

The Impact of Socioeconomic Status and Food Environment on Vegetable Consumption: Children in Santa Clara and San Mateo Counties, California

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Leading Health Indicator: Increase the contribution of total vegetables to the diets of the population aged 2 years and older (NWS-15.1)

Target: Increase from 0.8 to 1.1 cup equivalent per 1,000 calories

Population: Children aged 2-11 years old living in Santa Clara County, California

Exposure: Socioeconomic status and food environment

Comparison: Children aged 2-11 years old living in San Mateo County, California

Outcome: Daily intake of total vegetables

Eating vegetables has been shown to have several health benefits including providing a good source of vitamins and minerals lacking in most American diets, protecting against certain kinds of cancer, and reducing the risk of chronic diseases such as cardiovascular disease and diabetes (United States Department of Agriculture [USDA] and United States Department of Health and Human Services [1]). Healthy People 2020 has listed "Increase the contribution of total vegetables to the diets of the population aged 2 years and older" as a leading health indicator (USDHHS Office of Disease Prevention and Health Promotion, n.d.). In order to understand how to increase vegetable consumption, we must first know how much Americans are currently consuming, how that amount might be different according to income and geography, and how a population's food environment may affect their diet choices and potential health outcomes. Understanding these variables on a local level can help providers address barriers their community faces when making diet choices and provide evidence-based recommendations. This paper will focus on the question: How do differences in socioeconomic status and food environment influence daily intake of vegetables for children aged 2-11 years old in Santa Clara County, compared with children aged 2-11 years old in San Mateo County?

Healthy people 2020 show the baseline level of mean daily vegetable consumption as 0.8 cups, based on data from the 2001-2004 National Health and Nutrition Examination Survey (NHANES) and states the goal is to increase that number to 1.1 by 2020 (USDHHS, n.d.). The latest NHANES results available come from the 2009-2010 survey, which showed mean daily intake of total vegetables for all individuals over the age of 2 years was 1.41 cups. From these data, it appears that the Healthy People 2020 goal of 1.1 cups mean daily intake of total vegetables has been met.

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When focusing on the pediatric population, the results appear less optimistic. Individuals age 2-5 years old consumed 0.67 cups, those aged 6-11 consumed 0.79 cups, and those aged 12-19 consumed 1.10 cups [2]. In a study using the NHANES data compared with recommendations of the 2010 Dietary Guidelines for Americans, vegetable intake for children ages 2-17 had not changed from 2003-2008. Healthy Eating Index scores remained at 2.3 for each study, which is 46% of the recommended daily intake [3].

Ideally, surveys at the national, state and county level would measure vegetable intake the same way. However, that is not the case. In the Centers for Disease Control and Prevention's (CDC) State Indicator Report on Fruits and Vegetables [4] vegetable consumption was measured in how many times per day subjects reported eating vegetables. No information was available on children or adolescents living in California using that measurement. The most current data comparing county level vegetable intake in California can be found through the 2011-2012 California Health Interview Survey. The California Health Interview Survey combines vegetable intake with fruit intake and uses yet another measure to identify consumption. Participants were asked if their child eats five or more servings of fruits and vegetables daily. For the most recent survey, data are only available for individuals age 2-11. Results for the entire state of California showed 52.6% of children ate 5 or more servings of fruit/vegetables. Around 50% of children living in San Mateo County ate 5 or more fruits and vegetables daily while only 40.2% of Santa Clara children did [5]. Are the differences in Santa Clara and San Mateo levels of fruits and vegetable consumption in children the result of disparities in socioeconomic status and food environment?

Socioeconomic status is health determinant that has been shown to be a factor in a person's capability to achieve good health (USDHHS, n.d.). Per the 2008-2012 American Community Survey 5-Year Estimates conducted by the U.S. Census Bureau [6], San Mateo County's median household income was \$87,751 and ranged from \$47,950 in East Palo Alto to \$228,393 in Atherton.

In the San Mateo County's latest community assessment, they reported "There are two San Mateo Counties: one for the economic "haves" and one for the economic "have nots." The gap between these two is growing" [7]. Santa Clara County's median household income was \$90,747, making it the 14th most affluent county in the country [8]. Per Santa Clara County's most recent community assessment, there are immense differences in opportunities and access across several indicators including income [5]. Median household income in Santa Clara ranged from \$59,560 in Burbank to \$196,484 in Los Altos Hills [8]. When examining vegetable intake as it relates to poverty level for these counties, The California Health Interview Survey found that 52.4% of children living in San Mateo County at 300% of the federal poverty level were eating 5 or more servings of fruits and vegetables daily while only 33.9% of that same population in Santa Clara County did [5]. Why do two neighboring counties with similar affluence and similar polar extremes of income levels have such differences in vegetable consumption by children, especially for those living in poverty?

Access to healthy foods should be explored as a possible reason for this difference. Populations who live closer to supermarkets that normally offer a variety of affordable fruits and vegetables might have healthier diets and therefore better diet-related health outcomes [4]. In November 2012, USDA published a national research report examining 2010 population census data, and distance from supermarkets that were most likely to provide affordable and nutritious food. Ver Ploeg et al. found that in urban regions, people living in poverty, (at or below 200 percent of Federal poverty thresholds for family size), and people living in low-income areas were closer to supermarkets than moderate- and high-income populations and areas. For low-income populations that lived more than 1 mile from a supermarket (common definition for low access), a larger percentage was located in moderate/high-income areas than in low-income areas. To examine the availability of supermarket choice and competition, proximity to 3 different supermarkets was also assessed. On average, low-income populations and areas were also closer to three supermarkets than moderate/high-income population and areas. When examining the effect of vehicle ownership on supermarket access, the USDA report found that households without vehicles were closer to supermarkets in both low-income areas and in moderate- and high-income areas than households with cars. The USDA report found that around 90% of low-income Americans living in urban areas had access to at least one supermarket [9].

County data on grocery store proximity can be found through the Food Access Research Atlas provided by the USDA. Their interactive map of supermarket access from 2010 data showed the percent of the total population with low access to grocery stores in Santa Clara County was 9.55% and in San Mateo County was 11.51%. 2.37% of children living in Santa Clara County versus 2.67% of children in San Mateo County had low access to supermarkets in 2010 [10]. Santa Clara County's total population and subpopulation of children have more access to supermarkets than those populations in San Mateo County, yet they are consuming fewer vegetables. Proximity to supermarkets does

not appear to be central in explaining barriers to consumption of vegetables for low-income children in these two counties.

Another factor related to food environment that could affect diet choices is the relative presence of fast food restaurants. In 2011, the CDC's Division of Nutrition, Physical Activity and Obesity published a report using a measure for food environment that takes into account both access to supermarkets as well as density of fast food restaurants. The modified Retail Food Environment Index (mRFEI) measures percent of healthy food choices in an area. Lower mRFEI scores indicate either lower availability of healthy food stores, a greater number of convenience stores and fast food restaurants relative to the number of healthy food places, or both. The CDC found a difference between impoverished census tracts and the rest of the population for both national and state food environments. The mRFEI for the US as a whole was 10 and for impoverished census tracts, it was 7. California's mRFEI was 11, with impoverished census tracts scoring a 10 [11]. In 2007, the California Center for Public Health Advocacy also used this measure with results reported as a ratio of retail food outlets that offer few healthy choices (like fast food restaurants and convenience stores) to those that typically provide healthy food choices (supermarkets, produce stores, and farmers markets). In California as a whole, there were 4.18 times as many fast-food restaurants and convenience stores as supermarkets and produce vendors. In Santa Clara County the ratio was 4.32 and in San Mateo County it was 2.79 [12]. These data correlate better with the vegetable intake data for these counties with children in Santa Clara County consuming fewer vegetables and living in environments with a higher density of fast-food restaurants and convenience stores in comparison to healthy food retailers.

Reviewing data related to vegetable consumption in children and adults nationwide, at state levels, and at regional levels has revealed extensive variety in method for measurement of vegetable consumption and populations studied. Most studies rely on surveys for their results, which can be flawed by subject error and bias. Income alone does not seem to be correlated with vegetable consumption in Santa Clara and San Mateo counties, though the wide range of income levels in the counties and specific neighborhoods may make that correlation more difficult to assess. When assessing distance to supermarkets, national data revealed that lower income populations actually live closer to supermarkets than higher income populations and have greater access. However low-income populations living in high-income areas may have lower access to healthy foods, which reveals a problem of focusing only on low-income areas when assessing access instead of examining neighborhood and family data. Santa Clara County had better supermarket access than San Mateo County according to USDA data, but had lower vegetable consumption. Retail Food Environment Index, however seemed to be a better indicator of health disparities related to diet in low-income populations and correlated with differences in vegetable consumption at the county level. Policies aimed at improving vegetable consumption in California should focus on reducing the ratio of fast food restaurants and convenience stores to farmers markets and grocery stores [13-15].

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