor behind the elevated disability rates among 18 to 34 year olds in the region. Therefore, analysis of this younger cohort may uncover factors other than age that contribute to higher disability rates in the region.

Figure C.7

Disability Rates by Age Range (2017 - 2021)



Note. Data sourced from the ACS.

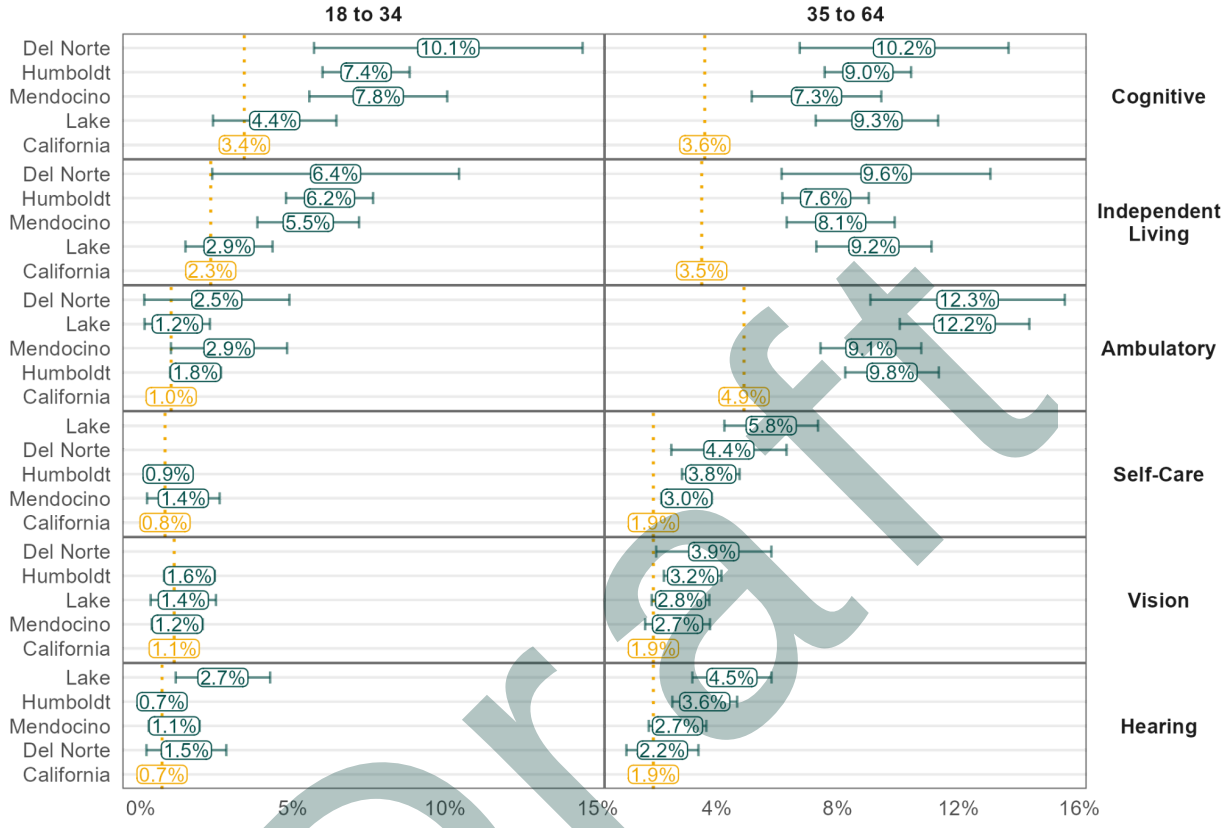
As shown below, the data signal higher cognitive and independent living among this cohort. The American Community Survey (ACS) defines a cognitive disability as a difficulty resulting from a *physical, mental, or emotional* challenge that results in "serious difficulty concentrating, remembering, or making decisions," whereas an independent living disability is defined as a difficulty resulting from a *physical, mental, or emotional* challenge that results in difficulty "doing errands alone such as visiting a doctor's office or shopping".[47] Therefore, the two disability types that have the strongest signal of disparity have a potential mental health dimension. Both mental health and substance use disorders are leading causes of disability and *the* dominant causes of disability among adults younger than 35, accounting for over 35% of

[47] American Community Survey disability definitions:
Cognitive: 'due to physical, mental, or emotional condition: "serious difficulty concentrating, remembering, or making decisions"'
Independent living: 'due to physical, mental, or emotional condition, difficulty: "doing errands alone such as visiting a doctor's office or shopping"'
Ambulatory: "serious difficulty walking or climbing stairs"
Self-care: "difficulty dressing or bathing"
Vision: "blind or … serious difficulty seeing even when wearing glasses"
Hearing: "deaf or … serious difficulty hearing"

years lived with disability nationwide (National Center for Complementary and Integrative Health).

Figure C.8

Disability Rates by Type and Age Range (2017 - 2021)



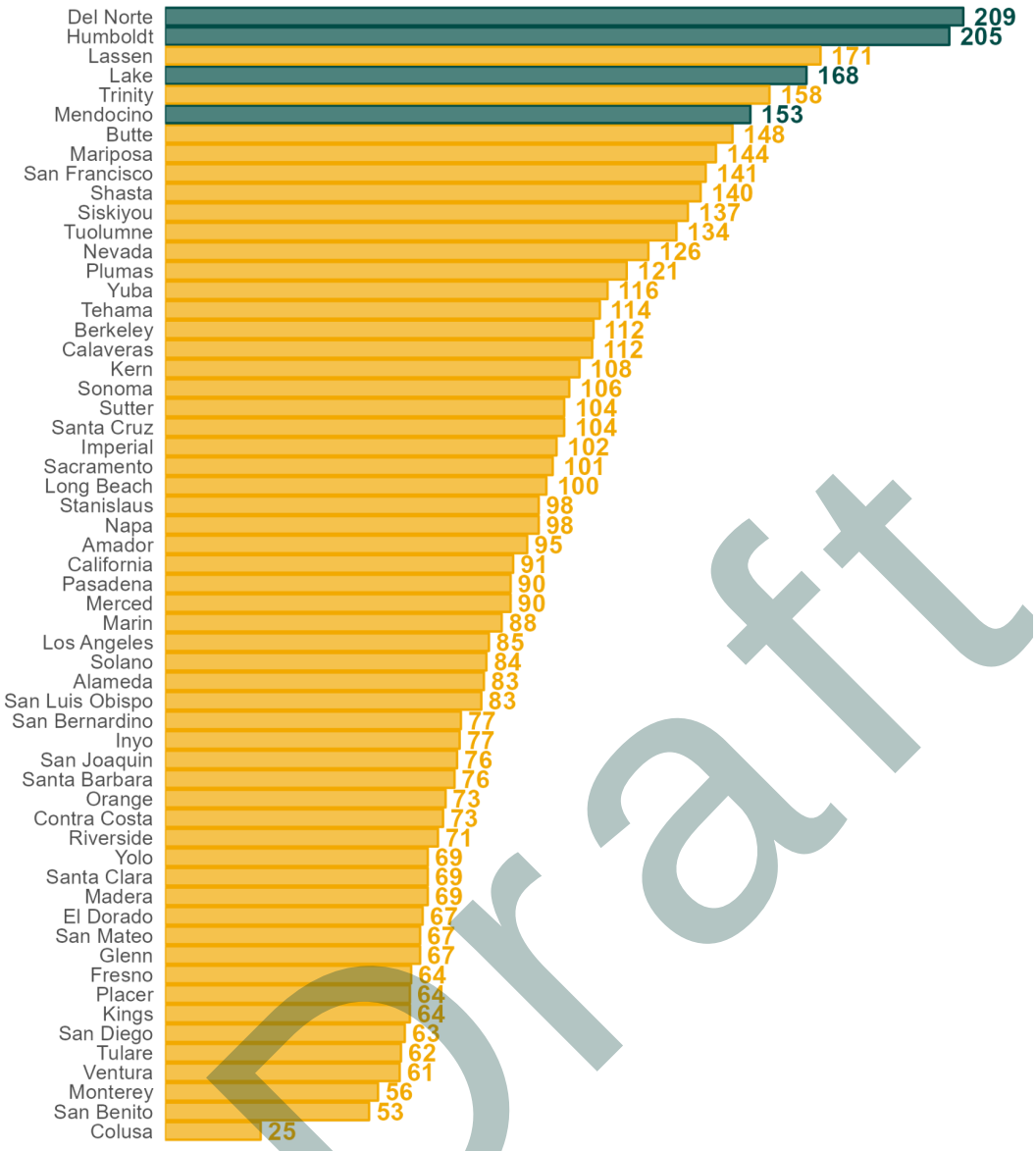
Note. Data sourced from the ACS. Values that have a lower confidence interval that includes zero are excluded from the visualization.

Given the evidence of mental health and substance use challenges for the region, these proximate factors may be major forces behind the region's disparities in disability rates, at least among adults younger than 35.

Hepatitis C Infections

Figure C.9

Newly Reported Chronic Hepatitis C per 100,000 Population (2014, 2016, and 2018)



Note. Data sourced from the CDPH. Rates are averaged over 2014, 2016, and 2018.

Stroke Mortality in Humboldt County

Humboldt County's elevated stroke rate is persistent and rising over time. The rate has been consistently elevated since at least the 2015-2017 CDPH data release (source) when the age-adjusted rate was 67.6 per 100,000. As shown in Appendix C, the rate was 85 for the 2017-2019 data release compared to 98 for the 2019-2021 data release.

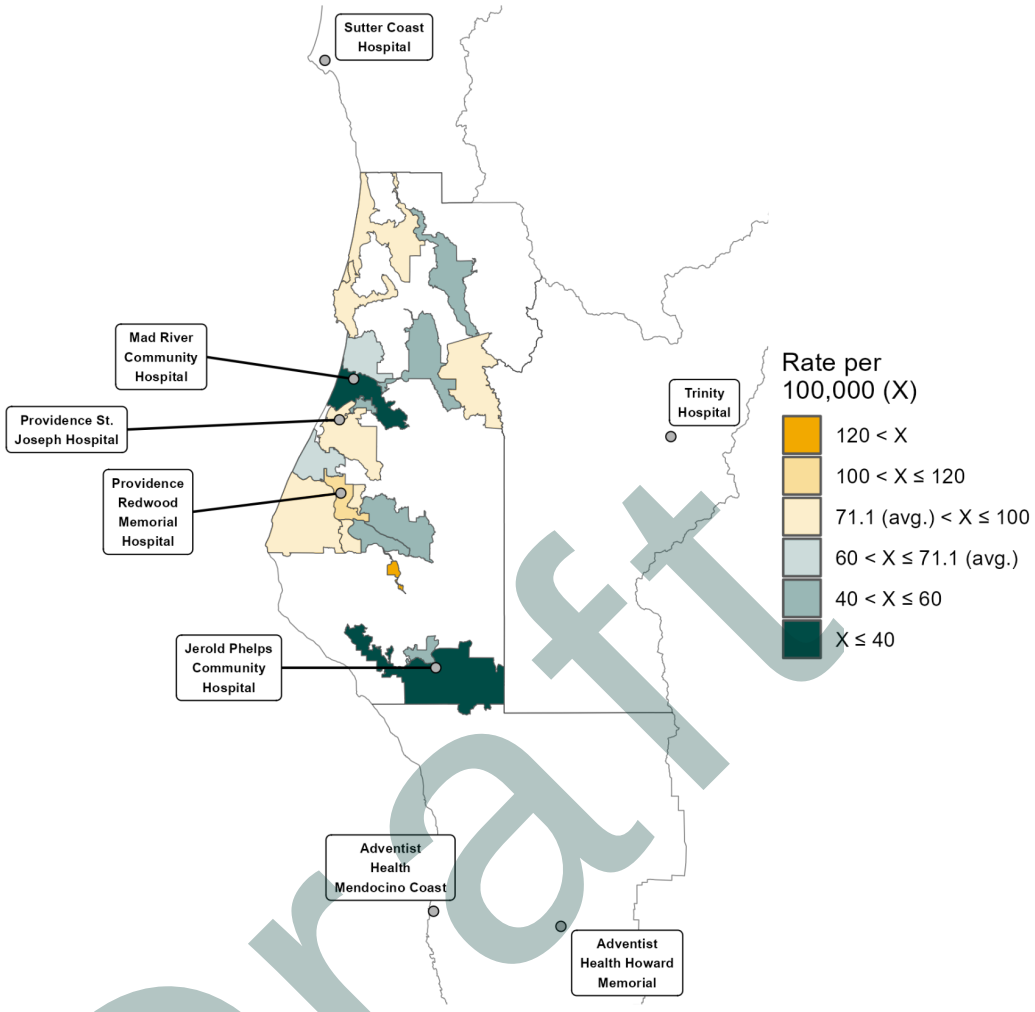
A report from the Humboldt County Department of Health and Human Services (HDHHS) found that the elevated stroke rate is evident in over 80% of Humboldt County ZIP codes, ranging from the most rural to the most populous areas of the county. Furthermore, the report found that the

average age of stroke death in Humboldt County is 83 and that the region's elevated rate is driven, at least in part, by factors *other than* risk behaviors (e.g. smoking) and chronic conditions (source).

Both prevention and the time it takes to receive emergency care are key risk factors for stroke mortality. Local doctors indicate smoking, check ups to catch warning signs, lack of facilities that can treat stroke, timely access to care, and culture of delaying care or avoiding medicine as factors potentially contributing to the county's exceptional rate (source).

The only two ZIP codes in Humboldt County with a stroke mortality rate lower than the state average have a hospital within them; these include the Mad River Community Hospital in 95521 and the Jerold Phelps Community Hospital in 95542. On the other hand, other ZIP codes which have a hospital have higher than average rates, indicating the proximity to an emergency department is not the only factor contributing to higher stroke mortality rates.

Figure C.10
Emergency Department Location and Stroke Mortality Rate by ZIP Code in Humboldt County (2005 - 2018)



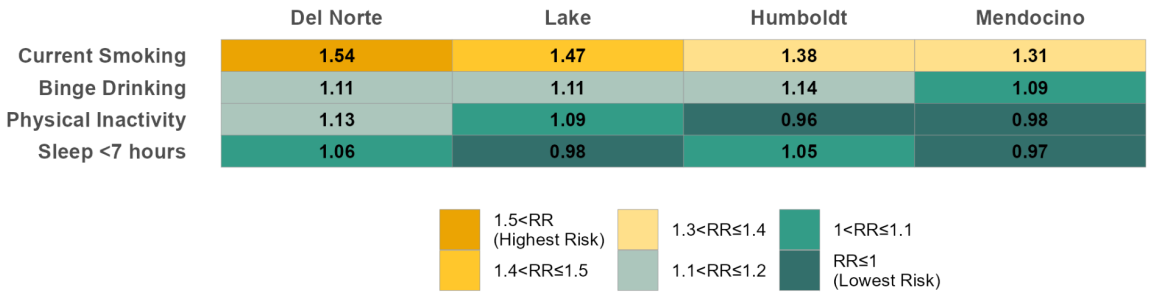
Note. Stroke data sourced from HDHHS. Emergency facility data sourced from California Health and Human Services. Humboldt County's average rate for 2005 to 2018 was 71.1 per 100,000. Gold areas indicate ZIP codes with higher than county average rates and emerald areas indicate lower than county average rates. The California rate during this time period was 43.4. ZIP codes with fewer than five stroke mortalities are not shown.

Appendix D: Further Analysis of Health Risks

Health Risk Behaviors, SAE Estimation Techniques

Figure D.1

Estimated Health Behaviors Risk Ratios (RR), SAE Technique (2019 - 2020)

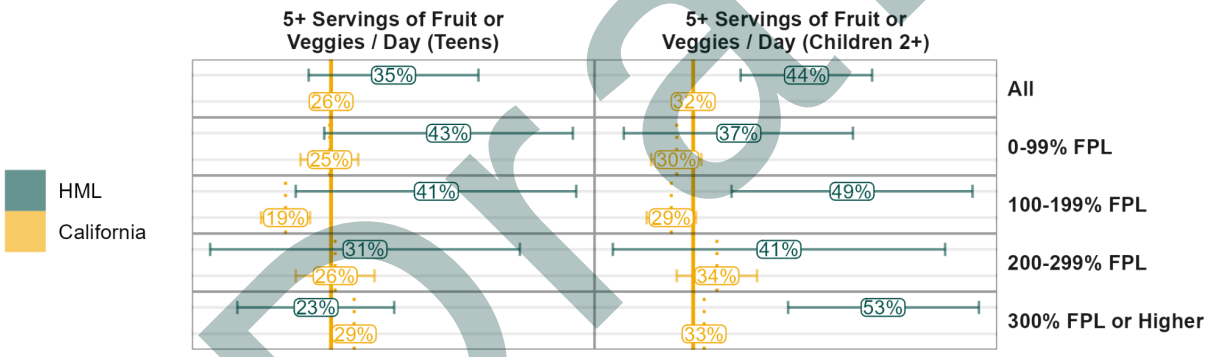


Note. Data sourced from the Centers for Disease Control and Prevention's 2022 release of the PLACES data set, *PLACES: Local Data for Better Health, County Data*. California estimates and not provided by the data source. California estimates were calculated by the author by taking a population-weighted average of all California counties using the population estimates provided in the dataset. Risk ratios (RR) calculated by taking the ratio of the local rate divided by the state rate. RR > 1 indicates higher risk relative to the state.

Diet and Physical Activity

Figure D.2

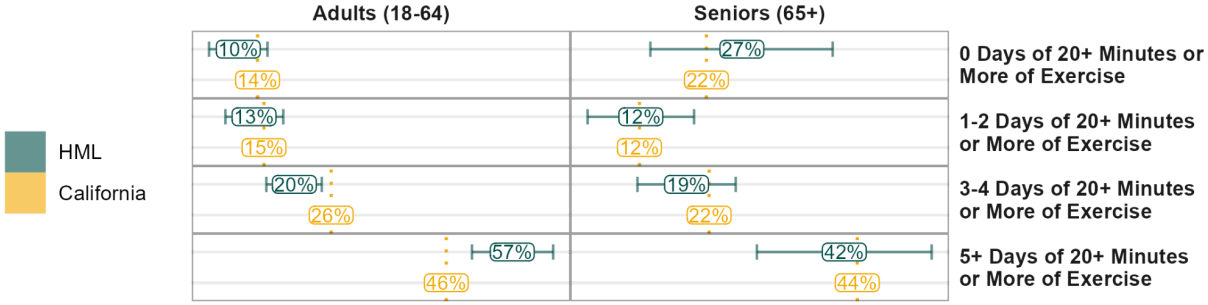
Diet Indicators, Youth (2011-2020)



Note. Data sourced from the CHIS. FPL = federal poverty line.

Figure D.3

Physical Activity (2017-2018)

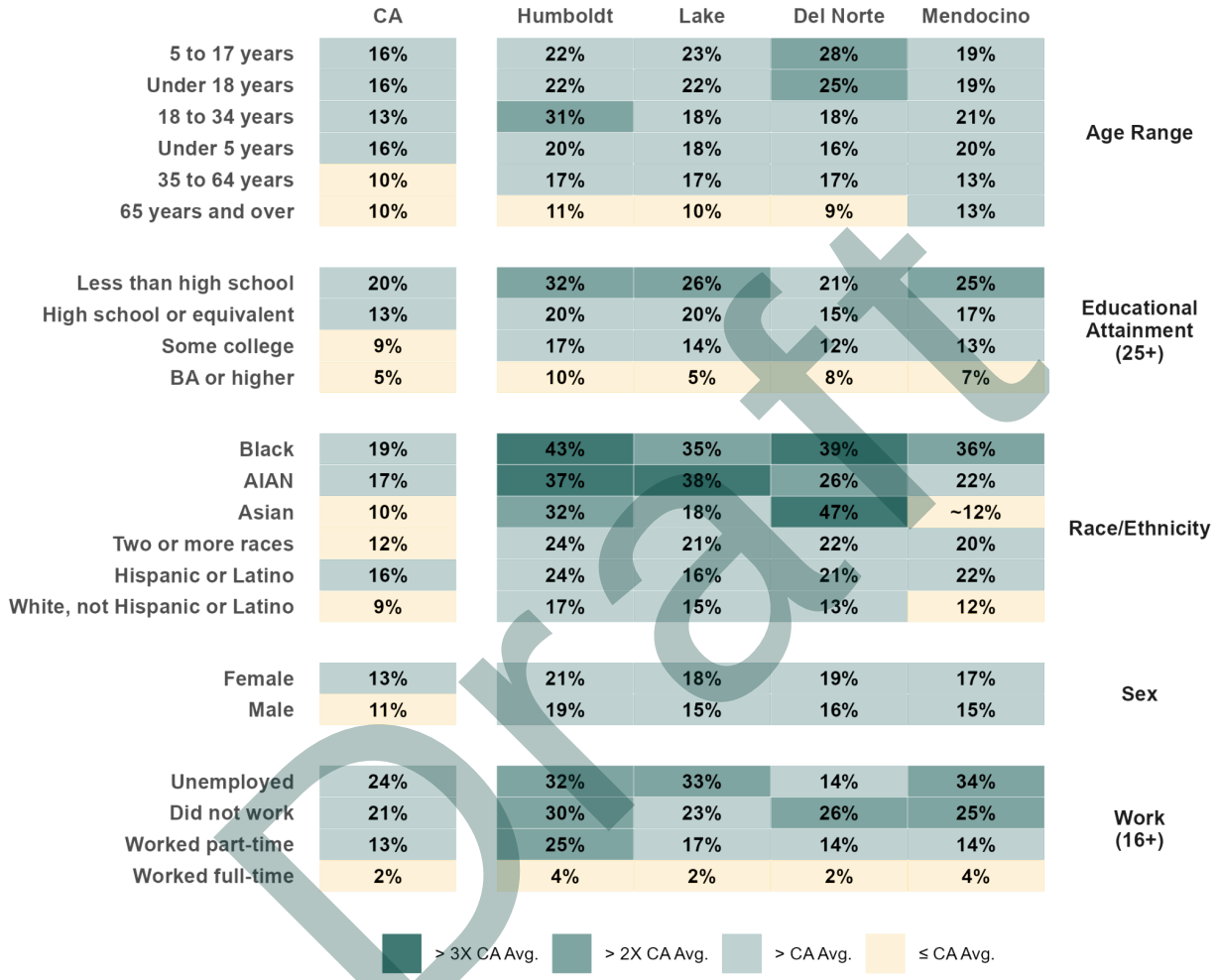


Note. Data sourced from the CHIS.

Appendix E: Disaggregated Poverty Rates

Figure E.1

Disaggregated Poverty Rates.



Note. Data sourced from the ACS. (~) denotes statistically unstable estimate[48].

Appendix F: ACEs, Child Abuse, and Domestic Violence

Figure F.1

Odds Ratios, Adjusted for Age, Gender, Race, and Educational Attainment (Anda et al., 1998)

Number of ACEs	0	1	2	3	4 or More

[48] For these data, an estimate is determined to be statistically unstable if it is not significantly higher than 0 or significantly lower than 100%.

Current smoker	1	1.1	1.5	2	2.2
Considers self an alcoholic	1	2	4	4.9	7.4
Ever used illicit drugs	1	1.7	2.9	3.6	4.7
Ever injected drugs	1	1.3	3.8	7.1	10.3
Two or more weeks of depressed mood in the past year	1	1.5	2.4	2.6	4.6
Ever attempted suicide	1	1.8	3	6.6	12.2

Figure F.2

Reported or Substantiated Abuse or Neglect per 1,000 Children Aged 0 to 17 (2020)

Note. For reported abuse, data is sourced from KidsData's 2020 data set titled "Reports of Child Abuse and Neglect;" for substantiated abuse, data is sourced from KidsData's 2020 data set titled "Substantiated Cases of Child Abuse and Neglect."

Figure F.3

Domestic Violence Calls per 1,000 Population (2016-2020)

Note. Domestic violence call totals sourced from Kidsdata.org. Population data sourced from ACS five year estimates. Data were aggregated over a five year period and rates were calculated by the author.

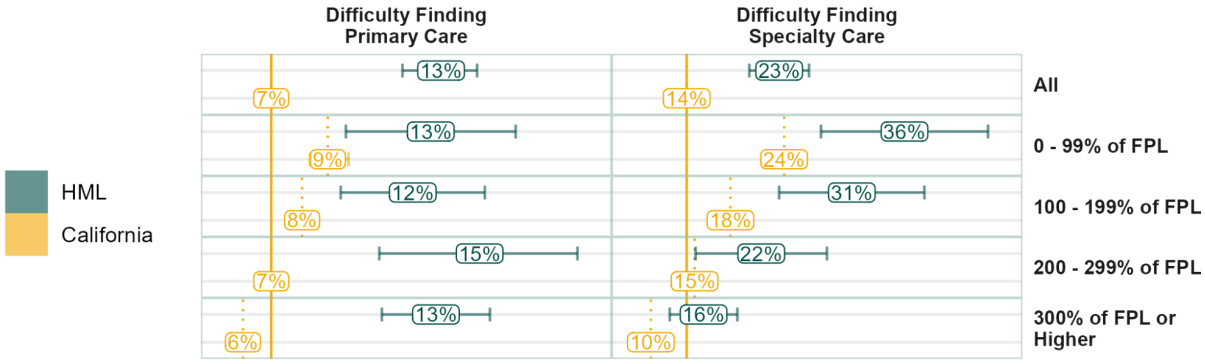
Appendix G: Further Evidence for Healthcare Barriers

'Difficulty' Accessing Care by Income Level

All income strata report 'difficulty' accessing care at rates significantly higher than the state rate.

Figure G.1

Difficulty Finding Care, Percent of Adult Population (2013-2022)



Note. Data sourced from the CHIS.

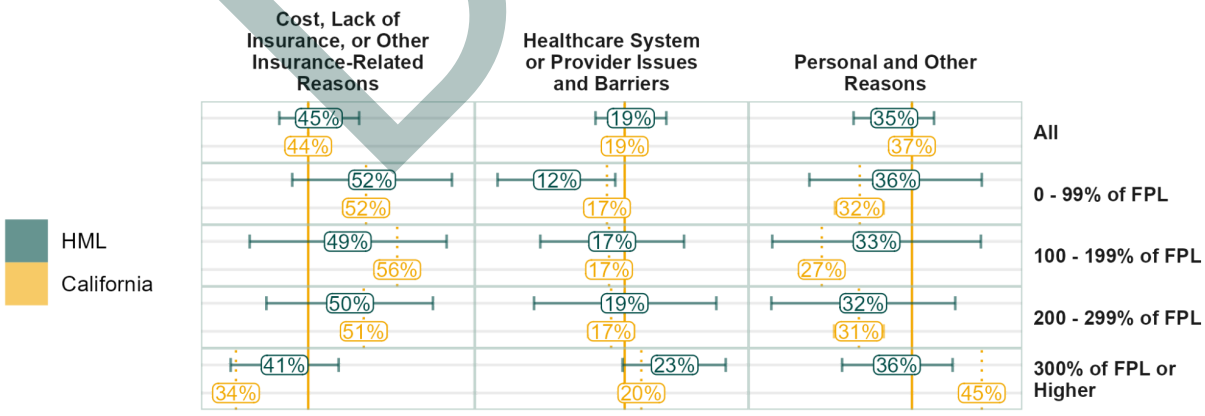
Further Analysis of Barriers to Healthcare

Rural areas are uniquely impacted by barriers to healthcare. Cultural, transportation, financial, and technology barriers as well as a simple lack of available healthcare resources all contribute to reduced healthcare access and utilization in rural areas (Biswas et al., 2015).

Regionally, issues arising specifically from the limitations of the region's healthcare system may only be one factor in producing delayed care among low income individuals, suggesting that factors not specifically tied to the shortage of healthcare providers and facilities in the region may be salient. As shown below, among low income households that delayed care, only about 12% cite the healthcare system as the reason. Roughly half cite cost of insurance issues, but a remaining one-third cite personal or other reasons for their healthcare delays.

Figure G.2

Main Reason for Delayed or Forgone Care, Population Who Delayed Care (2013 - 2022)

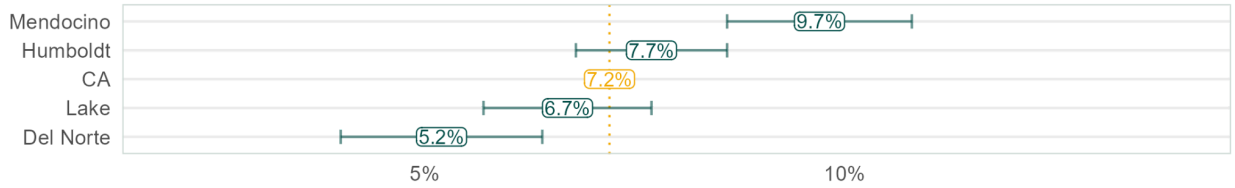


Note. Data sourced from the CHIS.

Cost and Insurance Barriers: Insurance barriers appear to disproportionately impact households with children, AIAN, and Hispanic communities.

Figure G.3

Uninsured Rates (2017 - 2021)



Note. Data sourced from the ACS.

Figure G.4

Disaggregated Uninsured Rates (2017 - 2021)

	CA	Mendocino	Lake	Humboldt	Del Norte	
19 to 64 years	10%	14%	11%	11%	7%	Age Range
Under 19 years	3%	7%	2%	5%	5%	
65 years and older	1%	2%	1%	~0%	~1%	
Not a citizen	22%	32%	27%	23%	~1%	Citizenship
Foreign born	13%	22%	17%	13%	~0%	
Native born	5%	8%	6%	7%	6%	
Naturalized	5%	8%	6%	4%	~0%	
Less than high school graduate	18%	19%	17%	14%	5%	Educational Attainment (25+)
High school graduate (includes equivalency)	11%	15%	8%	10%	8%	
Bachelor's degree or higher	3%	5%	4%	5%	4%	
American Indian and Alaska Native	12%	16%	22%	11%	12%	Race/Ethnicity
Hispanic or Latino (of any race)	12%	16%	12%	8%	5%	
Two or more races	8%	14%	9%	6%	11%	
White, not Hispanic or Latino	4%	7%	4%	7%	4%	
Black or African American	6%	~2%	~7%	13%	~0%	
Asian	4%	8%	~2%	6%	~0%	
Male	8%	12%	9%	9%	5%	Sex
Female	6%	8%	5%	6%	5%	
Unemployed	18%	21%	22%	15%	15%	Work (16+)
Employed	9%	14%	10%	10%	8%	
Not in labor force	12%	12%	10%	12%	4%	

> 3X CA Avg. > 2X CA Avg. > CA Avg. ≤ CA Avg.

Note. Data sourced from the ACS.

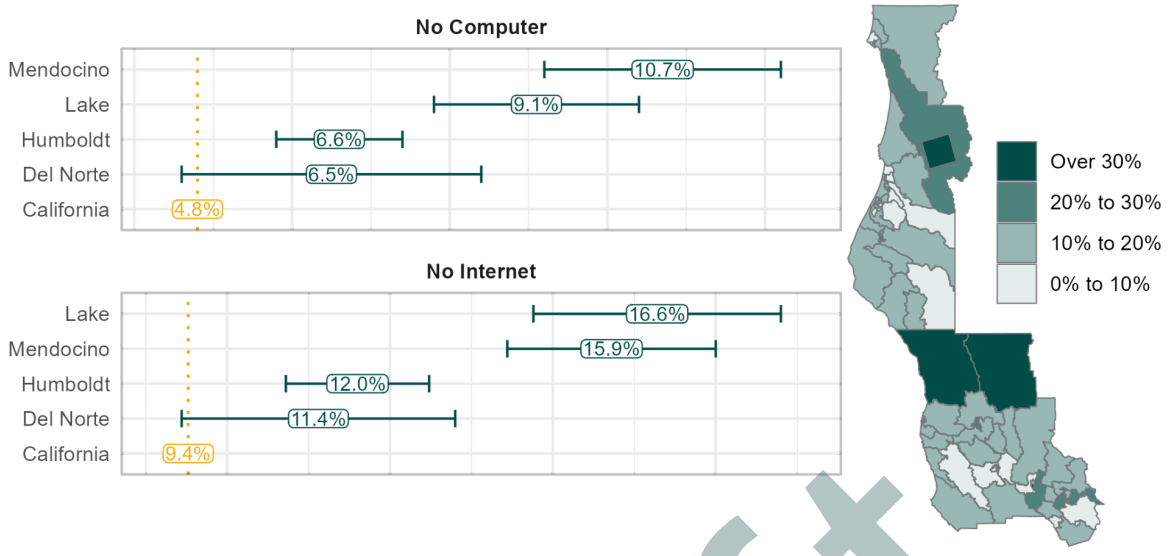
The remaining 36% of respondents (in the figure above) cited personal or other reasons as the main reason for delayed care.

Cultural Perceptions: Patients in rural areas may hesitate to seek medical care due to concerns about stigma, discrimination, and confidentiality, especially when their healthcare providers are also part of their close-knit community. Studies have shown that rural residents, including minorities and vulnerable populations, face barriers in accessing healthcare, with factors socio-economic status and stigmas influencing their treatment-seeking behaviors and the quality of care they receive (Biswas et al., 2015). For instance, as shown in "Equity Analysis and At-Risk Populations," lesbian, gay, and bisexual individuals are significantly more likely to have recently delayed care.

Transportation: Travel time has also been shown to be a barrier to healthcare-seeking and transportation barriers are particularly critical among lower income and the under or uninsured (Biswas et al., 2015; Gerber et al., 2013). Transportation may also be a complicating factor for individuals with disabilities. As shown in "Equity Analysis and At-Risk Populations," individuals with disabilities are significantly more likely to have recently delayed care.

Internet Access: With the rise of telehealth services, access to the internet (particularly in a private setting) is increasingly helpful for addressing transportation barriers to healthcare. Unfortunately, significantly more Redwood Coast households lack internet access compared with the state averages (as shown below). This problem is likely caused by a combination of the region's rural setting, which limits access to affordable broadband, and its high poverty rate, which makes internet access unaffordable for many. The rise of telehealth could be a part of the region's overall strategy to improve healthcare access; however, increasing the availability of broadband will be critical in this effort.

Figure G.5
Householders without Internet Access (2017 - 2021)



Note. Data sourced from the ACS. Map indicates percentage of households lacking any form of internet subscription.

Appendix H: Further Evidence for Social Isolation

Figure H.1

Living Alone, Percent of Population (2011 - 2021)

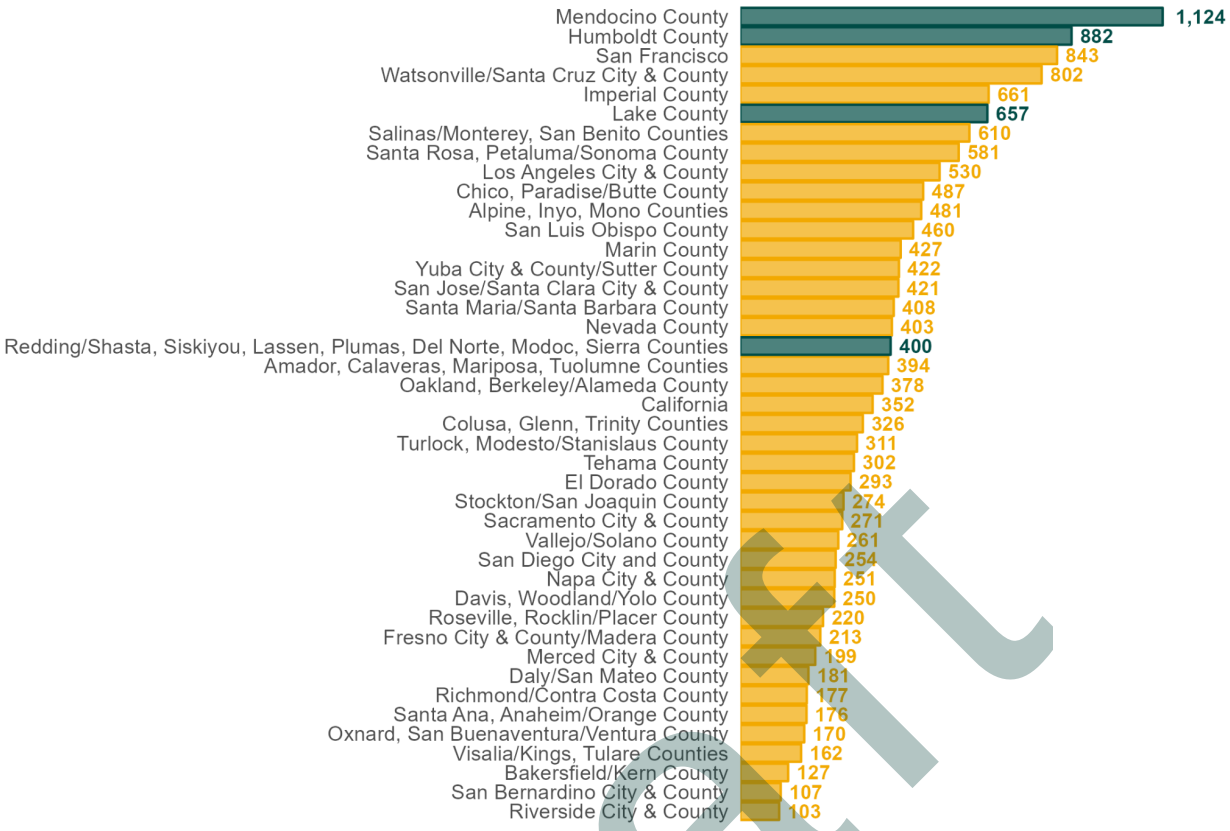
Note. Data sourced from the CHIS. Note that these data are percent of population whereas the ACS data in the body of the report are percent of households.

Appendix I: Statewide Point-in-Time Homeless Counts per 100,000 Population

Below is the complete version of the point-in-time count for each continuum of care reporting to HUD in California.

Figure I.1

Total Counted Homeless (Sheltered and Unsheltered) per 100,000 Population (2016 - 2020)

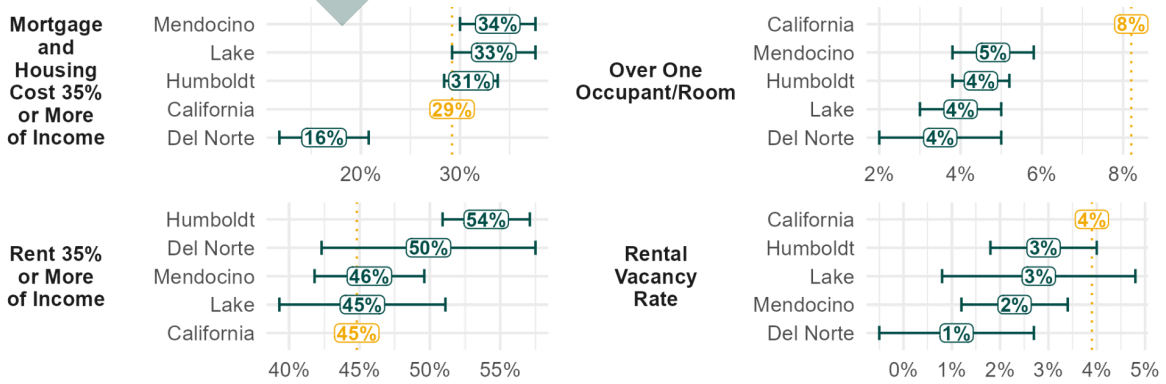


Note. Data sourced from the U.S. Department of Housing and Urban Development's datasets on Point-in-Time (PIT) estimates, a count of sheltered and unsheltered individuals experiencing homelessness. Data are 5-year averages from 2016 to 2020. Rates calculated by the author using population data are 5-year estimates from the American Community Survey from 2016 to 2020. Population estimates are summed for each CoC service area by county.

Appendix J: Housing Affordability Indicators

Figure J.1

Housing Affordability, Conditions, and Availability (2017 - 2021)

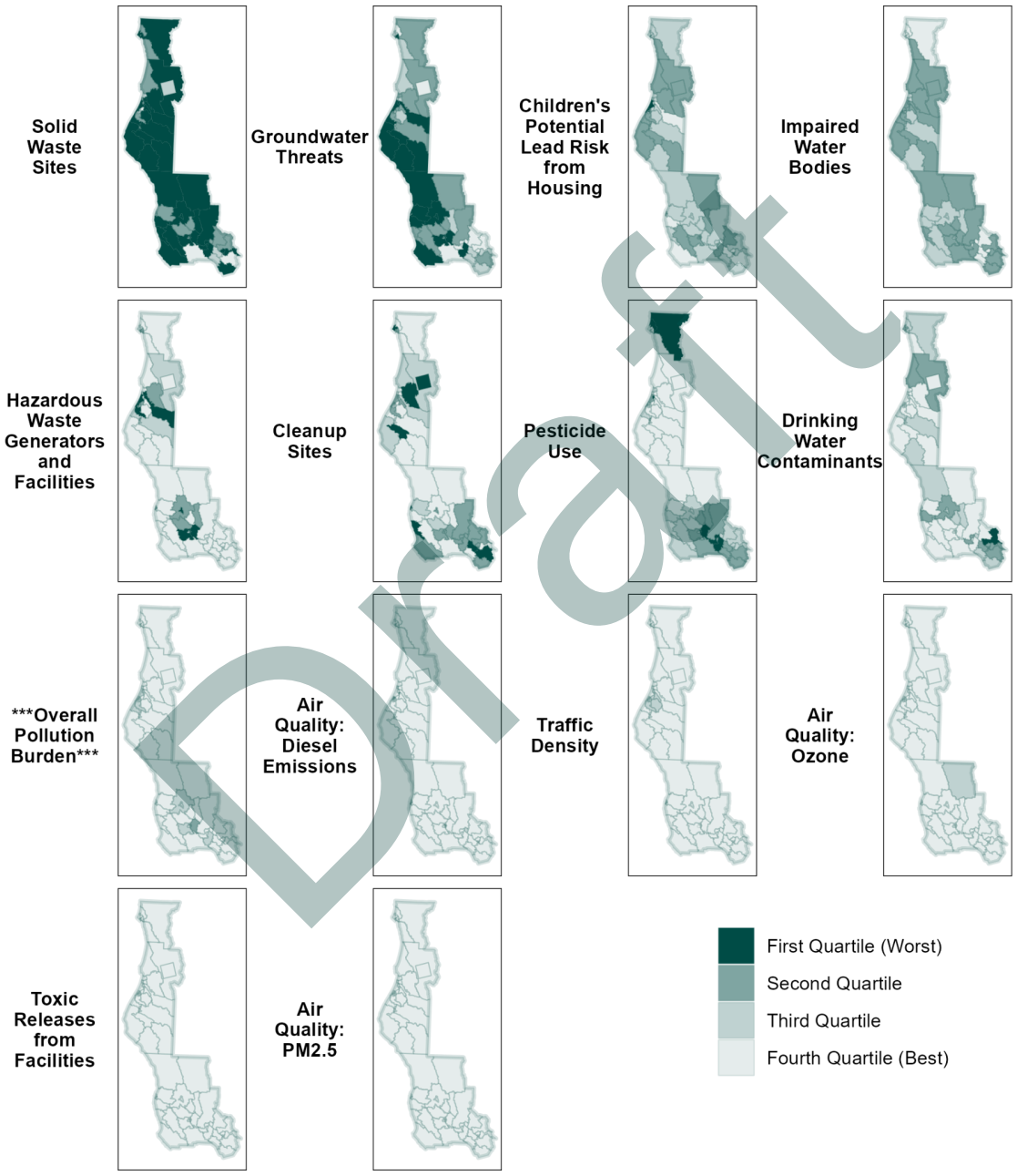


Note. Data sourced from the ACS.

Appendix K: CalEnviroScreen 4.0 All Indicators

Figure K.1

CalEnviroScreen 4.0 All Indicators



Note. Data sourced from CalEnviroScreen 4.0.

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