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A Place-Based Study of Race, Economic Status, Health, and Recreation Spaces in Orange County, California

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Brason Alexander

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Department of History & Government

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A Place-Based Study of Race, Economic Status, Health, and Recreation Spaces in Orange County, California

by Brason Alexander

This dissertation written by

Brison Alexander

has been approved by the

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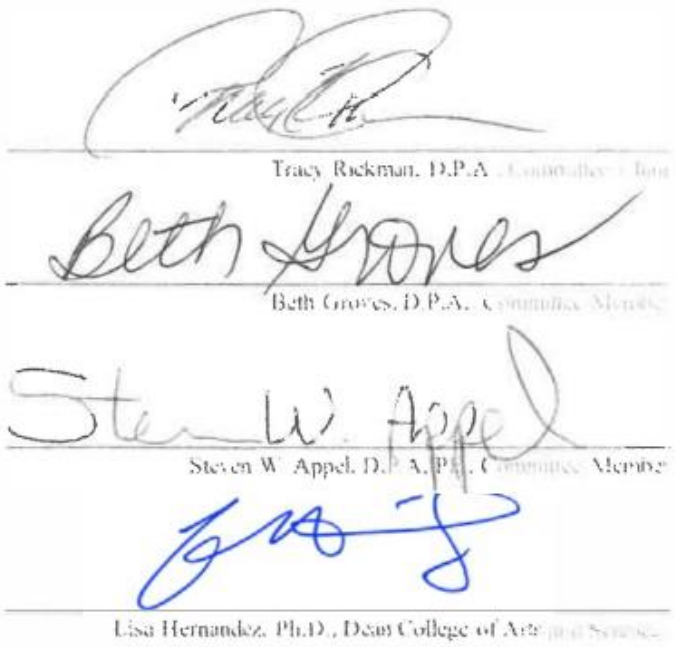

Tracy Rickman, D.P.A., Committee Chair

Beth Groves, D.P.A., Committee Member

Steven W. Appel, D.P.A., P.E., Committee Member

Lisa Hernandez, Ph.D., Dean College of Arts and Sciences

ABSTRACT

Purpose. Recreation spaces have long been valued as essential to society because of their mental, physical, and social benefits. The question then becomes, is equitable access to recreation spaces across communities? The specific problem examined in this study was whether the geographical distribution of recreation spaces in Orange County affects the health equity of the cities within the county boundaries. Orange County was a significant area to study because it is home to 34 incorporated cities, 3.1 million people, over 857 outdoor recreation spaces, over 75,784 acres of outdoor recreation spaces, and 122 indoor recreation spaces.

Theoretical Framework. The study used place-based theory that states geographical locations have a relationship with environmental variables. The researcher used a place-based theory to analyze the geographical locations of recreation spaces and their relationship with race and economic status of Orange County, California cities. The study compared the equity of recreation spaces with the racial and economic status in cities of Orange County. To inspect the possible implications of a community, the researcher created a dasymetric equity map of Orange County. The index used scores based on residents' ages, the city's walkability, data on indoor recreation spaces, and data on outdoor recreation spaces.

Findings. Ultimately, the study found that there are disparities in geographical locations of recreation spaces concerning race and socioeconomics. The wealthier a community, the more outdoor recreation spaces and the larger the area occupied. The whiter a community, the more outdoor recreation spaces and the larger the area occupied. The

number of indoor recreation spaces showed a significantly weaker relationship with race and socioeconomic status.

Conclusions and Recommendations. Cities located in North Orange County and inland were predominately those that scored in most need of recreation spaces. The four cities with the best distribution of recreation spaces were all located on the coastline: Huntington Beach, Newport Beach, Dana Point, and Laguna Beach.

Keywords: Correlation, equity, equity zones, physical activity, place, place-based, race, recreation spaces, socioeconomic status

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CHAPTER 1: INTRODUCTION

Background

As the COVID-19 pandemic began shutting down the United States in the Spring of 2020, the importance of recreational spaces became vastly apparent (Hu & Schweber, 2020). The National Recreation and Park Association (NRPA) reported that over 60% of parks departments reported increased usage during the same period a year earlier in 2019 (Way, 2021). In a survey conducted by the NRPA, 83% of the adults responded that parks were "essential" to their health (Way, 2021, para. 1). Centers for Disease Control and Prevention (CDC; 2020) encouraged outdoor recreational facilities as a strategy to prevent the spread of COVID-19. Roxane Sutton, Director of Communications for the NRPA, stated,

> There was this recognition of how important these spaces are to our mental health and our physical health. When gyms closed, parks were open. I say it all the time: I wouldn't have made it through [the pandemic] without my local parks! (Way, 2021, para. 2)

The pandemic had illuminated recreation spaces as a vital piece of a healthy environment within communities (Volenec et al., 2021). The question then becomes, "Do all communities have access to recreational spaces?"

During the difficult times of the pandemic in which the NRPA found access to parks and facilities essential, nearly 30% of the population lacked access and opportunity (NRPA, n.d.-a). A study conducted in 2014 and 2015 by North Carolina State University Parks, Recreation, and Tourism Management Department, National Park Service (NPS), and the CDC suggested three geographical access measures for recreational spaces:

1. Proximity – Percentage of the population (city/county/state/national) living within a half mile of a public park or trail corridor boundary.
2. Walking Access – Percentage of the population (city/county) with less than a half-mile walk route to a public park or trail entrance.
3. Park Connectivity – Ratio of the number of people with less than a half-mile walk route to a public park or trail entrance to the number of people living within a half mile of that specific park or trail corridor boundary. (Merriam et al., 2017, p. 4)

This study focused on the implications of geography and recreational spaces. There are other factors to the makeup of access, and some of the crucial contributors are traffic safety, crime, proximity, and infrastructure (Babey et al., 2007; NRPA, n.d.-d; Watson et al., 2016). However, the emphasis on location and geography of recreational spaces is consistent with the NRPA, whose chair of Board of Directors Michael Kelly (2021) penned, "Access to recreation begins with proximity of our residents to a parks or open space" (p. 6). Recreational spaces located within a community are more likely to be used than those outside (Rosenberger et al., 2009).

One study found that over 100 million people, including 28 million children across the country, lack a park within a 10-min walk from home (Gaskins & Pertillar, 2021). Walkability is not the sole determiner of recreation usage. However, park usage or access is hampered when spaces require private travel or are not within walkable distance (Kane & Tomer, 2019). A 2016 study found that 70% of Americans contend they can walk to a recreational space (May, 2016). It is important to note that the NRPA considers walkability subjective and is not bound to a specific distance (May, 2016).

Walkability is an essential factor of equity in recreation spaces because it has implications for access and availability. The NRPA has recently joined up for the 10-Minute Walk campaign, a collaborative effort to provide access to a park within a 10-min walk of any home by 2050 to improve equity in recreation (NRPA, n.d.-b). This study will add to the discussion on equity of recreational spaces as it evaluates a given region's recreation spaces' availability and proximity.

National studies on equity in recreational spaces have been inconsistent and often lacked proper analysis of local communities (Wen et al., 2013). It is concerning that with 100 million people lacking park access across the country, knowledge is inconsistent about who has access and who does not. As the COVID-19 pandemic continued, the general populace recognized the importance of recreational spaces (Outdoor Industry Association, 2020; Volenec et al., 2021). COVID-19 also highlighted a suspected concern in communities across the country. This concern was inequities in the distribution of recreational spaces (Aboelata & Bennett, 2021; Moore et al., 2008; NRPA, n.d.-a). Access to green spaces has been viewed as an environmental justice issue because distribution has been inequitable between races and socioeconomic classes (T. G. Williams et al., 2020). Two examples of the pandemic illuminating inequities in community recreation spaces were in Georgia and California.

The Parks and Recreation Department of Douglasville, Georgia did an equity audit of its programs before COVID-19. Douglassville is divided into five wards. The department determined inequity issues in facilities, services, and programs provided (Bass, 2020). Among those inequities was the fact that specific wards lacked access to recreational spaces and opportunities. These wards lacked walkability; residents had to

travel an excess of 20 min to a park. As COVID-19 progressed, it brought recreation and operating programs and facilities challenges. Those wards without recreational spaces were further compromised because they did not have direct access to recreation spaces, thus recreational opportunities. COVID-19 forced the realization that communities lacking in recreational areas were at a disadvantage when it came to public health associated with recreation (Dolesh, 2020). COVID-19 forced the Douglassville community outside to its local recreational spaces, and it was very apparent that some communities lacked the same opportunities.

COVID-19 also brought inequity in San Francisco to the forefront as residents fled to parks for socialization and exercise during shutdowns (Hom, 2021). An analysis of San Francisco showed that although the city ranked high nationally for its parks, it was underserving low-income communities. Underserved communities had less opportunity to recreate because of their neighborhood's lack of recreational spaces. San Francisco's inequity in park access is consistent with some national trends. Significant cities' poorer populations are more likely to have limited access to recreational spaces (Kane & Tomer, 2019). The San Francisco Recreation & Parks department has been trying to rectify its equity issues. In 2020, the department spent nearly 80% of its capital dollars in "equity zones" (Eskenazi, 2021, para. 1). Douglasville and San Francisco were examples of what was happening across the country: inequities in recreational spaces were being brought to the forefront by the COVID-19 pandemic (Kim et al., 2022).

Studies that have outlined inequity in recreational spaces within American communities are intriguing and allude to a potentially more significant issue because recreation has been associated with countless health benefits (Bedimo-Rung et al., 2005;

Floyd & Stodolska, 2019; Moore et al., 2008; Rigolon, 2016). From mental health to physical health, recreation has become a valued instrument of community health (Conejo Recreation & Park District, 2011; Wen et al., 2013). Outdoor recreation has promoted physical activity levels recommended by the CDC to reduce obesity and heart disease (Rosenberger et al., 2009). Parks have exhibited physical, psychological, social, and even economic benefits (Bedimo-Rung et al., 2005). Studies have shown that proximity to parks alone can benefit health (Babey et al., 2007; Ulrich & Addoms, 1981). If communities lack recreational spaces, they could be lacking the positive health capital of those spaces.

The lack of equity in recreational spaces reduces health benefits and exposes communities to negative health implications. Studies have shown that a lack of park access contributes to diabetes, obesity, heart disease, and a lower quality of life (Gaskins & Pertillar, 2021). These negative health consequences can be even more important to communities of color with higher obesity rates than White communities (Penbrooke, 2017; Rigolon, 2016). Teens living in areas lacking recreational facilities had significantly lower physical activity levels. This lack of physical activity can be linked to hypertension, diabetes, and other chronic ailments (Babey et al., 2007). A study on the Latino community found that depressive symptoms were higher when parks and facilities were unavailable (Perez et al., 2015). Equity in recreational spaces has important good and bad health implications for a community.

Public administrations that desire healthy communities cannot ignore equity in recreation. The equity of recreation can illuminate past policies, actions, and administrations that acted inappropriately or incompetently (N. J. Johnson & Svara,

2011). The American Society for Public Administration (n.d.) defined social equity in public administration as follows:

> The fair, just and equitable management of all institutions serving the public directly or by contract, and the fair, just and equitable distribution of public services, and implementation of public policy, and the commitment to promote fairness, justice, and equity in the formation of public policy. (para. 2)

Social equity has been viewed as the "gold standard," one that has morphed "beyond procedural approaches to equity to consider the nature of resource allocation and the differential impact of government action on individuals and groups in society" (N. J. Johnson & Svara, 2011, p. 195). Fair distribution of recreation spaces is a valuable endeavor for public administrations to raise a community's health capital.

Recreation studies have identified the need for strategic and in-depth analysis of recreation to offer hope and possible remedies for inequities in recreation (Floyd & Stodolska, 2019; Godbey et al., 2005). Scholars have asked for studies that look at the geographic makeup of recreational and the environmental variables within those communities (Floyd & Stodolska, 2019). Studying recreation with more depth and strategic analysis is no surprise because recreation saw a significant shift in the 1980s. Studies began to view recreation through a social-psychological lens. This view brought studies to value recreation as a multidisciplinary study. Recreation's scientific value was no longer relegated to simple adaptations but included planning, anthropology, kinesiology, psychology, and geography (Godbey et al., 2005). The growth or shift in the scholarly analysis could not come at a more opportune time. Communities of color and low income have had a history of inequality in American recreation (Gaskins & Pertillar,

2021; Nesbitt et al., 1970). An in-depth geographical analysis of the distribution of recreational spaces allows allocating resources and providing potential solutions to communities with disparities.

The COVID-19 pandemic has shined a spotlight on how inequities in recreation spaces can be damning to those communities. If communities of color or with low income lack recreational spaces, they are missing an environmental community variable deemed essential in any time. Dr. Jei Africa, the Director of Marin County Behavioral Health and Recovery Services, found that communities of color have seen increased individuals struggling with mental health because of the pandemic (Rodriguez, 2021). Dr. Africa believed that parks and recreation could be a positive force to combat the ills of the pandemic. This study analyzes recreation spaces and their relationship with race and socioeconomic status in Orange County, California, to provide a road map of understanding the importance of equity and facilitating more robust public health.

Orange County's Significance to Recreation Studies

Orange County is a major community with a makeup that could be often overlooked. Orange County has 34 incorporated cities, with Anaheim being the first in 1870. The county was formed in 1889 and is home to over 3.1 million people (Orange County Historical Society, n.d.). If Orange County were a state, its population would be more significant than 20 other states. It is the fifth most populated county in the country (Lewinnek et al., 2022). The county has over 40 miles of coastline and 948 square miles. By 2004, more than 50% of Orange County's population was of color. It has significant industries in tourism, aeronautics, manufacturing, and health care (Data USA, n.d.;

Epting, 2011; Orange County Historical Society, n.d.). Orange County is more than the generic Anglo experience often portrayed (Lewinnek et al., 2022).

Orange County's history is reflective of a community that is diverse and dynamic. In the late 1800s and early 1900s, agricultural and oil industries dominated the economics of the County (Orange County Historical Society, n.d.). These industries brought a racialized workforce not depicted in the marketed perception of Orange County (Lewinnek et al., 2022). The 1950s saw significant growth in Orange County fueled by transportation construction, the arrival of major military bases, and significant growth of the tourism industry. This included the opening of Disneyland in 1955 (Epting, 2011). These industries brought more employment that continued to offer employment opportunities to those of color (Lewinnek et al., 2022). In 1920, Orange County's population was 61,375. By 1970 it was over 1.4 million (Middlebrook, 2005). The second half of the 20th century saw the formation of over half the county's incorporated cities. Orange County became a mixture of suburbia and racial quarters (Epting, 2011; Lewinnek et al., 2022; Middlebrook, 2005).

Orange County's history makes for a recreational makeup that is captivating and anything but plain. Chapman Sports Park in Garden Grove is a former nuclear missile site gifted by the army in the 1970s (Lewinnek, 2022). In 1925, a group of African Americans purchased beach property in Huntington Beach and were going to create a club that would allow them to recreate on the beaches of Southern California. The Pacific Beach Club failed because of racially motivated outside pressures (Jefferson, 2020; Lewinnek et al., 2022). Orange County is home to the Bolsa Chica Wetlands with 1,400 acres. This land's occupants included a gun club for wealthy Los Angelenos, U.S.

Army defense facilities, and oil wells. The land became a public recreation area after environmentalists won a contested court battle in 1889 (Lewinnek et al., 2022). Orange County recreation spaces are the product of a history that is anything but generic. Instead, the recreation spaces resulted from Orange County's immense growth in population, economic expansion, and evolving environment (Epting, 2011; Lewinnek et al., 2022; Orange County Historical Society, n.d.).

Statement of the Research Problem

Over the last 10 years, studies on recreation have shown the health benefits to communities because of access to parks and recreation spaces (Bocarro & Edwards, 2016; Hom, 2021; May, 2021; Mummert, 2021). Although these studies have aided in understanding the benefits of recreation, there has been a lack of investigation into the role of environmental attributes that include race and economic status (Wen et al., 2013). A study found that 10 urban American areas with the least access to parks had above-average poverty rates (Kane & Tomer, 2019). In California, Santa Ana has a poverty percentage of 13.9% and was ranked 95th in a park access study of the 100 most populated U.S. cities (The Trust for Public Land, 2016). Another Orange County city, Anaheim, has a poverty percentage of 13.8% and was ranked 64th in the same study. Santa Ana and Anaheim had the third and fourth highest poverty rates in Orange County. Race has not fared any better (Floyd & Stodolska, 2019). An emerging notion is that access to beneficial opportunities, such as recreation, can be directly connected to health inequalities (Babey et al., 2007; Gaskins & Pertillar, 2021; LaVeist et al., 2011). A strategic evaluation is necessary to comprehend the impact parks and recreation spaces have on a community.

Properly assessing the equity of parks and recreation spaces and their impact on their environment requires a dynamic approach (Dupre et al., 2016; Frerichs et al., 2016). A dynamic approach is necessary to understand "today's spatial patterns" of parks and recreation spaces (Wen et al., 2013, p. S25). Past studies have lacked depth. As of 2007, only 4.5% of studies on recreation dealt with race or ethnicity (Floyd & Stodolska, 2019). To fully comprehend the impact of equity, the researcher must understand that recreation is a multidisciplinary specialty. To properly evaluate, one must consider planning, geography, and sociology (Godbey et al., 2005). Scholars Stodolska and Floyd (2019) illustrated the problematic gap in recreation studies:

> The key for future leisure research, however, will be to expand the investigation in the ways in which discrimination in leisure contexts can be linked to public health —both directly through limiting people's use of recreation spaces and involvement in health-promoting behaviors, and indirectly through ecosystem degradation and perpetuating economic and social disparities. (p. 86)

The overlying goal of recreational research should be to close the long-standing gap between those who can recreate and those who cannot (Nesbitt et al., 1970).

A study of Orange County, CA's equity of parks and recreation spaces, race, and economic status would require the researcher to take a dynamic and local focus to evaluate correctly. This dynamic research can provide health implications to the Orange County community. This study explicitly targeted the relationship between recreational spaces and low socioeconomic and White populations. Unfortunately, recreation history has underserved low socioeconomic and non-White populations (Eskenazi, 2021; K. J. J.

Lee et al., 2020; Nesbitt et al., 1970). Scholars believe that rectifying health disparities is instrumental to public administrations (Dupre et al., 2016).

Purpose Statement

This study tested the place-based theory that posits geography is related to environmental variables. The geographical locations and dimensions of recreation spaces and their relationship with race and economic status of Orange County, California cities were applied to place-based theory in this study. The study evaluated the equity of recreation spaces in Orange County. Recreation research has been growing in recent years. There has been a considerable number of resources, attention, and studies dedicated to the implications of active living (Godbey et al., 2005). An essential addition to this research is the study of environmental variables and their influence on active living. Environmental research has had mixed results, with disparities in sociodemographics that are less than consistent (Duncan et al., 2013). The study compared the equity of recreation spaces with the racial and economic status makeup of cities in Orange County.

Research Questions

1. Is there a significant relationship between a communities' White populations and access to recreation spaces in Orange County, California?
2. Is there a significant relationship between communities of low economic status and access to parks and recreation spaces in Orange County, California?

Significance of the Problem

The specific problem examined in this study was whether the geographical placement of recreation spaces in Orange County affects the health equity of the cities

within the county boundaries. Recreation spaces include public facilities that afford free or low-cost recreational opportunities. Public facilities include state, county, and city parks and recreation facilities within Orange County. Recreation spaces include community centers, parks, playgrounds, designated green spaces, and more. Orange County has over 859 public recreation spaces for its over 3.1 million residents. Recreation resources disbursed equitably provide better overall community health.

Orange County residents may be significantly affected by the equity of its recreational spaces. Communities that lack recreational spaces are disadvantaged in public health because they are deprived of the countless benefits of parks and recreation (NRPA, n.d.-a; Watson et al., 2016). Parks and recreation have immense benefits to communities. These include a reduction of crime, increased cultural harmony, countless healthy initiative measures, and much more (Conejo Recreation & Park District, 2011). Regardless of race or economic status, parks and recreation spaces should be distributed efficiently and equitably so that all communities can reap the public health benefits. Inequity in recreation goes against the very nature of discipline of recreation (Allison, 2000; Crompton & West, 2008).

The problem is that historically, race and economic status of various communities have significantly influenced access and opportunities to recreation (Eskenazi, 2021; Hom, 2021; LaVeist et al., 2011; Penbrooke, 2017). If race and economic status influence recreation access and opportunities, the distribution of recreational spaces will be inequitable and biased. There is a need to expand on the study of environmental bias and its promotion or reduction of recreation in communities (Godbey et al., 2005). A

comprehensive examination of Orange County recreation spaces could illuminate a disparity in recreation spaces.

There has been a notion that there is a disparity in recreation spaces for non-White and lower economic communities regarding recreation spaces (Moore et al., 2008; NRPA, n.d.-d). A study of New York City found that poor neighborhoods had an average park size of 6.4 acres, but wealthy neighborhoods in New York City had an average of 14 acres. The study also found that the average park size for a predominately Black neighborhood was 7.9 acres while predominantly White neighborhoods had an average of 29.8 acres (Hu & Schweber, 2020). Although this notion has shown to be accurate in New York City and other communities, two contentions further facilitate analysis.

The first contention that further warrants geographical analysis of recreation spaces is that evidence of inequity because of environmental factors has not always been consistent. Scholars Wen et al. (2013) believed that race and social class, and recreation spaces "do not follow a straightforward inequality paradigm" (p. S21). Wen et al. urged for more research of spatial analysis of access to recreation spaces. The second contention coincides with the sentiments of Wen et al. that analysis of recreation spaces is incomplete (Floyd & Stodolska, 2019; Godbey et al., 2005; Wen et al., 2013). Prominent recreation scholars Floyd and Stodolska (2019) wrote, "While some of the topics examined by leisure researchers align with current issues, there is no way to conclude that our field is in a good position to adequately respond to the challenges of our times" (p. 89).

An examination of Orange County, California was intended to expand on the equity status of parks and recreation spaces concerning race and economic status. The study sought to fill several gaps in the field of recreation. The first gap is the need for more strategic analysis or recreational areas. Next, provide insight into how race and economic status correlate with recreation spaces in a significant community. Last, a proper analysis of equity can shed light on the health of a community and its needs for the future (Boone et al., 2009; Comer & Skraastad-Jurney, 2008). By illuminating inequities in a community, the ability to combat those deficiencies can be improved (Burrowes, 2020).

Definitions

Economic status. The study focused on two primary variables for economic status. The U.S. Census Bureau provided statistics for these variables. First is median household income. Included is income for the past 12 months and all income of those 15 or older in the household (U.S. Census Bureau, n.d.-b). The second is a percentage of the population living in poverty. The Census Bureau uses a threshold that determines who is in poverty. This threshold does not vary geographically (U.S. Census Bureau, n.d.-a).

Ecosystems. Professor John M. Gaus (2006) introduced ecosystems in public administration. Gaus used ecology, the interrelationship of living organisms and their environments, through a public administration lens (UKEssays, 2018). Gaus saw ecology or ecosystems as a product of the ground up. Location, physical and social technology, and other environmental factors create the dynamics of the people (Gaus, 2006). Ecosystems in this study looked at the dynamics of the people and environmental factors of Orange County and the cities within Orange County.

Environment. Environment is "the aggregate of social and cultural conditions that influence the life of an individual or community" (Merriam-Webster, n.d.-b).

Environmental justice. Environmental justice (EJ) refers to the fair treatment of all people regardless of ethnicity, income, education, race, and more. Policies, laws, and regulations should prohibit any population from bearing a "disproportionate burden of negative human-health impacts" (W. Taylor et al., 2007, p. S52). There have been two waves of EJ. The first EJ wave in the 1970s and 1980s and was committed to undesirable land use and local pollutants. The second was in the 1990s and 2000s and was a commitment to public design and health that promoted access to and quality of outdoor recreation (W. Taylor et al., 2007).

Equity zones. Equity zones are places deemed vulnerable, thus those most needing recreation spaces (Eskenazi, 2021). Cities using environmental data have been calculating areas in recreation spaces. Although the terminology may be different—in Chattanooga, Tennessee, it was fitness zones, and in San Diego, it was climate equity index, the purpose remains the same (Bostrom et al., 2017; City of San Diego, 2019). These places created a data-driven system of need prioritization for recreation spaces in a given area.

Gentrification. Mullenbach and Baker (2020) stated,

> Gentrification is a process of change and displacement of a lower wealth population by a higher wealth population (Atkinson, 2002). Displacement most often refers to the process by which residents are forced or choose to move from their homes to a different neighborhood. (p. 431)

The addition or improvement of recreation spaces have led to concerns about the possible negative impacts of gentrification (Rouse, 2018).

Health capital. Measuring health is a complex and multilayered notion (Cutler & Richardson, 1997). Scholar Michael Grossman (1972) described health capital as an individual's or community's ability to produce "healthy time" (p. 246). Grossman also illustrated that health capital can depreciate over time and there our external variables that can have positive or negative effects. The notion in this study is that access to recreational areas can influence health capital of communities.

Health equity. Health equity affords everyone access to be their healthiest (Gaskins & Pertillar, 2021). Health equity has been defined as "the absence of disparities in health (and in its key social determinants) that are systematically associated with social advantage/disadvantage" (Braveman & Gruskin, 2003, p. 256). It is important to note that equity does not mean equality. Equality focuses on treating all parties the same. Equity centers on all parties that have equal opportunities.

Physical activity (PA). PA is the exertion of energy by the skeletal muscles' movement of the body (Caspersen et al., 1985). It is important to note that PA has a positive relationship with health. PA can lead to the reduction of a multitude of ailments, including obesity, heart disease, diabetes, and more (Babey et al., 2007; Bedimo-Rung et al., 2005; Perez et al., 2015). Recreation spaces provide PA through incredibly accessible and cost-friendly opportunities (Bedimo-Rung et al., 2005; Chiesura, 2004; Kaczynski et al., 2008; Mowen et al., 2008; Penbrooke, 2017).

Place. Place is more than a geographic location. Place is viewed more dynamically, including location, locale, and a sense of place. Location is the physical

destination. Locale is the relationship between the people and the physical destination. Sense of place refers to the shared experiences and connections between the people and the area (National Geographic, n.d.). Place-based theorists Norton and Hannon (1997) believed space or scales of distinguishable and spatially subsystems formed place.

Race. Race refers to the grouping of people by physical differences. In this study, skin color is used to group race (Takezawa et al., 2020). Races include White, African American, Mexican American, Asian American, and non-White Hispanic.

Recreation spaces. Recreation spaces follows the definition of the U.S. Environmental Protection Agency (n.d.): "Recreational spaces would include land that is designed, constructed, designated, or used for recreational activities" (p. 1). Recreation spaces include community centers, playgrounds, parks, and other public facilities dedicated to recreation. Recreation spaces in Orange County, CA, were the only facilities analyzed for this study. Recreation spaces include city, county, and state parks and recreation spaces. Recreation spaces do not include private properties and nonprofit facilities. It includes school facilities that are listed on public agency websites because those agencies provide after-hours access. Studies often omit schools because no access is provided during nonschool hours (Boone et al., 2009).

Socioeconomic status (SES). SES "refers to one's current social and economic situation … it is relatively mutable" (Rubin et al., 2014, p. 196). Recreation studies often refer to high or low SES (Gordon-Larsen et al., 2006, K. H. Lee et al., 2019, Moore et al., 2008). The study used the U.S. Census Bureau's (n.d.-a) definition of poverty. The Census Bureau's definition does not mean all "low SES" references are referencing poverty. The poverty definition provided Census Bureau falls under low SES.

Organization of the Study

In the following chapters, the analysis of recreation spaces is developed and ultimately arrives at the conclusions and recommendations. Chapter 2 is an in-depth review of literature that presents the scholarly literature on parks and recreation. The literature review also illustrates the meaning and creation of a place-based approach to evaluation. Chapter 3 focuses on methodology. This quantitative study method evaluated the recreational opportunities within the cities in Orange County, CA. Chapter 4 presents the data and findings. Last, Chapter 5 provides a conclusion and recommendations for future research.

CHAPTER 2: REVIEW OF THE LITERATURE

History of Recreation and Recreation Spaces

Recreation or leisure has been around for ages. Ancient civilizations had various forms of recreation. The Egyptians partook in wrestling, gymnastics, lifting, ball games, music, drama, dance, and so forth. Ancient Greece flourished with culture and recreation. The wealthy were the main benefactors of recreation, but athletics were a part of the general population's daily life (McLean & Hurd, 2015). Aristotle held to the notion that leisure was a separate endeavor from labor (Jenkins & Pigram, 2003). The Romans participated in athletics as well. Romans were also planners. Thus, as they developed their towns, they incorporated facilities such as stadiums, parks, and assembly halls (McLean & Hurd, 2015). The Middle Ages saw large spaces explicitly created for the wealthy and hunting endeavors (Jenkins & Pilgrim, 2003). The Renaissance brought three significant types of parks: royal hunting preserves, ornate gardens, and garden parks (McLean et al., 2019). Recreation has been an instrumental part of past societies that carried on to America.

Early American life did not leave an abundant amount of time for recreation. The necessity of survival brought long working hours and religious demands that left little time or appetite for recreation. Recreation or leisure activities were looked upon poorly and, in some cases, prohibited or at least restricted by social constraints of the time. Even though it was primarily reserved for the upper class, Americans did carry over the European proclivity for recreation (McLean et al., 2019). In 1641, the Plymouth Colony passed the Greater Ponds Act. This act designated large bodies of water for public fishing and hunting. By the late 1800s, the United States created its first national park

(Jenkins & Pigram, 2003). America was growing a recreational foundation, but a major shift was on the horizon.

On the footsteps of the Industrial Revolution, recreation went through a significant change. Religion and social norms became more accepting of recreation as a positive tool for families and the working class. A period between the mid-19th and early 20th century saw four significant development spaces: adult education; national, state, and municipal parks; voluntary organizations; and last, playground movement (McLean et al., 2019). McLean and Hurd (2015) referred to the mid-19th through the early 20th century as the "recreation movement" (p. 41). The early 20th century saw the emergence of the Playground and Recreation Association of America, the National Recreation Association, and the National Park Service. By 1935, over 1,800 cities had public recreation programs (McLean et al., 2019). Local governments benefited from laws passed to provide them with the authority to install recreation programs. Recreation buildings quadrupled from 1925 to 1935. The upper echelon of society no longer had a monopoly on recreation. It was by then a prominent fixture in the middle class of American society.

As recreation evolved, its physical footprint in America changed as well. Natural settings and gardens became the primary focus of early recreation spaces. The 20th century brought the emergence of neighborhood parks, pools, athletic fields, and community centers (Walls, 2009). World War II also emphasized recreation, facilities, and programs (McLean et al., 2019). A well-known architect and leader in the park movement, Frederick Law Olmsted pushed for cities with large spaces for recreation (National Recreation and Park Association [NRPA], 2021). One of Olmsted's projects

included the creation of New York City's Central Park in 1859. Olmsted was also responsible for creating a 1,000-acre park system in Boston. Recreation and recreational spaces were on the rise.

Today, there are 423 national parks in the United States (Lower & Watson, 2021). California has 280 state parks alone (California State Parks Foundation, n.d.). New York City has more than 1,592 playgrounds (Statista, n.d.-a). Irvine, California, ranks eighth in the country in the number of recreation and senior centers, with one per 11,750 residents (Statista, n.d.-b). The recreation movement empowered municipalities and federal agencies to implement recreation and develop recreation spaces (McLean & Hurd, 2015).

Race, Economic Status, and Recreation

America's rocky past with race relations did not avoid recreation. From the late 19th century, Jim Crow laws loomed primarily over public spaces and facilities legalizing segregation. Jim Crow laws were statues initiated in the 1880s that promoted segregation between Blacks and Whites. The statues legitimized the segregation of schools, theaters, restaurants, public parks, and more. The result of Jim Crow laws often left non-White populations with inequities in facilities (Lagassé, 2021). In California alone, 17 Jim Crow laws were created between 1866 and 1947 to discriminate against Chinese Americans regarding their access to recreation spaces (NRPA, 2021).

The U.S. Supreme Court's ruling in *Plessy v. Ferguson* in 1896 created the doctrine of separate but equal. Separate but equal's ability to influence recreation was substantial (NRPA, 2021). This doctrine gave authorities the ability to separate services, and separation of recreation services was rarely equal. For example, in the 1920s, Los

Angeles pools allowed African Americans to swim only on the days before the pools were cleaned. African Americans in Southern California also had beach access that only included two limited places, Ink Well in Santa Monica and Bruce's Beach in Manhattan Beach (Wolcott, 2012). The manipulation of laws, rules, and regulations to discriminate was very apparent in recreation. African American sociologist Charles Johnson (1943) summed up discrimination in recreation when he wrote, "The ubiquitous color line in the United States thus traces a varied and complex pattern. It is less often seen and defined than discreetly or defiantly sensed by Negroes, and imperiously or indefinitely felt by whites" (p. 227).

In the 1900s, zoning and redlining emerged as another way to restrict access to recreation for minorities. Rules and regulations were created to reduce minority access to White neighborhood amenities (Aboelata & Bennett, 2021; NRPA, 2021). In the 1930s and 1940s, organizations and agencies that promoted recreation often discriminated against minorities and lower SES classes. Non-White neighborhoods were appraised to be unsafe; thus, home buyers were deprived of loans (Dickerson, 2021). Fear, hatred, and denigration of minorities were prevalent in recreation and legitimized by state and local laws (McLean et al., 2019). These initiatives reduced the equity of amenities in non-White communities.

Recreation equality and equity was challenged and improved throughout the 20th century, but growth was difficult. Professor and historian Victoria Wolcott's (2012) *Race, Riots, and Roller Coasters: The Struggle Over Segregated Recreation America* outlined countless challenges to discrimination of recreation facilities that culminated in violence and, ultimately, riots. Wolcott illustrated that Whites perpetuated recreation

segregation with violence or the threat of violence. In Pittsburgh in the 1930s, African Americans who defied discrimination and swam at the city's Highland Park pool were beaten by Whites. Wolcott also illustrated advocates for equity for recreation like the National Association for the Advancement of Colored People and student movement groups and had litigious success. They had their efforts challenged by subversion of the law by public officials, neglect and ultimately closing of facilities, privatization, and much more. Too often, communities of color and low SES have lacked the clout and resources to effectively challenge the lack of access to public amenities (Skelton & Miller, 2016).

The second half of the 20th century saw several acts to improve recreation equality (NRPA, 2021). The Civil Rights Act of 1964 prohibited discrimination in hiring, public accommodations, and funded programs. The act also increased voting rights and desegregated schools. It canceled out Jim Crow's legal authority. In 1972, Title IX of Education Amendments forbade discrimination based on sex in education programs and activities receiving federal financial assistance. The Community Development Block Grant Program was created and provides funding to economically disadvantaged communities. The Community Development Block Grant program has allocated over $100 million annually to park and recreation infrastructure. There was hope for recreation and race, but Walker (2009) noted that they are still subject to the ghost of Jim Crow. Wolcott (2012) believed the "virulent racism of massive resistance" of the pre-1970s has lost much of its luster (pp. 681–682).

Recreation has been shown to have a similar, less-than-fair relationship with communities of low SES (Scott, 2013). In the mid- to late 19th century, parks were

primarily in spaces where access was limited to those with means (NRPA, 2021). Unfortunately, the lack of public parks and recreation spaces in low economic communities has been true as providers have struggled to address deficiencies (Nesbitt et al., 1970). A study of communities of high SES found they have significantly more recreation facilities (Gordon-Larsen et al., 2006). In contrast, communities of lower SES and minorities were 50% less likely to have recreation facilities. In a 2004 study, Powell et al. found a relationship between higher SES and increased levels of access to recreational opportunities. Recent studies have illuminated a gap in equity of recreation and low SES that deserves exploration and illumination.

There is hope for the future despite recreation's rocky past with equity. A sign of possible growth and equitable services may have been best found in the dirt in Stonewall, Mississippi, in 2005 (Wolcott, 2012). Real estate developers discovered concrete coming out of the ground of the property they had purchased. Developers uncovered a well-crafted public pool. The pool was buried to prevent Blacks from swimming with Whites in the 1970s. The developers went on to reopen the pool for Stonewall communities and swimmers of all races. The Stonewall Mill Community Swimming Pool reflects the past and a glimpse of a better future. However, monumental change will likely come from the continued research and advocacy of groups like The City Project, the National Association for the Advancement of Colored People, and other stakeholders.

History of Recreation Studies

Recreation studies have significantly evolved like the recreation spaces' physical footprint. Early recreation studies primarily focused on elevating the quality of life of poor people, children, the elderly, and other disadvantaged groups (Godbey et al., 2005).

In the 1940s, the American institutions centered recreation curriculum on career development, therapeutic recreation, and outdoor recreation. The 1980s brought a shift in recreation studies into a dynamic understanding that viewed recreation through a social-psychological lens. This shift in recreation studies led to over 2 decades of more dynamic research, including an in-depth analysis of active living.

The 1990s ushered in a more in-depth analysis (Stodolska, 2018). The 1990s saw the first wave of the Environmental Justice (EJ) movement. This movement sought to bring about fair treatment and care for all people by creating and implementing laws, policies, and regulations (W. Taylor et al., 2007). The EJ movement had a significant impact on recreation studies. In 1992, the NRPA conducted a national study to evaluate American usage and perception of recreation services. In 1992, a comprehensive study evaluated recreation variables about users' age, education, community type, race, income, and gender (Pitas et al., 2015). The 1992 study addressed environmental variables such as distance to, dynamics of the participants of, and beliefs on the benefits of local parks. The NRPA's comprehensive evaluation of recreation variables and their social implications clearly showed that EJ was impacting studies on recreation.

The EJ movement pushed studies further when in 1994 President Clinton signed an executive order requiring every federal agency to develop strategies "that identifies and addresses disproportionately high and adverse human health or environmental effects of its programs, policies or activities on minority populations" (Clinton, 1994, p. 16). The first wave of EJ studies focused on variables and their correlation to undesirable land uses, including pollution, landfills, and refineries. Correlation is defined as "a relation existing between phenomena or things or between mathematical or statistical variables

which tend to vary, be associated, or occur together in a way not expected by chance alone" (Merriam-Webster, n.d.-a). One study found that 75% of landfills were found in African American communities despite African Americans only representing a quarter of the population (W. Taylor et al., 2007). The EJ movement brought together the environmental activist and the civil rights movements, two of the most meaningful undertakings, and EJ's impact on recreation studies was substantial (N. J. Johnson & Svara, 2011).

EJ had a second wave that moved the discussion from undesirable land uses to desirable community attributes. The EJ second wave included urban design, public health, and access to recreation (W. Taylor et al., 2007). The second wave was significant for recreation and its studies. The conversation was then about access and equal distribution of recreation spaces and services. Studies in the last 2 decades transformed from assessment of environmental disamenities to environmental amenities (Boone et al., 2009). A prime example is a 2006 study that found nationally that lower SES and high racial minority groups were less likely to have recreation facilities, but high SES had considerably higher chances of having recreation facilities (Gordon-Larsen et al., 2006). The EJ movement ignited recreation studies that are impactful and intentional.

Eminent recreation scholar and professor Monika Stodolska (2018) acknowledged that recreation studies have moved forward in the last 2 decades because of EJ. However, there is currently an opportunity and necessity for further EJ studies within recreation. Stodolska agreed with scholars W. Taylor et al. (2007), who said,

> PRS (parks and recreation services) appear to be amenable to EJ analysis, including documentation of a disproportionate burden and the need for fair

> treatment and meaningful involvement. Moreover, PRS represent an area of common focus among public health and parks and recreation researchers. (p. S54)

A study by Pitas et al. (2020) recreated the NRPA's 1992 nationwide study on usage and perception in recreation spaces to evaluate changes between 1992 and 2015. Although the study had many findings, results showed a growing difference among racial groups and recreation benefits. Pitas et al. concluded that further analysis in this area must continue to "paint a fuller picture" (p. 24). It is apparent that despite growing scholarly endeavors in recreation, there is a need for more.

Environmental variables of recreation have become more prevalent in research (Floyd & Stodolska, 2019; Godbey et al., 2005). Scholars Godbey et al. (2005) illustrated that recreation studies have shifted to a more comprehensive field by stating that "by definition, the study of leisure and recreation is multidisciplinary. Therefore, academic fields such as social and developmental psychology, planning, geography, sociology, anthropology, and kinesiology contribute to the field's scientific inquiry" (p. 156). Studies seeking to understand environmental variables and social factors are increasing and becoming more popular, but there is substantial room for more. Recent studies have lacked an emphasis on spatial relationships and environmental variables (K. H. Lee et al., 2019). Recreational studies are trying to catch up to the implications of recreations' vast impact, including the numerous recreational spaces across the country.

Despite the shift in recreation studies, there is still a growing demand for studies on recreation to explore race and SES. Even in academia, studies on race were largely ignored. In 2008, a review of five major journals on recreation or leisure discovered that only 8% dealt with race and 3% emphasized social justice (Floyd et al., 2008). Recent

studies have implicated that racism and discrimination are inadvertently perpetuated in recreation agencies, creating barriers (Allison & Hibbler, 2004). Studies on SES and recreation are on the rise and are showing results. In the 2000s, The City Project, a nonprofit legal and policy organization, researched and contested inequalities in park acreage in Los Angeles (Scott, 2013). The City Project ultimately led to over $41 billion in funding for underserved communities. Academia and the recreation profession desire future studies on recreation spaces and their relationship with race and SES.

As recreation studies have evolved, their commitment to understanding recreation benefits has remained. Recreation or leisure studies have been shown to have many physical and mental health benefits (Conejo Recreation & Park District, 2011). Thus, inequity in recreation leads to inequity in health. A significant focus of recreation studies is obesity and its rippling effects on health (Godbey et al., 2005; Gordon-Larsen et al., 2006; K. H. Lee et al., 2019; Powell et al., 2004; W. Taylor et al., 2007). The health benefits of recreation should not be taken lightly. The benefits of recreation are dynamic and diverse. Exercising for 20 min a week led to higher work production and fewer sick callouts (Mooney et al., 2002). Recreation promotes cultural diversity and harmony. People focus more on the recreation activity and less on the differences between those participating (California State Parks, 2005). The countless benefits make equity recreation an important social issue.

Studies have also shown a significant relationship between the location of recreation opportunities and health. A study found that people's proximity to public parks and tree-lined streets significantly impacted their life expectancy (Frumkin & Eysenbach, 2003). Similarly, K. H. Lee et al. (2019) found that the proximity of

recreation facilities increased participation in activities and reduced obesity. Although proximity is not the sole determining factor of participation in recreational activities, recreational spaces' access to and location is a critical piece of the health equity discussion on recreation. Studies on the benefits of recreation continue to be popular, but its value has increased with the growth of in-depth, sociopsychological lenses in recreation studies.

A Call for Place-Based Approach

As the recreation field has evolved, there has been a burgeoning demand for a place-based approach to research and studies (Morgan & Messenger, 2009; Stewart et al., 2003). Place-based approaches satisfy a desire for evaluation grounded in local views yet still considering environmental issues regarding regional, national, and global variables (Norton & Hannon, 1997). Scholar Sagoff (1988) believed environmental values should be mined from citizens and not customers. Scholars Norton and Hannon (1997) expanded on Sagoff's ideas when they hypothesized:

> We hypothesize that (a) environmental values are formed within a phenomenological space which is organized from some place and (b) that development of a full sense of place involves a recognition of the various scales on which one interacts with nature from that place. (p. 232)

Norton and Hannon saw an environment composed of scales interaction between the individual and the place. Recreation literature has regularly used researchers D. Williams and Roggenbuck's (1989) two-dimensional scale to gauge how one connects with place identity and place dependence. A place-based research dynamic and strategic approach to environmental analysis has made researchers look favorably upon it.

The place-based theory views environments through geographical locations (Brown et al., 2002). The place-based theory has two general hypotheses (Norton & Hannon, 1997):

- A scientific hypothesis relating the physical distance of an object from the point of domicile to intensity of value-judgements, and
- A social-scientific hypothesis that allows us not only to predict how people will value things, but also to measure changes in local preferences as a result of experiences in democratic formulation of management goals. (p. 231)

The place-based theory evolved from the idea of geographic discounting. This idea holds that land use of one's place hinders the preference for desirable variables to be close and less desirable variables to be further away. The place-based theory is also advantageous because it supports analyzing multiple levels of social and ecological environments, including relationships and influences related to their place (Floyd & Stodolska, 2019). The place-based theory fits the dynamic of a study that seeks to analyze and compare the place of recreation spaces with the race and economic status of the community.

Place-based research has been a part of outdoor recreation studies since the 1970s. This theory has been primarily reserved for place relationships to preserve outdoor recreational spaces (Wynveen et al., 2020). One cannot ignore the natural delineation of place and environmental variables of outdoor recreation spaces, such as national parks, forest reserves, and marine protected spaces. Researchers in the last 10 years have been identifying the traits of place-based research that made it effective with outdoor recreation spaces (Floyd & Stodolska, 2019; Godbey et al., 2005; K. H. Lee et al., 2019). Researchers see place-based approaches as a natural tool to understand the

multidimensional equity problem in recreation. The place-based approach allows the researcher to evaluate a location's equity regarding environmental variables like race or economic status. Scholars Floyd and Stodolska (2019) may have illustrated it best when they stated,

> The key for future leisure research, however, will be to expand the investigation of the ways in which discrimination in leisure contexts can be linked to public health —both directly through limiting people's use of recreation spaces and involvement in health-promoting behaviors, and indirectly through ecosystem degradation and perpetuating economic and social disparities. (p. 86)

Looking at all the cities of Orange County and their relationship with the distribution of recreation spaces will provide insight into the local communities' ecosystem.

Need for a Place-Based Study on Recreation Spaces in Orange County

Studying the correlation between recreation spaces and race and socioeconomic status could be predictable. Given the United States' rocky relationship with racial equality, one could assume that naturally, minorities and those of low SES would be relegated to fewer recreation spaces. However, the truth is that the relationship is more complex than that. Scholars conducted a study of spatial distributions of parks and green spaces in the USA found that inequalities in parks can be varying and inconsistent (Wen et al., 2013). Green spaces and their relationship with minorities and low economic status were more in line with perceived inequalities in rural settings. Green spaces were almost opposite correlated with minorities and low SES in rural settings. The inconsistencies among recreation spaces, when evaluated objectively, should not be surprising. It is a well-known notion among scholars that the development of public

spaces is often complex and subject to unexpected influences (Boone et al., 2009). Thus, the likelihood of recreation spaces in Orange County following a reliable country trend is unlikely or, at the very least, worth proving.

Recent Studies of Equity

Before the distribution of recreation spaces in Orange County is discussed, it is crucial to understand that communities across the nation are evaluating their equity. San Francisco, Denver, San Diego, and Austin have created equity offices within their municipal administration to better serve their community needs (City of Austin, n.d.; Hom, 2021; Mummert, 2021; Office of the City Auditor, City of San Diego [OCA], 2021). An equity audit in Parks and Recreation in San Diego unearthed a pivotal discovery in studying recreation. San Diego's Parks and Recreation could not evaluate equity properly because their primary data or feedback was from those only participating in programs (OCA, 2021). It is advantageous for studies of recreation to look beyond its own users when analyzing equity. Recent in-depth studies of equity of recreation spaces in Baltimore, Chattanooga, Denver, and San Diego were reviewed. These studies provide foundational knowledge to further investigative evaluations of equity and recreation spaces.

A study in 2009 by scholars Boone et al. of Baltimore, Maryland, provided insight into the equity of parks within the given region. Boone et al. (2009) used census data to evaluate the number of people per park area in a park service area. This evaluation yielded the park's potential congestion. The park service area was also evaluated over different income and racial clusters. The study found that African Americans had more access to parks, but Whites had access to large parks. SES followed a similar trend of

acreage associated with wealth. The scholars created a needs-based assessment based on a population under 18, over 65, and without a car in the household. Boone et al. assessed that Baltimore parks met park expectations for 70% of those in the highest need and 57% of those in the lowest need. The study of Baltimore was a strategic and dynamic approach to evaluating the equity of park distribution.

In the early 2010s, the city of Chattanooga, Tennessee partnered with the Trust for Public Land campaign Healthy Connected Chattanooga (HCC; The Trust for Public Land, 2016). The Trust for Public Land cooperated with the city to identify spaces available for recreation and identify "fitness zones" that could provide opportunities for populations in need (The Trust for Public Land, 2016, p. 5). The campaign created a formula for accessing needs that included population density, household income, age, and health indicators (Bostrom et al., 2017). The HCC found that Chattanooga's park system underserved 67% of the population. The HCC created an online data mapping system used by the city's administration and community partners to improve recreational opportunities. The HCC was an excellent example of geographical analysis of recreation spaces and the population's needs.

In 2021, scholars Rigolon and Németh conducted a Denver, Colorado, case study. Rigolon and Németh's (2021) approach was to create a foundation of knowledge of the distribution of parks and the historical events that influenced distribution (see Figure 1). The study found that White residents have better access and more acreage than populations of color. Acreage for populations of color has improved over time, but they are still lacking compared to the White population. The study found that between 1990 and 2015, larger parks were built primarily in White, affluent neighborhoods. Rigolon

and Németh used geographic information systems (GIS) data and Census in quantitative analysis. They also used secondary sources and interviews with planners and historians to conduct historical research. Rigolon and Németh's case study sought to expand on the geographical implications of parks and the historical makeup of parks to expand future equity conversations.

Figure 1

Distribution of Parks, Denver, CO

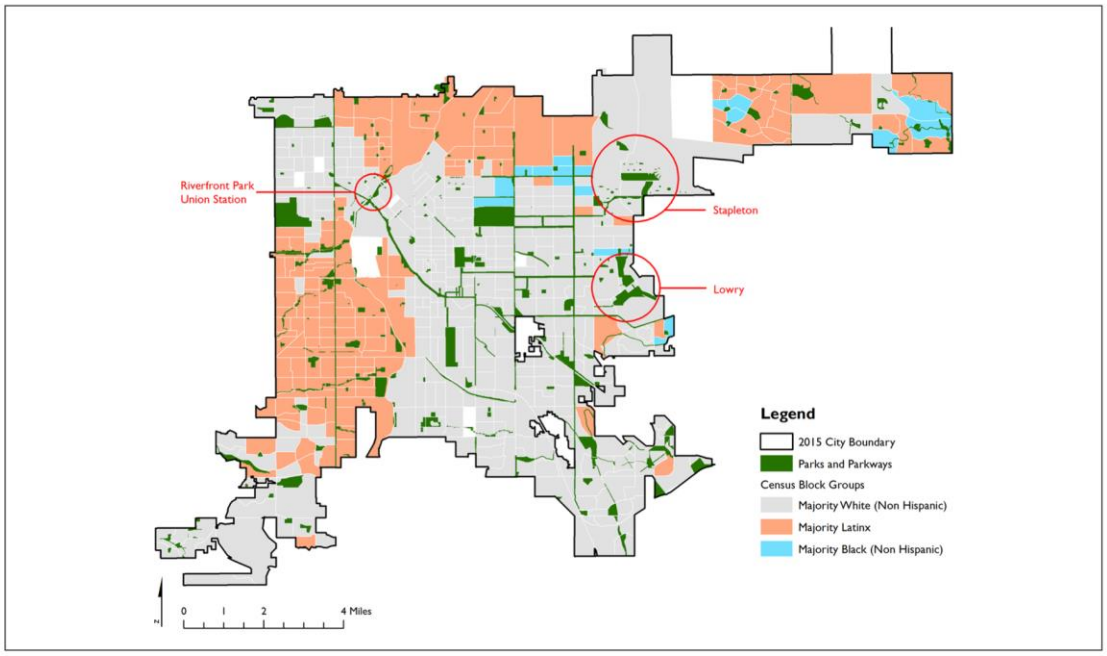


Figure 3. The distribution of parks in 2015.
Sources: United States Census Bureau (2016a) and City and County of Denver (2016).

Note. This image was created for an educational journal article on access to amenities in Denver. From "What Shapes Uneven Access to Urban Amenities? Thick Injustice and the Legacy of Racial Discrimination in Denver's Parks," by A. Rigolon and J. Németh, 2021, *Journal of Planning Education and Research*, *41*(3), p. 318. Copyright 2021 by Sage Publishing.

The last case study reviewed is a comprehensive evaluation of recreation in San Diego, California. In 2015, the City of San Diego's Climate Action created a strategy to

address EJ and social equity concerns (City of San Diego, 2019). They created a climate equity index (CEI) as part of this plan. CEI scored census tract based on 35 well-established indicators of equity. These indicators included mobility, health, housing, environmental, and socioeconomics. The results of CEI were impactful. Forty-eight of the 172 census tracts that have low opportunities were communities of color. Thirteen census tracts that had meager opportunities were communities of color. San Diego has since adopted a parks master plan with equity goals to improve access to historically underserved communities (City of San Diego, n.d.). Although the review of San Diego's recreation included programs and services, its facilities showed a significant inequity in recreation spaces by parks, fields, recreation centers, acreage, and square feet (Parks and Recreation Department, City of San Diego, 2019). OCA stated that San Diego's comprehensive evaluation of its recreation department was fueled by "making appropriate recreational investments in each community so that all communities can access and enjoy the same recreation benefits" (p. 5).

The studies conducted in Chattanooga, Baltimore, Denver, and San Diego provided foundational knowledge that is instrumental to a study on recreational spaces. All four studies used population density, population age, socioeconomics, and race data. For example, nonadults under 18 were consistently viewed as having a higher need for recreation. It is significant to note that the Chattanooga study did not specifically use race, but it used health indicators in which age and race were primary factors (The Trust for Public Land, 2016). All four of these studies provided data that can be used to flesh out inequities. This task is often tricky because inequities are obscure, depending on the

gauge used to measure (Boone et al., 2009). For comparisons, future studies can use Chattanooga, Baltimore, Denver, and San Diego.

The studies provided common elements for future analysis of equity of recreational spaces. The first common element is that the studies view recreational space equity through EJ and equity of public health view (Boone et al., 2009). The following commonality in the studies was that they used dasymetric maps. According to Mennis (2015), dasymetric maps are "aerial weighting … which exhaustively tessellates a region into nominal classes related to the distribution of the variable being mapped" (p. 117). For example, these dasymetric maps are used to show geographical locations of recreation spaces alongside population data (see Figure 2). Another common trend in the case studies was using a 10-min walkability standard for park access. Last, all four studies used data strategically. The studies illustrated gaps in recreational space distribution throughout their various communities and created a need-based metric among their populations.

Chattanooga, Denver, Baltimore, and San Diego are excellent resources for future evaluations. These studies were comprehensive. Differing parties also conducted the studies. These parties included municipal operations, nonprofits, and scholars (Boone et al., 2009; Bostrom et al., 2017; OCA, 2021; Rigolon & Németh, 2021). This is key because these various stakeholders with exceptional knowledge used common elements in their evaluations. The cultivation of strategic knowledge on recreational distribution is necessary to create a comprehensive evaluation of recreational spaces (Bostrom et al., 2017). A future study that uses these common elements would be justified in its pursuit

of understanding the equitable distribution of recreation spaces in a community because they have been cultivated by local and social science sources (Lihua, 2018).

Figure 2

Healthy, Connected Chattanooga Fitness Zones Map Analysis

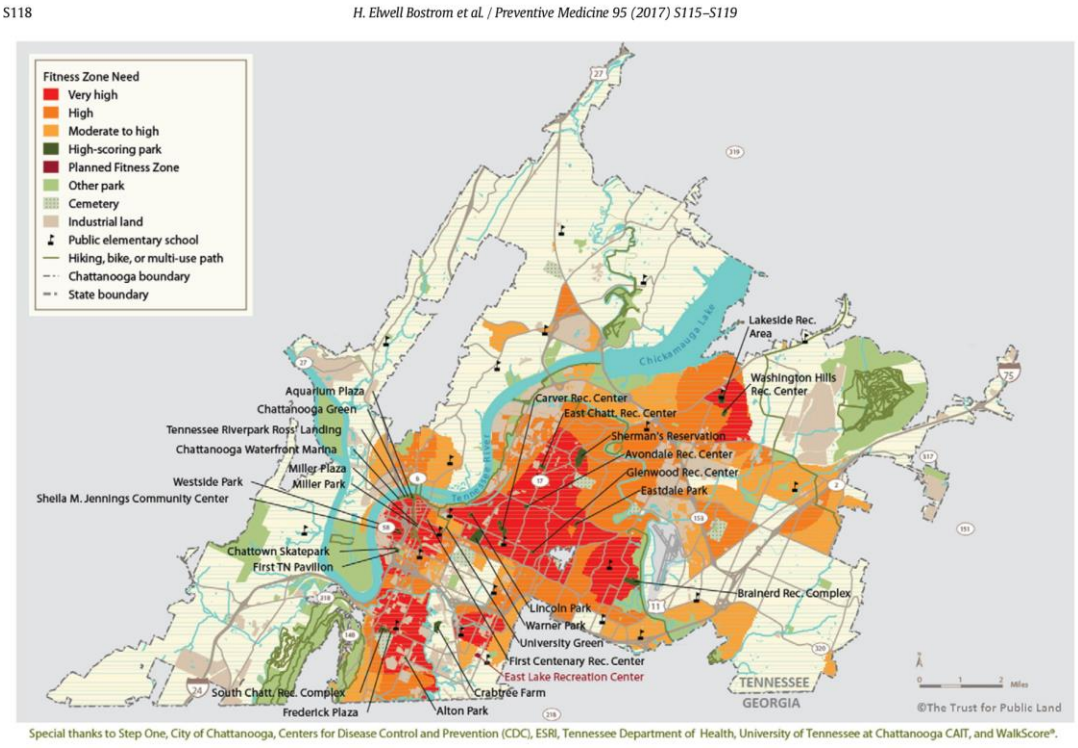


Fig. 1. Healthy, Connected Chattanooga Fitness Zone® map analysis.

Note. Dasymetric example from a study of recreation spaces in Chattanooga, Tennessee. From "Strategic and Integrated Planning for Healthy, Connected Cities: Chattanooga Case Study," by H. E. Bostrom, B Shulaker, J. Rippon, and R. Wood, 2017, *Preventive Medicine*, *95*(Suppl.), p. S118. Copyright 2016 by Elsevier Inc.

CHAPTER 3: METHODOLOGY

Purpose Statement

This study tested the place-based theory that posits geography is related to environmental variables. The geographical locations and dimensions of recreation spaces and their relationship with race and economic status of Orange County, California cities were applied to place-based theory in this study. The study evaluated the equity of recreation spaces in Orange County. Recreation research has been growing in recent years. There has been a considerable number of resources, attention, and studies dedicated to the implications of active living (Godbey et al., 2005). An essential addition to this research is the study of environmental variables and their influence on active living. Environmental research has had mixed results, with disparities in sociodemographics that are less than consistent (Duncan et al., 2013). The study compared the equity of recreation spaces with the racial and economic status makeup of cities in Orange County.

Research Questions

1. Is there a significant relationship between a communities' White populations and access to recreation spaces in Orange County, California?
2. Is there a significant relationship between communities of low economic status and access to parks and recreation spaces in Orange County, California?

Research Design

This quantitative study collected comprehensive community-based data on Orange County's recreation spaces, economic status, and racial makeup. The study followed the characteristics of quantitative research with its focus on a linear and

thorough collection of publicly available data. Quantitative research's commitment to data enhances objectivity and generalizations (Mertler, 2016). Scholar and professor Mertler's (2016) work provided an aspect of quantitative research that is uniquely significant to this study: "When conducting quantitative research studies, researchers seek to describe current situations, establish relationships between variables, and sometimes attempt to explain causal relationships between variables" (p. 109). Quantitative research allowed for the proper identification and collection of variable data in this study. The quantitative research followed the methodology of action research's cyclical and problem-solving aptitude (Gray, 2004).

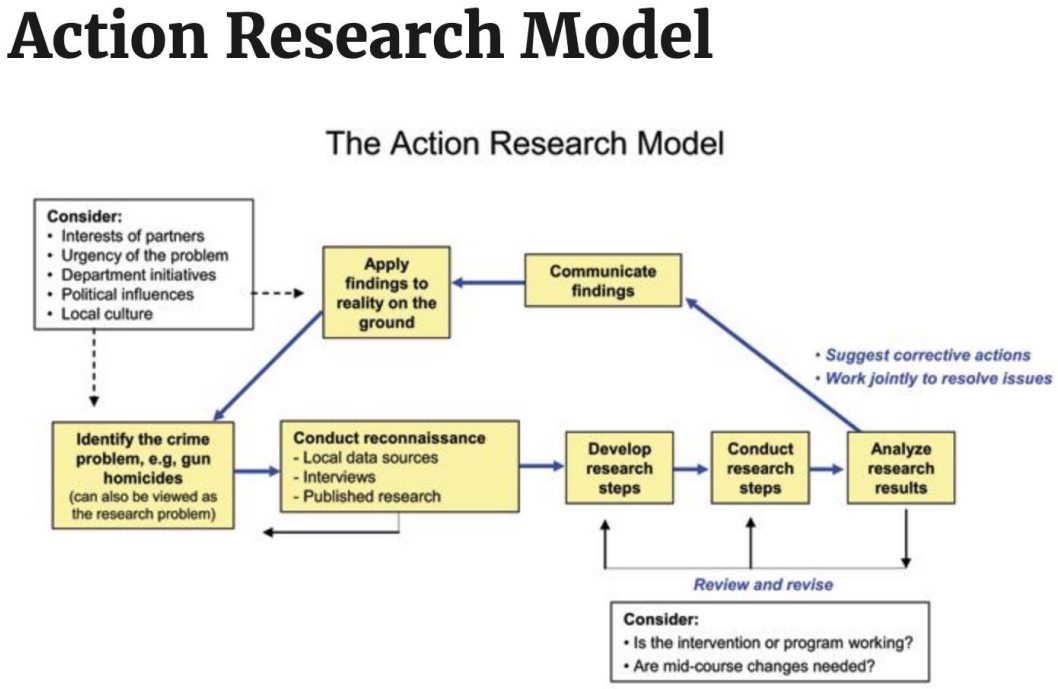
Action research uses cyclical organization to gather, analyze, and inform action to solve a problem (C. Taylor et al., 2006; Willis et al., 2014). This study used the action research model (ARM), or cycle outlined by the National Institute of Justice (NIOJ) (see Figure 3). The cycler nature of the model by the NIOJ allows the researcher to evaluate results and plans constantly. This is significant because action research is a living process (McNiff, 2013; Willis et al., 2014). The steps outlined in the action research model helped create a successful methodology for studying recreational spaces in Orange County. Action research provides a framework that improved the study's accuracy and effectiveness (Bostrom et al., 2017).

The ARM creates the necessary structure to satisfy the elements of a successful study on the equity of recreational spaces in Orange County:

- Identify the problem: The problem identified and evaluated was the inequity of recreational spaces, specifically regarding race and socioeconomic status.

Figure 3

Action Research Model Diagram



Note. Diagram of the action research model (ARM). From "The Action Research Model," by National Institute of Justice, n.d., p. 1 (https://nij.ojp.gov/media/image/19691). Copyright by U.S. Department of Justice.

- Conduct reconnaissance: The researcher collected community data on recreational spaces, socioeconomics, and race of Orange County. The researcher also used past case studies for foundational knowledge. Past studies included analyses of Baltimore, Chattanooga, Denver, San Diego, and more.
- Develop research steps: The researcher's reconnaissance created specific research steps. First, the researcher collected population data, including density, race, and socioeconomics. The researcher used census data to collect population data on each city in Orange County. The researcher analyzed the data to determine the strength of the relationship between variables. The researcher also collected the

number of recreational spaces and their size. The researcher used GIS and other resources to collect data on recreational spaces in each city in Orange County.

- Conduct research: The researcher implemented the research steps to acquire the necessary data. Like similar studies, the analysis omitted school facilities (Boone et al., 2009; Office of the City Auditor, City of San Diego [OCA], 2021; Rigolon & Németh, 2021; The Trust for Public Land, 2016).
- Analyze research results: The strength of the relationships between variables was determined. For example, are non-White areas less prone to having recreational areas? The research saw whether there were inequities or gaps in recreational spaces according to race and socioeconomics.
- Communicate findings: Correlational strength was calculated to identify the strength in relationships between recreation spaces and city populations. To successfully communicate findings, the researcher used dasymetric mapping similar to the Baltimore, Chattanooga, Denver, and San Diego studies. These maps provided a visual presentation of equity in Orange County.
- Apply findings to reality on the ground: After the equity of Orange County was analyzed, the researcher applied these results to health implications for their communities. The researcher used an abundance of secondary resources on the health implications of recreation spaces in Orange County.
- Consider: The ARM has a box in Figure 3 of items to consider. As the researcher applied findings, it was prudent to consider the study's limitations. At this juncture, the researcher outlined potential issues of contention within the study.

- Problem: Following action research and its circular nature, the researcher outlined implications for the future. These implications will provide potential future problems. These problems could begin a new action research cycle and invoke another study.

Identifying the Problem

Population

The researcher evaluated recreation spaces in a significant community in the United States. The researcher looked at the relationship between places and their distributed recreation spaces. In this study, places were ultimately cities. Cities provide a geographical delineation in which civic services and experiences reside. Individual cities use local codes, plans, and policies to govern land use and building development (Ziegler, 2007). The researcher evaluated recreation spaces of the 34 incorporated cities within Orange County, California.

Cities have various public recreation spaces, including state, county, and municipal. The United States now has 423 national parks and over 6,600 state parks (Bilis, 2022; Walls, 2009). A study found that Santa Ana, California alone had 330 acres of park land (Walls, 2009). That same study found that parks account for 10% of the total land area of an average city. The 20th century expanded recreation facilities beyond parks, including community centers, indoor facilities, swimming pools, and more. In a 2013 article, "The Geography of Recreational Open Space: Influence of Neighborhood Racial Composition and Neighborhood Poverty," Duncan et al. (2013) acknowledged that a limited number of studies investigated "spatial clustering of recreational facilities. These studies found significant positive spatial autocorrelation" (p. 625). Access to these

recreation spaces varies across the country. This study expanded on the conversation about the geographic equity of recreation spaces by examining Orange County, California and its relationship with the recreation spaces, including parks, playgrounds, and indoor facilities.

Sample

The study analyzed recreation spaces in cities in Orange County, California. Orange County is a significant community in California, home to over 3.1 million residents. The population comprises 39.8% White, 2.1% Black/African American, 21.7% Asian, and 34% Hispanic or Latino. Orange County has a median household income of $90,234, with 9.5% of the population living in poverty (U.S. Census Bureau, n.d.-b). If Orange County were a state, it would rank 30th in population in the United States (Infoplease, n.d.). Orange County has a significant population worthy of evaluation and educational exploration regarding recreational research.

Orange County comprises 34 incorporated cities covering over 790 square miles of Southern California (OC Parks, n.d.). Santa Ana, Anaheim, and Orange are Orange County's longest incorporated cities since 1888, and Aliso Viejo is the most recent, incorporated in 2001. Located within Orange County's cities are recreation spaces coordinated and developed by city, county, state, and local recreation departments. OC Parks is the county recreation department containing 60,000 acres of park land, open space, and shoreline (OC Parks, n.d.). An examination of Orange County's recreation spaces will expand the current discussion on the correlation between recreation spaces and race and economic status locally and nationally.

Conducting Reconnaissance

Instrumentation

This researcher collected comprehensive community-based data from public information-based sites. This information is readily available because of public sources. Orange County racial and economic data were collected from the U.S. Census Bureau. The U.S. Census Bureau (2017) is the federal government's largest statistical agency driven to be a premier provider of data on America's population. The U.S. Census Bureau (2021) invokes a strategic methodology to calculate the ever-changing dynamics of populations. Data collection on race and economic status were ultimately easier to collect because the Census Bureau has created an excellent tool for researchers.

As stated previously, the researcher used the foundational knowledge from similar studies. This included several key insights from the studies done on Chattanooga, Baltimore, Denver, and San Diego. Those studies investigated a population's density, income, and age. Age was critical because youth 18 years and younger yield a higher need for recreation spaces (The Trust for Public Land, 2016). These studies did not include public school facilities (Boone et al., 2009; OCA, 2021; Rigolon & Németh, 2021; The Trust for Public Land, 2016). Past studies on recreation have yielded consistent variables for a researcher to value when analyzing equity in a local area.

Recreation spaces followed a similar collection instrument because data are available to the public. The researcher created a spreadsheet to manage the inventory and size of the individual city's recreation spaces. Recreation agencies provided information on their facilities, parks, green spaces, and more on their public websites. The researcher searched local recreation agencies, cities, county, and state for recreation spaces.

Overall, data for this study relied on community-based data that were available via electronic sources. The study created an analysis of Orange County on a geographic scale, which is vital to studies on equity (Tian et al., 2013).

Developing and Conducting Research Steps: Data Collection

As outlined previously, publicly available online resources provided the necessary community-based data. The following are some key attributes of the data collection process.

Data on race and economic status were also collected through online public data sources. The U.S. Census Bureau has a website that affords direct access to pertinent data. The Census Bureau (n.d.-b) outlines its calculation for median household (see Appendix A). All data collected were organized by city to be comparatively analyzed. The study collected data on all 34 cities of Orange County's population density, race, and economic status.

Online community resources provide data on recreation spaces. City, county, and state recreation departments have their recreation spaces listed on their websites as they are used to guide the public. Many cities have created GIS that organize and efficiently present data. Public agencies also produce reports on the status of recreation spaces. A comprehensive inventory of recreation spaces was created using several online public agency resources.

It is instrumental that data are gathered in a timely fashion. Significant changes to parks and recreations spaces are unlikely, but in the spirit of accuracy, an efficient collection of data is advantageous. Parks and recreation spaces are generally improved or created based on the recreation department's funding, guidelines, and more. As a result,

significant changes to data in a reasonable amount of time are unlikely. For example, the City of Newport Beach (n.d.) each year identifies playground projects to improve in a year. Projects have to go through several steps, including planning, bid acquisition, inspection, and so forth. Last, project improvements are generally public and easily identified. The researcher intended to identify project improvements in data collection, improving accuracy. The researcher planned to collect data in a 3-month interval.

The next step was to analyze these variables to see whether there was a significant relationship. This step in the study followed the guidelines of correlational research. Correlational research seeks to discover the nature and strength of the relationship between variables (Mertler, 2016). Correlation does not mean causation, but it does allow the researcher to make predictions. In this study, the researcher measured each city in Orange County's racial makeup, economic constitution, and the number of recreational spaces. The study used a correlation coefficient to determine the strength and direction of the relationship. The idea was that correlational research would allow findings and lead to explanatory conclusions or implications of how the variables affect the communities. Recreation has been associated with many health benefits (Conejo Recreation & Park District, 2011). Therefore, the lack, surplus, or adequate number of parks and recreation spaces could have community health implications.

Analyzing Research Results: Data Analysis

As stated previously, this research was part of a correlation design. The results in economic and racial makeups of individual cities evaluated the strength and nature of these variables and their relationships with the prospective recreation spaces. Spearman's rank correlation coefficient method generates the correlation coefficient (r_s). This

method determines the correlation *r* value of the relationship. The range is from -1 to 0 to +1. The strongest associations are those close to + 1, with + being a positive correlation and - being a negative correlation. A 0 equals no correlation (R. Taylor, 1990). Spearman's rank is a nonparametric technique often used in geography and environment variables (Barcelona Field Studies Centre, n.d.). Spearman's is similar to Pearson's, but it functions on ranks and not raw data. A positive of this study will be Spearman's ability not to be influenced by distribution population (Gauthier, 2001). Spearman's rank provided the study with data on the relational strength of recreation spaces and Orange County cities.

As the relationships between city populations and recreation spaces were determined, the researcher identified areas of need or inequity. The study on Chattanooga identified areas of inequity as fitness zones (The Trust for Public Land, 2016). A study on San Francisco identified areas of inequity as simply equity zones (OCA, 2021). Ultimately, an equity map was created of Orange County that illustrates areas of need for recreation spaces. The equity map used indices from previous studies to provide a comprehensive outlook for Orange County. The equity map provided data that speak to the health implications of distribution of recreation spaces and makeup of the city populations.

Communicate Findings

The researcher created a table outlining each city within Orange County's population, the percentage of poverty, racial makeup, number of recreational spaces, total size, and correlation coefficients. An example of a similar table is listed in Figure 4 from a study on socioeconomics and racial differences in traffic-related metrics in the United

States (Tian et al., 2013). The researcher also created a dasymetric map similar to those created for Baltimore, Chattanooga, Denver, and San Diego (Boone et al., 2009; OCA, 2021; Rigolon & Németh, 2021; The Trust for Public Land, 2016). Figure 1 is an example of a dasymetric map. A dasymetric map and comprehensive table are crucial to communicating findings successfully. Maps and scientific analysis provide data that is digestible and useful (Comer & Skraastad-Jurney, 2008).

Figure 4

The Top 10 States With the Highest Correlation Coefficients of Traffic-Related Metrics With Racial/Ethnic and SES Variable

Table 3. The top 10 states with the highest correlation coefficients of traffic-related metrics with racial/ethnic and SES variables: (1) %Whites, (2) %Blacks, (3) %Hispanics, (4) %Poverty, (5) %Less than high school education, and (6) median household income.

Rank	State (1)	%Whites	State (2)	%Blacks	State (3)	%Hispanics	State (4)	%Poverty	State (5)	%Less than high school	State (6)	Median household income
Road density												
1	RI	−0.74	MN	0.78	RI	0.74	RI	0.70	SD	0.46	RI	−0.74
2	IN	−0.73	NE	0.76	NH	0.70	MA	0.56	ND	0.38	CT	−0.55
3	IA	−0.71	OR	0.75	CT	0.65	NJ	0.53	MT	0.27	NJ	−0.46
4	MN	−0.71	IA	0.74	AK	0.65	CT	0.52	AK	0.24	MA	−0.45
5	WI	−0.70	IN	0.72	MA	0.62	NY	0.40	NV	0.21	IN	−0.42
6	NH	−0.70	NH	0.72	WI	0.62	IN	0.40	VT	0.17	OH	−0.40
7	IL	−0.69	WI	0.72	NY	0.59	PA	0.38	RI	0.16	PA	−0.37
8	NE	−0.67	RI	0.71	IA	0.58	OH	0.37	UT	0.16	MD	−0.34
9	MO	−0.67	KS	0.68	MN	0.56	MD	0.35	NJ	0.14	VT	−0.31
10	MA	−0.65	AK	0.67	NJ	0.55	VT	0.34	CT	0.10	WI	−0.26

Note. An example of table using correlations and rankings. From "Evaluating Socioeconomic and Racial Differences in Traffic-Related Metrics in the United States Using a GIS Approach," by N. Tian, J. Xue, and T. Barzyk, 2013, *Journal of Exposure Science and Environmental Epidemiology*, *23*(2), p. 218 (https://doi.org/10.1038/jes.2012.83). Copyright 2013 by Springer Nature.

Apply Findings: Summary

Using a quantitative method, the study collected geographical community data on the cities within Orange County. That data included Census Bureau cultivated data on race and economic makeup of cities. The data also included searching online sources for

recreational spaces provided by the country, state, and local spaces. The idea tested these variables' strength and nature of the relationship with the number of recreational spaces within their city. The study then, drew observations on whether relationships exist between recreation spaces available and race and economics. By looking at the recreation spaces' locations, their size, and the community makeup, the equity of recreational spaces in Orange County is illuminated. Last, recreation space, population, and health implication data were used to assess the inferences for Orange County. Overall, the researcher sought to honor the steps of the correlation process to invoke success:

1. Identification of the topic/problem to be studied.
2. Review related literature.
3. Identification and selection of participants.
4. Speciation of the design and procedures for data collection.
5. Collection of data.
6. Analysis of data.
7. Answering research questions and drawing conclusions. (Mertler, 2016, pp. 121–122)

Orange County's statistical findings of geographic equity have further implications. The study looked at the implications this equity has on health. The researcher used the abundance of research on the geography of recreation spaces and health implications to make local conclusions on Orange County. Research has shown that geographical accessibility to recreation facilities is instrumental in promoting health (Bedimo-Rung et al., 2005; Sallis et al., 2006; Thompson et al., 2005). The data

cultivated by the study spoke to the equity of recreational spaces and the health of Orange County.

Considerations

Limitations

The study using correlation research brings out some limitations. The primary one is that data can be relatively simple. Simple data can lead to lackluster generalizations and implications. The higher the quality of data, the more reliable results, but data deficient in quality lead to unsatisfactory results (Mertler, 2016). Another limitation of correlational research is that it only illuminates a relationship. Correlational research cannot make conclude, especially conclusions on why a relationship exists (Gaille, 2020).

Another limitation was that the study only looked at race and economic status as variables. Although these variables are major contributors to the makeup of the communities, they may not tell the story in its entirety. Other factors could play a significant part in the equity of recreation spaces. Those could be the structure of the city government and their preferences. The history of populations could also explain shifts in recreational spaces. For example, a history whose foundation was as a commercial enterprise may not have the same emphasis as a city whose development was based around residential living. Places and communities are products of a multitude of layers; race and economics do make up significant variables.

The study was also limited to the geography and equity of recreational spaces. The number of facilities was directly related to the community's access to recreational spaces. The number and size of recreation spaces do not speak to the entirety of the

prevalence of recreation. The accessibility of parks, be it because of safety, hours of operation, and marketing of opportunities, play a significant role in recreational opportunities (Wan et al., 2020). A study of equity in parks of Orange County does not entirely represent the benefits and usage of recreational spaces.

The discovery of the square footage of recreation spaces was also a limitation of the study. Sources for square footage had contradictory results. Other recreation spaces did not provide square footage results, so the researcher had to use Google Maps to attain results. Square footage for indoor recreation spaces was even more challenging to discover. The researcher had to remove the square footage of indoor recreation spaces from the study because of an inability to attain results. Square footage proved to be a challenge for the researcher.

Last, a major limitation was that collecting data on recreation spaces was not uniform among cities. Although online content of public recreation spaces has vastly improved, there are still variations in its public access. Orange County cities all have their avenue for displaying their recreation spaces. This study did not involve privately run recreational spaces. Thus, it could have had an impact on cities' recreational spaces. The researcher needed to vet many resources for appropriately deemed recreation spaces.

Identifying the Problem

Although a study on the equity of recreation spaces in Orange County has implications, it could also lead to more questions. Questions brought out by the study will likely lead to identifying new problems, thus future studies. If a study on the equity of recreation spaces provides academic knowledge, it could illuminate a rising problem with addressing equity. Recreation organizations do not necessarily have the resources to

adequately address inequities in recreation spaces (Burns, 2016; Godbey & Mowen, 2010; Osborne et al., 2012). When the San Diego community researched equity in recreation, they then had to create solutions to those inequities (OCA, 2021). Like this study of Orange County, San Diego's study followed the ARM to provide knowledge and understanding that fostered repeated studies to provide further action (C. Taylor et al., 2006).

CHAPTER 4: RESEARCH, DATA COLLECTION, AND FINDINGS

Overview

Chapter 4 covers the study's execution of data collection, calculation, analysis, and findings for the cities of Orange County. Secondary public sources primarily provided the data, including city, county, and state websites. Public agency websites, general plans, news articles, tourism sites, and Google Maps supplied data on recreation spaces. For each city, person per outdoor acre, population per outdoor recreation spaces, and population per indoor recreation spaces were calculated using population data. Variables were then ranked. The study then used Spearman's rank correlation coefficient to determine the strength of relationships between recreation spaces and a community's White population and the population living in poverty.

Purpose Statement

This study tested the place-based theory that posits geography is related to environmental variables. The geographical locations and dimensions of recreation spaces and their relationship with race and economic status of Orange County, California cities were applied to place-based theory in this study. The study evaluated the equity of recreation spaces in Orange County. Recreation research has been growing in recent years. There has been a considerable number of resources, attention, and studies dedicated to the implications of active living (Godbey et al., 2005). An essential addition to this research is the study of environmental variables and their influence on active living. Environmental research has had mixed results, with disparities in sociodemographics that are less than consistent (Duncan et al., 2013). The study

compared the equity of recreation spaces with the racial and economic status makeup of cities in Orange County.

Research Questions

1. Is there a significant relationship between a communities' White populations and access to recreation spaces in Orange County, California?
2. Is there a significant relationship between communities of low economic status and access to parks and recreation spaces in Orange County, California?

Data Collection

The first data collected were county and city population data for Orange County. Population data were procured from the U.S. Census Bureau's website. The Bureau's data were based on the 2020 Census. The city data collected included population, persons under 18, percentage of White, Asian, African American, Hispanic, or Latino, and mixed-race persons, size, and population per square mile. To calculate poverty, the U.S. Census Bureau (n.d.-a) "uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty" (para. 1). The U.S. Census Bureau's (n.d.-c) racial data have two categories for White: "White alone, percent" and "White alone, not Hispanic or Latino, percent" (p. 1). For this study, researcher used White alone, not Hispanic or Latino. The study needed a clear delineation between the racial data. Last, the population data ranked the cities according to their results.

The researcher also collected the incorporation dates of all 34 Orange County cities. The Local Agency Formation Commission (LAFCO) of Orange County's website

provided data on the incorporations of Orange County cities. Orange County LAFCO (n.d.) "strives to ensure the delivery of effective and efficient public services such as water, sewer, public safety, and parks by local governments to Orange County residents" (para. 1). Incorporation data did not have initial direct usage, and the researcher felt that data might provide significant insight as data were analyzed. Orange County has had incorporations spanning 113 years, from 1888 to 2001.

It took 6 weeks to collect recreation area data in July and August of 2022. Collecting recreation area data for cities required a dynamic approach. Data collection proved to be a dynamic task that enlisted several sources of information. The primary information provider and dictator of the list of recreation spaces were the public websites of the city, county, and state recreation agencies. These websites included individual city recreation agencies, Orange County's OC Parks, and the California Department of Parks and Recreation. Another provider of data on recreation spaces was articles published by local news outlets, the *Orange County Register* (*OC Register*) and the *Daily Pilot*. Last and secondarily, were websites created for tourism and recreation enthusiasts that provided recreation area data.

It is important to note that the researcher created its recreation area lists from the city, county, and state public agencies' websites. There are recreation spaces that are absent from these websites. Recreation spaces excluded did not have public recreation agencies to direct support, including marketing, management, and directions. The researcher used public agencies to generate a list of recreation spaces that promoted cost-efficient recreation spaces for the general public. Some cities have public agencies that list school properties or parks in homeowners' association neighborhoods. Public

agencies listed these facilities because they provide management and, or access. This study focuses on recreation spaces where public agencies allocate public resources to promote, maintain, or provide access.

In collecting recreation area data, the researcher focused on collecting the number of outdoor recreation spaces, the number of indoor recreation spaces, and the acres of outdoor recreation spaces. Outdoor recreation spaces included parks, trails, athletic facilities, dog parks, skate parks, and more. Indoor recreation spaces included community centers, gymnasiums, event centers, and more. The researcher was also able to attain outdoor area acreage of recreation spaces. Unfortunately, the researcher could not attain the square footage of all the recreation facilities. Although not being able to discover the square footage of the indoor recreation facilities, the researcher still included the number of indoor recreation spaces because the number of areas available provides valuable information for a community's commitment to recreation. The researcher has found that past studies have often excluded indoor recreation spaces (Rigolon & Németh, 2021; Rosenberger et al., 2009; Volenec et al., 2021; Wen et al., 2013). The study focused on the number of outdoor recreation spaces, the number of indoor recreation spaces, and the acres of outdoor recreation spaces.

The researcher established a criterion for discovering the acreage of the outdoor recreation spaces. The first source for acreage information was the public agencies that provided acreage information. These searches included general city plans, facility inventories, commission reports, bid reports, and more. The researcher searched public documents for recreation data if acreage data were unavailable on a public agency's website. The researcher would look to local news outlets for articles on the recreation

spaces if public agency records or websites did not provide information. Local articles by the *Daily Pilot* and the *OC Register* often provide articles on creating or revitalizing parks, playgrounds, and athletic facilities. The next source was third-party websites that generated recreation area content for recreation enthusiasts, tourists, and community groups. The last resort for the researcher to discover acreage data was using Google Maps. Google Maps can trace property and provide acreage. The researcher used Google Maps and recreation area information to vet the boundaries of recreation spaces to the best of his ability. The researcher found the results to be reasonably accurate. The researcher noted those properties that used Google Maps tool to discover recreation area acreage so that later studies can improve upon the data collection.

Presentation and Analysis of Data

Presentation

Data were collected on population and recreation spaces on all 34 cities of Orange County. The variables initially collected were

- Incorporation year
- Population
- The percentage of population under 18 years of age
- The percentage of population in poverty
- The percentage of White population
- The percentage of Asian population
- The percentage of African American population
- The percentage of Hispanic or Latino population
- The percentage of mixed races population

- Size
- Population per square mile
- The number of outdoor recreation spaces
- The total acreage of outdoor recreation spaces
- The number of indoor recreation spaces.

Initial data were then used to calculate person per acre, population per outdoor recreation space, and population per indoor recreation space. Tables 1 and 2 present all of the data collected. Table 3 contains the recreation space specific data collected by the researcher. Table 4 displays the variables and their rankings. The researcher also chose to omit two cities, Villa Park, and Rancho Santa Margarita. Omitted cities' justification is described later in the study. Ultimately, data collected on 32 of the Orange County cities were then used in Spearman's rank correlation coefficient (r_s) to determine the statistical strength of the relationships between recreation spaces and the White population and poverty.

Overall Data Collection

Tables 1 and 2 show all the variables for the study's 32 cities of Orange County. All data remained essential to the study despite not being used in Spearman's equations. The data helped determine a path for the researcher. Initially, the study focused on whether communities of color and low social and economic communities had less access to recreation. When the data were collected, the more accessible and likely more accurate path was to look at the percentage of the White population's relationship with recreation spaces. The White alone, not Hispanic or Latino delineation in the Census Bureau's breakdown provided a clear delineation among races. The comprehensive population data also served as a reference point for potential insights, such as equity

zones, potential outliers, and others. Table 1 shows the comprehensive data used for Spearman's rank correlation coefficient and provides insight into Orange County and recreation spaces.

The study did omit two cities, and it is necessary to clarify the omission of Rancho Santa Margarita and Villa Park. Rancho Santa Margarita's privately owned recreation spaces led to its omission from the study (City of Rancho Santa Margarita, n.d.-b). Specifically, "Parks located within. The City of Rancho Santa Margarita are all privately owned and maintained by various homeowners' associations" (City of Rancho, n.d.-b). Rancho Santa Margarita contracts out its recreation programs at its local community Center to the Boys and Girls Clubs (City of Rancho Santa Margarita, n.d.-a). This study focused on the recreation spaces provided by public agencies.

The second city omitted from the study was Villa Park. Villa Park has the smallest population of the Orange County cities at 5,843 (U.S. Census Bureau, n.d.-c). Although size is not a disqualifier for the study, the relatively small size of Villa Park does reduce the impact omitting Villa Park would have on the study. Villa Park makes up 0.0018% of the Orange County population. The size was not the main reason for disqualifying Villa Park from the study. Villa Park does not have a recreation department or list of parks on their city website (City of Villa Park, n.d.). Villa Park's recreation is coordinated by a nonprofit that has worked with the city to support the city's only park (Villa Park Community Services Foundation, n.d.). Statisticians have removed outliers like Villa Park and Rancho Santa Margarita from studies when they are not a natural part of the population (Frost, n.d.). As stated previously, public agency websites determined recreation spaces because those areas are likely to be programmed and managed by

public resources. The researcher determined that Villa Park and Rancho Santa Margarita's lack of public agency supported recreation spaces made them unnatural members of the population, and thus, they were omitted.

Table 1

Orange County Cities' Population and Recreation Spaces Data

City	Incorporation yr.	Population	Under 18 %	Poverty %	White %
Aliso Viejo	2001	52,176	25.50	5.20	58.10
Anaheim	1888	346,824	23.50	13.80	23.90
Brea	1917	47,325	22.00	6.10	40.10
Buena Park	1953	84,034	22.30	10.30	23.60
Costa Mesa	1953	111,918	19.80	10.30	49.00
Cypress	1956	50,151	23.70	6.60	37.00
Dana Point	1989	33,107	17.40	4.80	73.70
Fountain Valley	1957	57,047	19.50	8.80	41.70
Fullerton	1904	143,617	23.10	12.70	33.80
Garden Grove	1956	171,949	21.40	12.90	18.70
Huntington Beach	1909	196,652	18.50	7.90	61.30
Irvine	1971	309,031	22.50	12.60	38.30
La Habra	1925	63,097	22.50	10.50	24.80
La Palma	1955	15,568	18.30	6.30	22.70
Laguna Beach	1927	23,032	16.00	6.20	83.60
Laguna Hills	1991	31,374	19.50	8.50	56.90
Laguna Niguel	1989	64,355	18.60	6.70	64.90
Laguna Woods	1999	17,644	0.30	11.40	71.10
Lake Forest	1991	85,858	21.80	6.50	51.80
Los Alamitos	1960	11,780	23.30	9.10	47.60
Mission Viejo	1988	93,653	20.10	4.80	62.10
Newport Beach	1906	85,239	16.70	6.90	77.90
Orange	1988	139,911	20.60	10.30	43.80
Placentia	1926	51,824	24.50	7.30	39.30
San Clemente	1928	64,293	22.60	5.20	73.20
San Juan Capistrano	1961	35,196	24.40	7.80	54.50
Santa Ana	1888	310,227	25.20	13.40	10.00
Seal Beach	1915	25,242	13.00	5.20	72.00
Stanton	1956	37,962	23.90	14.00	19.00
Tustin	1927	80,276	24.70	10.90	30.50
Westminster	1957	90,911	21.40	15.40	21.80
Yorba Linda	1967	68,336	23.30	4.60	56.50
Orange County		3,186,989	21.82	8.67	47.14

Table 2

Orange County Cities' Race Data, Size, and Population Per Square Mile

City	Asian %	African American %	Hispanic or Latino %	Mixed races %	Size	Population per sq. mile
Aliso Viejo	15.40	2.70	18.80	7.20	6.93	7,533.40
Anaheim	17.30	2.70	53.30	8.20	50.27	6,898.80
Brea	23.90	1.80	30.20	8.30	12.17	3,889.30
Buena Park	33.00	2.80	37.90	6.10	10.53	7,981.20
Costa Mesa	9.00	1.50	36.40	6.10	15.81	7,080.70
Cypress	36.80	3.10	18.70	6.30	6.61	7,583.70
Dana Point	3.90	2.10	16.30	4.60	6.49	5,102.80
Fountain Valley	36.60	0.40	16.60	6.90	9.07	6,288.20
Fullerton	23.90	2.20	36.80	7.20	22.42	6,406.00
Garden Grove	42.10	0.90	36.60	4.90	17.96	9,576.10
Huntington Beach	12.90	1.40	19.10	7.70	27.00	7,360.50
Irvine	43.60	1.50	10.70	7.00	65.61	4,689.40
La Habra	12.90	2.20	58.70	7.80	7.56	8,347.30
La Palma	49.20	4.70	20.00	6.80	1.78	8,748.50
Laguna Beach	2.90	0.50	8.20	4.70	8.89	2,589.60
Laguna Hills	15.50	1.60	20.90	7.50	6.55	4,791.40
Laguna Niguel	11.30	1.90	15.80	8.30	14.74	4,367.20
Laguna Woods	21.20	0.50	5.20	2.20	3.34	5,279.50
Lake Forest	18.10	2.20	23.20	7.50	16.71	5,136.90
Los Alamitos	14.30	5.30	27.50	10.00	4.01	2,938.40
Mission Viejo	13.90	1.10	18.50	8.50	17.66	5,303.40
Newport Beach	7.60	1.10	9.40	6.00	23.79	3,582.40
Orange	12.50	1.50	38.20	7.00	25.67	5,450.80
Placentia	16.20	2.50	38.30	8.30	6.61	7,837.90
San Clemente	5.10	1.10	16.10	6.60	18.36	3,502.60
San Juan Capistrano	3.60	0.70	37.30	7.50	14.43	2,439.10

Table 2 (*continued)*

City	Asian %	African American %	Hispanic or Latino %	Mixed races %	Size	Population per sq. mile
Santa Ana	12.10	1.00	76.00	5.70	27.34	11,347.40
Seal Beach	10.60	2.20	11.80	5.00	11.27	2,240.10
Stanton	27.30	1.60	49.20	7.10	3.100	12,241.90
Tustin	25.00	2.50	39.10	6.20	11.16	7,192.50
Westminster	51.30	1.10	22.90	5.60	10.05	9,056.70
Yorba Linda	20.70	1.20	18.00	6.00	19.95	3,424.70
Orange County	17.02	1.79	30.39	6.93	210.11	5,835.34

Note. Variable data driven from U.S. Census Bureau and secondary sources. In 2000, the census began allowing individuals to identify as more than one race. Individuals can identify as Hispanic, but Hispanic is defined as an ethnicity, not a race. Hispanics can thus choose other races. As a result of people being counted in multiple races percentages can add up to more than 100% of the population. Census data has six major races: White, Asian, American Indian/Alaska Native, Black or African American, Native Hawaiian and Other Pacific Islander, and Two or More Races. This study used the most prevalent Orange County groups for race and ethnicities data. See Appendix B for the Census Bureau's calculation of poverty percentage.

Calculated Variables

The researcher used collected data to create three variables that were then ranked. Spearman's rank correlation coefficient then used the cranked calculated variables. These three variables were person per outdoor acre, population per outdoor recreation spaces, and population per indoor recreation spaces (see Table 3). Dividing the total outdoor recreation acreage by the city's population yielded person per acre. Dividing the population by the total number of outdoor recreation spaces in a city yielded population per outdoor recreation spaces. Last, dividing the population by the number of recreation spaces generated the population per indoor recreation spaces.

Table 3

Orange County Cities' Recreation Spaces Info

City	Rec spaces outdoor	Rec acreage outdoor	Indoor rec spaces	Person per acre	Pop. per outdoor r_s	Pop. per indoor r_s
Aliso Viejo	2	4,507.70	2	0.090000000	26,088	26,088
Anaheim	64	888.71	6	0.002560000	5,419	57,804
Brea	19	632.24	1	0.013360000	2,491	47,352
Buena Park	15	220.23	3	0.002621000	5,602	28,011
Costa Mesa	36	624.52	4	0.005580000	3,109	27,980
Cypress	21	93.85	4	0.001871000	2,388	12,538
Dana Point	31	273.00	3	0.008246000	1,068	11,036
Fountain Valley	21	1,712.08	2	0.030012000	2,717	28,524
Fullerton	51	1,072.72	7	0.007469000	2,816	20,517
Garden Grove	20	151.48	6	0.000881000	8,597	28,658
Huntington Beach	82	2,367.15	8	0.012037000	2,398	24,582
Irvine	59	1,859.47	16	0.006017000	5,238	19,314
La Habra	23	135.02	1	0.002140000	2,743	63,097
La Palma	4	87.72	--	0.005635000	3,892	--
Laguna Beach	12	7,050.56	3	0.306120000	1,919	7,677
Laguna Hills	15	64.79	1	0.002065000	2,092	31,374
Laguna Niguel	26	4,856.83	2	0.075469000	2,475	32,178
Laguna Woods	2	1.46	-	0.000082748	8,822	--
Lake Forest	34	2,796.17	1	0.032567000	2,525	85,858
Los Alamitos	9	2,515.52	2	0.213542000	1,309	5,890
Mission Viejo	47	427.86	4	0.004569000	1,993	23,413
Newport Beach	35	4,864.68	5	0.057071000	2,435	17,048
Orange	27	28,776.08	1	0.205674000	5,182	139,911
Placentia	17	103.10	6	0.001989000	3,048	8,637
San Clemente	27	460.07	2	0.007156000	2,381	32,147
San Juan Capistrano	23	8,143.27	2	0.231553000	1,529	17,584
Santa Ana	45	346.60	12	0.001117000	6,894	25,852
Seal Beach	10	50.10	5	0.001985000	2,524	5,048
Stanton	8	33.91	2	0.000893000	4,745	18,981
Tustin	15	123.18	7	0.001534000	5,352	11,468
Westminster	22	95.01	1	0.001045000	4,132	90,911
Yorba Linda	35	449.90	3	0.006584000	1,952	22,779
Orange County	597	65,759.93	90	0.023780000	3,719	26,123

Rankings

Table 3 took all the data variables of the Orange County cities and ranked them. Cities were ranked first to 32nd. Regarding poverty or White percentage, the cities with the highest percentage ranked higher. The study generated rankings for all variables. In the end, the calculated ranked variables determined relationship strengths for the study: percentage of the population in poverty, the percentage of the White population, person per acre, population per outdoor recreation space, and population per indoor recreation space (see Table 4).

Spearman's Rank Correlation Coefficient

Spearman's rank correlation coefficient (r_s) was used to determine the strength of the relationship between the percentage of White and poverty population and recreation spaces. According to Barcelona Field Studies Centre (n.d.), Spearman's rank "has many common uses in geography including the analysis of changes in economic, social or environmental variables over distance along a transect line, or questionnaires with Likert scales" (para. 2). The coefficient r_s is calculated using formula in Figure 5.

Figure 5

Coefficient (r_s) Calculation

$$R_s = 1 - \left(\frac{6 \Sigma d^2}{n^3 - n} \right)$$

Note. Spearman's rank correlation coefficient formula. From "Spearman's Rank Correlation Coefficient R_s and Probability (p) Value Calculator," by Barcelona Field Studies Centre, n.d., p. 1 (https://geographyfieldwork.com/SpearmansRankCalculator.html). Copyright 2022 by Barcelona Field Studies Centre S. L.

Table 4

Orange County City Recreation Spaces Rankings

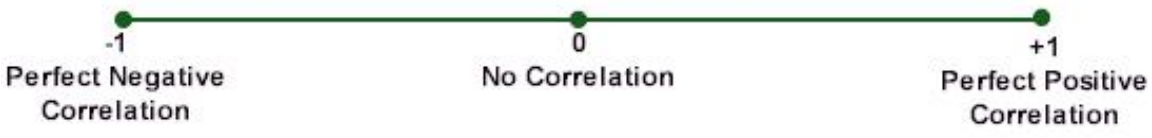
City	Poverty rank	White % rank	Person per acre rank	PPO rank	PPI rank
Aliso Viejo	29	10	5	32	17
Anaheim	3	26	21	27	26
Brea	26	19	10	13	25
Buena Park	13	27	20	28	19
Costa Mesa	11	15	18	20	18
Cypress	22	22	26	9	7
Dana Point	30	3	12	1	5
Fountain Valley	15	18	9	16	20
Fullerton	6	23	13	18	12
Garden Grove	5	31	31	30	21
Huntington Beach	17	9	11	10	15
Irvine	7	21	16	25	11
La Habra	10	25	22	17	27
La Palma	24	28	17	21	31
Laguna Beach	25	1	1	4	3
Laguna Hills	16	11	23	7	22
Laguna Niguel	21	7	6	12	24
Laguna Woods	8	6	32	31	32
Lake Forest	23	14	8	15	28
Los Alamitos	14	16	3	2	2
Mission Viejo	31	8	19	6	14
Newport Beach	20	2	7	11	8
Orange	12	17	4	24	30
Placentia	19	20	24	19	4
San Clemente	27	4	14	8	23
San Juan Capistrano	18	13	2	3	9
Santa Ana	4	32	28	29	16
Seal Beach	28	5	25	14	1
Stanton	2	30	30	23	10
Tustin	9	24	27	26	6
Westminster	1	29	29	22	29
Yorba Linda	32	12	15	5	13

Note. Orange County cities are ranked 1-32 based on their percentage of poverty, percentage of White population, person per acre, population per outdoor (PPO) recreation spaces, and population per indoor (PPI) recreation spaces. Villa Park and Rancho Santa Margarita are omitted. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

An r_s is between -1.0 and 1.0, and r_s of 0 signifies there is no correlation between the ranks (Barcelona Field Studies Centre, n.d.). Figure 6 shows the degree of strength of correlations.

Figure 6

Correlation Strength Scale



The strength of a correlation

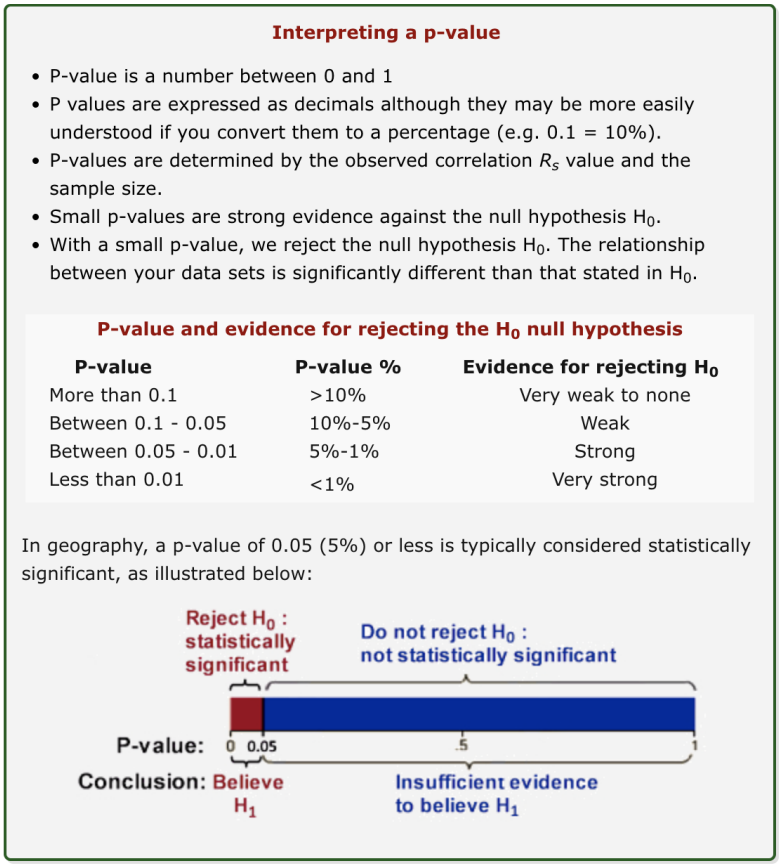
Value of coefficient R_S (positive or negative)	Meaning
0.00 to 0.19	A very weak correlation
0.20 to 0.39	A weak correlation
0.40 to 0.69	A moderate correlation
0.70 to 0.89	A strong correlation
0.90 to 1.00	A very strong correlation

Note. The strength of a correlation. From "Spearman's Rank Correlation Coefficient R_s and Probability (*p*) Value Calculator," by Barcelona Field Studies Centre, n.d., (https://geographyfieldwork.com/SpearmansRankCalculator.html). Copyright 2022 by Barcelona Field Studies Centre S. L.

To complete Spearman's evaluation, the *p* or probability was calculated to determine whether the correlation resulted from coincidence. If the *p* value is 5% or lower, it is considered vital (Barcelona Field Studies Centre, n.d.). Figure 7 displays the proper interpretation of the *p* value.

Figure 7

Interpreting a p Value



Note. Interpreting a *p* value. From "Spearman's Rank Correlation Coefficient R_s and Probability (*p*) Value Calculator," by Barcelona Field Studies Centre, n.d., p. 2 (https://geographyfieldwork.com/SpearmansRankCalculator.html). Copyright 2022 by Barcelona Field Studies Centre S. L.

The researcher conducted six different Spearman's evaluations. The first set of evaluations collected data for the rank of the percentage of the White population and the rank of three different recreation space variables in 32 cities within Orange County. The second set of evaluations collected data for the rank of the percentage of the population in poverty and the rank of three different recreation space variables in 32 cities within Orange County. Six individual Spearman's evaluations are listed as follows:

1. The percentage of the White population to the person per acre of outdoor recreation spaces.
2. The percentage of the White population to the population per outdoor recreation spaces.
3. The percentage of the White population to the population per indoor recreation spaces.
4. The percentage of the population in poverty to the person per acre of outdoor recreation spaces.
5. The percentage of the population in poverty to the person per outdoor recreation spaces.
6. The percentage of the population in poverty to the person per indoor recreation spaces.

It should be noted that if a city did not have outdoor or indoor recreation spaces, the city with the highest population would be the lowest rank. The notion is that the higher population had more people with less recreation. For example, La Palma and Laguna Woods did not have an indoor recreation space. Laguna Woods was ranked lower than La Palma because it had 2,076 more people.

Here are the results of the six Spearman's evaluations:

1. Spearman's rank correlation was computed to assess the relationship between percentage of the White population and the person per acre (PPA) of outdoor recreation spaces.

   There was a positive correlation between the two variables, $r_s(32) = .52$, $p = .005$.

2. Spearman's rank correlation was computed to assess the relationship between percentage of the White population and population per outdoor recreation space (PPORS).

   There was a positive correlation between the two variables, $r_s(32) = .59$, $p = .001$.

3. Spearman's rank correlation was computed to assess the relationship between percentage of the White population and population per indoor recreation space (PPIRS).

   There was a positive correlation between the two variables, $r_s(32) = .25$, $p = .20$.

4. Spearman's rank correlation was computed to assess the relationship between percentage of the population in poverty and the PPA of outdoor recreation spaces.

   There was a positive correlation between the two variables, $r_s(32) = -.47$, $p = .0064$.

5. Spearman's rank correlation was computed to assess the relationship between percentage of the population in poverty and PPORS.

   There was a positive correlation between the two variables, $r_s(32) = -.61$, $p = .0002$.

6. Spearman's rank correlation was computed to assess the relationship between percentage of the population in poverty and population per indoor recreation space (PPIRS).

   There was a positive correlation between the two variables, $r_s(32) = -.23$, $p = .1748$.

Calculations for these results can be found in Appendix D.

Summary of Correlations

Overall, data collection, calculation, and analysis yielded interesting results. All three Spearman's evaluations of the percentage of the White population and recreation spaces showed a moderate positive correlation. The stronger relationships were those that dealt with outdoor recreation spaces. Spearman's evaluations for populations in poverty and recreation spaces showed a moderate negative correlation. The *p* value for poverty per indoor recreation spaces was .1748. The data analysis indicated that the higher a community's poverty, the less access to recreation spaces. The analysis also displayed that the higher the White population in a community, the more access to recreation spaces. Ultimately, the analysis of the 32 cities of Orange County's recreation spaces yielded significant initial results, but there was more to be discovered.

Recreation Spaces and Race

The research showed a positive relationship between the percentage of the White population and recreation spaces in the cities of Orange County. The higher a community's White population, the higher the likelihood of larger recreation space acreage and number of outdoor and indoor recreation spaces. It should be noted that the indoor recreation spaces, although positive, were calculated to be weak (r_s value of 0.254). Spearman's rank correlation coefficient calculated the strength of the relationship, but it is important to examine further the data and the results. The race analysis and the distribution of recreation spaces in Orange County yielded noteworthy results.

The percentage of the city's White population showed a significant positive relationship with the area of recreation spaces occupied (see Table 5). The higher the

White population in the city, the larger the PPA. If a city was in the top 10 of White population percentage, then there was a 40% chance that they were in the top 10 for PPA. Laguna Beach had the highest percentage of the White population (83.6%) and ranked number one for PPA. There is no city with less than 40.10% White population in the top 10 outdoor PPA. Only two cities, Brea and Fountain Valley, are below Orange County's average White population (46.35%) in the top 10 for PPA (U.S. Census Bureau, n.d.-c). Fountain Valley and Brea are ranked ninth and 10th in PPA. The positive relationship a city's White population had on PPA is evident in the research.

Table 5

Orange County White Percentage and Acre per Person

City	Population	White %	White % rank	Acreage outdoor RS	PPA	PPA rank
Laguna Beach	23,032	83.60	1	7,050.56	0.306120000	1
Newport Beach	85,239	77.90	2	4,864.68	0.057071000	7
Dana Point	33,107	73.70	3	273.00	0.008246000	12
San Clemente	64,293	73.20	4	460.07	0.007156000	14
Seal Beach	25,242	72.00	5	50.10	0.001985000	25
Laguna Woods	17,644	71.10	7	1.46	0.000082748	32
Laguna Niguel	64,355	64.90	8	4,856.83	0.075469000	6
Mission Viejo	93,653	62.10	9	427.86	0.004569000	19
Huntington Beach	196,652	61.30	10	2,367.15	0.012037000	11
Aliso Viejo	52,176	58.10	12	4,507.70	0.090000000	5

Note. The table only ranks the top 10 cities based on the percentage of the White population. The table also shows where these cities rank according to PPA. RS = recreation space. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

It is also essential to analyze the opposite relationship of PPA with a city's White population (see Table 6). Does a lower percentage of the White population equate to a lower PPA? If a city is in the bottom 10 White population percentage, then there is a

60% chance they are at the bottom for PPA. The 13 lowest ranking cities in White population percentage are all in the bottom half of PPA outside of two: Irvine ranked 16th, and Fullerton ranked 13th. If a city's White population is below 40% the highest, it can rank in PPA 13th. Only two cities, Seal Beach and Laguna Woods, were in the top 10 for White population percentage (Seal Beach ranked fifth and Laguna Woods ranked sixth) and ranked in the bottom 10 for PPA (Seal Beach ranked 25th and Laguna Woods ranked 32nd). Laguna Woods and Seal Beach are cities worth exploring the thought of omitting them from the study. A private community, Laguna Village, makes up 90% of Laguna Woods (Zucco, 2016). Seal Beach is a small community of 7,552 acres in which 5,000 acres are occupied by a Naval Weapons Station Seal Beach (Seal Beach, California, 2022). Ultimately, cities with low White populations ranked lower in PPA.

Table 6

Orange County White Percentage and Acre per Person (Bottom 10)

City	Population	White %	White % rank	Acreage outdoor RS	PPA	PPA rank
Fullerton	143,617	33.80	25	1,072.72	0.007469	13
Tustin	80,276	30.50	26	123.18	0.001534	27
La Habra	63,097	24.80	27	135.02	0.002140	22
Anaheim	346,824	23.90	28	888.71	0.002560	21
Buena Park	84,034	23.60	29	220.23	0.002621	20
La Palma	15,568	22.70	30	87.72	0.005635	17
Westminster	90,911	21.80	31	95.01	0.001045	29
Stanton	37,962	19.00	32	33.91	0.000893	30
Garden Grove	171,949	18.70	33	151.48	0.000881	31
Santa Ana	310,227	10.00	34	346.6	0.001117	28

Note. The table only ranks the bottom 10 cities based on the percentage of the White population. The table also shows where these cities rank according to PPA. RS = recreation space. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

Orange County cities with smaller White populations often fall below the state's standard for acres of parkland per 1,000 residents. California's standard threshold is three acres per 1,000 residents. In California, 60% of residents do not live in tracts with three acres per 100 residents (California State Parks, n.d.). Orange County cities with low White populations fair even worse. This study added additional school properties that public agencies were managing to the total acreage. State Park research does not include these school grounds (California State Parks, n.d.). Essentially, this study afforded cities more opportunities for more recreation space acreage. Thirteen cities had less than three acres per 1,000 residents. Ten of those 13 cities had White populations below 40%.

The three cities that had over 40% White populations and below three acres per 1,000 residents were Seal Beach, Laguna Woods, and Laguna Hills. Nineteen of the 32 Orange County cities meet or exceed the standard. Cities that meet or exceed the standard include the city of La Palma (22.7% White), Irvine (38.3% White), and Fullerton (33.8% White). Overall, the larger the White population in a community, the more likely it will meet the state standard for acreage per 1,000 residents.

The total number of recreation spaces displayed a moderate positive relationship (r_s value of 0.5887) with Orange County cities. Interestingly, this relationship was significantly more robust with Laguna Woods removed from the study (see Table 7). Spearman's rank correlation was computed to assess the relationship between percentage of the White population and PPORS. There was a positive correlation between the two variables, $r_s(32) = .69$, $p = .00001$.

Table 7

Orange County White Percentage and Person Per Outdoor Recreation Space

City	White %	White % rank	Rec spaces outdoor	PPORS	PPORS rank
Laguna Beach	83.60	1	12	1,919.333	4
Newport Beach	77.90	2	35	2,435.400	11
Dana Point	73.70	3	31	1,067.968	1
San Clemente	73.20	4	27	2,381.222	8
Seal Beach	72.00	5	10	2,524.200	14
Laguna Woods	71.10	6	2	8,822.000	31
Laguna Niguel	64.90	7	26	2,475.192	12
Mission Viejo	62.10	8	47	1,992.617	6
Huntington Beach	61.30	9	82	2,398.195	10
Aliso Viejo	58.10	10	2	26,088.000	32

Note. The table only ranks the top 10 cities based on the percentage of the White population. The table also shows where these cities rank according to PPORS. RS = recreation space. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

Five of the top 10 in the White population were in the top for PPORS. Sixteen cities had White populations over the average Orange County (46.35%). Only three of those were not in the top half of PPORS. These include Laguna Woods, Aliso Viejo, and Costa Mesa. Los Alamitos ranks 16th in White population percentage (47.60%). The city of Orange ranks 17th in White population percentage (43.80%), but Orange's PPORS is nearly triple that of Los Alamitos. The larger the White population, the more likely the city will have more recreation spaces.

It is important to analyze how the smaller White populations performed with the PPORS (see Table 8). Six of the 10 least White cities were in the bottom 10 of PPORS. Out of 10 of the least White cities, none of them was in the top half of the PPORS. Only three cities in the bottom half of White populations ranked in the top half PPORS,

Fountain Valley (16th), Brea (13th), and Cypress (ninth). Los Alamitos faired the best because it was ranked 16th in the White population (47.60%) and second in PPORS. Overall, cities with small White populations had fewer PPORS, which contradicts past studies (Boone et al., 2009; Wen et al., 2013).

Table 8

Orange County White Percentage and Person Per Outdoor Recreation Space (Bottom 10)

City	White %	White % rank	Rec spaces outdoor	PPORS	PPORS rank
Fullerton	33.80	23	51	2,816.020	18
Tustin	30.50	24	15	5,351.733	26
La Habra	24.80	25	23	2,743.348	17
Anaheim	23.90	26	64	5,419.125	27
Buena Park	23.60	27	15	5,602.267	28
La Palma	22.70	28	4	3,892.000	21
Westminster	21.80	29	22	4,132.318	22
Stanton	19.00	30	8	4,745.250	23
Garden Grove	18.70	31	20	8,597.450	30
Santa Ana	10.00	32	45	6,893.933	29

Note. The table only ranks the bottom 10 cities based on the percentage of the White population. The table also shows where these cities rank according to PPORS. RS = recreation space. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

The percentage of the White population's relationship with indoor recreation spaces was positive but weak (r_s value of 0.254; see Table 9). Although this relationship is not surprising compared to other studies of indoor recreation spaces (McKenzie et al., 2013), it is worth acknowledging some overall findings. Four of the top 10 Whitest cities were in the top 10 for population per indoor recreation space (PPIRS). The top-ranked White city, Laguna Beach, ranked third in PPIRS. Four of the top 10 Whitest cities ranked in the bottom half of PPIRS, Aliso Viejo (17th), Laguna Niguel (24th), San

Clemente (23rd), and Laguna Woods (32nd). If the study removed Laguna Woods, the relationship's strength improves to 0.322. Four of the top 10 least White communities were in the bottom 10 for PPIRS. Overall, the percentage of the White population did not have the same correlation as it did with outdoor recreation spaces, but the results were still worth analyzing.

Table 9

Orange County White Percentage and Person Per Indoor Recreation Space

City	White %	White % rank	Indoor rec areas	PPIRS	PPIRS rank
Laguna Beach	83.60	1	3	7,677.330	3
Newport Beach	77.90	2	5	17,047.800	8
Dana Point	73.70	3	3	11,035.670	5
San Clemente	73.20	4	2	32,146.500	23
Seal Beach	72.00	5	5	5,048.400	1
Laguna Woods	71.10	6	0	0	31
Laguna Niguel	64.90	7	2	32,177.500	24
Mission Viejo	62.10	8	4	23,413.251	14
Huntington Beach	61.30	9	8	24,581.500	15
Aliso Viejo	58.10	10	2	26,088.000	17

Note. The table only ranks the top 10 cities based on the percentage of the White population. The table also shows where these cities rank according to PPIRS. RS = recreation space. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

The study clearly displays that there is a significant positive relationship between a city's White population and recreation spaces. If a city is in the top half of the Whitest cities, there is a 69% chance their rank in any of the recreation space variables is in the top half. These cities were all above the Orange County average of the percentage of the White population.

If the study removed Laguna Woods and Seal Beach, then cities in the top half of the White population percentage would have a 73% chance of ranking in the top of recreation space variables. Orange County's positive relationship between the White population percentage and recreation spaces displayed there is an equity issue with respect to recreation spaces.

The comprehensive data collected does afford the opportunity to see how non-White races fared in recreation spaces in Orange County. The largest non-White population in Orange County cities is Hispanic. Cities with a Hispanic population over 30% have a 30% chance that they rank in the top half of any of the recreation space variables. The Orange County Average Hispanic population percentage is 30.74%. The second largest non-White race in Orange County is Asian. The average percentage of the Asian population in Orange County city is 22.14%. Cities with an Asian population above the average have a 38.46% chance that they rank in the top half of recreation spaces variables. The African American population is relatively small in Orange County, with an average of 1.66% (U.S. Census Bureau, n.d.-a). As a result of the small African American population, the researcher is hesitant to make assumptions based on the minor degree differences. Overall, non-White populations appear to have a negative relationship with recreation spaces, but further analysis is warranted in future studies.

Recreation Spaces and Economic Status

The research showed that there is a negative relationship between the percentage of the population in poverty and recreation spaces in the cities of Orange County. The higher a city's population in poverty, the lower the likelihood of more significant recreation space acreage, number of outdoor recreation spaces, and indoor recreation

spaces. It should be noted that the indoor recreation spaces, although negative, were calculated to be weak (r_s value of 0.254). Spearman's rank correlation coefficient calculated the strength of the relationship, but it is important to examine further the data and the results.

Orange County cities with a more significant percentage of people in poverty consistently had less acreage of outdoor recreation space (see Table 10). The larger the city's poverty population, the lower it ranked in PPA. Six of the top 10 most impoverished cities ranked in the bottom 10 of PPA. The highest ranked of the 10 most impoverished cities ranked was Fullerton, which was ranked sixth with 12.7% population in poverty and was ranked 13th in PPA. Four of the top five impoverished cities ranked in the bottom five for PPA. If Laguna Woods were removed from the study, then those four of the top five impoverished cities would make up the bottom four ranked PPA. The average poverty percentage for Orange County is 9% (U.S. Census Bureau, n.d.-c). There are 16 cities that are above Orange County's average poverty percentage. Five of those cities rank in the top half of PPA, Los Alamitos (third), Orange (fourth), Fountain Valley (ninth), Fullerton (13th), and Irvine (16th). If an Orange County city is below the average poverty population, it has an 84% chance of being in the bottom half of PPA.

Those cities with a lower percentage of poverty generally performed better in PPA (see Table 11). Thirteen cities had a population of less than 7% of people in poverty. Nine cities with less than 7% poverty were in the top 16 for PPA. Cities below the county average for poverty had a 37.5% chance of being in the top quarter of PPA. Laguna Beach was ranked first in PPA and 25th in poverty percentage in Orange County. A city below the county average in poverty (8.4%) has a 34.3% chance of being in the

top half of PPA. Cypress had the highest ranking in PPA (26th) of a city below the county average for the poverty population. Cypress was one of only two Orange County cities with below-average poverty populations but ranked in the bottom 25% in PPA. Cities with low poverty percentages consistently had more outdoor recreation acreage for their citizens.

Table 10

Orange County Poverty Percentage and Acre per Person

City	Poverty %	Poverty rank	Acreage outdoor RS	PPA	PPA rank
Westminster	15.40	1	95.01	0.001045000	29
Stanton	14.00	2	33.91	0.000893000	30
Anaheim	13.80	3	888.71	0.002560000	21
Santa Ana	13.40	4	346.60	0.001117000	28
Garden Grove	12.90	5	151.48	0.000881000	31
Fullerton	12.70	6	1,072.72	0.007469000	13
Irvine	12.60	7	1,859.47	0.006017000	16
Laguna Woods	11.40	8	1.46	0.000082748	32
Tustin	10.90	9	123.18	0.001534000	27
La Habra	10.50	10	135.02	0.002140000	22

Note. The table only ranks the top 10 cities based on the percentage of the population in poverty. The table also shows where these cities rank according to PPA. RS = recreation space. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

Table 11

Orange County Poverty Percentage and Acre per Person (Bottom 10)

City	Poverty %	Poverty rank	Acreage outdoor RS	PPA	PPA rank
Lake Forest	6.50	23	2,796.17	0.032567	8
La Palma	6.30	24	87.72	0.005635	17
Laguna Beach	6.20	25	7,050.56	0.306120	1
Brea	6.10	26	632.24	0.013360	10
San Clemente	5.20	27	460.07	0.007156	14
Seal Beach	5.20	28	50.10	0.001985	25
Aliso Viejo	5.20	29	4,507.7	0.090000	5
Dana Point	4.80	30	273.00	0.008246	12
Mission Viejo	4.80	31	427.86	0.004569	19
Yorba Linda	4.60	32	449.90	0.006584	15

Note. The table only ranks the bottom 10 cities based on the percentage of the population in poverty. The table also shows where these cities rank according to PPA. RS = recreation space. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

The study's most robust relationship was between the percentage of the population in poverty and the number of outdoor recreation spaces per person or PPORS (see Table 12). The Spearman's calculated an r_s value of -0.607, a moderate negative correlation. No city in Orange County ranked in the top 13 for poverty was in the top half of cities in PPORS. Los Alamitos, Fountain Valley, and Laguna Hills are the only cities above the county's average poverty percentage population ranked in the top half of PPORS. The top 10 most impoverished cities of Orange County make up six of the bottom 10 in PPORS. Los Alamitos may be the best performer of cities with an above county average poverty. Los Alamitos is ranked 14th (9.1%) in the poverty population,

with PRORS ranking second. Overall, the more impoverished cities make up the lower-ranking PPORS.

Table 12

Orange County Poverty Percentage and Population per Outdoor Recreation Space

City	Poverty %	Poverty rank	Rec spaces outdoor	PPORS	PPORS rank
Westminster	15.40	1	22	4,132.318	22
Stanton	14.00	2	8	4,745.250	23
Anaheim	13.80	3	64	5,419.125	27
Santa Ana	13.40	4	45	6,893.933	29
Garden Grove	12.90	5	20	8,597.450	30
Fullerton	12.70	6	51	2,816.020	18
Irvine	12.60	7	59	5,237.814	25
Laguna Woods	11.40	8	2	8,822.000	31
Tustin	10.90	9	15	5,351.733	26
La Habra	10.50	10	23	2,743.348	17

Note. The table only ranks the top 10 cities based on the percentage of the population in poverty. The table also shows where these cities rank according to PPORS. RS = recreation space. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

Cities with a lower percentage of the population in poverty consistently performed better in PPORS (see Table 13). Cities below the county average percentage for poverty made up six of the top eight PPORS. The two cities not in the top eight of PPORS were Los Alamitos (9.1% poverty, second in PPORS) and Laguna Hills (8.5% poverty, seventh in PPORS). Three Orange County cities ranked in the bottom half for poverty ranked in the bottom half for PPORS. These cities include Aliso Viejo (29th in poverty, 32nd in PPORS), La Palma (24th in poverty, 21st in PPORS), and Placentia 19th in poverty, 19th in PPPORS). Yorba Linda, Mission Viejo, and Dana Point had poverty

percentages below 4%, and all three cities ranked in the top six for PPORS. The strength of the moderate negative relationship was only -0.093 from being strong, which is evident in the data.

Table 13

Orange County Poverty Percentage and Population per Outdoor Recreation Space (Bottom 10)

City	Poverty %	Poverty rank	Acreage outdoor RS	PPPORS	PPORS rank
Lake Forest	6.50	23	34	2,525.235	15
La Palma	6.30	24	4	3,892.000	21
Laguna Beach	6.20	25	12	1,919.333	4
Brea	6.10	26	19	2,490.789	13
San Clemente	5.20	27	27	2,381.222	8
Seal Beach	5.20	28	10	2,524.200	14
Aliso Viejo	5.20	29	2	26,088.000	32
Dana Point	4.80	30	31	1,067.968	1
Mission Viejo	4.80	31	47	1,992.617	6
Yorba Linda	4.60	32	35	1,952.457	5

Note. Table only ranks the bottom 10 cities based off the percentage of population in poverty. Table also shows where these cities rank according to PPORS. RS = recreation space. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

The relationship between a city's percentage of population in poverty and indoor recreation spaces was lowest (-0.2273) strength of the Spearman's coefficients calculated for the study (see Table 14). The moderated negative relationship is worth analyzing. Of the cities that were above the county average for poverty only six were ranked in the top half for PPIRS. Westminster (first in poverty) and Anaheim (third in poverty) continued to lack in recreation spaces as they finished 29th and 26th in PPIRS. Despite a weak

strength of relationship between poverty percentages of a city and PIRS, the results are still intriguing.

Table 14

Orange County Poverty Percentage and Population per Indoor Recreation Space

City	Poverty %	Poverty rank	Indoor rec spaces	PPIRS	PPIRS rank
Westminster	15.40	1	1	90,911.00	29
Stanton	14.00	2	2	18,981.00	10
Anaheim	13.80	3	6	57,804.00	26
Santa Ana	13.40	4	12	25,852.25	16
Garden Grove	12.90	5	6	28,658.17	21
Fullerton	12.70	6	7	20,516.71	12
Irvine	12.60	7	16	19,314.44	11
Laguna Woods	11.40	8	0	0	32
Tustin	10.90	9	7	11,468.00	6
La Habra	10.50	10	1	63,097.00	27

Note. The table only ranks the top 10 cities based on the percentage of the population in poverty. The table also shows where these cities rank according to PPIRS. RS = recreation space. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

The bottom half of cities ranked by poverty continued to show a negative relationship (see Table 15). Cities ranked 17th-32nd made up 10 of those in the top half of PPIRS. Four of those 10 ranked in the top five for PPIRS, Seal Beach (first), Laguna Beach (third), Placentia (fourth), and Dana Point (fifth). Seal Beach had one of the most significant differentials between its poverty rank (28) and its PPIRS rank (27th). Dana Point's differential between rankings was 25 spots, and Laguna Beach's differential was 22. Five cities with differentials of less than five spots had poverty percentages below

the county average. Cities with a low rank in PPIRS tended to have higher ranks regarding poverty rankings.

Table 15

Orange County Poverty Percentage and Population per Indoor Recreation Space (Bottom 10)

City	Poverty %	Poverty rank	Indoor rec spaces	PPIRS	PPIRS rank
Lake Forest	6.50	23	1	85,858.000	28
La Palma	6.30	24	0	0	31
Laguna Beach	6.20	25	3	7,677.330	3
Brea	6.10	26	1	47,352.000	25
San Clemente	5.20	27	2	32,146.500	23
Seal Beach	5.20	28	5	5,048.400	1
Aliso Viejo	5.20	29	2	26,088.000	17
Dana Point	4.80	30	3	11,035.670	5
Mission Viejo	4.80	31	4	23,413.251	14
Yorba Linda	4.60	32	3	22,778.670	13

Note. RS = recreation space. The table only ranks the bottom 10 cities based on the percentage of the population in poverty. The table also shows where these cities rank according to PPIRS. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia).

When it comes to poverty in Orange County cities, there is a negative relationship between recreation spaces. Poverty had its strongest relationship with the number of outdoor recreation spaces. This relationship is not surprising because a growing number of studies support similar findings (Abercrombie et al., 2008; Rigolon, 2016; Scott, 2013). Studies have also shown exceptions to these findings across the United States, and regional analysis is encouraged (Abercrombie et al., 2008). The acreage associated with a city's social economics also displayed a moderate negative relationship. Indoor

recreation spaces' relationship with poverty faired relatively less than outdoor recreation spaces variables.

Health Implications and Recreations Spaces

Although the discovery of the relationships between recreation spaces and poverty and race are significant, are they formidable enough to speak to the health implications of recreation spaces? Are there health implications to communities regarding the geographical locations of their recreational spaces in Orange County? One needs to analyze the geographical relationship between recreation spaces and key health variables, such as walkability, age of population, socioeconomic status, percentage of population with obesity, race, and more to answer this question properly (Beaty, 2020; Boone et al., 2009; Office of the City Auditor, City of San Diego [OCA], 2021; Rigolon & Németh, 2021; The Trust for Public Land, 2016). Previous studies of equity support the notion that there are health implications to environmental variables and the geographical locations of recreation spaces (Abercrombie et al., 2008; Babey et al., 2007; Bedimo-Rung et al., 2005; Boone et al., 2009; Bostrom et al., 2017). This study sought to extract significant environmental variables that have health implications and can illuminate the need for equity in recreation spaces in Orange County.

The first variable is how the economic status of a community or city impacts its health (Babey et al., 2007; Muilins-Cohen, 2014). This study has shown a relationship between a city's poor community and outdoor recreation spaces. The higher the percentage of poor, the lower the area and number of outdoor recreation spaces. Studies have shown that recreation spaces improve poorer neighborhoods' overall quality and health (Penbrooke, 2017). Poorer communities depend more on easily accessed

recreation spaces for health-benefiting physical activity (Scott, 2013). When recreation spaces are limited to poor communities, obesity and other health complications are more ubiquitous (Babey et al., 2007, Comer & Skraastad-Jurney, 2008). The connection between poverty and recreation spaces is even more substantial as America has been less than successful in providing recreation spaces for low socioeconomic communities. America continues to see an inequality trend (Scott, 2013). Unfortunately, those cities with lower socioeconomic standing are more likely to struggle with recreation space to provide healthy opportunities.

The study found that the higher the White population in a community, the more outdoor recreation spaces, and the larger the area occupied. Thus, cities that offer more recreation spaces will have more people participating in physical activity (Ball et al., 2001; Brownson et al., 2001; De Bourdeaudhuij et al., 2003; Humpel et al., 2002; Huston, 2003). Communities of color are at greater health risk because of a lack of physical activity. A lack of physical activity has been shown to have a relationship with limited recreation space access (Floyd & Stodolska, 2019; Wen et al., 2013). Although this study has not shown direct causation between health and recreation space access, it has shown that higher the White population the more access to recreation spaces. Thus, cities like Garden Grove and Westminster, with a lower White population, are less likely to have the recreation spaces of cities with larger White populations. This would disadvantage Garden Grove and Westminster for good health because of less access to recreation spaces.

Studies on recreation have shown that age is a variable connected to health and recreation spaces. People under 18 and over 65 benefit more from access to recreation

spaces (Muilins-Cohen, 2014). Adolescents are a population that needs physical activity, and access to recreation spaces as obesity has doubled for youth 12 to 19 years and tripled for youth 6 to 11 years old over the last 4 decades (Penbrooke, 2017). Over a quarter of the youth aged 12 to 15 in the United States do not get the recommended 60 min of daily exercise ("US Youth Should Get Moving," 2013). Older adults can reduce health complications that come with aging by being physically active (Goggin & Morrow, 2001). Only 33% of adults 65 years and older get enough consistent physical activity (CDC, 2005). Age impacts health, and its relationship to the access and locations of recreation spaces can be instrumental.

This study has explained walkability as a variable of access. Walkability means that residents can reach a recreation space in 10 min or less on foot (NRPA, n.d.-d). The study has not covered why this is important to health. Walkability to a recreation space has been shown to promote physical activity, thus improving health (NRPA, n.d.-d). When the public can access nearby green spaces, parks, or athletic fields, their social, physical, mental, and economic health is improved (Bedimo-Rung et al., 2005; Fenton et al., 2017; Perez et al., 2015; Rosenberger, 2009). Walkability is directly related to proximity. When the state parks are calculating walkability, they look at those within a half-mile zone around a park. California has nearly nine million people living outside a half-mile radius of a park (California State Parks, n.d.). Those who lack walkability are missing out on the health benefits of being close in proximity to a park.

All of these environmental variables related to recreation spaces have health implications. Recreation spaces have been shown to mental health implications including improved moods, lower anxiety, and reduce depression (Bedimo-Rung et al., 2005;

Orsega-Smith et al., 2004; Perez et al., 2015). Recreation spaces also improve the health equity of a community by improving the social quality (Perez et al., 2015; Volenec et al., 2021). The economic health of a community benefits from recreation spaces (Boone et al., 2009; NRPA, n.d.-c). Recreation spaces have shown to reduce a family's expenditures on health care (Rosenberger et al., 2009). Studies have shown that recreation spaces have a positive impact on property value and housing prices (Mullenbach & Baker, 2020, Rouse, 2018). With all the benefits of recreation the question becomes, "Is there a way to see whether there are local health implications to Orange County's recreation spaces distribution?"

Equity Mapping Orange County

In the spirit of being comprehensive and the cyclical nature of action research, this study looks more thoroughly at the geographical locations and health implications of recreation spaces in Orange County's cities. The idea is that action research delves into the question or problem stated. As action research appraises the research results, it can enact another cycle of action research to further problem solve (Willis et al., 2014). In response to the health implications of recreation spaces, the study created an equity map of recreation spaces in Orange County to better serve the study. An equity map would display variables that have implications of a geographical nature in Orange County.

The creation of an equity map for the study helped the efficacy of the study's commitment to communicating the findings. To communicate the findings properly, the creation of a dasymetric equity map essentially required another micro-ARM on the creation of equity map. The action research needed to create followed the earlier model in Figure 3: identify the problem, conduct reconnaissance, develop research steps,

conduct research steps, analyze, communicate, and apply the findings. The creation of a quality equity map of recreation spaces improved the validity of the overall findings.

Identifying the Problem

The problem in creating an equity map of recreation spaces in Orange County cities is the notion of creating a map that has validity. Race, poverty, and distribution of recreation spaces are essential variables to an equity map. Looking at past studies that have created an equity map, the researcher looked for common environmental variables or indices that speak to equity. These studies have found variables that communicate an equitable need based on the variable's health implications with recreation spaces (Beaty, 2020; Bostrom et al., 2017; Comer & Skraastad-Jurney, 2008; OCA, 2021; San Francisco Recreation & Parks, 2020). By analyzing past equity maps, one realizes the need for more variables than race, poverty, and distribution of recreation spaces.

Conduct Reconnaissance

Past equity maps have used many variables to create proper equity maps. An equity study on Chattanooga, Tennessee, used data on its park system that included local, state, and federal agencies and created a demographic profile to create fitness zones. The Chattanooga study used several variables in creating fitness zones, including walkability, population density, percentage of the population 19 years old and younger, household income, and more (Bostrom et al., 2017). A study by San Francisco Recreation & Parks (2020) used 10 disadvantaged characteristics to create equity zones. The characteristics were broken down into two categories. The first was sensitive population indicators, including asthma, cardiovascular disease, low birth weight, age (youth and seniors), and non-White. The second category was socioeconomic factors, which included linguistic

isolation, poverty, unemployment, educational attainment, and housing burden. The city of San Diego created a CEI map based on an index of grouped indicators. These indicators included environment, health, housing, mobility, and socioeconomics (City of San Diego, 2019). Another study by Denver Parks and Recreation scored indicators that included park access, park investment, park acres, density, race, youth, low income, and obesity (Beaty, 2020). In reviewing past studies on equity, the researcher clearly found that other indicators would be necessary to create a substantial equity map of recreation spaces in Orange County.

Develop Research Steps

After reviewing past equity maps and indices, the researcher selected variables or indices to create an equity map of Orange County. The first variable was the percentage of a city's population in poverty. This research and past studies showed a correlation between lower socioeconomic communities having less recreation (Aboelata & Bennet, 2021; Scott, 2013; T. G. Williams et al., 2020). The next index used in the mapping was residents under 18 years old. Youth has been a reoccurring factor in studies of equity and recreation (Beaty, 2020; Bostrom et al., 2017; San Francisco Recreation & Parks, 2020). Next, residents over 65 were included in the index. Like youth, older citizens have been identified as a population that needs and benefits from recreation spaces (Bostrom et al., 2017; San Francisco Recreation & Parks, 2020). Walkability was the following index added. Walkability has been constant throughout recreation studies on equity. Walkability consistently appeared in research as residents being within a 10-min walk to recreation space (Boone et al., 2009; May, 2016). The California State Parks' (n.d.) park access tool provided walkability data. The California State Parks data for walkability

differed from the researchers because their data omitted all school facilities. The researcher ultimately decided to use the tool because it was a consistent and valid recreation index for cities. Literature has consistently found that children, the elderly, and low-income communicates have the strongest need for close proximity recreation spaces (Boone et al., 2009). The last three indices added are of Orange County cities' recreation spaces rankings: PPORS, PPIRS, and PPA.

The indices selected for the equity map were the percentage of population in poverty, residents under 18, residents over 65, walkability, PPA rank, PPORS rank, and PPIRS rank. A scoring method for the indices needed to be created. The researcher took the indices' ranges and broke them into equal intervals. The researcher felt this was the best method because equal interviews are best for familiar data ranges, such as percentages (Esri, n.d.). Indices were placed into four intervals. The intervals were assigned scores of 1, 2, 3, and 4. The higher the score, the more that variable was in need of recreation space. For example, the higher the percentage of 18 years old and younger residents, the higher the score.

Analyzing Research Steps

To attain scores for each variable or index, the researcher looked at the individual ranges and then divided them into quarters. For residents under 18, there was a range from 0.3% of Laguna Woods to 25.5% of Aliso Viejo. The range scored as follows: 1 point for 0.3% to 6.6%, 2 points for greater than 6.6% to 12.9%, 3 points for greater than 12.9% to 19.2%, and 4 points for greater than 19.2% to 25.5%. The poverty percentage range for Orange County cities went from Yorba Linda at 4.6% to Westminster at 15.40%. The range for poverty scored 1 point for 4.6% to 7.3%, 2 points for greater than

7.3% to 10.0%, 3 points for greater than 10.0% to 12.7%, and 4 points for greater than 12.7% to 15.4%. The range for over 65 years old went from Aliso Viejo at 8.5% to Seal Beach at 41.7%. The range for 65 years old scored as follows: 1 point for 8.5% to 16.8%, 2 points for greater than 16.8% to 25.1%, 3 points for greater than 25.1% to 33.4%, and 4 points for greater than 33.4% to 41.7% and higher. Laguna Woods had a uniquely high poverty percentage of 85.4% because of the city being primarily made up of senior community. In effort to not skew the range, Laguna Woods was excluded from the range but still given a score of 4 points for its over 65 population percentage. The range for walkability went from La Palma, with 0% of residents living further than a half mile from a park to Garden Grove at 28%. The range for walkability scored as follows: 1 point for 0% to 7%, 2 points for greater than 7% to 14%, 3 points for greater than 15% to 21%, and 4 points for greater than 21% to 28%. The last indices scored were the rankings of the cities concerning the recreation space-specific variables. The range scored as follows: 1 point for ranking 1 to 8, 2 points for ranking 9 to 16, 3 points for ranking 17 to 24, and 4 points for ranking 25 to 32. The recreation spaces were all scored individually. Tables 16 and 17 show the results of the scores.

Communicate Findings

The highest score and those cities in most need of recreation spaces were Anaheim (23), Garden Grove (23), and Buena Park (22). The lowest scores were Laguna Beach (11), Dana Point (11), and Newport Beach (12). The cities scored into one of four equity zones based on their scores. The top scoring (19.76-23) cities were in the equity zone with the most need for recreation spaces. The lowest scoring (11-13.25) cities put

Table 16

Orange County Equity Map Scoring Variables

City	Under 18%	Poverty %	White %	PPA rank	PPORS rank	PPIRS rank	Walkability %	Over 65%
Aliso Viejo	25.50	5.20	58.10	5	32	17	2	8.5
Anaheim	23.50	13.80	23.90	21	27	26	14	11.8
Brea	22.00	6.10	40.10	10	13	25	16	15.0
Buena Park	22.30	10.30	23.60	20	28	19	20	14.3
Costa Mesa	19.80	10.30	49.00	18	20	18	3	11.9
Cypress	23.70	6.60	37.00	26	9	7	1	15.7
Dana Point	17.40	4.80	73.70	12	1	5	2	20.4
Fountain Valley	19.50	8.80	41.70	9	16	20	5	20.3
Fullerton	23.10	12.70	33.80	13	18	12	5	13.2
Garden Grove	21.40	12.90	18.70	31	30	21	28	14.1
Huntington Beach	18.50	7.90	61.30	11	10	15	1	18.2
Irvine	22.50	12.60	38.30	16	25	11	16	9.9
La Habra	22.50	10.50	24.80	22	17	27	3	13.7
La Palma	18.30	6.30	22.70	17	21	32	0	19.3
Laguna Beach	16.00	6.20	83.60	1	4	3	1	23.9
Laguna Hills	19.50	8.50	56.90	23	7	22	20	17.9
Laguna Niguel	18.60	6.70	64.90	6	12	24	10	18.4
Laguna Woods	0.30	11.40	71.10	32	31	31	9	85.4
Lake Forest	21.80	6.50	51.80	8	15	28	6	13.5
Los Alamitos	23.30	9.10	47.60	3	2	2	12	14.3
Mission Viejo	20.10	4.80	62.10	19	6	14	2	21.3
Newport Beach	16.70	6.90	77.90	7	11	8	3	24.0
Orange	20.60	10.30	43.80	4	24	30	26	13.8
Placentia	24.50	7.30	39.30	24	19	4	2	13.9
San Clemente	22.60	5.20	73.20	14	8	23	25	18.8
San Juan Capistrano	24.40	7.80	54.50	2	3	9	23	18.0
Santa Ana	25.20	13.40	10.00	28	29	16	11	9.8
Seal Beach	13.00	5.20	72.00	25	14	1	23	41.7
Stanton	23.90	14.0	19.00	30	23	10	13	12.5
Tustin	24.70	10.90	30.50	27	26	6	9	12.3
Westminster	21.40	15.40	21.80	29	22	29	2	16.5
Yorba Linda	23.30	4.60	56.50	15	5	13	10	18.0

Note. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia); *Park Access Tool, by* California State Parks, n.d. (https://www.parksforcalifornia.org/parkaccess/?overlays1=parks%2Cnoparkaccess&overlays2=parks%2Cparksper1000).

Table 17

Index Scoring Results

City	PV pts	U18 pts	O65 pts	Walkability pts	APP pts	PPORS pts	PPIRS pts	Total pts
Garden Grove	4	4	1	4	4	4	3	24
Laguna Woods	3	1	4	2	4	4	4	22
Anaheim	4	4	1	2	3	4	4	22
Westminster	4	4	1	1	4	3	4	21
Buena Park	3	4	1	3	3	4	3	21
Santa Ana	4	4	1	2	4	4	2	21
Orange	3	4	1	4	1	3	4	20
Stanton	4	4	1	2	4	3	2	20
Seal Beach	1	3	4	4	4	2	1	19
La Habra	3	4	1	1	3	3	4	19
Tustin	3	4	1	2	4	4	1	19
Irvine	3	4	1	3	2	4	2	19
Laguna Hills	2	4	2	3	3	1	3	18
Costa Mesa	3	4	1	1	3	3	3	18
La Palma	1	3	2	1	3	3	4	17
San Clemente	1	4	2	4	2	1	3	17
Brea	1	4	1	3	2	2	4	17
Fountain Valley	2	4	2	1	2	2	3	16
San Juan Capistrano	2	4	2	4	1	1	2	16
Fullerton	3	4	1	1	2	3	2	16
Aliso Viejo	1	4	1	1	1	4	3	15
Mission Viejo	1	4	2	1	3	1	2	14
Laguna Niguel	1	3	2	2	1	2	3	14
Huntington Beach	2	3	2	1	2	2	2	14
Yorba Linda	1	4	2	2	2	1	2	14
Cypress	1	4	1	1	4	2	1	14
Placentia	1	4	1	1	3	3	1	14
Lake Forest	1	4	1	1	1	2	4	14
Los Alamitos	2	4	1	2	1	1	1	12
Newport Beach	1	3	2	1	1	2	1	11
Dana Point	1	3	2	1	2	1	1	11
Laguna Beach	1	3	2	1	1	1	1	10

Note. Equity map variables and scores for Orange County. The higher the "total points," the more in need of recreation spaces. Adapted from *Quick facts: Orange County, California, by* U.S. Census Bureau, n.d.-c. (https://www.census.gov/quickfacts/orangecountycalifornia); *Park Access Tool, by* California State Parks, n.d. (https://www.parksforcalifornia.org/parkaccess/?overlays1=parks%2Cnoparkaccess&overlays2=parks%2Cparksper1000).

in the equity zone with the least need for recreation spaces. The middle equity zones scored 13.26-16.5 and 16.5-19.75. The equity zones and their scores can be seen in Figure 8.

Figure 8

Orange County Equity Zones and Scores

City	Total Pts	City	Total Pts
Garden Grove	24	San Juan Capistrano	16
Anaheim	22	Fullerton	16
Laguna Woods	22	Fountain Valley	16
Santa Ana	21	Aliso Viejo	15
Buena Park	21	Placentia	14
Westminster	21	Cypress	14
Stanton	20	Yorba Linda	14
Orange	20	Lake Forest	14
Tustin	19	Mission Viejo	14
La Habra	19	Laguna Niguel	14
Irvine	19	Huntington Beach	14
Seal Beach	19	Los Alamitos	12
Costa Mesa	18	Dana Point	11
Laguna Hills	18	Newport Beach	11
San Clemente	17	Laguna Beach	10
Brea	17		
La Palma	17		

Note. The scores placed into four categories, with white being the cities with the least need of recreation spaces, blue being the second lowest in need of recreation spaces, yellow being the cities with second highest need for recreation spaces, and red being the cities with the most need for recreation spaces.

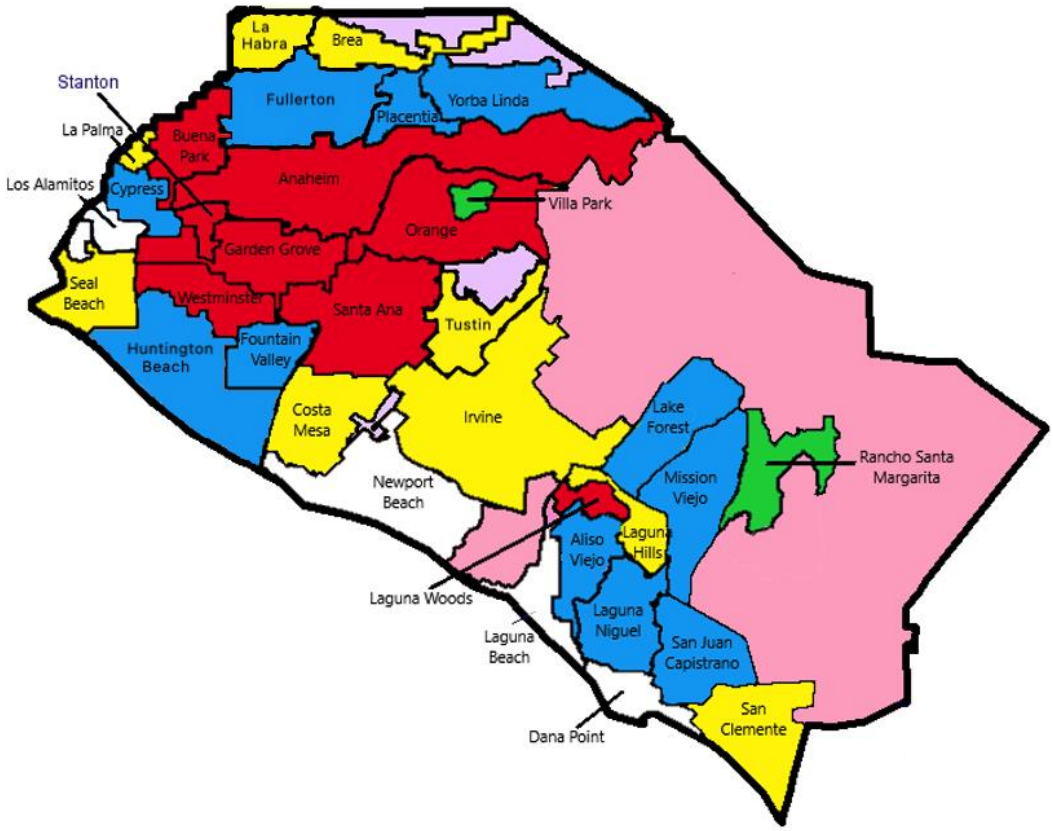
Apply Findings

This study analyzed the geographical locations of recreation spaces in Orange County. The equity indices created a dasymetric map to better illustrate findings geographically. The dasymetric map provides visual locations of those cities with the biggest to the least need for recreation space. Figure 9 is the dasymetric map of Orange County that shows the four cities with the least need for recreation spaces are all located along the coast of the Pacific Ocean: Huntington Beach, Newport Beach, Laguna Beach, and Dana Point. All cities with the most need for recreation spaces, except for San Clemente, were located in North Orange County. The map also shows that Huntington Beach and Westminster share the only border between a city with the least and most need for recreation spaces. The dasymetric map of Orange County provides an aerial perspective of the distribution of recreation spaces among cities in the county.

In creating the dasymetric map, a visual presentation was created using other environmental variables outside of recreation spaces that have health implications. The study then combined the recreation spaces variables and the other variables to create a visual metric that showed those in most need. Based on past research on recreation and health, the higher a city scored, the more at risk its residents were for health complications. Also, those cities that scored lower were likely healthier. The dasymetric also followed the ARM. It identified the problem that the study of relationships between poverty, race, and recreation spaces was not comprehensive enough to speak to the geographical health implications of recreation spaces. Creating a comprehensive index for the equity and dasymetric maps provided a more comprehensive study of recreation spaces and health.

Figure 9

Orange County Recreation Equity Map



Note. The scores placed into four categories, with white being the cities with the least need of recreation spaces, blue being the second lowest in need of recreation spaces, yellow being the cities with second highest need for recreation spaces, and red being the cities with the most need for recreation spaces. Pink areas reflect unincorporated areas of Orange County. The two omitted cities, Villa Park and Rancho Santa Margarita, are in green.

Unexpected Findings

Beach Cities

It should be recognized the role beaches play in recreation spaces. The beach cities predominately fared well in recreation spaces. Huntington Beach, Newport Beach, Laguna Beach, and Dana Point are three cities with significant access to and usage of beaches. Seal Beach and San Clemente may not have fared as well, but there are

reasonable explanations for this. As stated previously, a major percentage of Seal Beach is a military installation. San Clemente was the 23rd-ranked city for indoor recreation spaces but ranked in the top half of outdoor recreation spaces, 14th in PPA, and eighth in PPORS. Walkability and a large under-18 population impacted Santa Clemente's lower score on the equity map. Generally, beach cities benefited from the recreation spaces provided by acres of state beaches. These cities could even have more recreation space as the ocean provides a large recreation area for surfing, swimming, sailing, and other water recreation.

Irvine

The city of Irvine has one of the most extensive overall recreation programs. The city lists over 40 neighborhood parks and 22 community parks. It has also opened the Great Park, a multifaceted recreation space with athletic fields, indoor facilities, playgrounds, basketball courts, and more. The facility is already 300 acres large, and there are 3,000 more acres in progress (City of Irvine, n.d.-c). With Irvine's commitment to recreation, it is intriguing that it did not rank higher in PPA (16th), PPORS (25th), and PPIRS (11th). Irvine would likely warrant its own study to fully comprehend its recreation spaces' environmental reach.

Future studies will likely look more positively at Irvine. First, this study could not properly account for Irvine's extensive trails and bike paths. Trails and bike paths account for over 400 miles of recreational riding (City of Irvine, n.d.-a). Irvine also shares borders with a couple of recreation spaces that likely provide recreation to residents. These shared adjacent recreation spaces on Irvine's borders include the Crystal Cove State Park. The researcher also chose not to include the Irvine Ranch Conservancy

located at the northwest edge of Irvine. Irvine Ranch Conservancy is a nonprofit that manages the 50,000 acres of protected wildlands (City of Irvine, n.d.-c). Ultimately, a study that does not focus on public agencies' management and marketing of recreation spaces would likely to hold Irvine in higher light.

Age Matters?

Does the age of a city have recreation and health implications? This study did not test this hypothesis, but the data presented an interesting view between the age of the city and recreation spaces. The equity index had 17 cities in its two top tiers for cities that most need recreation; only four of those cities incorporated after 1960. The top tier in the index had two cities, Laguna Woods and Orange, not incorporated before the 1950s. The study has already spoken to Laguna Woods's shortcomings. As for Orange, it still boasted the fourth most total acreage outdoor recreation spaces. Newer incorporated cities tended to score higher on the equity map. Eight of the 15 cities that scored in the bottom two groups for need of recreation spaces incorporated after 1959. Outside of Placentia, the older cities that fared the best on the equity map were those with ample access to beachfront: Huntington Beach, Laguna Beach, and Dana Point. A future study could look at how newer cities have likely placed a premium on recreation.

Conclusions

The geographical locations of recreation spaces have a relationship with socioeconomics and race. Orange County's most significant relationships are between outdoor recreation spaces and socioeconomics and race. The larger the White population, the more recreation spaces there are and the larger the area occupied. Socioeconomics warrants a similar statement: the less poor a community, the more recreation spaces and

the larger the area occupied. Cities with high poverty or a higher minority population would be wise to be cognizant of the available recreation spaces for their community.

The relationship with indoor recreation spaces was weaker but still had intriguing correlations. Indoor recreation spaces warrant further study. A study of indoor recreation spaces could benefit from more in-depth information such as the programs' size, safety, and cleanliness.

An indoor recreation spaces study would also be wise to do as San Diego did and analyze the programs provided at the indoor recreation spaces. The study also recognized that it needed to analyze those not using the programs (OCA, 2021). Internal recreation spaces were complex to vet because facility size data were difficult to find. Thus, it was omitted from the study.

This study created an equity map to further the discovery of the geographical implications of recreation spaces. The walkability, poverty, age, outdoor recreation acreage, number of outdoor recreation spaces, and number of indoor recreation spaces variables created the equity map. The scores of these indices created a dasymetric map that showed cities in most need of recreation. The index used variables shown to have associations with health benefits. Ultimately, the map created showed that those in most need of recreation were in North Orange County and inland from the ocean. The equity map also showed the importance of beach access to a community's health because the best performers were all located on the coast. The creation of the equity map provided a visual context of the equity of recreation spaces in Orange County, and the creation of the index illuminated the relationship between recreation spaces and health implications.

Race has shown a relationship with recreation spaces, but the researcher intentionally left the race variable out of the equity map. The notion was that the equity map could stand alone and illuminate the need-level recreation spaces in Orange County. The researcher now looks to inject the racial makeup into that study to show that the inequity in recreation spaces can be further complicated. There is a correlation that the cities that scored high in the equity map index and desired more recreation spaces have smaller White populations. Figure 10 displays that Orange County cities' geographical distribution of recreation spaces is even more interesting as those most in need of health benefits are those with more diverse populations. Minority populations have traditionally been victims of inequities in recreation spaces (Aboelata & Bennett, 2021; Comer & Skraastad-Jurney, 2008; Scott, 2013; Watson et al., 2016; T. G. Williams et al., 2020). Orange County equity is further complicated because the health implications of the geographical locations of recreation spaces appear to share a negative relationship with race as well. Essentially, cities that scored high on the equity index and are in the most need of recreation spaces are likely also to be serving more non-White communities of Orange County.

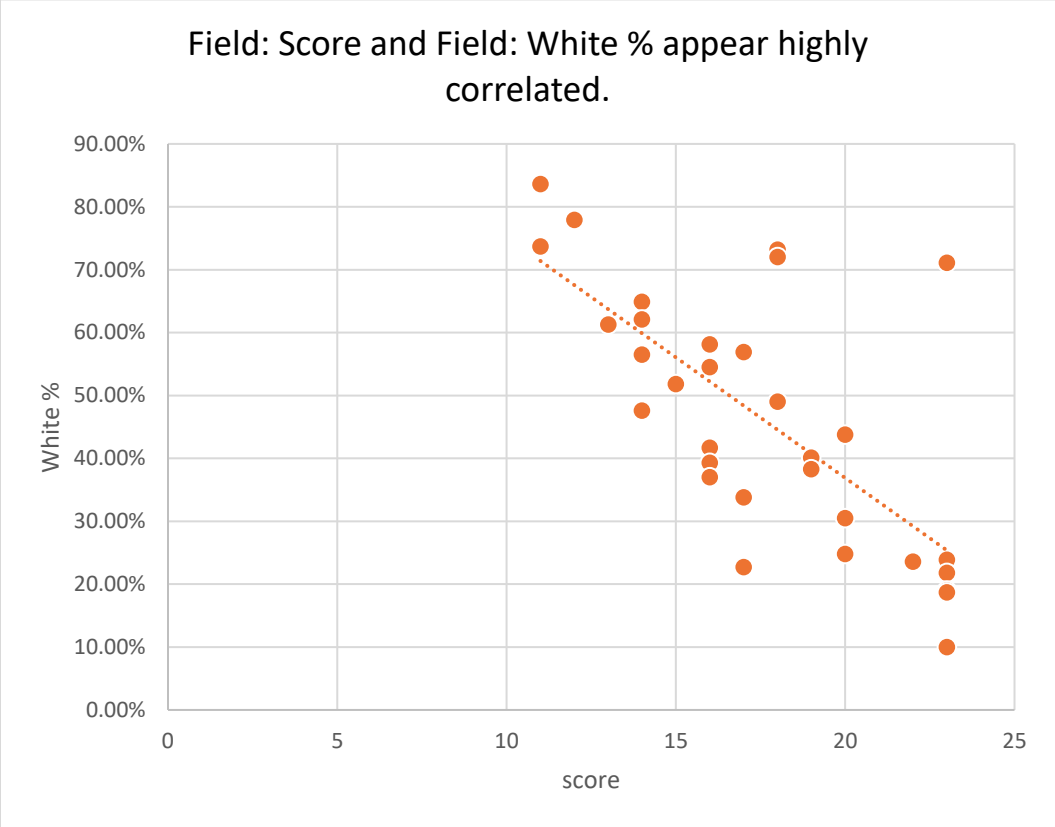
Poverty, Race, and Recreation Spaces

In an effort to look more closely at the relationship between poverty, race, and recreation spaces, the researcher performed a Spearman's calculation, a combined ranking of poverty and race with recreation space variables. The researcher ranked cities' poverty percentage by the lower the percentage, the higher the rank. Ranking poverty in this manner was opposite of the previous tables. The researcher then took the rankings of the White population percentage—the higher the White percentage, the higher the rank.

The researcher then combined the two scores and ranked them accordingly. The lower the score, the lower the combined ratio of White and persons in poverty. Table 18 displays the relationship between poverty, race, and recreation spaces.

Figure 10

Graph of Equity Map Scores and Percentage of White Population



Note. The graph displays the 32 cities scoring on the equity map and their percentage of the White population and their total score on equity map. The higher the score the more in need of recreation. The graph shows that the higher the White population, the lower the equity map score, thus less need for recreation spaces.

Table 18

Orange County Poverty + White Percentage and Recreation Space Variables

City	White % rank	PV rank (inverted)	White + PV (total)	PV & W rank	PPA rank	PPORS rank	PPIRS rank
Westminster	29	32	61	1	29	22	29
Stanton	30	31	61	1	30	23	10
Santa Ana	32	29	61	1	28	29	16
Garden Grove	31	28	59	2	31	30	21
Anaheim	26	30	56	3	21	27	26
Fullerton	23	27	50	4	13	18	12
Tustin	24	24	48	5	27	26	6
La Habra	25	23	48	5	22	17	27
Irvine	21	26	47	6	16	25	11
Buena Park	27	20	47	6	20	28	19
Orange	17	21	38	7	4	24	30
Costa Mesa	15	22	37	8	18	20	18
La Palma	28	9	37	8	17	21	31
Fountain Valley	18	18	36	9	9	16	20
Los Alamitos	16	19	35	10	3	2	2
Placentia	20	14	34	11	24	19	4
Cypress	22	11	33	12	26	9	7
Laguna Woods	6	25	31	13	32	31	32
San Juan Capistrano	13	15	28	14	2	3	9
Laguna Hills	11	17	28	15	23	7	22
Brea	19	7	26	16	10	13	25
Huntington Beach	9	16	25	17	11	10	15
Lake Forest	14	10	24	18	8	15	28
Laguna Niguel	7	12	19	19	6	12	24
Newport Beach	2	13	15	20	7	11	8
Aliso Viejo	10	4	14	21	5	32	17
Yorba Linda	12	1	13	22	15	5	13
San Clemente	4	6	10	23	14	8	23
Seal Beach	5	5	10	23	25	14	1
Mission Viejo	8	2	10	23	19	6	14
Laguna Beach	1	8	9	24	1	4	3
Dana Point	3	3	6	25	12	1	5

Note. Table contains the ranks of all 32 cities in regard to combined rankings of poverty and White population, PPA, PPORS, and PPIRS. The poverty rank was inverted from previous tables. The higher the percentage of poverty the higher rank.

In analyzing the cities by the combination ranks of the percentage of White and in-poverty populations, the researcher found it clear there was a correlation with PPA. Spearman's calculations found an r_s value of -.51 and a p value of 0.003 (99.7% statistical significance). Five of the top 10 ranked Whitest and least poor cities were in PPA's top 10. Ten of the top half-ranked Whitest and least poor cities ranked in the top half of PPA. The tail of the PPA may be more telling. The bottom 10 of Whitest and least poor cities outside of two ranked in the bottom half of PPA. Fullerton was ranked 22nd in poverty and White percentage and 13th in PPA. Irvine was ranked 20th in poverty and White percentage and 16th in PPA. The combination of poverty and Whiteness of a city had a clear relationship with the acreage of recreation space distribution.

In analyzing the cities by the combination ranks of the percentage of White and in-poverty populations, the researcher found there is a correlation with PPORS. Spearman's calculations found an r_s value of -.65 and a p value of 0.00005 (99.9% statistical significance). This correlation is significantly higher than that of the PPA. Five of the top 10 Whitest and least poor cities are in the top 10 for PPORS. The other five in the top 10 do not rank below 15th in PPORS, besides Aliso Viejo at 32nd. Aliso Viejo and Laguna Woods are the only cities ranked in the top half of the combination of White and poverty percentage, not in the top half of PPORS. Los Alamitos is possibly the most decisive contradiction of the relationship because it ranked 16th in White and poverty percentage but second in PPORS. Despite a handful of cities like Los Alamitos contradicting the relationship between Whiteness, poverty, and PPORS, many cities held the relationship true.

In analyzing the cities by the combination ranks of the percentage of White and in-poverty populations, the researcher found there is a correlation with PPIRS. Spearman's calculations found an r_s value of -.27 and a p value of 0.13 (87% statistical significance). This relationship is consistent with race and poverty's earlier individually calculated relationships with PPIRS. The strength of the relationship remained weak despite the combination of race and poverty.

It is intriguing to look at the strength of the relationships between combined variables of White population percentage and percentage in poverty and their counterparts (see Table 19). When race and poverty were combined, the strength of their relationship with PPA was slightly more than the average of the two individual relationships. The combination of race and poverty led to a stronger relationship than its relationships with PPORS.

Table 19

Relationship Strength Comparison: Poverty, Race, and Recreation Space Variables

Variable	Variable 2	r_s value (strength)	p value
Poverty %	PPA	-0.47180	0.01000
Poverty %	PPORS	-0.60700	0.00100
Poverty %	PPIRS	-0.22730	0.50000
Race (White %)	PPA	0.51650	0.00500
Race (White %)	PPORS	0.58870	0.00100
Race (White %)	PPIRS	0.25400	0.20000
Race & Poverty	PPA	-0.50711	0.00305
Race & Poverty	PPORS	-0.65921	0.00005
Race & Poverty	PPIRS	-0.27080	0.13385

Note. This table displays the relationship strength of the original variables along with the addition of strength of relationships between a combined variable of race and poverty.

A combination of race and poverty came within .041 from moving into the strong category of relationships. Combining race and poverty variables in the study further developed the understanding of these variables with recreation spaces in Orange County cities. Race and SES have implications on recreation distribution and then health equity of a community.

CHAPTER 5: FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Findings

The study set out to take an in-depth look at the equity of recreation spaces in Orange County, California. Orange County is a significant community that can add to the educational knowledge of recreation spaces. Orange County recreation spaces were analyzed geographically, specifically to see whether there was a relationship between the distribution of recreation spaces, race, and economic status. At the city of San Diego, the Office of the City Auditor ([OCA], 2021) had a significant finding. OCA realized that parks and recreation programs were ascertaining feedback from those only in the programs. The problem is that by only receiving feedback from those in programs, one effectively omits barriers or demands for accessing programs. OCA highlighted that parks and recreation needed a comprehensive analysis to take on equity. The researcher respected the notion that recreation needed to look at equity with a wide lens. The study of Orange County sought to take a comprehensive view of access and, thus, equity of recreation spaces. Chapter 5 presents findings based on the comprehensive study of recreation spaces in the cities of Orange County.

Conclusion

Recreation and its outdoor and indoor spaces are essential to the health of the communities. Their ability to provide low-cost, accessible opportunities for physical and social activity makes them vital to the health capital of a community. Research has shown that recreation has even more potential if it allocates resources and energy effectively (Godbey & Mowen, 2010). Studies on equity recreation spaces can help expand the knowledge of recreation. This expansion of recreation knowledge can lead to

improvements of public health and thus improve environmental justice (Boone et al., 2009). This study sought to improve the knowledge of recreation within the analysis of Orange County, California's recreation spaces by city. The study focused on those recreation spaces that public agencies advocated through their online presence. The idea was that those spaces promoted by recreational agencies, city, county, and state were likely to be adequately supported for access and usage. There were limitations to the study, but there was enough relevant data and analysis to provide insights and implications on recreation and its spaces.

Ultimately, the study found that there are disparities in geographical locations of recreation spaces concerning race and socioeconomics. The wealthier a community, the more outdoor recreation spaces and the larger the area occupied. It was also found that the larger the White population in a community, the more outdoor recreation spaces and the larger the area occupied. The number of indoor recreation spaces showed a significantly less strong relationship with race and socioeconomic status. Unfortunately, the size of indoor spaces was too challenging to attain for such a large area and will need future studies. Cities in Orange County showed an apparent inequity in recreation spaces, and this finding may have health implications.

To inspect the possible health implications of a community, the study created an equity dasymetric map of Orange County. The index used scores based on residents' ages, the city's walkability, data on indoor recreation spaces, and data on outdoor recreation spaces. After studying previous equity studies in Denver, Chattanooga, San Diego, and San Francisco, these variables were selected. The index created a dasymetric map showing the locations of cities that are in most need of recreation spaces. Cities

located in North Orange County and inland were predominately those that scored in most need of recreation spaces. The four cities that currently have the best distribution of recreation spaces are all located on the coastline: Huntington Beach, Newport Beach, Dana Point, and Laguna Beach. Race was intentionally left off the index so that scores could be looked at independently. The study could later interject this data so its impact would draw the necessary attention. The equity map displayed communities in most need and whose health would benefit the most from improved recreation space access.

Implications for Actions

Funding

The dynamics of the creation of inequities in environments are complex, but the idea is that a study such as this one could help remedy those imbalances (Floyd & Stodolska, 2019; Rigolon & Németh, 2021). Studies on equity in recreation spaces can hopefully avoid mistakes like those in Los Angeles in the 1990s when park funding expanded inequities in recreation spaces (Wolch et al., 2013). In Denver, large outdoor recreation spaces built between 1990 and 2015 were in high socioeconomic and predominately White neighborhoods (Rigolon & Németh, 2021). Studies on the equity of recreation spaces give park planners, community partners, parks commission, and other stakeholders the ability to recognize inequities in their communities (Boone et al., 2009; Comer & Skraastad-Jurney, 2008; OCA, 2021; Rigolon & Németh, 2021).

Studies like this one can facilitate coordinating where funding goes. Equity studies give park planners and agencies the ability to navigate their landscapes and combat past policies and decisions (Rigolon & Christensen, 2019, Rigolon & Németh, 2021). Studies show that communities support public agencies facilitating equitable

access to recreation spaces (May, 2021). Agencies and advocates for equitable recreation need the tools to bring about change. Disadvantaged communities received $41 billion for recreation spaces in Los Angeles because of research and legal work of the City Project, a nonprofit advocacy agency (Scott, 2013). Funding for recreation spaces is valuable and abundant. On election day in 2020, amid the pandemic, over 11 states approved $3.7 billion of spending on recreation spaces (Burrowes, 2020). The support for equitable recreation spaces will allow communities to right past wrongs. However, it will take local environmental knowledge to provide effective solutions.

Gentrification?

Although funding will be necessary to improve equity in recreation spaces, the answer to the complexities of inequities is more problematic (Rigolon & Németh, 2021). Communities and cities that have tried to address inequities by providing significant resources have not always addressed their problems (Mullenbach & Baker, 2020). Communities that have provided areas in need with large parks have often seen gentrification, ultimately moving those underserved populations out of the locations where recreation spaces where revitalized or installed (Rigolon & Christensen, 2019; Rouse, 2018). The high line effect could result from allocated resources to recreation spaces. The high line effect is named after an abandoned rail line that was converted into a park, leading to a significant increase in property value and commercial popularity that displaced previous residents (Mullenbach & Baker, 2020). Adding recreation spaces is not guaranteed to improve equity in communities. Like gentrification, problems in equity can still be prevalent even after resources are allocated to recreation spaces (Floyd & Stodolska, 2019).

Researchers attempting to remedy inequity in recreation spaces are not completely clear on actions that will not be counterproductive, but there are some common ideas of practice (Mullenbach & Baker, 2020). The first is that when improving or adding to recreation spaces, agencies and advocates must engage the community at large (Rigolon & Christensen, 2019; Rouse, 2018). Scholars Rigolon and Christensen (2019) believed park developers must engage the community early before business entities can influence it. The common idea is that recreation spaces should leverage community benefits with community priorities. Last, recreation space improvements should include community priorities. This can include but is not limited to affordable housing, local employment, recreation spaces cognizant of their communities, and more (Rigolon & Christensen, 2019; Rouse, 2018). Scholars Mullenbach and Baker (2020) deemed these ideas to be acts that are "green enough" (p. 441). The hope is that green enough investments will help close the recreation space equity gap without displacing those that benefit.

Recommendations for Further Research

Deep Dive Into Health Implications and Recreation Spaces

This study looked primarily at recreation spaces' general health implications and distributions. Future studies could investigate further the health implications of specific recreation spaces. For example, a safe park improves a women's social and emotional quality of life (Perez et al., 2015). Recreation space's health implications go well beyond physical activity. Recreation spaces have several aspects connected to an improved quality of life (Conejo Recreation & Park District, 2011). These aspects include the fact that access to green spaces have been shown to reduce health complaints and a healthier spirit (Sherer, 2003). Outdoor recreation spaces have positively impacted self-awareness,

creativity, expression, and more (Driver et al., 1991). Recreation spaces also improve social environments (Conejo Recreation & Park District, 2011). Parks have reduced crime, improved family cohesion, promoted ethnic harmony, and enhanced tolerance (California State Parks, 2005; Frumkin & Eysenbach, 2003; McAvoy & Estes, 2001). Recreation spaces have also demonstrated their ability to reduce adverse health behaviors, including reduction of drug and alcohol abuse, criminal behavior, and teen pregnancy (Rudick, 1996; U.S. Department of Health and Human Services, 2001). Future research can dive into the specific health implications of various recreation spaces and their attributes.

Equity in Orange County

The equity map in this study created a unique visual depiction of recreation spaces. This depiction is even more intriguing when compared to the work done by the OC Health Care Agency (HCA). The HCA (n.d.-a) mission is "In partnership with the community, deliver sustainable and responsive services that promote population health and equity." The HCA (n.d.-b) has created an equity map that

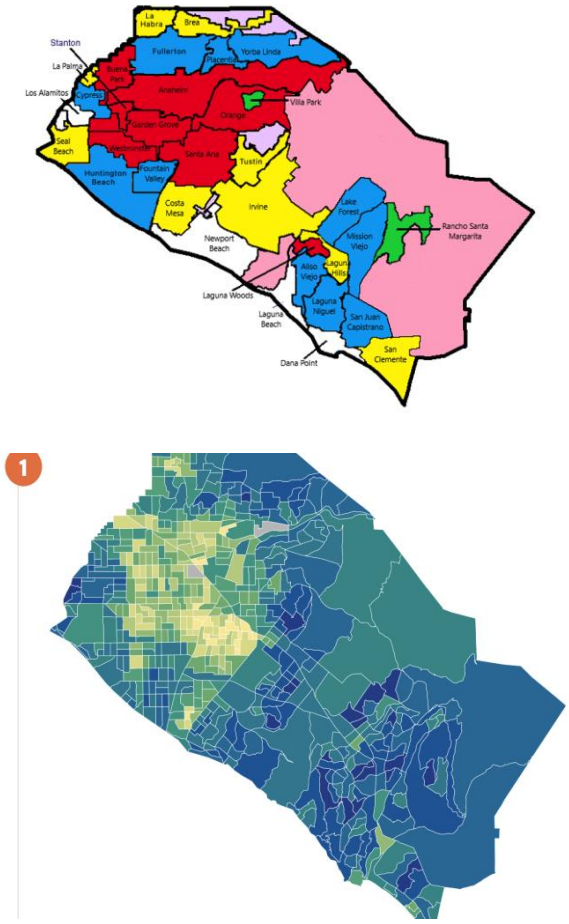
> spotlights social and health disparities in Orange County neighborhoods. This interactive map visualizes 580 census tracts across the county and displays scores from the Social Progress Index (SPI), Centers for Disease Control (CDC) Health Indicators, and population demographic data. This tool allows our communities to identify what health inequities exist and where they are most felt, so we can work together to eliminate them. (p. 2)

HCA (n.d.-b) created an index from 50 social and environmental markers. Tracks in yellow scored poorly in SPI. Purple represents tracks that scored high in the SPI. The

lower the score, the less desirable outcome. The similarities are thought-provoking when viewing the equity map created by this study and the HCA (see Figure 11).

Figure 11

Side by Side: OC Recreation Equity Map & HCA's Social Progress Index Map



Note. Side-by-side comparisons of the OC Recreation Equity Map and the HCA's Social Progress Index Map. Maps have similarities in areas of need. From *Orange County Equity Map: Instructional Manual*, by OC Health Care Agency, n.d.-b, p. 2 (https://bit.ly/3Jf19Bf).

The areas of the HCA equity map with low scores on the social progress index are in very similar locations to the cities that most needed recreation. This comparison is even more intriguing when comparing the two indexes. Walkability is the only index that is very similar between the two equity maps. Otherwise, the HCA (n.d.-b) index

(Appendix C) was made up of indices from groups based on nutrition and basic medical care, water sanitation, housing, personal safety, health and wellness, access to basic knowledge, access to information and communications, environmental quality, personal rights, personal freedom and choice, inclusiveness, and access to advanced education. Access to recreation or recreation spaces is not in the HCA's index for equity. The implications of these two equity maps could warrant a study. Nevertheless, the rudimentary similarities between locations of low-scoring communities' SPI and high-scoring communities that need recreation spaces cannot be ignored. The dasymetric map of the HCA would support the notion that the locations of recreation spaces relate to a community's health.

City Studies

As this study developed, it became evident that there were few studies on Orange County recreation spaces. Future studies would be wise to look even more closely at recreation spaces. Future studies should include individual cities doing similar micro-studies on their recreation spaces. Scholars could break down population data for cities by their tracts provided by the U.S. Census Bureau:

> A census tract is a geographical unit of measurement designed by the US Census Bureau to have a population range between 2,500 to 8,000 individuals with an average population size of 4,000. Census tracts are unique among geographic units in the United States in that they are explicitly designed for statistical comparison and analysis. (OC Health Care Agency, n.d.-b, p. 3)

This regional study responded to national studies lacking local knowledge; thus, more significant recreation space trends did not represent local communities (Wen et al., 2013).

Cities would be wise to follow a similar suit as the knowledge attained could help them remedy their inequities in recreation spaces (Rigolon & Christensen, 2019; Rouse, 2018).

Not Just Recreation Spaces

Those looking to future studies should look beyond the number, location, and size of recreation spaces. Although access to recreation spaces is key to equity, analyzing the users of recreation spaces is also significant (Rosenberger et al., 2009). The usage of recreation spaces is a major contributor to community health (Perez et al., 2015; Rosenberger et al., 2009). In San Diego, the OCA (2021) did a program assessment and found, "Although the Parks and Recreation Department tracks certain program information, current practices diminish its ability to implement a data-driven approach for resource allocation, monitoring, evaluation, and reporting" (p. 5). Two major study components were identifying the user's needs and allocating resources properly. Cities in Orange County could benefit from similar individual assessments of users so that they can allocate resources based on access, usage, and programming.

A unique theme regarding usage that continually appeared in research that warrants study in recreation spaces is safety (NRPA, n.d.-d; Watson et al., 2016; Wen et al., 2013; T. G. Williams et al., 2020). Safety is a major factor in access to recreation spaces (Erwin, 2008). It has also shown that unsafe recreation spaces intensify inequities in a city (T. G. Williams et al., 2020). Safety plays an even more important role for youth communities of low SES than high SES (Erwin, 2008). For people of color and low SES, studies have shown disproportions in safe recreation spaces compared to more White and high-SES communities (Rigolon, 2016; Wen et al., 2013). The safety of

recreation spaces warrants research because past studies have shown its importance to equitable recreation.

Indoor Recreation Spaces

There are more than 65,000 indoor recreation spaces across the United States (Godbey & Mowen, 2010). As this study developed, the vast majority of the studies dealt with outdoor recreation spaces, and scholars McKenzie et al. (2013) confirmed this notion. When the researcher of this study analyzed indoor recreation spaces in Orange County, it was challenging to find the size of these spaces. In contrast, acreage of outdoor spaces was readily available. Indoor recreation spaces do not occupy the same scholarly place as outdoor recreation spaces. It is vital to study indoor recreation spaces because they make a significant piece of the recreation ecosystem.

The recreation ecosystem's vastness and what they provide warranted an in-depth analysis of indoor recreation spaces. These indoor recreation facilities provide opportunities for physical activity, social interaction, health services, and more. Indoor recreation facilities or specific community centers provide similar health capital as outdoor recreation spaces (Colistra et al., 2017). A study on recreation centers in San Diego County concluded that the number of centers was similar across the board, but the quality of the facilities and programs was not. The researcher would admit that recreation center research was relatively limited and needed more analysis (McKenzie et al., 2013). Indoor recreation facilities warrant future research because there is a limited amount of indoor recreation studies, and there are a large number of indoor recreation spaces in the ecosystem, and there are significant health benefits associated with indoor recreation spaces.

Concluding Remarks and Reflections

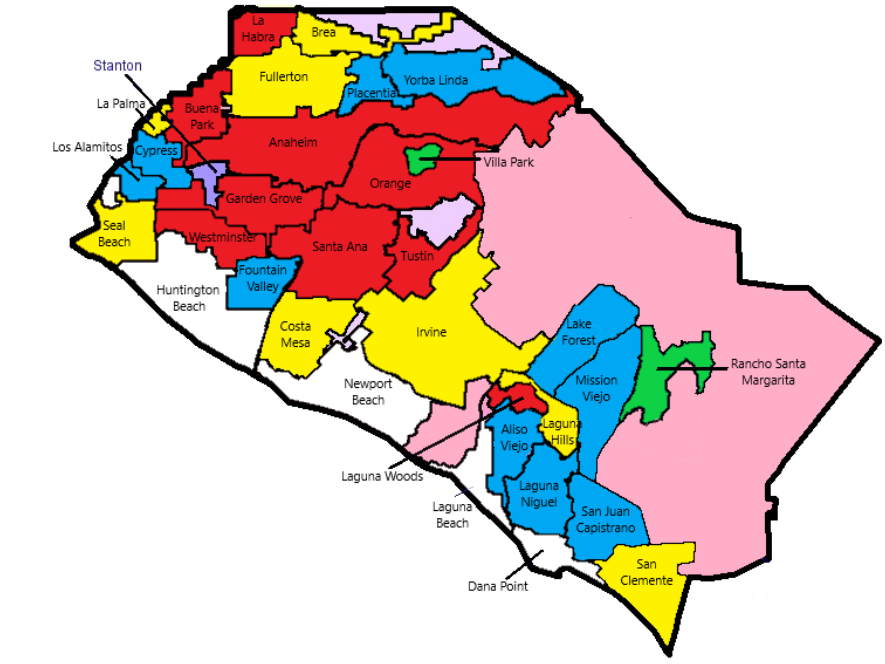
Call Back to the COVID-19 Pandemic

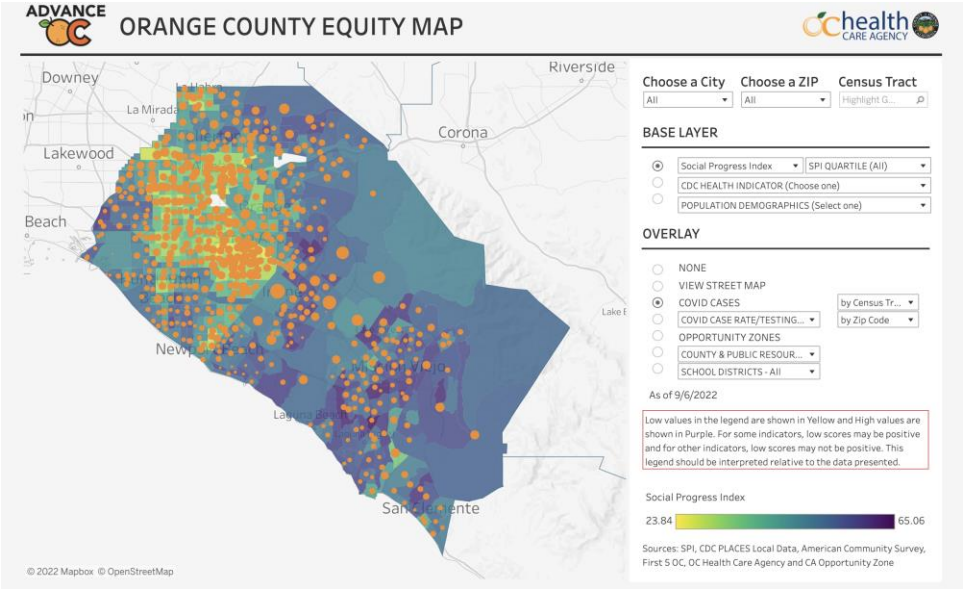
The COVID-19 pandemic sparked this study and its ability to accentuate environmental cracks in communities. In this case, the pandemic illuminated that communities with disparities in recreational spaces were at a disadvantage. Disadvantaged communities were at risk as their lack of access restricted healthy behavior associated with recreation spaces (Hom, 2021).

It is interesting to view the equity map of this study and the OC HCA's equity map with an overlay of COVID-19 cases table. When viewing the two dasymetric maps in Figure 12, it is clear that there were more COVID-19 cases in areas of need for recreation spaces. This study does not imply that lack of recreation spaces led to more COVID-19 cases. Recreation spaces allowed residents to get physical activity in a safer environment during COVID-19 pandemic. Residents of areas with more recreation spaces are likely healthier, which could reduce contagious periods (Roth, 2021; Volenec et al., 2021). These cities that had a disparity in recreation spaces could have benefited from more recreation spaces when dealing with COVID-19.

Figure 12

OC Recreation Equity Map & HCA Equity Map w/COVID Cases Comparison





Note. Side-by-side comparisons of the OC Recreation Equity Map and the HCA's Social Progress Index Map. The orange dots represent COVID-19 cases across the County. From *Orange County Equity Map: Instructional Manual*, by OC Health Care Agency, n.d.-b, p. 1 (https://bit.ly/3Jf19Bf).

Glass Half Full

Despite a disparity in recreation spaces, Orange County has plenty of positives to build on when it comes to recreation. First, overall, Orange County's proximity or walkability is very high. Based on the research of this study, every city is under the national average of 30% out of walkable range to an outdoor recreation space (May, 2016). Twenty-five of the 32 cities in this study have walkability of 16% or less. Recreation studies have said the distance between home and recreation space is "the most important" element to whether someone recreates (Babey et al., 2007; Godbey & Mowen, 2010). Orange County has 17 cities with walkability in single digits. Orange County may have an equity issue with recreation spaces, but it performs well nationally in the most critical element, walkability.

The next positive for Orange County is its vast amount of recreation spaces. This study alone identified through public agency websites that 32 Orange County cities account for 857 outdoor recreation spaces, over 75,784 acres of outdoor recreation spaces, and 122 indoor recreation spaces. These recreation space totals do not account for some regional parks that border cities, trail systems, and more. Orange County has over 60,000 acres of county outdoor recreation space and over 300 recreation spaces of state parks and beaches (OC Parks, n.d.; See California, n.d.) Orange County has an immense amount of recreation spaces that could provide recreation to cities in close proximity that may suffer inequities.

Another positive for Orange County is that it has a favorable climate for recreation. Orange County has a climate with eight comfortable months of temperatures between 70 and 85 degrees. Orange County is considered one of the moderate

temperature places in California. Orange County also has limited precipitation and humidity (Best Places, n.d.). The weather can affect recreation usage (Brandenburg, 2007; de Freitas, 2013; Verbos et al., 2018). Orange County's climate is advantageous for taking advantage of its vast recreational spaces. Across the state of California, Orange County teens score high in participating in regular physical activity (Orange County Healthy Together, n.d.). At the very least, Orange County's climate offers users of recreational spaces fewer hurdles to recreating.

The last positive presented for Orange County and California has going for it is a commitment to equity. As a state, California is allocating significant resources to state parks to facilitate "California Outdoors Access for All" (Office of the Governor, n.d.; Rigolon & Christensen, 2019, p. 38). Orange County launched the OC Equity Map, a data-driven tool to provide agencies with a road map to combating inequalities and disparities (HCA, 2021). The California Parks and Recreation Society (n.d.) strongly advocated for recreational spaces for all Californians. Orange County also benefits from good examples of neighbors embracing equity in recreation spaces and being agents of change in Los Angeles and San Diego (OCA, 2021; Scott, 2013). Cities in Orange County are combatting equity as well. In 2021, The Irvine City Council solidified its ad-hoc diversity, equity, and inclusion committee as a standing committee and expanded its members to seven (City of Irvine, n.d.-b). Advocating for equity is an essential issue in Orange County and California; it will only benefit from future studies that help marry resources and strategic advocacy.

Final Remarks

Recreation has come a long way. It has transformed from a pastime of the elites to an instrumental player in the health of a community. Recreational research has also transformed from focusing on the individual benefits of physical activity to the strategic understanding of the dynamic benefits of recreation and its spaces. Scholars Rigolon and Németh (2021) felt that this shift to a comprehensive understanding of recreation spaces was critical. Although past blatant discriminatory acts have gone away, communities still have been impacted by past transgressions (Rigolon & Németh, 2021). This study sought to aid in recreation transformation by analyzing the complexity of recreation spaces' geographical distribution. In San Francisco, the recreation department acknowledged inequities in park delivery (San Francisco Recreation & Parks, 2019). It allocated 80% of its capital funding, about 239 million, to areas deemed equity zones (Eskenazi, 2021). The NRPA (n.d.) acknowledges a significant positive impact when access to recreation is equitable. The hope of the research was to provide a tool for the future that acknowledged the current and past environments.

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APPENDICES

APPENDIX A

Median Household Income (in 2019 Dollars), 2015-2019

Definition:

Income in the Past 12 Months - Income of Households: This includes the income of the householder and all other individuals 15 years old and over in the household, whether they are related to the householder or not. Because many households consist of only one person, average household income is usually less than average family income. Although the household income statistics cover the past 12 months, the characteristics of individuals and the composition of households refer to the time of interview. Thus, the income of the household does not include amounts received by individuals who were members of the household during all or part of the past 12 months if these individuals no longer resided in the household at the time of interview. Similarly, income amounts reported by individuals who did not reside in the household during the past 12 months but who were members of the household at the time of interview are included. However, the composition of most households was the same during the past 12 months as at the time of interview.

The median divides the income distribution into two equal parts: one-half of the cases falling below the median income and one-half above the median. For households and families, the median income is based on the distribution of the total number of households and families including those with no income. The median income for individuals is based on individuals 15 years old and over with income. Median income for households, families, and individuals is computed on the basis of a standard

distribution. For the complete definition, go to ACS subject definitions "Income in the Past 12 Months.

APPENDIX B

How the Census Bureau Measures Poverty

Following the Office of Management and Budget's (OMB) Statistical Policy Directive 14, the Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. The official poverty thresholds do not vary geographically, but they are updated for inflation using the Consumer Price Index (CPI-U). The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits (such as public housing, Medicaid, and food stamps).

Money Income: Income Used to Compute Poverty Status

The income used to compute poverty status includes (*before taxes*):

Earnings, Unemployment compensation, Workers' compensation, Social Security, Supplemental Security Income, Public assistance, Veterans' payments, Survivor benefits, Pension or retirement income, Interest, Dividends, Rents, Royalties, Income from estates, Trusts, Educational assistance, Alimony, Child support, Assistance from outside the household, Other miscellaneous sources

Money income does not include:

Capital gains or losses, Noncash benefits (e.g., food stamps and housing subsidies), Tax credits

Poverty Thresholds: Measure of Need

Poverty thresholds are the dollar amounts used to determine poverty status.
The Census Bureau assigns each person or family one out of 48 possible poverty thresholds.

- Thresholds vary by the size of the family and age of the members.
- The same thresholds are used throughout the United States (they do not vary geographically).
- Thresholds are updated annually for inflation using the Consumer Price Index for All Urban Consumers (CPI-U).

Although the thresholds in some sense reflect a family's needs, they are intended for use as a statistical yardstick, not as a complete description of what people and families need to live.

Computation

To calculate total family income, the incomes of all related family members that live together are added up to determine poverty status. If an individual or group of individuals (such as housemates) are not living with family members, their own individual income is compared with their individual poverty threshold.
Thus, all family members have the same poverty status, and some families may be composed of single unrelated individuals.
If total family income:

- Is less than the poverty threshold for that family - that family and everyone in it is considered to be in poverty.
- Equals or is greater than the poverty threshold - the family is not considered to be in poverty.

People Whose Poverty Status Cannot Be Determined

Poverty status cannot be determined for people in:

- Institutional group quarters (such as prisons or nursing homes)
- College dormitories
- Military barracks
- Living situations without conventional housing (and who are not in shelters)

Additionally, poverty status cannot be determined for unrelated individuals under age 15 (such as foster children) because income questions are asked of people age 15 and older and, if someone is under age 15 and not living with a family member, we do not know their income. Since we cannot determine their poverty status, they are excluded from the "poverty universe"
(table totals).

Equals or is greater than the poverty threshold—the family is not considered to be in poverty.

Party Threshold

Size of family unit	Weighted average thresholds	Related children under 18 years			
		None	One	Two	Three
One person (unrelated individual):	13,171				
Under age 65	13,465	13,465			
Aged 65 and older	12,413	12,413			
Two people:	16,733				
Householder under age 65	17,413	17,331	17,839		
Householder aged 65 and older	15,659	15,644	17,771		
Three people	20,591	20,244	20,832	20,852	
Four people	26,496	26,695	27,131	26,246	26,338
Five people	31,417	32,193	32,661	31,661	30,887
Six people	35,499	37,027	37,174	36,408	35,674
Seven people	40,406	42,605	42,871	41,954	41,314
Eight people	44,755	47,650	48,071	47,205	46,447
Nine people or more	53,905	57,319	57,597	56,831	56,188

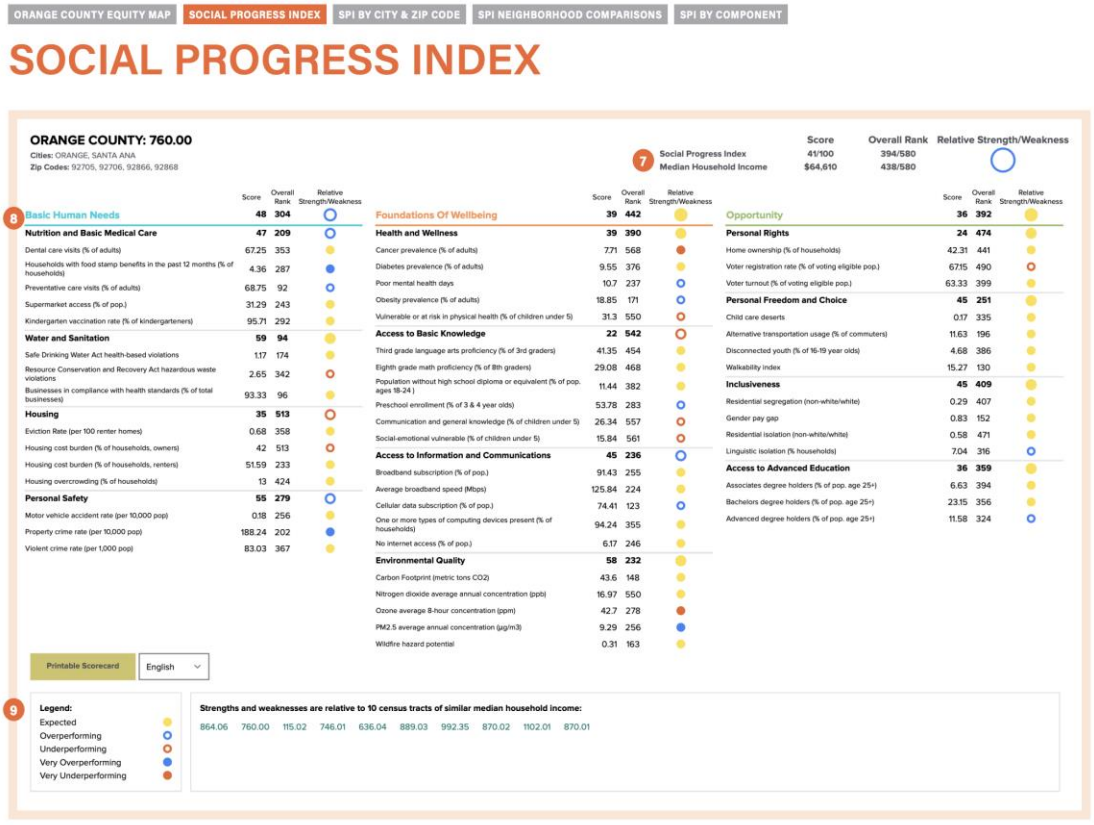
Source: U.S. Census Bureau.

Size of family unit					
	Four	Five	Six	Seven	Eight or more
Four people					
Five people	30,414				
Six people	34,582	33,935			
Seven people	40,124	38,734	37,210		
Eight people	45,371	44,006	42,585	42,224	
Nine people or more	55,132	53,679	52,366	52,040	50,035

Source: U.S. Census Bureau.

APPENDIX C

Social Progress Index



APPENDIX D

Spearman's Calculations

White Population & Person Per Acre

X Values	Y Values	X_{Ra}	$X_{Ra} - M_x$	Y_{Ra}	$Y_{Ra} - M_y$	*Sum Diffs*
12	15	12.00	-4.50	15.00	-1.50	6.75
8	19	8.00	-8.50	19.00	2.50	-21.25
3	12	3.00	-13.50	12.00	-4.50	60.75
10	5	10.00	-6.50	5.00	-11.50	74.75
5	25	5.00	-11.50	25.00	8.50	-97.75
4	14	4.00	-12.50	14.00	-2.50	31.25
19	10	19.00	2.50	10.00	-6.50	-16.25
1	1	1.00	-15.50	1.00	-15.50	240.25
28	17	28.00	11.50	17.00	0.50	5.75
14	8	14.00	-2.50	8.00	-8.50	21.25
22	26	22.00	5.50	26.00	9.50	52.25
7	6	7.00	-9.50	6.00	-10.50	99.75
2	7	2.00	-14.50	7.00	-9.50	137.75
20	24	20.00	3.50	24.00	7.50	26.25
13	2	13.00	-3.50	2.00	-14.50	50.75
9	11	9.00	-7.50	11.00	-5.50	41.25
11	23	11.00	-5.50	23.00	6.50	-35.75
18	9	18.00	1.50	9.00	-7.50	-11.25
16	3	16.00	-0.50	3.00	-13.50	6.75
27	20	27.00	10.50	20.00	3.50	36.75
17	4	17.00	0.50	4.00	-12.50	-6.25

Calculation

R = CoVariance / (X_{Ra} St. Dev. * Y_{Ra} St. Dev.)

Key

X_{Ra} = Ranks of X Values; Y_{Ra} = Ranks of Y Values
$X_{Ra} - M_x$ = X rank minus mean of X ranks
$Y_{Ra} - M_y$ = Y rank minus mean of Y ranks
Sum Diffs = ($X_{Ra} - M_x$) * ($Y_{Ra} - M_y$)

Result Details

X Ranks
Mean: 16.5
Standard Dev: 9.38

Y Ranks
Mean: 16.5
Standard Dev: 9.38

Combined
Covariance = 1409 / 31 = 45.45
R = 45.45 / (9.38 * 9.38) = 0.516

$r_s = 0.5165$, p (2-tailed) = 0.00248.

By normal standards, the association between the two variables would be considered statistically significant.

White Population & Outdoor Recreation Spaces

X Values	Y Values	X_{Ra}	$X_{Ra} - M_x$	Y_{Ra}	$Y_{Ra} - M_y$	*Sum Diffs*
12	5	12.00	-4.50	5.00	-11.50	51.75
8	6	8.00	-8.50	6.00	-10.50	89.25
3	1	3.00	-13.50	1.00	-15.50	209.25
10	32	10.00	-6.50	32.00	15.50	-100.7
5	14	5.00	-11.50	14.00	-2.50	5
4	8	4.00	-12.50	8.00	-8.50	28.75
19	13	19.00	2.50	13.00	-3.50	106.25
1	4	1.00	-15.50	4.00	-12.50	-8.75
28	21	28.00	11.50	21.00	4.50	193.75
14	15	14.00	-2.50	15.00	-1.50	51.75
22	9	22.00	5.50	9.00	-7.50	3.75
7	12	7.00	-9.50	12.00	-4.50	-41.25
2	11	2.00	-14.50	11.00	-5.50	42.75
20	19	20.00	3.50	19.00	2.50	79.75
13	3	13.00	-3.50	3.00	-13.50	8.75
9	10	9.00	-7.50	10.00	-6.50	47.25
11	7	11.00	-5.50	7.00	-9.50	48.75
18	16	18.00	1.50	16.00	-0.50	52.25
16	2	16.00	-0.50	2.00	-14.50	-0.75
27	28	27.00	10.50	28.00	11.50	7.25
17	24	17.00	0.50	24.00	7.50	120.75

Calculation

R = CoVariance / (X_{Ra} St. Dev. * Y_{Ra} St. Dev.)

Key

X_{Ra} = Ranks of X Values; Y_{Ra} = Ranks of Y Values
$X_{Ra} - M_x$ = X rank minus mean of X ranks
$Y_{Ra} - M_y$ = Y rank minus mean of Y ranks
Sum Diffs = $(X_{Ra} - M_x) * (Y_{Ra} - M_y)$

Result Details

X Ranks
Mean: 16.5
Standard Dev: 9.38

Y Ranks
Mean: 16.5
Standard Dev: 9.38

Combined
Covariance = 1606 / 31 = 51.81
R = 51.81 / (9.38 * 9.38) = 0.589

$r_s = 0.58871$, p (2-tailed) = 0.00039.

By normal standards, the association between the two variables would be considered statistically significant.

White Population & Indoor Recreation Spaces

X Values	Y Values	X_{Ra}	$X_{Ra} - M_x$	Y_{Ra}	$Y_{Ra} - M_y$	*Sum Diffs*
12	13	12.00	-4.50	13.00	-3.50	15.75
8	14	8.00	-8.50	14.00	-2.50	21.25
3	5	3.00	-13.50	5.00	-11.50	155.25
10	17	10.00	-6.50	17.00	0.50	-3.25
5	1	5.00	-11.50	1.00	-15.50	178.25
4	23	4.00	-12.50	23.00	6.50	-81.25
19	25	19.00	2.50	25.00	8.50	21.25
1	3	1.00	-15.50	3.00	-13.50	209.25
28	31	28.00	11.50	31.00	14.50	166.75
14	28	14.00	-2.50	28.00	11.50	-28.75
22	7	22.00	5.50	7.00	-9.50	-52.25
7	24	7.00	-9.50	24.00	7.50	-71.25
2	8	2.00	-14.50	8.00	-8.50	123.25
20	4	20.00	3.50	4.00	-12.50	-43.75
13	9	13.00	-3.50	9.00	-7.50	26.25
9	15	9.00	-7.50	15.00	-1.50	11.25
11	22	11.00	-5.50	22.00	5.50	-30.25
18	20	18.00	1.50	20.00	3.50	5.25
16	2	16.00	-0.50	2.00	-14.50	7.25
27	19	27.00	10.50	19.00	2.50	26.25
17	30	17.00	0.50	30.00	13.50	6.75

Calculation

R = CoVariance / (X_{Ra} St. Dev. * Y_{Ra} St. Dev.)

Key

X_{Ra} = Ranks of X Values; Y_{Ra} = Ranks of Y Values
$X_{Ra} - M_x$ = X rank minus mean of X ranks
$Y_{Ra} - M_y$ = Y rank minus mean of Y ranks
Sum Diffs = ($X_{Ra} - M_x$) * ($Y_{Ra} - M_y$)

r_s = 0.24597, p (2-tailed) = 0.17478.

By normal standards, the association between the two variables would not be considered statistically significant.

Result Details

X Ranks
Mean: 16.5
Standard Dev: 9.38

Y Ranks
Mean: 16.5
Standard Dev: 9.38

Combined
Covariance = 671 / 31 = 21.65
R = 21.65 / (9.38 * 9.38) = 0.246

Poverty & Person Per Acre

X Values	Y Values	X_{Ra}	$X_{Ra} - M_x$	Y_{Ra}	$Y_{Ra} - M_y$	Sum Diffs
1	29	1.00	-15.50	29.00	12.50	-193.7
2	30	2.00	-14.50	30.00	13.50	5
3	21	3.00	-13.50	21.00	4.50	-195.7
4	28	4.00	-12.50	28.00	11.50	5
5	31	5.00	-11.50	31.00	14.50	-60.75
6	13	6.00	-10.50	13.00	-3.50	-143.7
7	16	7.00	-9.50	16.00	-0.50	5
8	32	8.00	-8.50	32.00	15.50	-166.7
9	27	9.00	-7.50	27.00	10.50	5
10	22	10.00	-6.50	22.00	5.50	36.75
11	18	11.00	-5.50	18.00	1.50	4.75
12	4	12.00	-4.50	4.00	-12.50	-131.7
13	20	13.00	-3.50	20.00	3.50	5
14	3	14.00	-2.50	3.00	-13.50	-78.75
15	9	15.00	-1.50	9.00	-7.50	-35.75
16	23	16.00	-0.50	23.00	6.50	-8.25
17	11	17.00	0.50	11.00	-5.50	56.25
18	2	18.00	1.50	2.00	-14.50	-12.25
19	24	19.00	2.50	24.00	7.50	33.75
20	7	20.00	3.50	7.00	-9.50	11.25
21	6	21.00	4.50	6.00	-10.50	-3.25

Calculation

R = CoVariance / (X_{Ra} St. Dev. * Y_{Ra} St. Dev.)

Key

X_{Ra} = Ranks of X Values; Y_{Ra} = Ranks of Y Values
$X_{Ra} - M_x$ = X rank minus mean of X ranks
$Y_{Ra} - M_y$ = Y rank minus mean of Y ranks
Sum Diffs = ($X_{Ra} - M_x$) * ($Y_{Ra} - M_y$)

r_s = -0.47177, p (2-tailed) = 0.00641.

By normal standards, the association between the two variables would be considered statistically significant.

Result Details

X Ranks
Mean: 16.5
Standard Dev: 9.38

Y Ranks
Mean: 16.5
Standard Dev: 9.38

Combined
Covariance = -1287 / 31 = -41.52
R = -41.52 / (9.38 * 9.38) = -0.472

Poverty & Outdoor Recreation Spaces

X Values	Y Values	X_{Ra}	$X_{Ra} - M_x$	Y_{Ra}	$Y_{Ra} - M_y$	*Sum Diffs*
1	22	1.00	-15.50	22.00	5.50	-85.25
2	23	2.00	-14.50	23.00	6.50	-94.25
3	27	3.00	-13.50	27.00	10.50	-141.7
4	29	4.00	-12.50	29.00	12.50	5
5	30	5.00	-11.50	30.00	13.50	-156.2
6	18	6.00	-10.50	18.00	1.50	5
7	25	7.00	-9.50	25.00	8.50	-155.2
8	31	8.00	-8.50	31.00	14.50	5
9	26	9.00	-7.50	26.00	9.50	-15.75
10	17	10.00	-6.50	17.00	0.50	-80.75
11	20	11.00	-5.50	20.00	3.50	-123.2
12	24	12.00	-4.50	24.00	7.50	5
13	28	13.00	-3.50	28.00	11.50	-71.25
14	2	14.00	-2.50	2.00	-14.50	-3.25
15	16	15.00	-1.50	16.00	-0.50	-19.25
16	7	16.00	-0.50	7.00	-9.50	-33.75
17	10	17.00	0.50	10.00	-6.50	-40.25
18	3	18.00	1.50	3.00	-13.50	36.25
19	19	19.00	2.50	19.00	2.50	0.75
20	11	20.00	3.50	11.00	-5.50	4.75
21	12	21.00	4.50	12.00	-4.50	-3.25

Calculation

R = CoVariance / (X_{Ra} St. Dev. * Y_{Ra} St. Dev.)

Key

X_{Ra} = Ranks of X Values; Y_{Ra} = Ranks of Y Values
$X_{Ra} - M_x$ = X rank minus mean of X ranks
$Y_{Ra} - M_y$ = Y rank minus mean of Y ranks
Sum Diffs = ($X_{Ra} - M_x$) * ($Y_{Ra} - M_y$)

Result Details

X Ranks
Mean: 16.5
Standard Dev: 9.38

Y Ranks
Mean: 16.5
Standard Dev: 9.38

Combined
Covariance = -1656 / 31 = -53.42
R = -53.42 / (9.38 * 9.38) = -0.607

r_s = -0.60704, p (2-tailed) = 0.00023.

By normal standards, the association between the two variables would be considered statistically significant.

Poverty & Indoor Recreation Spaces

X Values	Y Values	X_{Ra}	$X_{Ra} - M_x$	Y_{Ra}	$Y_{Ra} - M_y$	*Sum Diffs*
1	29	1.00	-15.50	29.00	12.50	-193.7
2	10	2.00	-14.50	10.00	-6.50	5
3	26	3.00	-13.50	26.00	9.50	94.25
4	16	4.00	-12.50	16.00	-0.50	-128.2
5	21	5.00	-11.50	21.00	4.50	5
6	12	6.00	-10.50	12.00	-4.50	6.25
7	11	7.00	-9.50	11.00	-5.50	-51.75
8	32	8.00	-8.50	32.00	15.50	47.25
9	6	9.00	-7.50	6.00	-10.50	52.25
10	27	10.00	-6.50	27.00	10.50	-131.7
11	18	11.00	-5.50	18.00	1.50	5
12	30	12.00	-4.50	30.00	13.50	78.75
13	19	13.00	-3.50	19.00	2.50	-68.25
14	2	14.00	-2.50	2.00	-14.50	-8.25
15	20	15.00	-1.50	20.00	3.50	-60.75
16	22	16.00	-0.50	22.00	5.50	-8.75
17	15	17.00	0.50	15.00	-1.50	36.25
18	9	18.00	1.50	9.00	-7.50	-5.25
19	4	19.00	2.50	4.00	-12.50	-2.75
20	8	20.00	3.50	8.00	-8.50	-0.75
21	24	21.00	4.50	24.00	7.50	-11.25

Calculation

R = CoVariance / (X_{Ra} St. Dev. * Y_{Ra} St. Dev.)

Key

X_{Ra} = Ranks of X Values; Y_{Ra} = Ranks of Y Values
$X_{Ra} - M_x$ = X rank minus mean of X ranks
$Y_{Ra} - M_y$ = Y rank minus mean of Y ranks
Sum Diffs = ($X_{Ra} - M_x$) * ($Y_{Ra} - M_y$)

r_s = -0.23314, p (2-tailed) = 0.19909.

By normal standards, the association between the two variables would not be considered statistically significant.

Result Details

X Ranks
Mean: 16.5
Standard Dev: 9.38

Y Ranks
Mean: 16.5
Standard Dev: 9.38

Combined
Covariance = -636 / 31 = -20.52
R = -20.52 / (9.38 * 9.38) = -0.233