

Inland Empire Food Pantries in Relation to Social Vulnerability, Poverty, Homelessness & COVID- 19 Cases

MPP Capstone

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ABSTRACT

Spatial analysis was conducted to find hot spots for availability of food pantry resources to at-risk populations due to social vulnerability, poverty, homelessness, and COVID-19 cases in the Inland Empire, to help identify vulnerable cities within the region and to propose target cities for San Bernardino and Riverside Counties to increase food pantry resources to these communities. Food pantry data for the IE was mainly obtained from the San Bernardino County Public Health Department. Social vulnerability and below-poverty data were collected from the Centers for Disease Control and Prevention website, and Point-In-Time homeless data and COVID-19 case data were collected from the Department of Housing and Human Development and the Public Health Departments for San Bernardino and Riverside Counties, respectively. Food pantry addresses for both counties were assigned a spatial location in a map (geocoded), rates of social vulnerability, poverty, homeless count, and COVID-19 cases per food pantry were calculated, and hot spot analyses were conducted. The null hypothesis of the study states the complete spatial randomness of the values associated with each of the data sets used. Western region cities were more food pantry-rich in comparison to Eastern region cities. Some Eastern region cities, despite their affluence, lacked food pantry resources to assist poor people, homeless people, and those affected by COVID-19, in particular, Desert Hot Springs, Cathedral City, Palm Springs, and Rancho Mirage. Far Eastern cities such as Blythe and Needles showed greater challenges to respond to public health crises such as COVID-19. Consequently, food pantry resources through relief packages and/or funding to non-profit organizations in Eastern region cities are needed. Local churches in this region shall be engaged and supported to develop food pantry infrastructure, and more mobile food pantries to serve remote communities should be promoted.

INTRODUCTION

According to the Centers for Disease Control and Prevention, minorities and low socioeconomic status populations are more socially vulnerable because of poverty, education levels, housing quality, and lack of transportation among other factors. The COVID-19 pandemic has mostly affected the health and finances of minority communities and those with low SES. Over 20 million jobs were lost in the U.S. by early May, resulting in a national unemployment rate of 14.7%¹, a level not seen since the Great Depression. In California, 4.8 million people applied for unemployment since March 12, resulting in about a 25% unemployment rate². Given this sharp increase in unemployment and economic upheaval, the federal government issued the Federal Coronavirus Aid, Relief, and Economic Security (CARES) Act³ to help individuals, small businesses, hospitals and struggling corporations among others. The aid included stimulus checks and expanded unemployment benefits to eligible individuals, grants and loans along with an eviction moratorium for homeowners and renters until July 25, 2020. The federal assistance did not include assistance to undocumented immigrants, which constitutes about over 2 million people in California⁴. To address this issue the State of California has recently approved a relief package of \$75 million for undocumented adults⁵, who are not eligible for other forms of government assistance, such as unemployment benefits and federal stimulus checks. Even with this assistance, many individuals may experience an increase in food insecurity and homelessness. To that end, the State of California, with an already existing homeless crisis pre-COVID-19 that reached 151,000 in 2019, a 16% increase from 2018⁶, established some protections to homeowners and renters. Over 150 cities and counties including Riverside and San Bernardino have enacted local eviction moratoriums protecting tenants until the end of the statewide emergency⁷. Despite these protections, evictions have taken place and a potential increase in homelessness may be imminent upon lifting of emergency rules in California and put increased pressure on food banks. Also, Inland Empire legal residents who are yet to become U.S. citizens may not be applying for unemployment benefits in fear of being disqualified during the citizenship application process because of the current public charge rule although it does not apply to them⁸. According to the Food Rescue Anti-Hunger Coalition of the San Bernardino County Department of Public Health, food insecurity will become one of the many aftermaths of COVID-19⁹, resulting in a drastic demand at food banks.

The present study used hot spot analysis to identify at-risk populations within the Inland Empire (IE) due to social vulnerability, poverty, homelessness, and COVID-19 cases, and to establish target cities to increase food pantry resources for these communities. Some Eastern region cities, despite their affluence, lacked food pantry resources to assist poor people, homeless

¹ [April Unemployment Rate Rose to a Record 14.7%](#)

² [California Gov. Newsom: Federal Government Has Responsibility To Help States Recover](#)

³ [The CARES Act Works for All Americans | US Department of the Treasury](#)

⁴ [California Offers First Covid-19 Cash Aid to Undocumented Immigrants](#)

⁵ [Governor Newsom Announces New Initiatives to Support California Workers Impacted by COVID-19](#)

⁶ [California fast-tracks plans to house homeless residents amid COVID-19 outbreak](#)

⁷ [California Eviction Bans | Coronavirus](#)

⁸ [The USCIS “Public Charge” Barrier: Legal Immigration Just Got Tougher](#)

⁹ <https://www.kvcrnews.org/post/latest-covid-19-updates-inland-empire#stream/0>

people, and those affected by COVID-19, in particular, Desert Hot Springs, Cathedral City, Palm Springs, and Rancho Mirage. Far Eastern cities such as Blythe and Needles showed greater challenges to respond to public health crises such as COVID-19.

LITERATURE REVIEW

Food Insecurity

Food security “exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” according to a worldwide definition of food security based on the Plan of Action of the Rome Declaration, adopted at the 1996 World Food Summit¹⁰. The concept is based on four different dimensions including food availability, access to food, food utilization, and food stability. Food availability refers to “sufficient quantities of safe and nutritious food are consistently available to individuals within a country, are in a reasonable proximity to them or are within their reach”, access to food refers to having adequate resources to obtaining appropriate food for a nutritious diet by households and all individuals within them, food utilization deals with proper biological use of food, requiring a diet that provides sufficient energy and essential nutrients, potable water and adequate sanitation”, and stability of food supply entails a ‘reliable supply of food products available for all people at all times.’” Besides, two key concepts affecting the risk of food insecurity among people including vulnerability and resilience are used¹¹. The former refers to people presently capable of maintaining an adequate level of food intake but at risk of becoming food insecure in the future due to natural, health, life cycle, social, economic, political and/or environmental causes. Resilience, on the other hand, has several definitions depending on the agency. The United States Agency for International Development defines resilience as “the ability of people, households, communities, countries, and systems to mitigate, adapt to and recover from shocks and stresses in a manner that reduces the chronic vulnerability and facilitates inclusive growth.”

There are different levels of food security including global, national/regional, household and individual and a paradigm shift in food security levels from the 1970s¹². In the 1970s, the emphasis was on supply, national self-sufficiency, and world food stocks or import stabilization schemes. In the 1980s, the focus was on access and entitlement but there were ambiguities about whether the unit of analysis should be the individual or the household. Finally, since the 1990s, priority has been given to access to food by individuals in the household and intra-household resource allocation. Furthermore, food insecurity can be chronic, when there is long-term inadequate access to enough food, transitory, when there is inadequate but temporary access to food. More specifically, transitory includes temporary food insecurity, which is due to household entitlements being affected by sudden and unpredictable shocks, and cyclical food insecurity, where a regular pattern of inadequate access to food exists.

¹⁰ [Maria Sassi Key Features, Indicators, and Response Design](#)

¹¹ Ibid., 10.

¹² Ibid., 10.

Regarding the severity of food insecurity, there are multiple classifications, scales and phases being used to identify the intensity of food insecurity¹³. For instance, the Integrated Food Security Phase Classification (IPC), part of a global effort to develop a common approach to food security analysis and response, undertaken by 12 agencies including the FAO, and the World Food Programme among others¹⁴ provides a common approach to classifying the severity and magnitude of acute food insecurity cases. It categorizes the severity of acute food insecurity at the household by area level and with five phases including none or minimal, stressed, crisis, emergency, and humanitarian catastrophe or famine, the most extreme situation.

In the U.S., the United States Department of Agriculture (USDA) uses two food insecurity labels including low and very low food security¹⁵. Low food security formerly known as food insecurity without hunger refers to reduced quality, variety, or desirability of diet, with little or no indication of reduced food intake. Very low food security, on the other hand, previously known as food insecurity with hunger depicts multiple indications of disrupted eating patterns and reduced food intake. At the same time, “food-insecure households are uncertain of having, or unable to acquire, at some time during the year, enough food to meet the needs of all their members because they had insufficient money or other resources for food”. Both low food security and very low food security are included in the definition of food insecurity. Also, “households with very low food security are food insecure to the extent that normal eating patterns of some household members are disrupted at times during the year, with self-reported food intake below levels considered adequate.”

According to the United Nations Global Food Programme in its Global Report on Food Crises¹⁶, the current COVID19 pandemic affecting not only the U.S. but also the rest of the world will double the number of people facing food scarcity. In the Inland Empire, there has been an increase in food insecurity with over 10,000 households needing assistance in San Bernardino county due to the pandemic, most of them who did not need assistance before¹⁷.

The Household Food Security in the United States in 2018 report¹⁸ issued by the USDA’s Economic Research Service based on data collected in the Food Security Supplement to the Current Population Survey (CPS)^{19,20} (n=37,300 households responded), showed a decrease in food insecurity in U.S. households from 11.8% in 2017 to 11.1% in 2018, returning to the 2007 pre-recession levels. Thus, 14.3 million U.S. households were food insecure at least some time during 2018, mainly due to a lack of financial resources. In the same year, 5.6 U.S. million households (4.3%) had very low food security, which remained unchanged compared to 2017.

¹³ Ibid., 10.

¹⁴ www.ipcinfo.org/ipcinfo-about/ipcinfo-partnership/en/

¹⁵ [Definitions of Food Security](#)

¹⁶ [2020 GLOBAL REPORT ON FOOD CRISES](#)

¹⁷ <https://iecn.com/community%e2%80%88action-partnership-of-san-bernardino-county-receives-100000-donation-provides-food-boxes-to-2100-families/#.XrN15e8o4FU>

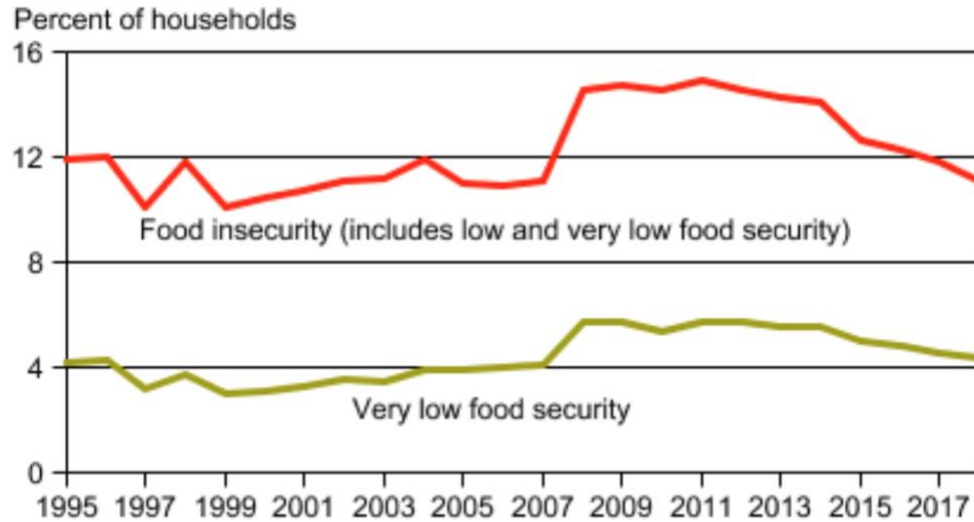
¹⁸ [Household Food Security in the United States in 2018](#)

¹⁹ Homeless families and individuals were not included in these statistics.

²⁰ 10 questions were asked of households without children and 18 questions were asked only if households included children age 0-17.

Relative to unemployment and poverty, other measures of hardship, food insecurity took longer to return to pre-recession levels. See Figure 1.

Figure 1. Trends in prevalence rates of food insecurity and very low food security in U.S. households, 1995-2018²¹.



Note: Prevalence rates for 1996 and 1997 were adjusted for the estimated effects of differences in data collection screening protocols used in those years.

In 2018, 37.2 million people (13.9%) lived in food-insecure households including 26.2 million adults and 11.2 million children, while 2.7 million children in those households (7.1%) did not receive nutritious food at times. Among households with children experiencing very low food security²² (0.6 % or 220,000 households), both adults and children faced hunger, skipped meals and were unable to eat for whole days due to a lack of money. See Figure 2.

Although overall food insecurity levels decreased in 2018, some segments of the population continue to face higher than average food insecurity rates including households with annual incomes 185% below the Federal poverty line (35.3%), single mother households with children (27.8%), single father households with children (15.9%), Black, non-Hispanic households (21.2%) and Hispanic households (16.2%).

Comparisons among states showed relevant differences due to State-level characteristics, such as average wages, cost of housing, unemployment, and State-level policies impacting unemployment insurance, the State Earned Income Tax Credit, and nutrition assistance programs. Differences for 2016-2018 data ranged from 7.8% in New Hampshire to 16.8% in New Mexico.

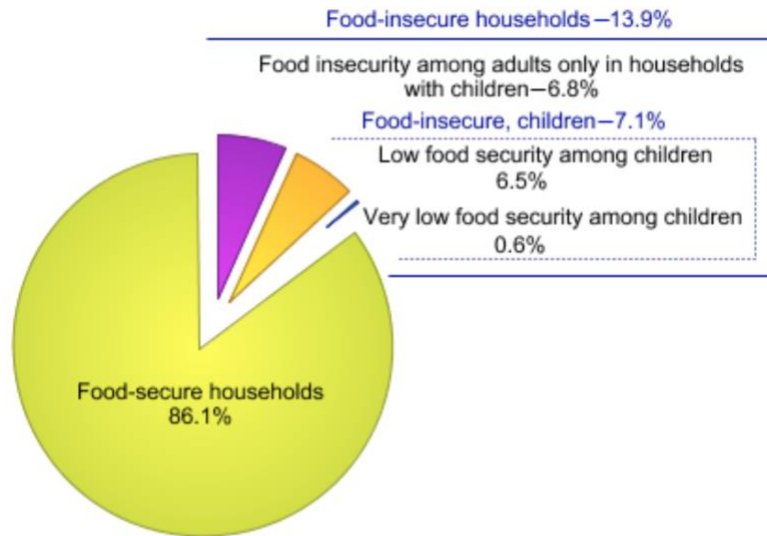
²¹ Ibid., 18.

²² “Households with children are classified as food insecure if they report 3 or more indications of food insecurity in response to the entire set of 18 questions; they are classified as having very low food security if they report 8 or more food-insecure conditions in response to the entire set of 18 questions.”

Estimated prevalence rates of very low food security ranged from 2.8% in New Hampshire to 6.8% in Alabama and Louisiana. California was among 16 states with food

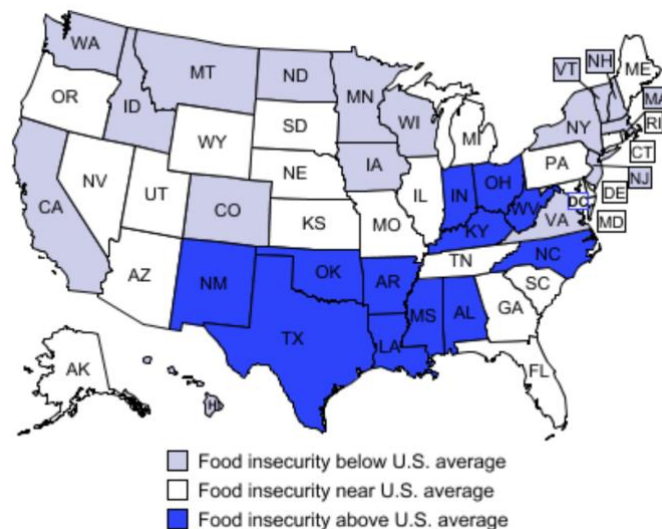
insecurity significantly lower than the national average with prevalence of 6.7% and 3.9% for low and very low food security, respectively. See Figure 3.

Figure 2. U.S. households with children by food security status and children, 2018²³.



Note: In most instances, when children are food insecure, the adults in the household are also food insecure.

Figure 3. Prevalence of food insecurity, average 2016-18²⁴.



²³ Ibid., 18.

²⁴ Ibid., 18.

Regarding Federal nutrition assistance participation and food spending, on average 56% of food-insecure households reported having participated, in one or more of the three largest Federal nutrition assistance programs (Supplemental Nutrition Assistance Program (SNAP); Special Supplemental Nutrition Program for Women, Infants, and Children (WIC); and National School Lunch Program); and the “typical (median) food-secure household spent 21% more for food than the typical food-insecure household of the same size and composition. These estimates include food purchases made with SNAP benefits.”

According to the Feeding America network²⁵, the nation’s largest domestic hunger-relief organization working alongside individuals, charities, businesses, and government to end hunger, households with children are more likely to experience food insecurity, and many households that face food insecurity, do not qualify for federal nutrition programs and rely on local food banks and other hunger relief organizations for support. The same agency states that families experiencing food insecurity come from both suburban and rural communities. The Inland Empire (IE) located east of Los Angeles encompasses both suburban and rural areas in a region spanning Riverside and San Bernardino Counties²⁶, with an area of 27,000 square miles and a population of about 4 million people.

People living in rural areas face hunger at a higher rate due to increased potential of food deserts, remote access to food banks located hours away, low-wage jobs, increased unemployment, and underemployment²⁷. About 2.3 million households in rural communities are dealing with hunger, with the same communities making 63% of U.S. counties and 78% of counties reflecting the highest rates of overall food insecurity. Sadly, the same rural communities experiencing food insecurity are where crops are grown. Compared to urban areas where food insecurity was 10.8% in the USDA’s 2018 Household Food Security report, food insecurity in rural areas was 12.7% due to increased poverty²⁸. The use of SNAP and WIC is higher among rural communities, and a greater number of food banks and food pantries have been reported for rural areas compared to urban areas. Although the study did not study California per se, it included Texas, which is a State like California regarding its Latino heritage, migration pattern, and agricultural activities among other characteristics, and Oregon, a bordering State to California. The study reported significant struggles to food-insecure rural households including family financial challenges, along with the distance from low-cost and healthy options. Living in rural areas provides limited employment opportunities, a lack of safe and affordable housing, a lack of organized activities for children after school hours, and in some cases increased crime, violence, and drugs over time. Agricultural workers experience unemployment during the off-seasons and single-parent households and lack of child support payments were commonplace. Participation in federal nutrition assistance programs and charitable food assistance programs was challenging when limited access to transportation. Dealing with SNAP customer service was difficult for participants in contrast to WIC. For those having access to school summer meals, participating in summer schools was an added benefit given the distance some of them had to travel. For those using food pantries, having

²⁵ [Hunger in America](#)

²⁶ [About the Inland Empire](#)

²⁷ Ibid., 25.

²⁸ [Examining Food Insecurity in the Rural United States: A Qualitative Study](#)

more access to meats and fresh fruits and vegetables and more conveniently located banks was more desirable. Other issues raised to using charitable food assistance programs included quality and quantity of food, hours of operation, paperwork, and perception linked to stigma and pride. Using food assistance programs synergistically was reported since respondents participated in multiple assistance programs thus, they used WIC for staple items, SNAP for preferred items, and patronized food pantries and church programs towards the end of the month when SNAP benefits were diminishing. Participants expressed the need for an increased number of food pantries with improved quality of food, along with more accessibility and better directions to applying to SNAP benefits, having elected officials recognizing the issue of food insecurity in their communities and increased access to jobs.

Food insecurity and poverty are interrelated concepts, with the former being a cause and manifestation of the latter. See Figure 4 for the interdependency between food insecurity and poverty, affecting productivity and physical and cognitive development. Fighting food insecurity involves the eradication of poverty²⁹.

Figure 4. Interdependency between food insecurity and poverty³⁰.



Food Banks & Food Pantries

A food bank is a non-profit that stores millions of pounds of food to be delivered to local food programs, like a food pantry. They store food donated from local neighbors, retailers, grocery stores, and restaurants, and vary in size, with some of them being double the size of an average wholesale club. A food pantry, on the other hand, receives food from a food bank and is a

²⁹ Ibid., 10.

³⁰ Ibid., 10.

distribution center where hundreds of families and individuals can receive food per week³¹. Food banks and food pantries are necessary community resources and play a critical role in California's food safety net, reaching over five million people in need, including children, seniors, the working poor, disabled, homeless, and veterans³².

The California Association of Food Banks (CAFB) represents over 40 food banks throughout California. They provide members with programs and services including helping food banks build capacity, providing funding opportunities and food resources, strengthening local advocacy programs, networking and advocating for anti-hunger programs and policies at the federal, state and local levels, collaborating with other agencies to improve the Cal Fresh system, provide funding and program guidance to local food banks and nonprofits that conduct Cal Fresh Outreach programs, and through the Farm to Family program, which works with growers and packers to provide fresh produce to food banks³³.

The Feeding America network is the largest domestic hunger-relief organization. It works with 200 food banks and 60,000 food pantries and meal programs nationwide and serves 1 out of 7 Americans³⁴. The IE branch serves Riverside and San Bernardino counties (FARSB)³⁵ and it is the largest hunger-relief organization in the region. It started in 1980 and currently partners with over 250 local nonprofit agencies and monthly distributes over 2 million pounds of food to over 100,000 people. According to their statistics, over 800,000 people are living below the poverty line in the IE with over 400,000 food-insecure people. Besides, "compared to the U.S., a higher share of the IE's poverty-stricken are of Hispanic origin and reside in households with heads who are non-citizens, jobless, and with heads who are single mothers, and who lack a high school degree. Poverty in the IE is higher than it is in the U.S., and California."

The current COVID-19 pandemic has increased food insecurity among Californians to 31% levels and the demand for food banks and food pantries in the IE^{36,37}. To help alleviate the pressure on state revenues and increased need for vital public programs and services, Governor Newsom released a revised 2020-2021 budget to close the deficit and meet the demands for the COVID-19 response aid. To that end, a \$30 million funding increase to the Department of Social Services was added to assist food banks for total funding of \$50 million³⁸.

Dietary Food Quality of Food Banks: Research studies indicate that the dietary intake of most food pantry users does not meet recommendations^{39,40}. Clients of charitable food programs may be at higher risk for chronic diseases including diabetes, hypertension, and obesity if the emphasis of food banks is not shifted from hunger and malnutrition alleviation through shelf-stable foods to

³¹ [Our Work](#)

³² [California Association of Food Banks |](#)

³³ Ibid., 31.

³⁴ Ibid., 30.

³⁵ [Inland Empire Food Bank](#)

³⁶ [CA's May Budget Revise Provides Critical Investment in Emergency Food Program](#)

³⁷ [Food Banks Respond to CA's 2020-21 Fiscal Statement](#)

³⁸ [Social services including Preschool Development Grant, ECPC Council, & CalWORKs](#)

³⁹ [The Dietary Quality of Food Pantry Users: A Systematic Review of Existing Literature](#)

⁴⁰ <https://pubmed.ncbi.nlm.nih.gov/27727101/>

health promotion through access to healthy food for their prevention and management⁴¹. For some patrons, the food obtained at food banks is their sole food source⁴². The inclusion of fresh fruits and vegetables among other healthier offerings in charitable food is paramount, requiring that food banks develop strategic plans, distribution practices, and policies related to offering fresh fruits and vegetables to food pantry patrons. Nutritional guidelines for food bank networks have been proposed but there are no universal standards⁴³. The Feeding America Network plans to have 50% of the food distributed by its affiliated food banks be fresh and vegetables by 2025⁴⁴. Other food bank networks nationwide have also expressed interest in increasing healthier foods for their clients and to help shape community health. However, an obstacle to establishing more formal nutrition guidelines among food bank executives resides on either a perceived lack of interest from food donors or fears of offending current donors⁴⁵.

Social Vulnerability Index

The social vulnerability index was created by the Centers for Disease Control and Prevention to help emergency response planners and public health officials identify and map communities that will most likely need support before, during, and after a hazardous event, such as a disease outbreak like COVID-19.⁴⁶ The index can be used to estimate the number of needed supplies like food and water or to identify communities that will need continued recovery support.⁴⁷ The index uses census data to determine social vulnerability based on 15 factors grouped in four themes including *socioeconomic status* (below poverty, unemployed, income, no high school diploma), *household composition and disability* (aged 65 or older, aged 17 or younger, civilian with a disability, single-parent households), *minority status and language* (minority, speak English “less than well”), and *housing and transportation* (multi-unit structures, mobile homes, crowding, no vehicle, group quarters). The index ranges from 0 to 1, with 0 being the least vulnerable, and while 1 the most vulnerable. Each census tract receives an overall ranking and a separate ranking for each of the four themes. See Figure 5. If a tract has a percentile rank of 0.8, that means the tract is considered more vulnerable than 80% of all ranked tracts⁴⁸. “Studies have shown the socially vulnerable are less prepared for a disaster event, less likely to fully recover from it and more likely to be injured and die. Effectively addressing social vulnerability decreases human suffering and reduces the post-disaster cost to society”.⁴⁹

The 2016 overall social vulnerability index for Riverside⁵⁰ and San Bernardino Counties⁵¹ are displayed in Figure 6. Thirty-five out of 52 cities (67%) in both counties showed indices above 0.5. Adelanto, Barstow, Coachella, San Bernardino, Rialto, San Jacinto, Desert Hot Springs,

⁴¹ [Charitable food as prevention: Food bank leadership perspectives on food banks as agents in population health](#)

⁴² [Nutrition Environment Food Pantry Assessment Tool \(NEFPAT\): Development and Evaluation](#)

⁴³ Ibid., 40.

⁴⁴ Ibid., 40.

⁴⁵ Ibid., 40.

⁴⁶ [Social Vulnerability Index CDC](#)

⁴⁷ [Social Vulnerability Index CDC 2](#)

⁴⁸ <https://www.youtube.com/watch?v=REKFHOrYfIA&feature=youtu.be>

⁴⁹ [Introduction to CDC's Social Vulnerability Index \(SVI\)](#)

⁵⁰ https://svi.cdc.gov/Documents/CountyMaps/2016/California/California2016_Riverside.pdf

⁵¹ https://svi.cdc.gov/Documents/CountyMaps/2016/California/California2016_San%20Bernardino.pdf

Hemet, Victorville, Blythe, Yucca Valley, Needles, and Twenty-nine Palms showed very high social vulnerability with indices above 0.75. See Table 1 under Methods for more details on indices for all 52 cities in the IE.

Figure 5. Social vulnerability index factors and themes⁵².

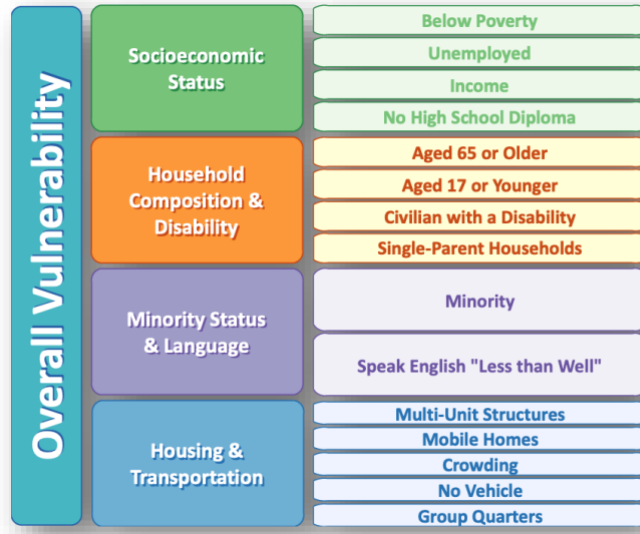
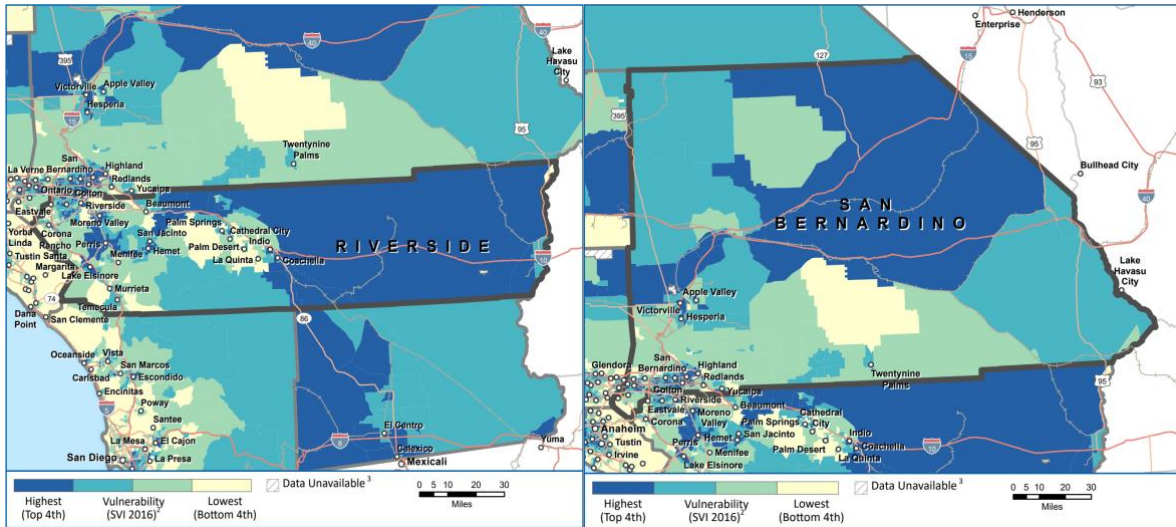


Figure 6. Overall social vulnerability indices for Riverside and San Bernardino Counties in 2016^{53,54}.



Riverside County

San Bernardino County

⁵² Ibid., 48.

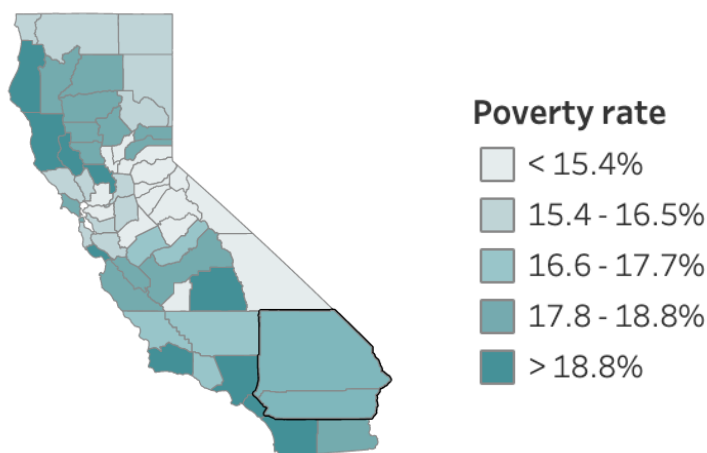
⁵³ Ibid., 50.

⁵⁴ Ibid., 51.

Poverty in the Inland Empire

According to the Public Policy Institute of California (PPIC)⁵⁵, the average poverty rate between 2015-2017 for Riverside and San Bernardino counties were 17.6% and 17.2%, respectively (Figure 7). This rate is based on the California Poverty Measure, a joint research effort between PPIC and the Stanford Center on Poverty and Inequality, and considers the cost of living and resources from social safety net programs, unlike the official poverty measure. The unemployment rate for the IE increased from 5.2% in March 2020 before the pandemic was declared to 14.4% in April⁵⁶, with Desert Hot Springs, East Hemet, Highgrove, and Coachella showing the highest unemployment rates ranging from 22.65 and 21.5% as compared to 16.1% for the State of California in the same month and according to the California Employment Development Department. This dramatic increase in the unemployment rate for the IE due to the COVID-19 pandemic may result in increased poverty levels among its vulnerable population.

Figure 7. Average poverty rate between 2015-2017 based on the California Poverty Measure.⁵⁷



Homelessness in the Inland Empire

Homelessness in the county of San Bernardino increased to 19.9% based on the January 23, 2020, Point-In-Time Count, with 3,125 people counted as homeless compared to the 2,607 people identified in 2019. The additional 518 homeless counted included 470 unsheltered individuals and 48 sheltered individuals temporarily housed in shelters, motels, or through transitional housing programs. The City of San Bernardino had the highest number of homeless individuals at 1,056, followed by Victorville at 451, Redlands at 186, Colton at 136, and Fontana

⁵⁵ [California Poverty by County and Legislative District](#)

⁵⁶ <https://www.nbclosangeles.com/news/coronavirus/riverside-countys-unemployment-rate-hits-record-high-of-15-3-in-april/2367538/>

⁵⁷ Ibid., 52.

at 116⁵⁸. Homelessness in Riverside increased 5% from 2,045 in 2019 to 2,155 in January of 2020 before the pandemic was declared⁵⁹. The cities with the largest counts were Riverside at 587, and Moreno Valley at 165, which quadrupled its count from the year before. The number of homeless individuals for the IE is expected to increase given the increased unemployment rate in the region, and the lack of a region-wide measures to prevent evictions past May 31, 2020, when the statewide moratorium expired. There are some exceptions including the city of Riverside that extended the moratorium for both residential and commercial renters for six months.

COVID-19 Cases in the Inland Empire

Public health crises like the COVID-19 pandemic dramatically impact the health of socially vulnerable communities⁶⁰. According to the California Health and Human Services open data portal⁶¹, as of June 12, 2020, there were *10,616 confirmed cases and 383 deaths in Riverside County*, and *6,707 confirmed cases and 229 deaths in San Bernardino County*. In Riverside County⁶², the city of Riverside has shown the highest number of confirmed cases (1,670), followed by Moreno Valley (943), Indio (688), Coachella (615), Corona (483), Jurupa Valley (440), Perris (375), Hemet (304), Cathedral City (281) and Palm Desert (243) to name but a few. For San Bernardino County⁶³, on the other hand, the city of San Bernardino has shown the highest number of confirmed cases (1,112) followed by Chino (978), Fontana (751), Ontario (639), Rialto (372), Redlands (324), Rancho Cucamonga (321), Victorville (293), Colton (281), and Yucaipa (239) to mention but a few. According to the LA Times coronavirus tracking system⁶⁴, the number of cases in Riverside County is declining, while they are stable in San Bernardino County.

POLICY ISSUE, RESEARCH QUESTION & OBJECTIVE

Policy issue: Availability of food pantry resources to vulnerable populations due to poverty, homelessness, and/or COVID-19.

Research question: Which cities in the Inland Empire need to be targeted for food pantry resources?

Objective: To propose target cities for San Bernardino & Riverside Counties to increase food pantry resources.

⁵⁸ [Homelessness in San Bernardino County up 19.9%](#)

⁵⁹ <https://www.pe.com/2020/05/06/riverside-countys-homeless-population-climbs-5/>

⁶⁰ <https://www.sciencedirect.com/science/article/pii/S0749379720302592>

⁶¹ [California COVID-19 Hospital Data and Case Statistics - California Health and Human Services Open Data Portal](#)

⁶² <https://www.latimes.com/projects/california-coronavirus-cases-tracking-outbreak/riverside-county/>

⁶³ <https://www.latimes.com/projects/california-coronavirus-cases-tracking-outbreak/san-bernardino-county/>

⁶⁴ <https://www.latimes.com/projects/california-coronavirus-cases-tracking-outbreak/>

METHODS

Data Collection

This study utilizes data from multiple sources, including San Bernardino County Department of Public Health, Riverside County Department of Public Health, the Department of Housing and Urban Development point-in-time count, the Southern California Association of Governments, and the Centers for Disease Control and Prevention.

Food Pantries: Point data for food pantries/resources was collected from the Food Rescue Anti-Hunger Coalition compiled by San Bernardino County Department of Public Health Nutrition, which was updated in March of 2020. The data was compiled as an “Inland Empire Food Assistance Resource List,” which includes food assistance programs and services in San Bernardino and Riverside Counties. The list of food pantries and resources was the most comprehensive data available, but it is not exhaustive, and was used as a starting point for data collection. Food pantries at colleges in the IE were added to the dataset. The dataset used has 581 food pantry/resource addresses in total. The food pantry/resource points were aggregated by city in an excel file.

Social Vulnerability Index: The social vulnerability index from the Centers for Disease Control and Prevention uses census data to determine social vulnerability. The social vulnerability index was downloaded as a shapefile and added to ArcMap (ArcGIS, 10.8). The tracts in each city were summarized to show the overall social vulnerability index for each city on a 0 to 100 scale.

Poverty: The number of individuals living 100% below the federal poverty level was included in the social vulnerability index data from the Centers for Disease Control and Prevention. This data was originally collected from the census. The tracts in each city were summarized to show the overall number of individuals living 100% below the federal poverty level in each city.

Homelessness: The homelessness data was collected from the 2019 San Bernardino County Point-In-Time count and the County of Riverside 2019 Point-In-Time count⁶⁵⁶⁶. The homeless Point-In-Time count is federally mandated by the United States Department of Housing and Urban Development to count the homeless population in cities throughout the nation. Homeless is defined as adults, children, and unaccompanied children who, on the night of the count, are living in shelters for the homeless; and those who reside in places not meant for human habitation, such as cars, parks, sidewalks, abandoned buildings, or on the street.⁶⁷ The homelessness counts were downloaded from San Bernardino County and Riverside County Point-In-Time count reports and aggregated into an excel file by city.

⁶⁵ [RivCoPIT2019](#)

⁶⁶ [SBCoPIT2019](#)

⁶⁷ [RivCoPIT2019 2](#)

COVID-19 Cases: COVID-19 cases by city were updated on April 20th, 2020 and collected from the Riverside County Public Health Department and the San Bernardino County Public Health Department⁶⁸⁶⁹. The COVID-19 cases by city were aggregated into an excel file.

Inland Empire Cities: A shapefile of California cities was downloaded from the Southern California Association of Governments (SCAG)⁷⁰ website, and utilized to map the data by cities in the Inland Empire.⁷¹ SCAG is the nation's largest metropolitan planning organization (MPO), which encompasses six counties, 191 cities and more than 19 million residents. They are involved in planning and policy initiatives for Southern California. The SCAG shapefile was downloaded from their website and uploaded into ArcGIS. The following data was joined onto the SCAG shapefile: (1) A count of total food pantries/resources as of March 2020, (2) a count of COVID-19 cases as of April 2020, (3) a count of homeless individuals as of 2019, (4) and a social vulnerability index from the 2010 census.

Data Cleaning

To connect our variables to food pantries, the field calculator tool in ArcGIS was utilized to calculate rates per food pantry for the SVI score, poverty, number of homeless, and COVID-19 cases. In order to eliminate 0 division, 1 was added to any variable with a 0 value. Below are the field calculations utilized:

- After selecting fields with “0” data points, field calculator: [variable] +1
- Field calculator: [SVI*100 / food pantry count]
- Field calculator: [poverty / food pantry count]
- Field calculator: [homelessness / food pantry count]
- Field calculator: [covid cases / food pantry count]

Upon creating the rates for each variable, a statistical analysis of the data to determine which cities of the IE need more food pantries or food resources was performed.

Data Analysis

Hot Spot Analysis: This analysis will establish the availability of food pantry resources to at-risk populations due to social vulnerability, poverty, homelessness, and COVID-19 cases in the Inland Empire, to help identify vulnerable cities within the region and to propose target cities for San Bernardino and Riverside Counties to increase food pantry resources to these communities through spatial analysis. The Getis-Ord local clustering method was applied to find statistically significant

⁶⁸ [RivCoPH COVID](#)

⁶⁹ [SBCoPH COVID](#)

⁷⁰ [SCAG](#)

⁷¹ [US Census Cartographic Boundary Files](#)

“hot” and “cold” spots.⁷² A local statistic, G_i^* , was calculated for each feature within the context of its neighbors. It also determines whether a local pattern is statistically significant from the global pattern, in this case, a comparison of IE cities.

The standardized G_i^* is a Z-score associated with statistical significance.⁷³ “Hotspots” are cities that have a significantly higher value than expected.⁷⁴

$$G_i^*(d) = \frac{\sum_{j=1}^n W_{ij}(d)x_j}{\sum_{j=1}^n x_j}$$

“The $G_i^*(d)$ is the local G statistic for a feature i within a distance (d), and $W_{ij}(d)$ is the spatial weight for the target-neighbor i and j pair. Ord and Getis developed a z-transformed form of G_i^* to improve statistical testing.⁷⁵ The statistical significance and degree of clustering is evaluated according to the confidence level and on the Z-scores. The statistical significance and degree of clustering is evaluated according to the confidence level and on the Z-scores. If $Z(G_i^*)$ has a positive value and significant, it means that the pixel has a relatively high frequency of being a hot spot area. Otherwise, if $Z(G_i^*)$ has a negative value and is significant, the pixel has a high frequency of being a cold spot area”⁷⁶. “The z-scores and p-values are measures of statistical significance that tell you whether or not to reject the null hypothesis. They indicate whether the observed spatial clustering of high or low values is more pronounced than one would expect in a random distribution of those same values.”⁷⁷ Confidence levels or p values used were 1%, 5% and 10%. Clusters with positive z values for these p values were considered hot spots, while clusters with negative values at the same p values were considered cold spots.

Hypothesis testing:

- Null hypothesis: There is complete spatial randomness of the values associated with each of the data sets used.
- Alternative hypothesis: There is spatial clustering of the values associated with each of the data sets used.

Contiguity edges and corners for the conceptualization of the spatial relationship parameter were used. This was chosen based on how the features interact with each other in space. The polygon features, in this case cities, that share a boundary, influence computations for the target polygon feature. It is best to utilize contiguity conceptualizations with polygon features in cases when modeling contagious processes or continuous data represented as polygons, which are cities.⁷⁸

⁷² [Getis Ord 1992](#)

⁷³ <http://onlinepubs.trb.org/onlinepubs/conferences/2011/RSS/2/Manepalli,UR.pdf>

⁷⁴ [Hakkert and Mahalel, 1978](#)

⁷⁵ [Getis Ord 1995](#)

⁷⁶ [J. Navarro-Estupiñan, et al](#)

⁷⁷ [Z-scores and P-values](#)

⁷⁸ [Modeling spatial relationships](#)

SVI score/food pantry: Hot spots indicate cities where the social vulnerability is high in relation to the number of pantries. These are cities where temporary pantries are needed during hazardous

outbreaks such as COVID-19. In contrast, cold spots are located in cities where vulnerability in relation to the number of food pantries tends to be low.

Number of people below poverty/food pantry: Hot spots indicate cities where the number of people in poverty is high in relation to the number of pantries. These are cities where temporary pantries are needed during hazardous outbreaks such as COVID-19. In contrast, cold spots are located in cities where the number of people in poverty in relation to the number of food pantries tends to be low.

Number of homeless/food pantry: Hot spots indicate cities where the number of homeless people is high in relation to the number of pantries. These are cities where temporary pantries are needed during hazardous outbreaks such as COVID-19. In contrast, cold spots are located in cities where the number of homeless people in relation to the number of food pantries tends to be low.

COVID-19 cases/food pantry: Hot spots indicate cities where the number of COVID-19 cases is high in relation to the number of pantries. These are cities where temporary pantries are needed during hazardous outbreaks such as COVID-19. In contrast, cold spots are located in cities where the number of COVID-19 cases in relation to the number of food pantries tends to be low.

Table 1 contains information on all cities in the IE along with their respective food pantry count, social vulnerability index, social vulnerability score per food pantry, poverty count, poverty count per food pantry, homeless count⁷⁹, homeless count per food pantry, COVID-19 cases⁸⁰, and COVID-19 cases per food pantry.

⁷⁹ 2019 Point-In-Time count.

⁸⁰ April 20, 2020 data.

TABLE 1. Cities in Riverside (R) and San Bernardino (SB) counties, food pantry count, social vulnerability index (SVI), social vulnerability score (SVS) per food pantry, poverty count, poverty count per food pantry, homeless count, homeless count per food pantry, COVID-19 cases and COVID-19 cases per food pantry. *2019, April 20, 2020**

CITY	COUNTY	FOOD PANTRY COUNT	SVI	SVS/FOOD PANTRY	POVERTY COUNT	POVERTY COUNT /FOOD PANTRY	HOMELESS COUNT*	HOMELESS COUNT /FOOD PANTRY	COVID19 CASES**	COVID19 CASES/FOOD PANTRY
Canyon Lake	R	0	0.50	49.82	7499	7499	0	0	8	8
Cathedral City	R	0	0.58	58.17	15884	15884	82	82	65	65
Eastvale	R	0	0.39	39.15	6955	6955	0	0	50	50
La Quinta	R	0	0.51	50.97	12434	12434	9	9	46	46.00
Wildomar	R	0	0.52	52.21	9409	9409	13	13	31	31.00
Blythe	R	1	0.77	76.76	4580	4580	48	48	1	1.00
Calimesa	R	1	0.38	38.00	3957	3957	16	16	16	16.00
Chino Hills	SB	1	0.30	29.93	12245	12245	4	4	51	51.00
Indian Wells	R	1	0.33	32.54	5063	5063	2	2	10	10.00
Needles	SB	1	0.76	76.09	1520	1520	29	29	0	0.00
Palm Springs	R	1	0.54	54.18	15522	15522	196	196	82	82.00
Rancho Mirage	R	1	0.39	38.62	5903	5903	6	6	22	22.00
Coachella	R	2	0.81	40.56	13010	6505	51	26	90	45.00
Grand Terrace	SB	2	0.63	31.74	4862	2431	1	1	16	8.00
Yucca Valley	SB	2	0.76	38.22	8446	4223	72	36	12	6.00
Desert Hot Springs	R	3	0.78	26.16	12559	4186	45	15	27	9.00
Lake Elsinore	R	3	0.69	22.96	19694	6565	66	22	78	26.00
Palm Desert	R	3	0.34	11.18	11345	3782	23	8	75	25.00
Perris	R	3	0.75	24.83	27556	9185	77	26	117	39.00
Twentynine Palms	SB	3	0.75	25.06	6034	2011	40	13	8	2.67
Loma Linda	SB	4	0.56	14.06	7651	1913	25	6	24	6.00

CITY	COUNTY	FOOD PANTRY COUNT	SVI	S790oVS/FOOD PANTRY	POVERTY COUNT	POVERTY COUNT /FOOD PANTRY	HOMELESS COUNT*	HOMELESS COUNT /FOOD PANTRY	COVID-19 CASES**	COVID-19 CASES/FOOD PANTRY
Menifee	R	4	0.50	12.47	13866	3467	17	4	85	21.25
Montclair	SB	4	0.72	17.95	18749	4687	24	6	20	5.00
Beaumont	R	5	0.53	10.50	10388	2078	15	3	71	14.20
Big Bear L	SB	5	0.43	8.66	3589	718	39	8	4	0.80
San Jacinto	R	5	0.79	15.74	17095	3419	48	10	36	7.20
Temecula	R	5	0.38	7.60	11084	2217	59	12	85	17.00
Adelanto	SB	6	0.89	14.77	19415	3236	14	2	11	1.83
Banning	R	6	0.60	9.96	10443	1741	39	7	18	3.00
Barstow	SB	6	0.83	13.86	12791	2132	62	10	10	1.67
Highland	SB	6	0.71	11.75	24307	4051	72	12	60	10.00
Norco	R	6	0.42	6.96	5745	958	11	2	17	2.83
Hesperia	SB	7	0.71	10.19	25976	3711	24	3	39	5.57
Indio	R	7	0.60	8.62	22514	3216	52	7	106	15.14
Murrieta	R	8	0.46	5.69	14183	1773	17	2	77	9.63
Apple Valley	SB	9	0.70	7.72	20038	2226	23	3	18	2.00
Hemet	R	9	0.78	8.66	28023	3114	112	12	138	15.33
Upland	SB	9	0.45	5.04	17959	1995	58	6	47	5.22
Chino	SB	10	0.54	5.45	14783	1478	23	2	77	7.70
Redlands	SB	10	0.45	4.47	16957	1696	183	18	73	7.30
Corona	R	11	0.46	4.16	24719	2247	164	15	141	12.82
Rancho Cucamonga	SB	12	0.42	3.48	24089	2007	58	5	83	6.92
Yucaipa	SB	12	0.45	3.79	9100	758	16	1	148	12.33
Jurupa Valley	R	13	0.67	5.17	24612	1893	139	11	80	6.15
Colton	SB	14	0.71	5.05	22952	1639	58	4	36	2.57

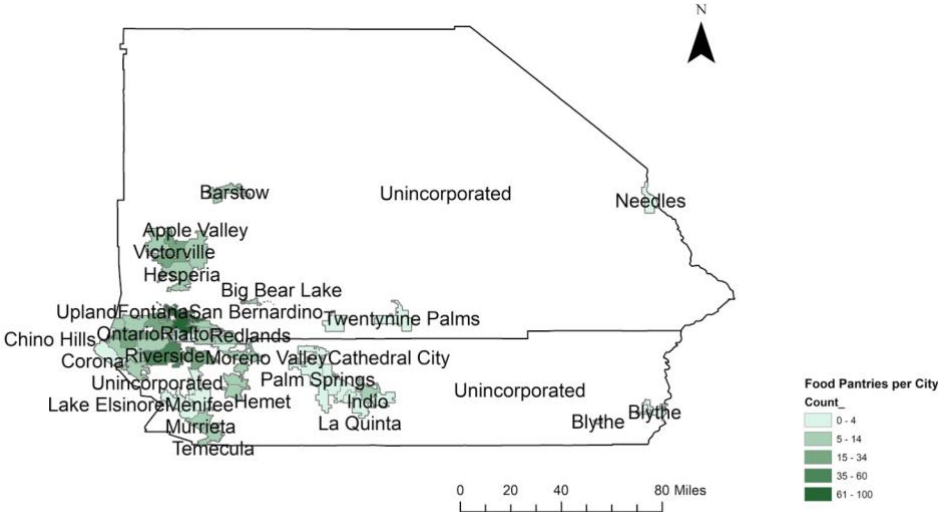
CITY	COUNTY	FOOD PANTRY COUNT	SVI	SVS/FOOD PANTRY	POVERTY COUNT	POVERTY COUNT /FOOD PANTRY	HOMELESS COUNT*	HOMELESS COUNT /FOOD PANTRY	COVID-19 CASES**	COVID-19 CASES/FOOD PANTRY
Ontario	SB	18	0.66	3.68	37619	2090	128	7	77	4.28
Victorville	SB	19	0.78	4.10	45708	2406	333	18	67	3.53
Moreno Valley	R	23	0.72	3.12	35455	1542	38	2	303	13.17
Rialto	SB	24	0.79	3.29	30760	1282	133	6	59	2.46
Fontana	SB	28	0.69	2.45	45049	1609	94	3	155	5.54
Riverside	R	46	0.63	1.38	62578	1360	439	10	477	10.37
San Bernardino	SB	100	0.80	0.80	92886	929	890	9	159	1.59

RESULTS AND KEY FINDINGS

The results of this study provide possible target cities that may need an increase of food resources or food pantry pop-ups currently, or during the COVID-19 pandemic.

In Figure 8, the number of food pantries in each city is visualized, with 581 addresses collected in total. The darker green signifies a higher number, and the lighter green signifies a lower number of food pantries per city. The cities of San Bernardino and Riverside along with surrounding cities show a higher number of food pantries compared to cities in the Eastern regions of both counties.

Figure 8. Inland Empire Food Pantries per City. N = 581.



Using the GIS Hot Spot Analysis tool with the Getis-Ord G_i^* statistical tool, analyses of each city in reference to its social vulnerability score per food pantry, the number of people below 100% poverty level per food pantry, the number of homeless people per food pantry, and the number of COVID-19 cases per food pantry were conducted.

Figure 9 shows hot and cold spots of each city's social vulnerability score per food pantry. Cities in orange and red have significantly higher positive z scores and low p values resulting in hotspots. Cities in blue have significantly higher negative z scores and low p values resulting in cold spots. The z-scores, p-values, and confidence level bins for each city are provided in Table 2. The G_i _Bin field classifies the data into a range from -3 (Cold Spot – 99% Confidence) to 3 (Hot Spot – 99% Confidence). Not significant cities are not included in Table 2.⁸¹

Cities like Blythe and Needles have a high vulnerability score and may be limited in their ability to respond to hazardous events such as disease outbreak, and in terms of providing food resources, they do not have enough food pantries. Similarly, Desert Hot Springs, Cathedral City, Palm Springs, and Rancho Mirage have a statistically significant high social vulnerability score and low number of food pantries. As you can see in the legend in Figure 10, the red cities have a 99% confidence level, and the orange cities have 95% confidence level.

On the contrary, Rialto and Riverside show significant clustering for low values (cold spots). These cities have a high number of food pantries in relation to their vulnerability scores (Figure 11). These cities may not need an influx of pantries and food resources during disastrous times. However, vulnerability only provides context for the overall risk during a disaster. To determine which cities may need an increase of food pantries or food resources, it is necessary to know how many people need food pantries in each city. A similar analysis in terms of the number of people in poverty per food bank was completed.

Figure 12 shows statistically significant hot and cold spots of each city's number of individuals below the federal poverty level per food pantry. Hot spots are shown in Figure 13 for Desert Hot Springs, Cathedral City, Palm Springs, Rancho Mirage, Indio, and Menifee. Indio for example has around 23,000 individuals living below the federal poverty level with only 7 food pantries. While in Figure 14, cold spot cities, like Colton also have around 23,000 people living below the poverty level, with 14 food pantries. Other statistically significant cold spot cities include Riverside and Rialto. Hot spot cities have higher ratios of people living in poverty in relation to how many food pantries they have. These hot spot cities are potentially target cities for an increase of food pantries or food resources during a disaster that impacts those in poverty; for instance, during the COVID-19 outbreak since many have lost their jobs. Table 3 contains high/low spatial clustering for poverty level per food pantry for the IE.

Considering the 100% below the poverty level used, an even deeper examination was carried out using the homeless Point-In-Time count to determine if enough food pantries for homeless individuals in each city were available.

⁸¹ <https://glenbambrick.com/2016/01/21/hotspot-analysis-using-arcgis/>

Figure 9. Hot and cold spots for social vulnerability score per food pantry using the Getis-Ord Gi* statistical tool.

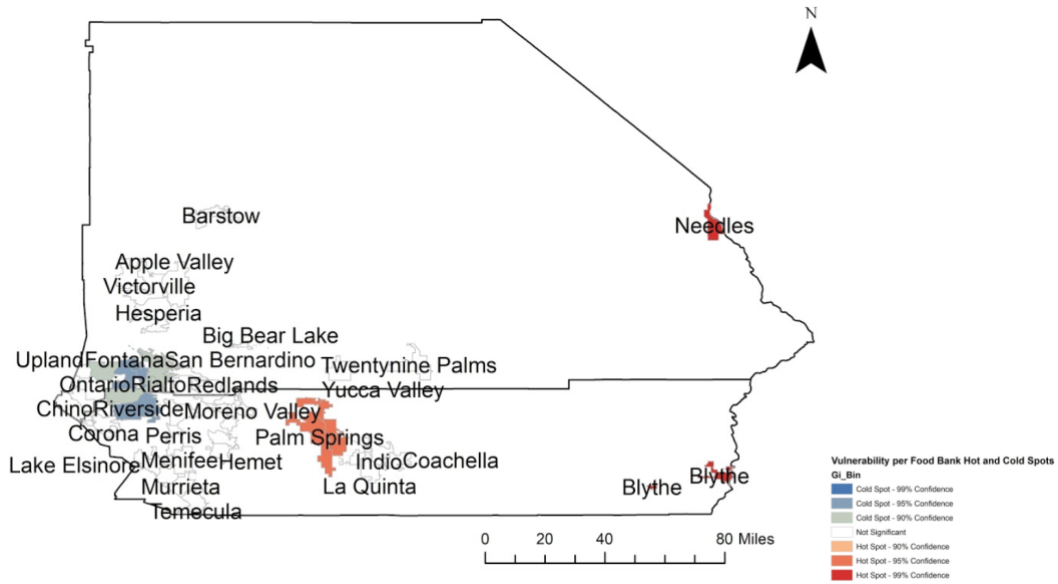


Figure 10. Hot Spots for social vulnerability score per food pantry.

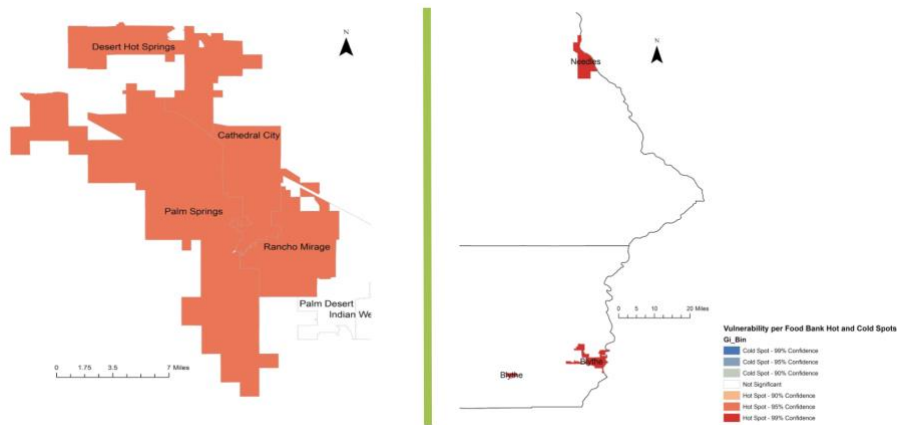


Figure 11. Cold spots for social vulnerability score per food pantry.

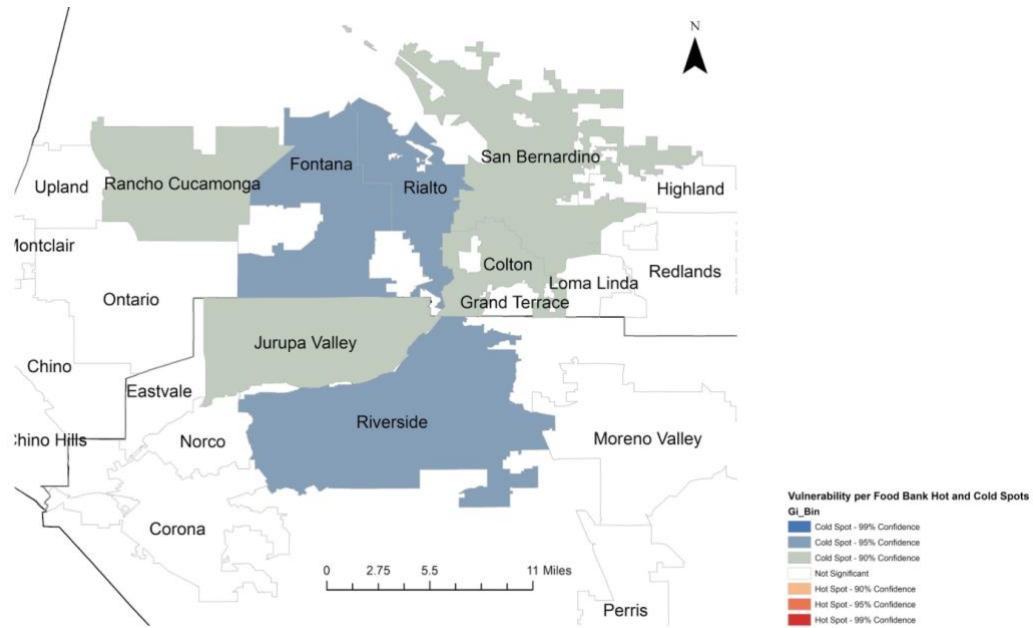
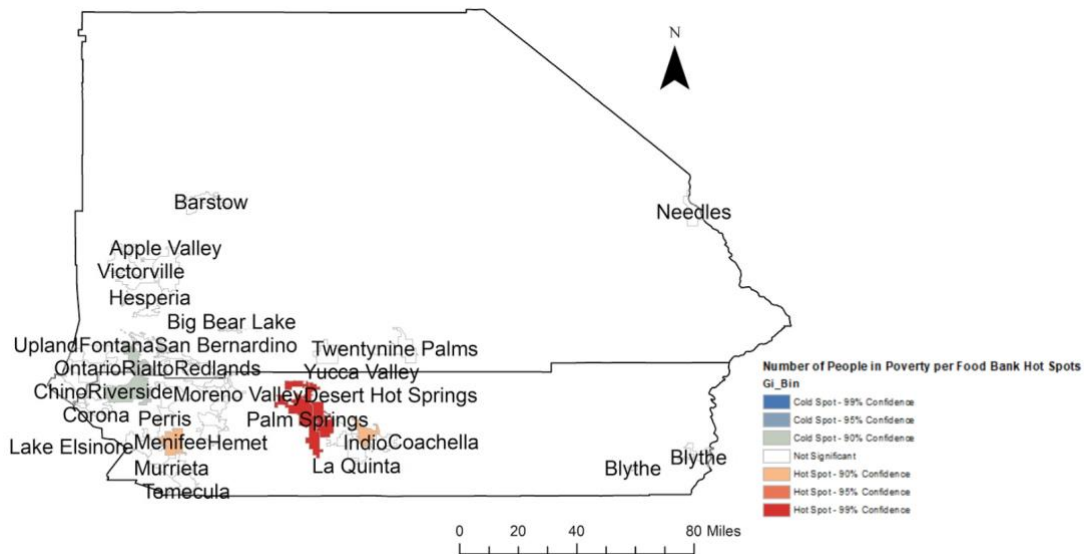


Table 2. High/low spatial clustering for social vulnerability score (SVS) per food pantry for Inland Empire cities using Getis-Ord Gi* statistics.

FID	City	SVS/Food Pantry	Z Score	P Value	NNeighbors	Gi_Bin	Spot
3	Colton	5	-1.67	0.10	7	-1	Cold
10	Rialto	3	-2.03	0.04	5	-2	Cold
11	Fontana	2	-1.99	0.05	5	-2	Cold
14	Rancho Cucamonga	3	-1.76	0.08	4	-1	Cold
16	San Bernardino	1	-1.82	0.07	6	-1	Cold
28	Riverside	1	-2.12	0.03	6	-2	Cold
43	Jurupa Valley	5	-1.86	0.06	8	-1	Cold
5	Needles	76	2.85	0.00	1	3	Hot
35	Desert Hot Springs	26	2.34	0.02	3	2	Hot

FID	City	SVS/Food Pantry	Z Score	P Value	NNeighbors	Gi_Bin	Spot
37	Rancho Mirage	39	2.13	0.03	4	2	Hot
45	Cathedral City	58	2.53	0.01	4	2	Hot
46	Blythe	77	2.89	0.00	1	3	Hot
49	Palm Springs	54	2.53	0.01	4	2	Hot

Figure 12. Hot and cold spots for poverty level per food pantry using the Getis-Ord Gi* statistical tool.



Figures 15 and 16 show a hot spot analysis of each city’s homeless counts in relation to the number of food pantries they have. There are no cold spots that resulted from this analysis. Only not significant cities, and significant hotspot cities with 99% confidence. Desert Hot Springs, Cathedral City, Palm Springs, and Rancho Mirage have a statistically high number of homelessness in relation to their number of food pantries ($p < 0.01$). Table 4 provides the spatial clustering for homeless count per food pantry for IE cities. For example, for every 1 food pantry in Palm Springs, there are 196 homeless individuals.

Figure 13. Hot spots for poverty level per food pantry.

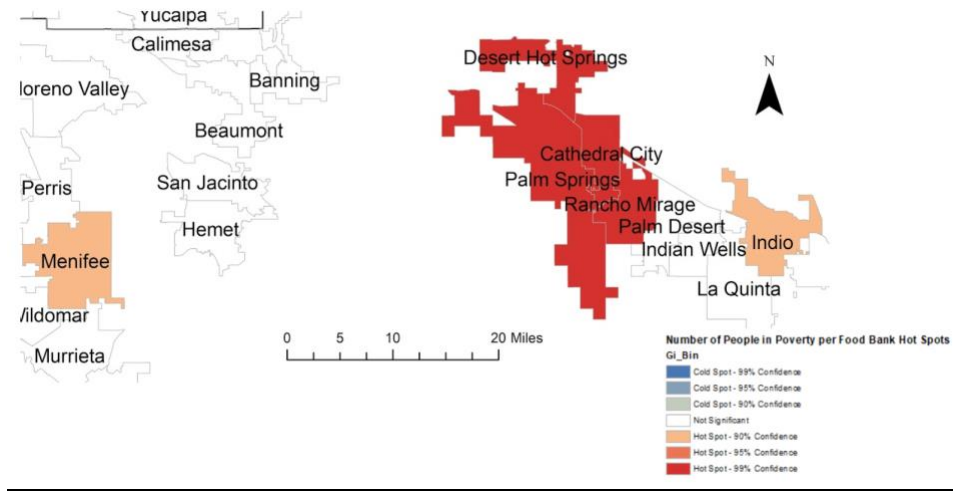


Figure 14. Cold spots for poverty level per food pantry.

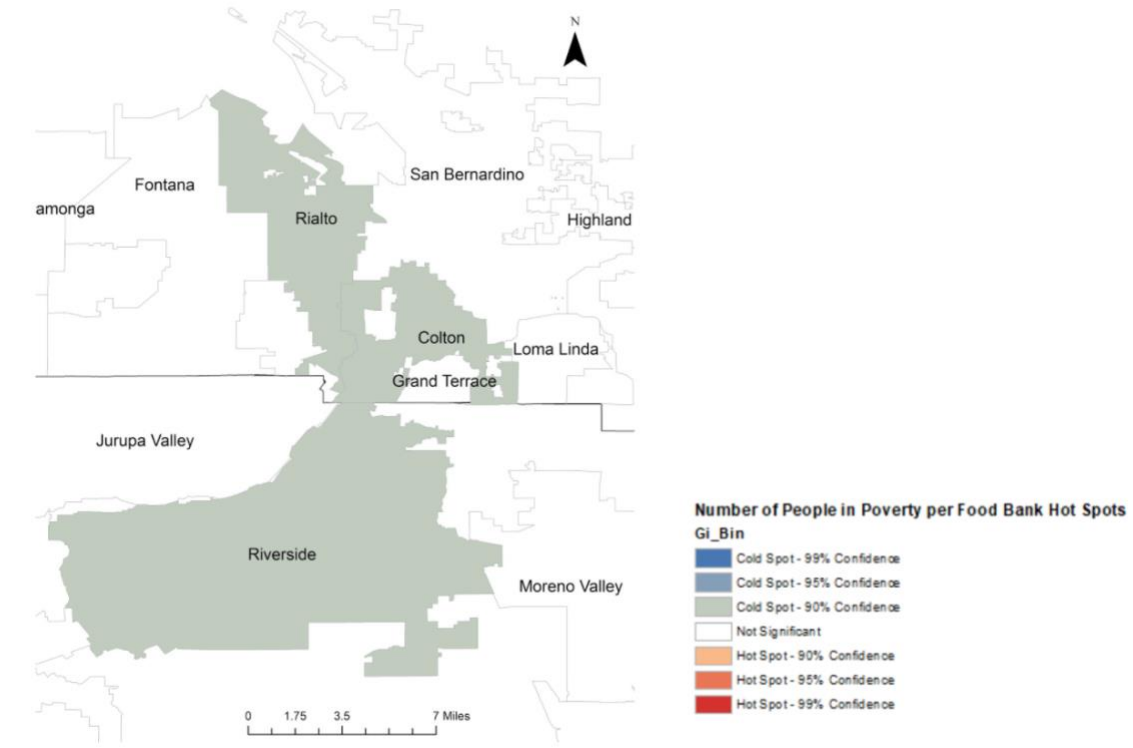


Table 3. High/low Spatial clustering for poverty level per food pantry for Inland Empire cities using Getis-Ord Gi* statistics.

FID	City	Poverty Level/Food Pantry	Z Score	P Value	NNeighbors	Gi_Bin	Spot
3	Colton	1639	-1.90	0.06	7	-1	Cold
10	Rialto	1282	-1.68	0.09	5	-1	Cold
28	Riverside	1360	-1.76	0.08	6	-1	Cold
35	Desert Hot Springs	4186	3.90	0.00	3	3	Hot
37	Rancho Mirage	5903	3.62	0.00	4	3	Hot
40	Menifee	3467	1.66	0.10	6	1	Hot
45	Cathedral City	15884	3.68	0.00	4	3	Hot
48	Indio	3216	1.67	0.10	3	1	Hot
49	Palm Springs	15522	3.68	0.00	4	3	Hot

Figure 15. Hot spots for homeless count per food pantry using the Getis-Ord Gi* statistical tool.

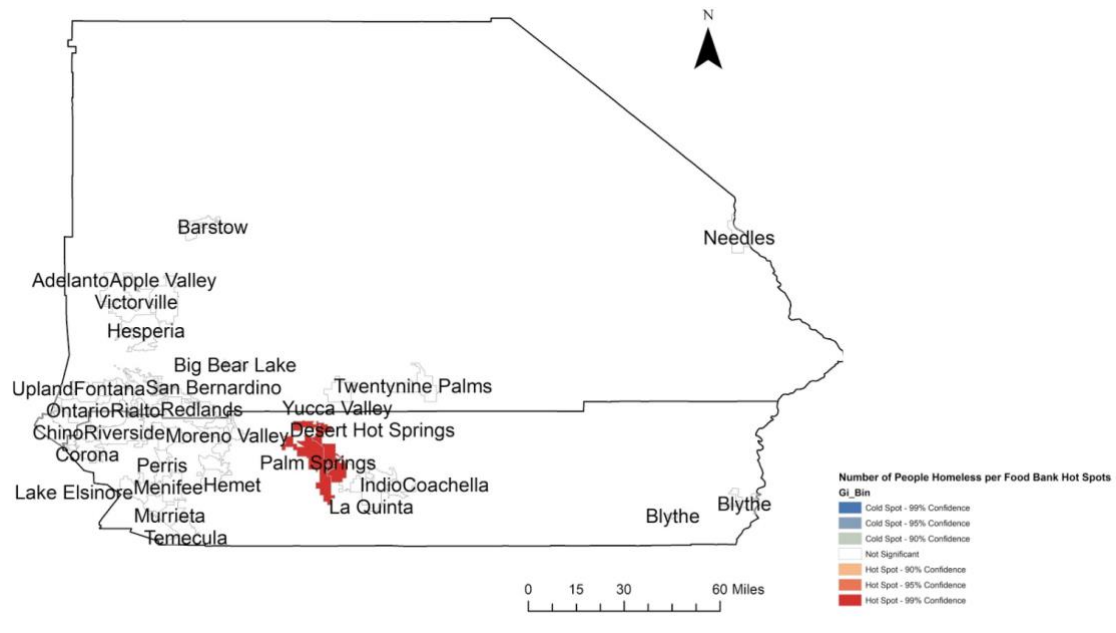


Figure 16. Hot spots for homeless count per food pantry.

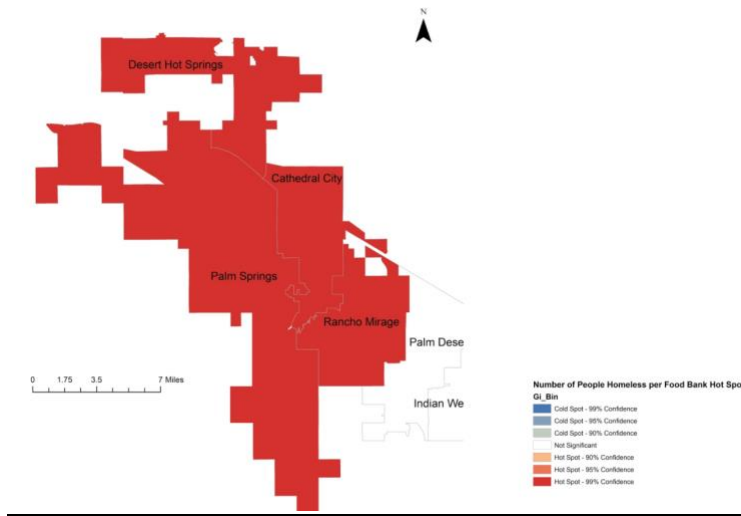


Table 4. High/low spatial clustering for homeless count per food pantry for Inland Empire cities using Getis-Ord G_i^* statistics.

FID	City	Homeless Count/Food Pantry	Z Score	P Value	NNeighbors	Gi_Bin	Spots
35	Desert Hot Springs	15	5.08	0.00	3	3	Hot
37	Rancho Mirage	6	4.15	0.00	4	3	Hot
45	Cathedral City	82	4.29	0.00	4	3	Hot
49	Palm Springs	196	4.29	0.00	4	3	Hot

At least 30 million Americans have lost their jobs due to COVID-19, and unemployment numbers are rising at an unprecedented level during this pandemic. With a drastic number of people experiencing financial hardship and food insecurity during this time, it is important that food resources increase for communities that are being affected by COVID-19. The analysis in Figure 11 aims to show target cities who may need additional food resources based on the number of COVID-19 cases, as of April 2020. Figures 17 and 18 show statistically significant hot-spot cities that have a high number of COVID-19 cases in relation to how many food pantries they have. Similar to previous analyses, Desert Hot Springs, Palm Springs, Cathedral City, Rancho Mirage and Indio are identified as hot spots. Table 5 provides the data for each hot spot city. For example, for every 1 food pantry in Cathedral City, there are 65 COVID-19 cases.

Figure 17. Hot spots for COVID-19 cases per food pantry using the Getis-Ord Gi* statistical tool.

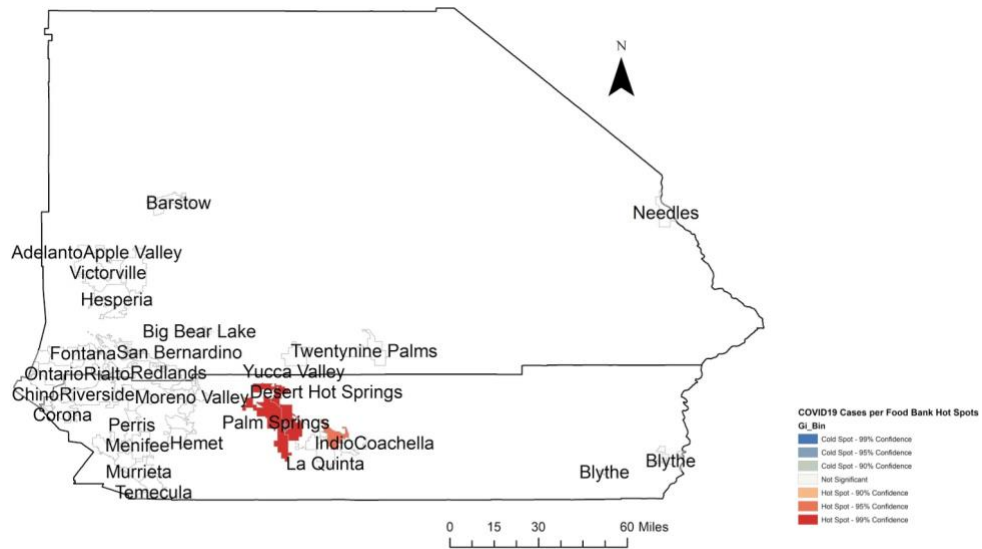


Figure 18. Hot spots for COVID-19 cases per food pantry.

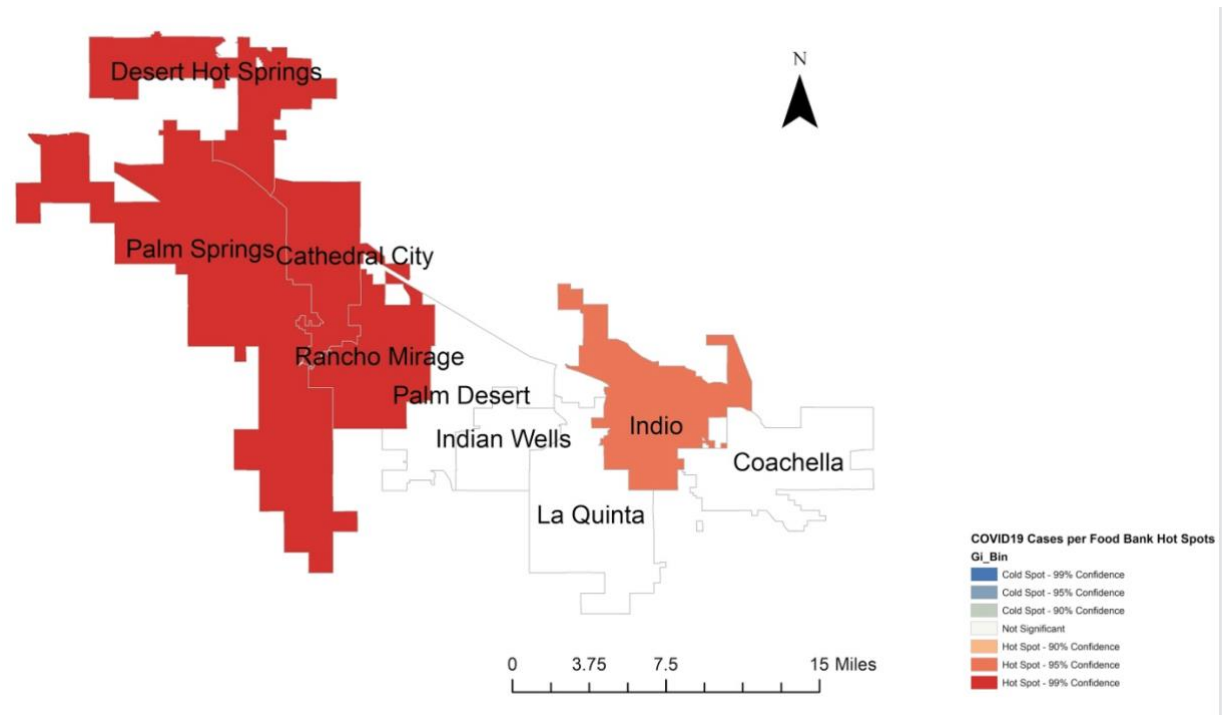


Table 5. High/low spatial clustering for COVID-19 cases per food pantry for Inland Empire cities using Getis-Ord Gi* statistics.

FID	CITY	COVID-19 Cases/Food Pantry	Z Score	P Value	NNeighbors	Gi_Bin	Spots
35	Desert Hot Springs	9	3.73	0.00	3	3	Hot
37	Rancho Mirage	22	3.94	0.00	4	3	Hot
45	Cathedral City	65	3.47	0.00	4	3	Hot
48	Indio	15	2.05	0.04	3	2	Hot
49	Palm Springs	82	3.47	0.00	4	3	Hot

Summary of Findings:

After conducting spatial analysis to identify hot spots for availability of food pantry resources to at-risk populations due to social vulnerability, poverty, homelessness, and COVID-19 cases in the Inland Empire, to help identify vulnerable cities within the region, the following target cities are proposed for San Bernardino and Riverside Counties:

1. Social vulnerability: Needles, Blythe, Desert Hot Springs, Cathedral City Palm Springs and Rancho Mirage,
2. Poverty: Desert Hot Springs, Cathedral City, Palm Springs, Rancho Mirage, Indio and Menifee,
3. Homelessness: Desert Hot Springs, Cathedral City, Palm Springs and Rancho Mirage,
4. COVID-19 Cases: Desert Hot Springs, Palm Springs, Cathedral City, Rancho Mirage and Indio Hot Spots.

LIMITATIONS

There is a common theme amongst Eastern Riverside cities. A surface level analysis points to these cities not having enough food resources. However, upon a deeper dive, we found that this area was utilizing mobile delivery services that may not have been present in our data set since they do not have physical addresses. Also, we recently learned of immediate funds that have been dispersed to widen the outreach to remote rural areas, specifically in the Eastern Coachella Valley.

Considering that we pulled data on food banks from multiple data sources, we urge future research to engage organizations such as 211.org, ConnectIE, Foodbank.org, Foodbanks.net, and Feeding America to create a comprehensive list of food pantries and food resources for Inland Empire residents. Our analysis did not include food insecurity, food deserts, and SNAP usage data,

which was not readily available or only available at the county level. This data was not readily available for our study or was not available by the city.

Other data limitations include not having the most recent data or years for data points. COVID-19 cases were from April 2020, homelessness data was from 2019, and census data was from 2010. Also the number of COVID-19 cases may not necessarily reflect adequate testing, thus a high number may show a city that had more resources to do timely testing, whereas a low number may indicate either an actual low case load or a city where testing was not readily available.

CONCLUSIONS & FUTURE RESEARCH

The current COVID-19 pandemic has posed increased challenges for vulnerable Californians to access food. Although Californians had food insecurity levels below the national average before the pandemic, many more individuals are experiencing an increase in food insecurity because of COVID-19. Clustering analyses showed Inland Empire Western region cities as food pantry-rich in comparison to some Eastern region cities. Despite their affluence, some Eastern region cities lack food pantry resources. Cities such as Desert Hot Springs, Cathedral City, Palm Springs and Rancho Mirage displayed a greater need for food pantry resources to assist poor people, homeless people, and those affected by COVID-19. Lastly, Far Eastern cities such as Blythe and Needles showed heightened challenges to respond to public health crises such as COVID-19.

Future research should include food insecurity, food deserts, and SNAP usage data to get a more comprehensive picture of the need for emergency food programs in the IE. Studies are also needed to look at employment and poverty data for essential vs nonessential workers, and to reassess the current homeless count, which may be much higher given COVID-19, and the end of the moratorium on mortgage and rent, which expired in late May or will expire by October 2020, depending on the city.

POLICY RECOMMENDATIONS

State and local governments are encouraged to revise funding for the Emergency Food Assistance program to food banks since increased demands to these charity organizations may reflect a decrease in federal, state and city provision of welfare services and safety net benefits. Relief packages such as the CARES Act should target Eastern region cities of the IE to provide food resources. At the same time, non-profit organizations in Eastern region cities should be provided with emergency food resource funding to disperse, and churches in target cities need to be engaged and supported to develop food pantry infrastructure. Moreover, mobile food pantries found through FIND Food Bank, a member of Feeding America should be promoted to assist all remotely located areas lacking food pantries, since they currently don't serve Rancho Mirage or Needles. Furthermore, healthcare systems who refer clients to food pantries (i.e., Borrego Clinics) need to be engaged. Food pantry resource data should be compiled into a listserv and updated frequently.

Given the increase in food insecurity due to COVID-19 and the heightened demand to food banks, increased attention must be given to the diets of their unemployed and/or low-income

patrons considering that food banks operate on donations and surplus food and to address issues with hunger, malnutrition and/or obesity. Collaborations between public health stakeholders and leadership within the charitable food sector are encouraged to enhance the quality of food bank offerings to include fresh foods, and the implementation of community health improvement plans to assist their patrons. Nutrition education programs that meet specific nutrition and health-related needs of pantry participants need to be developed. Management, staff and volunteers at food banks and food pantries need to be trained on these nutrition programs, and on management of chronic disease and its relationship to nutrition. The identification and distribution of pantry foods that provide positive health benefits should be a high priority. Lastly, consumer publications focused on selecting and preparing pantry foods to maintain a healthy diet, manage a limited food budget and/or manage chronic diseases should be available in all food pantries.