An Evaluation of Esri's Tapestry Segmentation Product in Three Southern California Communities: Manhattan Beach, Santa Monica, and Venice Beach

by

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DEDICATION

I dedicate this document to my parents for their constant support, encouragement, and especially for their unconditional love.

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I would like to thank Dr. Wilson for his unending encouragements and advice through this whole process. I would also like to thank God, my family, and my friend Christie Snyker Root, without whom I could not have made it this far.

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LIST OF ABBREVIATIONS

ACS	American Community Survey
AFAC	Arlington Food Assistance Center
AIER	American Institute for Economic Research
CBED	Cluster-Based Economic Development
GHG	Greenhouse Gas
GIS	Geographic Information Systems
LA	Los Angeles
SES	Socioeconomic Status
SMURFF	Santa Monica Urban Runoff Facilities
ZIP	Zone Improvement Plan

ABSTRACT

California is known as the "golden state" and "the best coast" to the modern generation. Therefore, it is not surprising that in 2014, the U.S. Census Bureau reported that California was the most populous state in the country. California is also filled with tremendous diversity that blends and molds various demographic groups, cultures and lifestyles, which makes the state more vibrant and appealing. Known for its warm climate and being "always sunny" seems to outweigh the negative environmental factors (i.e. landslides, earthquakes, tsunami, air quality problems, and water shortages) that may persuade people not to move to California. This diversity varies across counties and cities within the state. Aside from history and political factors, this diversity has also created significant variation in wealth and the standard of living across the region. Each county and city independently strives to increase its economic wealth and standard of living. This can be seen more dramatically in California compared to other states. There are many factors that measure and indicate the level of overall prosperity. Understanding this can decipher why certain types of people are living in or are inclined to reside in specific locations. This study used two products – the Tapestry Segmentation Product produced by Esri and the American Community Survey produced by the U.S. Census Bureau – to look at demographic and socio-economic attributes in three neighborhoods: Venice Beach, the City of Manhattan Beach, and the City of Santa Monica. Spatially visualizing these neighborhoods will easily and effectively identify the lifestyle attributes that draw current and potential residents, and show how sensitive these outcomes are to the choice of source data aggregation level and the geographic granularity that is thereby embedded in these data products. The results show how the aggregation of median household, median age and population at the ZIP code scale hides considerable variation across the three study communities. This outcome – the realization that

the characterization of areal unit changes with the choice of aggregation level – demonstrates the importance of the modifiable area unit problem and the need for care in matching the resolution of the geographic data used to the problem or opportunity at hand.

CHAPTER 1: INTRODUCTION

Geographic information systems (GIS) can help to explain where people settle and the kinds of economic, social, and political outcomes that are fostered or afforded by these settlement choices. This information may also foster collaborations across two or more sectors (e.g. public, not-for-profit, or private organizations) that strengthen and better serve local communities. In addition, the knowledge of where people live may be augmented by their demographic and socio-economic characteristics with GIS, such that we can connect different lifestyle attributes as a whole to more fully understand the quality-of-life afforded by specific communities.

This approach leads to a method of analysis called segmentation. The idea behind this concept is that people tend to live near and around those with similar tastes and behaviors. This is what draws a group together to form a community or a neighborhood. While it may be the case that people's lifestyles are shaped by what a region offers, it may also be true that living in a specific community (i.e. one with other people with similar demographic and socio-economic profiles or trajectories) creates distinguishing trends. Segmentation utilizes a wide range of data to explain lifestyles and life stages, customer diversity and by doing so, may provide support for marketing campaigns (Esri.com, 2012). This concept led Esri to create a project called Tapestry Segmentation in 2014. Tapestry Segmentation is an online web platform that profiles and classifies communities by lifestyle attributes and defines SES and demographic compositions at the census track, census block group, ZIP code, and ZIP+4 levels (Esri.com, 2012).

1.1 Background

GIS technology is continuously evolving and Esri's Tapestry Segmentation platform was 30 years in the making and can be used by organizations to assess and analyze consumer behavior and trends (Esri.com/Tapestry, 2014). The fundamental idea is that people with similar lifestyles,

tastes, and behaviors can be categorized as a pattern or trend and therefore, can be measured, predicted, and targeted. Using consumer and demographic data, Esri's Tapestry Segmentation describes resident's lifestyles and life stage and maps clusters of consumers with similar goals and tastes (Esri.com/Tapestry, 2014).

As data collection has become more efficient, the public and private sectors have made a progressive effort to use this collected data to improve the quality of service and to better meet people's needs. Tapestry Segmentation provides this valuable information to both consumers and retailers. This platform provides a ZIP code search that describes the characteristics of the residents living in the chosen ZIP code using information pulled from the U.S. Census Bureau's 2010 Census. The platform divides U.S. residential areas into 67 distinctive segments based on their socioeconomic and demographic composition, and these segments are broken down further into Life Mode and Urbanization Groups (Esri.com/Tapestry, 2014). The GIS that supports the Tapestry Segmentation platform allows different demographic data sets to be brought together to create a complete picture of local communities and neighborhoods across the U.S. This GIS technology base illustrates relationships, connections, and patterns that are not necessarily obvious in any one data set, enabling organizations to make better decisions based on all of the relevant factors.

This is extremely beneficial to businesses and organizations whose success depends on targeting the appropriate demographic. The Tapestry Segmentation platform may help small and specialized businesses to find and target their customers. Using Tapestry Segmentation may also help businesses to increase their sales through a higher level of assessment of market needs and trends.

For larger and more established organizations, Tapestry Segmentation can help with decision making by providing an overview of the character of specific neighborhoods and their residents. Some organizations may be able to branch out further by identifying new opportunities for selling their products or to test out new products. This is a great way to gain additional insights to enhance customer service and ultimately, to increase sales and profits. When the delineation of certain patterns or trends within a region is clear, it is easier to visualize and create more successful plans. Non-profit and government organizations may also benefit when they are trying to solve specific problems within a region or to achieve specific improvements. Issues such as socioeconomic disparity can be quantified and measured through Tapestry Segmentation's approach. By applying traditional customer profiling techniques, the uses of the Tapestry Segmentation platform can easily identify a community's problems or special needs as well as provide solutions to complex local government challenges (e.g. public safety, fire protection, land use planning, and urban redevelopment).

1.2 Thesis Goals

As GIS is shifting more towards cloud computing and web platforms, this allows broader approaches to analyzing and interpreting data. There is an increasing need to understand lifestyles and the factors that contribute to quality-of-life. Consumer spending is all about choices and these decisions are influenced by market conditions and trends, which vary geographically. The U.S. population is increasingly diverse and highly mobile. According to the American Institute for Economic Research (Greenstein, 2015), the large numbers of people who move between regions (almost 5%), between states (over 4%), and within counties (5-6%), means that 25 to 28 million people move each year (Greenstein, 2015). This mobility is an enduring characteristic of U.S. society. At the start of 20th century, changes in technology,

ownership, and production processes in the agricultural sector all played a role in sending rural migrants to more urbanized areas. For the millennial group, technology growth and higher educational attainment mean this group is pulled to urban areas for the lifestyle amenities and experiences provided by these places (Greenstein, 2015). These factors exert a stronger influence to move than economic conditions for the millennials (Greenstein, 2015).

Within a neighborhood, consumer trends indicate the kinds of demographics by which the residents can be broken down – by race, ethnicity, income, education, as well as lifestyle attributes that characterize and distinguish one neighborhood or community from another. The trend data also measures local demand for goods and services and how this may change over time. Knowing this helps businesses to better provide for consumer needs.

Esri's new platform, Tapestry Segmentation seeks to meet those needs by using up-to-date census data to characterize neighborhoods at the ZIP code level. This study will look deeper into the Tapestry Segmentation platform and explore how three different communities are classified. Specifically, this study aims to look at three of the most prominent Los Angeles County beach communities: the City of Manhattan Beach, the City of Santa Monica, and Venice Beach, a unique and distinctive neighborhood that is part of the City of Los Angeles. A collection of census variables is used to see how well these lifestyle descriptions from the Tapestry Segmentation platform match the characteristics of the residents living in these three communities today.

This study had three aims as follows: (1) to explore Esri's Tapestry Segmentation platform and its descriptions of the residents and lifestyles in the various ZIP codes covering Manhattan Beach, Santa Monica, and Venice Beach; (2) to clarify which of the variables included in the U.S. Census Bureau's American Community Survey (ACS) best match the kinds

of socio-economic and demographic characteristics used to describe these residents in the Tapestry Segmentation platform; and (3) to calculate the fractions of the residents in these three communities that match the broad descriptions offered in the Tapestry Segmentation platform and where rates of compliance were higher in some parts of these communities than others.

1.3 Description of Study Area

Today, LA County is the eighth largest county (in terms of area) in California with an area of 4,752 mi^2, but the most populous county in the country with a population of 9,818,605 in 2010. This study used three communities in LA County to assess and understand the factors and trends defined by Esri's Tapestry Segmentation platform. The Cities of Manhattan Beach and Santa Monica plus the Venice Beach neighborhood in the City of Los Angeles bordering the Pacific Ocean coastline were selected (Figure 1).

For consistency, all three places will be considered and referred to hereafter as communities. Some characteristics describing the three communities are summarized in Table 1. These data show that Manhattan Beach and Venice Beach are similar in terms of population and land area but that Manhattan Beach has more schools, a larger percentage of married adults, homeowners, and adults with a bachelor's degree or higher.

Santa Monica is a much larger and more populous city (8.416 mi^2; 91,908 residents) that contains five different ZIP codes whereas both Manhattan Beach and Venice Beach had just one ZIP code. Santa Monica is a destination for tourists, as well as an attractive place to live. Santa Monica has a more diverse population than the other two communities. The next three sections provide some additional details about each of the three study communities.

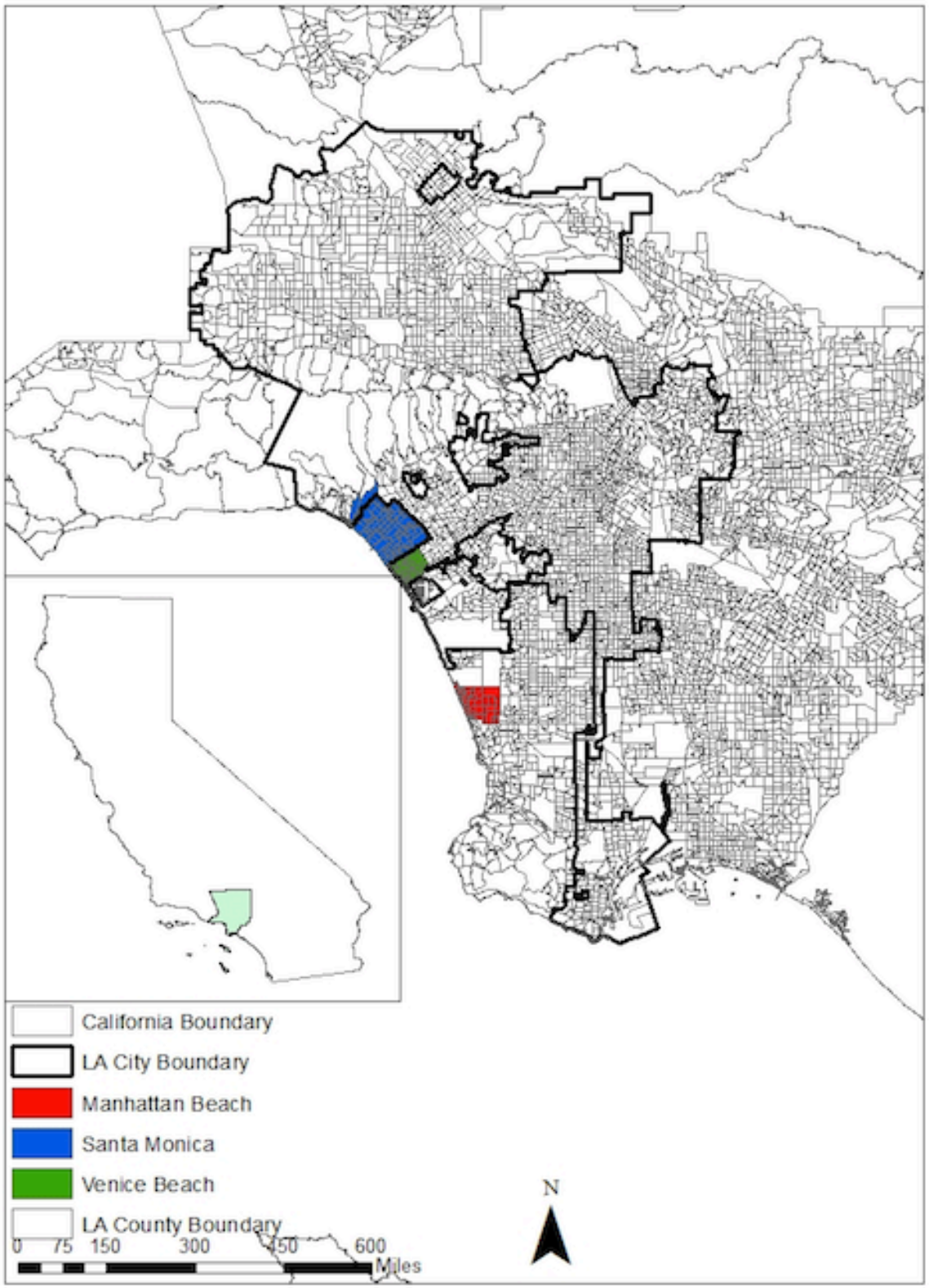

Figure 1: County of LA (outlined in green) showing the City of LA and the three communities: Santa Monica in red, Manhattan Beach in green, and Venice Beach in blue.

Table 1: Key variables describing the three communities chosen as the study area

Variables	Manhattan Beach	Santa Monica	Venice Beach
Communities	City	City	Neighborhood of LA City
Year Incorporated	1912	1912	1926
ZIP code(s)	90266	90401, 90402, 90403, 90404, 90405	90291
Area (Sq. Mi.)	3.941	8.417	3.17
Population	35,846	91,906	40,885
No. of Public Schools	13	29	5
% of Adults Married/ Single	85/15	73/27	74/26
% of Homeowners/ Renters	65/35	65/35	31/69
% of Adults with B.A./ B.S. or higher	72	63	49

(*Source*: Data adopted from Realtor.com, 2015)

1.3.1 Manhattan Beach

Founded by a Scottish immigrant in 1863, Manhattan Beach is a small coastal city in the South Bay of LA County (Figure 2). The city was incorporated in 1912 (Table 1) and today, 35,000 people live in the city which grew 1.5% over the past year. About 42% of the residents have owned the same home for at least five years and 16% moved in as residents during the past year. The majority of the residents are college graduates and married in their 40s either with or without children (Table 1). Most work in the office, administrative, sales, executive, and food sectors (Realtor.com, 2015). There is a total of 13 public schools (elementary, middle, and high). There

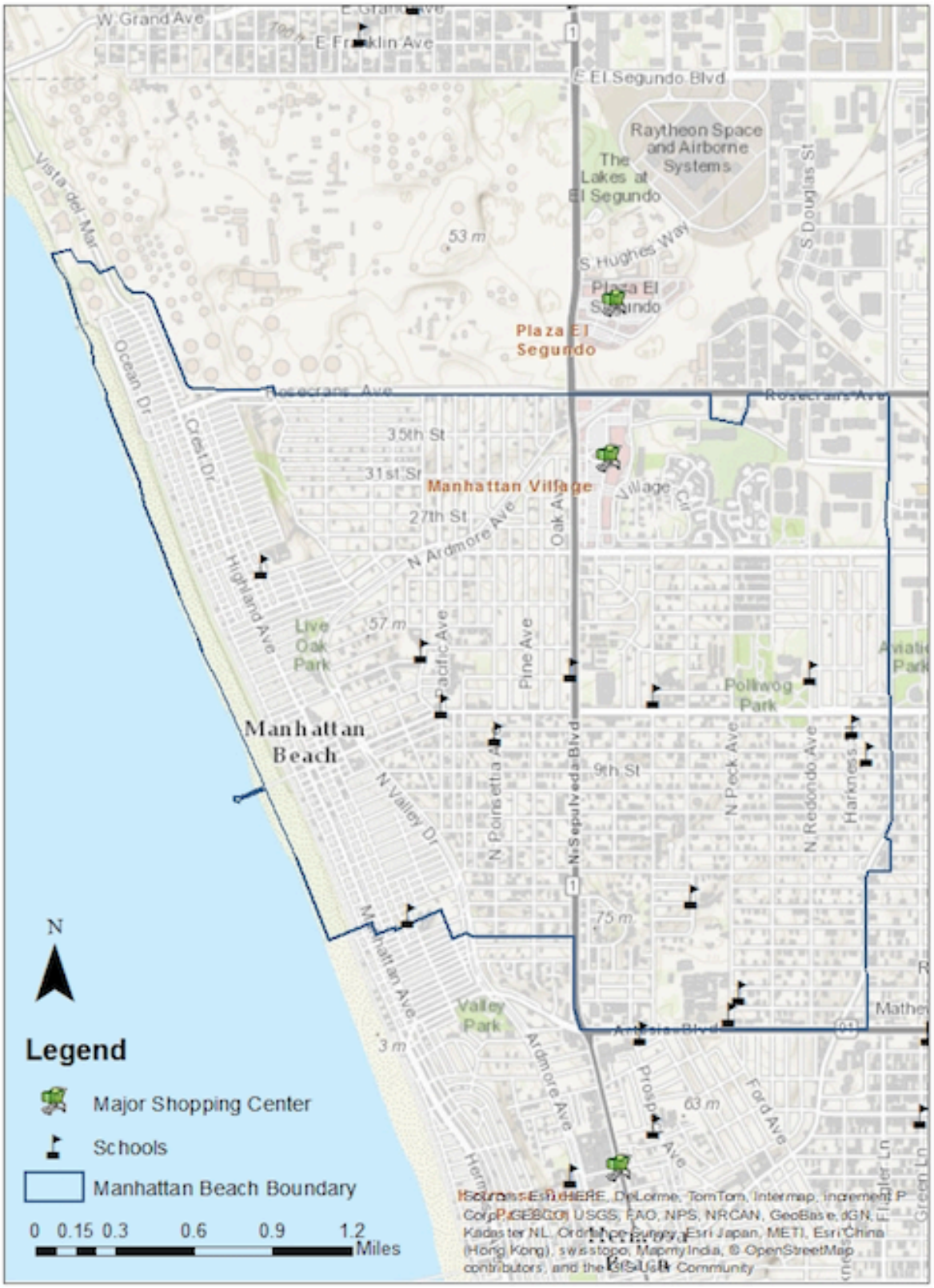

Figure 2: Map of the City of Manhattan Beach showing major roads, schools, parks, and the predominant shopping center (Manhattan Village).

are many attractive features about the area led by the proximity to the ocean, the beach, the pier and mild climate that make it an appealing place to live. Manhattan Village is a premier shopping destination and there are many fine dining and other entertainment options that serve the residents and the many visitors (Figure 2).

According to California Department of Education statistics, the Manhattan Beach Unified School District has test scores that rank third in the country. Forbes Magazine ranked Manhattan Beach as the sixth best school district in the country and the Beach Reporter newspaper has stated that Manhattan Beach has the most educated residents of any city in California. Many celebrities and high-profile athletes live in the city since the area easily accommodates their upscale lifestyles given the presence of many high-end oceanfront beach homes. GQ Magazine ranked the beach as one of the nation's six best beaches in their July 2014 issue. CNN Money's survey ranked the City of Manhattan Beach as one of the "2011 Best Places for the Rich and Single". For these and other reasons, Manhattan Beach is often referred to as the "Pearl of the South Bay".

1.3.2 Santa Monica

Santa Monica is a beachfront city in western LA County, which was named after the Christian saint, Monica (Figure 3). Prior to its settlement by Europeans, Santa Monica was already inhabited by the Native American tribe, Tongva and in their language the town was called Kecheek. The city was incorporated in 1886 and today, Santa Monica is home to many famous Hollywood celebrities and executives as well as other affluent residents. There are 91,000 people that live in the city and the city continues to grow due to the rebuilding and revitalization of its downtown, increasing numbers of jobs, and tourism. Many residents are college graduates and many are also married and in the 30s. Nearly two out of every three adults (63 percent) have a

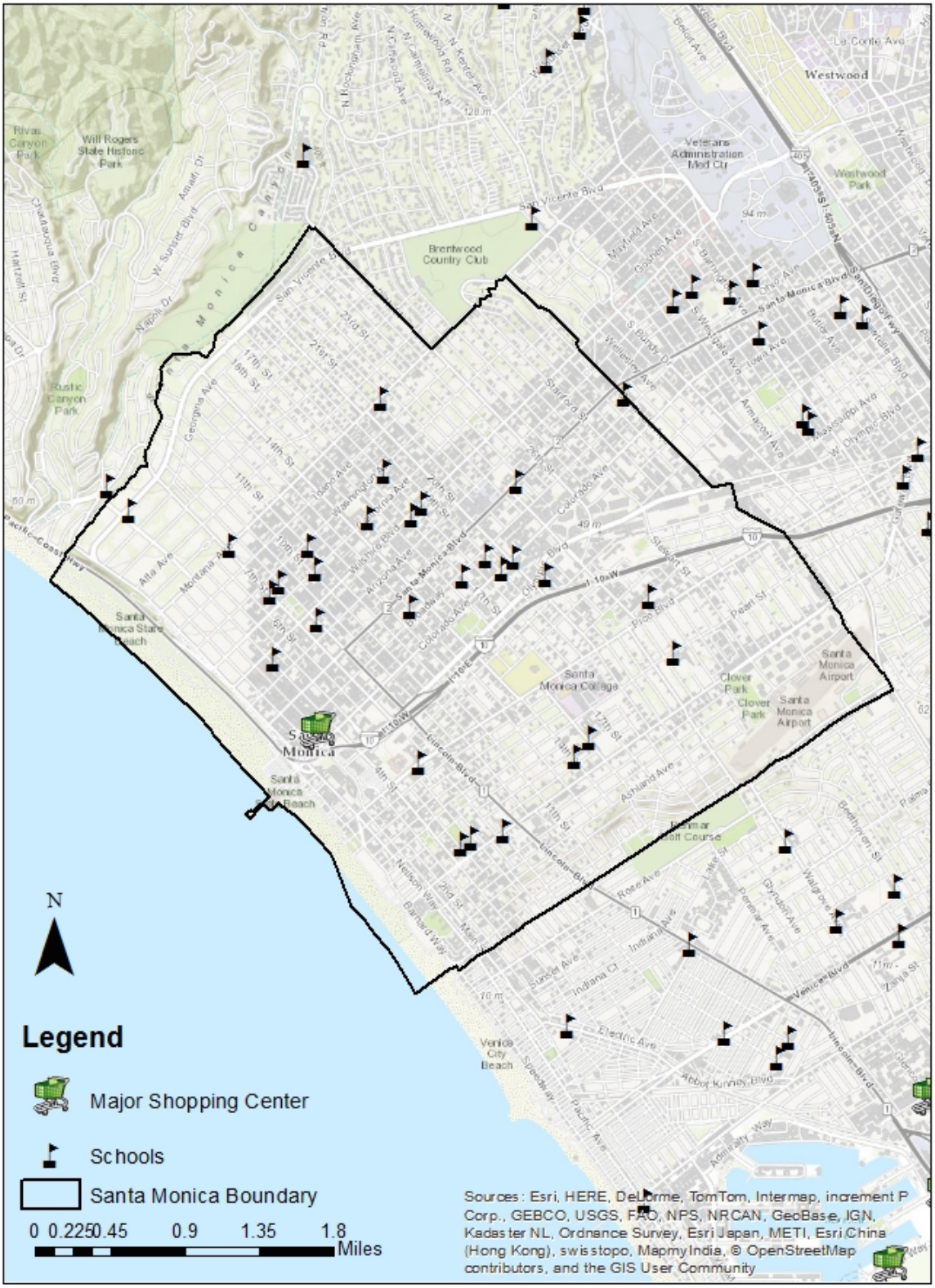

Figure 3: Map of the City of Santa Monica showing the major roads, major shopping center (Santa Monica Place), schools, and parks located within the city.

bachelor's degree or higher, which is 34 percent higher than the average rate for LA County. Home ownership rates are similar to Manhattan Beach and most of Santa Monica's residents have jobs in the office, administrative, sales, executive, and food sectors. There are total of 29 public schools (elementary, middle, and high). The beaches draw many visitors for surfing and other beach sports as well as running, walking, cycling, and skateboarding on the boardwalk that runs the length of the city's coastline (Figure 3).

Santa Monica has many attractions, a storied history, and is a leader in promoting environmental sustainability. The Santa Monica Looff Hippodrome (carousel) which sits on the Santa Monica pier is a National Historic Landmark. There are three main shopping districts each with its own distinctive personality that draw additional tourists: Main Street, Montana Avenue, and Santa Monica Place. The well-known Pacific Park also draws many people, especially families to enjoy the many rides, games, and other fun activities. Santa Monica is also filled with food and arts and every fall the Santa Monica Chamber of Commerce hosts the Taste of Santa Monica on the pier and there is also an annual Santa Monica Film Festival.

In addition, Santa Monica is known for being one of the most environmentally active cities in the nation. The city was one of the first cities in the early 1990s to promote sustainability by proposing to reduce waste and implement water conservation policies for both the public and private sectors. The City's goal is to reduce greenhouse gas (GHG) emissions by 30% below 1990 levels by 2015 for city operations and to reduce emissions 15% below 1990 levels by 2015 for the city as a whole (CoolCalifornia.org, 2014). Four out of every five of the city's public works vehicles currently run on alternative fuels. Santa Monica also operates an urban runoff facility (SMURFF), where they catch and treat approximately 3.5 million gallons of water each

week that would typically flow into the bay via storm drains. The city aims to become 100% water independent and to stop importing water by 2020.

1.3.3 Venice Beach

Venice Beach is a residential, commercial, and recreational beachfront neighborhood in western LA County (Figure 4). The neighborhood was founded in 1905 by a tobacco millionaire, Abbot Kinney, to be built as a seaside resort town and with the initial name of "Venice of America". Since then, there have been many political and social changes that have transformed the City of Los Angeles neighborhood into a modern day hot spot for both residents and tourists alike.

Today, the neighborhood boasts 40,000 residents with a growth rate of 1.5% over the past year. About 31% of the residents have owned their homes for at least five years and 23% moved in as residents since in the past year.

The majority of the adult population are married in the mid- to late-30s either with or without children. Most work in the office, administrative, sales, executive, and food sectors (Realtor.com, 2014). There are five public schools in the community (elementary, middle, and high) and 49 percent of the adult population has a bachelor's degree or higher.

Venice Beach is known for the Canal Historic District and Abbot Kinney Boulevard, which offers many restaurants, shops, and bars, the beach and breakwater for surfers, and the circus-like Ocean Front Walk, where many performers, fortune-tellers, artists, and vendors can be spotted. The city is also known as a hangout for the creative set, including poets, artists, and musicians.

Figure 4: Map of Venice Beach neighborhood, which is part of the city of LA, showing major roads, schools, and a park and golf course located within the neighborhood boundary.

1.4 Thesis Organization

The remainder of the thesis consists of four chapters. Chapter 2 describes the Tapestry Segmentation platform and how it has been used to date. Chapter 3 describes the methodology and data sources that were used to evaluate this platform. Chapter 4 describes the results and Chapter 5 discusses the significance of the results and offers several suggestions as to how the Tapestry Segmentation platform and/or its use could be further improved.

CHAPTER 2: RELATED WORK

This chapter takes a closer look at the variables, which help to shape the quality of life of residents in specific cities and/or neighborhoods. These discussions often start with socio-economic status (SES), which closely follows the economic development of a region and may be linked to a community's health status (Gatrell and Jensen, 2009). SES also varies by region and with changing employment and consumer trends in society or in a particular neighborhood. It is important to focus on finer geographical scales to make better assessments of lifestyles and quality of life. This is the vision that underpins and drives market segmentation.

2.1 Esri's Tapestry Segmentation Methodology

Historically, cluster analysis has been employed to study markets. In recent years, cluster-based economic development (CBED) has been used by policy makers and practitioners to further develop their economic development strategies. CBED is most effective when it is network-driven with collaboration from high numbers of participants (Reid et al., 2009). This approach is beneficial and provides an industry sector with crucial data, where an individual firm or organization may not have the resources to acquire and assess the industry themselves (Reid et al., 2009).

In addition to CBED and prior formation of Esri's Tapestry Segmentation, the concept of segmentation was already being utilized by various organizations and agencies to target various consumers. Some people used clusters to find customers within a certain distance of a major freeway or road, the numbers of eligible students for one or more education institutions or programs, the identification of customer characteristics and needs, and/or the number of customers interested in specific products or services such organic fruits or vegetables.

Tapestry Segmentation uses a similar but much more sophisticated approach that combines traditional cluster analysis methods and the latest data mining techniques to provide a robust and compelling segmentation of U.S. neighborhoods (Esri.com/Tapestry, 2014). This newly enhanced method and technology allows the platform to work with large geodemographic databases. Esri has a long history of acquiring; processing, and analyzing census data, and this has facilitated the development of the new TS platform.

The development of this platform has utilized multivariate statistical methods, factor analysis, principal components analysis, correlation matrices, and graphical methods (Esri.com/Tapestry, 2014). The end result is a platform that provides more than 60 attributes to identify and cluster US neighborhoods by market type (Table 2). Esri has combined these segments into 12 LifeMode Summary Groups based on life-style and life-stage composition, as summarized in Table 3 (Esri.com/Tapestry, 2014). Esri has also classified the nation into 11 Urbanization Groups ranging from the urban canyons of the largest cities to the rural lanes of villages or farms. These summary groups are based on geographic and physical features along with socio-economic characteristics (Table 4).

Segments provide more differentiating power than summary groups. However, if the user wants to summarize or analyze a smaller number of markets, summary groups are appropriate. Choosing between the two ways of grouping segments depends on the application at hand. For certain products or services, Urbanization Groups may more effectively distinguish the consumption pattern than LifeMode Groups; for example, going to the movies. But for certain life-style or life-stage-related behavior, such as domestic travel, grouping by LifeMode may be more effective (Esri.com/Tapestry, 2014).

Some of the ways the information for these groups can be used are discussed below.

Table 2 The market segment types included in Esri's Tapestry Segmentation platform

Segment Code	Segment Name	Segment Code	Segment Name
01	Top Rung	34	Family Foundations
02	Suburban Splendor	35	International Marketplace
03	Connoisseurs	36	Old and Newcomers
04	Boomburbs	37	Prairie Living
05	Wealthy Seaboard Suburbs	38	Industrious Urban Fringe
06	Sophisticated Squires	39	Young and Restless
07	Exurbanites	40	Crossroads
08	Laptops and Lattes	41	Southern Satellites
09	Urban Chic	42	The Elders
10	Pleasant-Ville	43	Urban Melting Pot
11	Pacific Heights	44	Urban Melting Pot
12	Up and Coming Families	45	City Strivers
13	In Style	46	Rooted Rural
14	Prosperous Empty Nesters	47	Las Casas
15	Silver and Gold	48	Great Expectations
16	Enterprising Professionals	49	Senior Sun Seekers
17	Green Acres	50	Heartland Communities
18	Cozy and Comfortable	51	Metro City Edge
19	Milk and Cookies	52	Inner City Tenants
20	City Lights	53	Home Town
21	Urban Villages	54	Urban Rows
22	Metropolitans	55	College Towns
23	Trendsetters	56	Rural Bypasses
24	Main Street, USA	57	Simple Living
25	Salt of the Earth	58	NeWest Residents
26	Midland Crowd	59	Southwestern Families
27	Metro Renters	60	City Dimensions
28	Aspiring Young Families	61	High Rise Renters
29	Rustbelt Retirees	62	Modest Income Homes
30	Retirement Communities	63	Dorms to Diplomas
31	Rural Resort Dwellers	64	City Commons
32	Rustbelt Traditions	65	Social Security Set
33	Midlife Junction		

Table 3: LifeMode Summary Groups included in Esri's Tapestry Segmentation platform

Group Codes	Names	Segment Codes	Description
L1	High society	01, 02, 03, 04, 05, 06, 07	Affluent and well educated. Slightly higher than 12% of all U.S. households, but generate nearly 25% of the total U.S. income. Median household income is $100, 216. Most households are married and this is the least ethnically diverse group in the U.S., but fastest growing (annual 2% increase). Participate in a wide variety of public activities and sports, and travel extensively.
L2	Upscale Avenues	09, 10, 11, 13, 16, 17, 18	Prosperity is the overriding attribute shared by the seven segments in *Upscale Avenues*. Years of hard work have brought success to this group. Well-educated with above average earnings (median household income at $65, 912). Urban markets such as *Urban Chic* and *Pacific Heights* favor townhouses and high-rises, *Pleasant-Ville* residents prefer single-family homes in suburban neighborhoods, and *Green Acres* residents prefer open spaces. This group likes to invest in their homes; the owners work on landscaping and home remodeling projects, and the renters buy new furnishings and appliances, play golf, lift weights, bicycling, and take domestic vacations. Although they are partial to new cars, they also save and invest their earnings.
L3	Metropolis	20, 22, 45, 51, 54, 62	Residents in the six segments of the *Metropolis* group live and work in America's cities. They live in older, single-family homes or row houses built in the 1940s or earlier. Rely more on public transportation. This group reflects the segment diversity in housing, age, and income. Employment status ranges from well-educated professionals to unemployed. Median household income is $39, 031. Their lifestyle is uniquely urban and media oriented such as urban and/or contemporary formats, which they listen to during their commutes. Watch a variety of TV programs from news to syndicated sitcoms, and would rather see movies than read books.
L4	Solo Acts	08, 23, 27, 36, 39	Residents here are young singles and prefer the city life. They are just starting out in more densely populated U.S. neighborhoods and well-established without child-rearing nor home ownership responsibilities. Second only to *High Society*, residents of this group tend to be well-educated, working professionals who are either attending college or already hold a degree. The median household income ranges from $39, 234 (*Old and Newcomers*) to $84, 612 (*Laptops & Lattes*). Home ownership is at 28 percent. *Solo Acts*' residents are moving into major cities such as New York; Chicago; Washington, D.C.; Boston; Los Angeles; and San Francisco. They enjoy the urban lifestyle such as dining out, attending plays and concerts, visiting museums, and both domestic and foreign travel.
L5	Senior Styles	14, 15, 29, 30, 43, 49, 50, 57, 65	More than 14.4 million households in the nine *Senior Styles* segments comprise one of the largest LifeMode summary groups. As the U.S. population ages, two of the fastest-growing American markets are found among *The Elders* and the *Silver and Gold* segments. Although incomes within this group cover a wide range, the median is $41, 334, attributable mostly to retirement income or Social Security payments. Many are traveling and relocating to warmer climates. Settled seniors are looking for retirement and remaining in their homes. Less privileged segments live alone and collect Social Security and other benefits. Their choice of housing depends on their income. Golf is their favorite sport; they play and watch golf on TV. They read the newspaper daily and prefer to watch news

			shows on television. They are also more likely to shop through QVC than online.
L6	Scholars and Patriots	40, 55, 63	This group includes youth, with the attendant lower incomes, and atypical environments such as college life or military service. Because of their transient lifestyle and lifestage, their home ownership rate is low. Most live in townhouses or apartments and 25% reside in single-family homes. *Military Proximity* is dominated by military life; *College Towns* and *Dorms* and *Diplomas*, are predominantly students who are pursuing college degrees. *Scholars* and *Patriots* residents' eclectic tastes in sports range from yoga to football. Electronically savvy, they have wireless Internet connections, notebook, computers, iPods, and digital cameras.
L7	High Hopes	28, 48	The *High Hopes* summary group includes *Aspiring Young Families* and *Great Expectations*. They are mix of married couples, single parents, and singles who seek the "American Dream" of home ownership and a rewarding job. Most live in single-family houses or multi-unit buildings; approximately half own their homes. Many would move to a new location for better opportunities. Many are young, mobile, and college educated; one-third are younger than 35 years. The median household income is $40, 928.
L8	Global Roots	35, 38, 44, 52, 58, 60, 61	Ethnic diversity is the common thread among the eight segments in *Global Roots*. *Las Casas* and *NeWest Residents* represent a strong Hispanic influence in addition to a broad mix of cultural and racial diversity found in *Urban Melting Pot* and *International Marketplace*. Typical of new households, *Global Roots'* residents are young, earn modest incomes, or rent in multiunit buildings. Half of all households have immigrated to the U.S. within the past 10 years. Married couples, usually with children; single parents; and people who live alone are typically *Global Roots* segments. Spending is high on baby products, children's clothing, and toys. They are more likely to use cell phones over PCs. They retain close ties with friends and relatives in their countries of origin with foreign travel.
L9	Family Portrait	12, 19, 21, 59, 64	This is the fastest growing population of the LifeMode summary groups, driven primarily by the rapid increase in the *Up and Coming* Families segment. Youth, family life, and young children are commonly seen within this group. The group is also ethnically diverse: more than 30% of the residents are of Hispanic descent. The neighborhoods are predominantly composed of homeowners who live in single-family homes. Their lifestyle revolves around their children and family, which consists of buying infant and children's clothing and toys and visiting theme parks and zoos.
L10	Traditional Living	24, 32, 33, 34	The four segments in Traditional Living convey the perception of real middle America, which is hardworking with settled families. Their median age is 37.8 years. Many of them are completing their child-rearing responsibilities and anticipating retirement. Many of them also continue to work hard for a modest living. They buy standard, four-door American cars, belong to veterans' clubs and fraternal organizations, take care of their homes and gardens, and rely on traditional media such as newspapers for their news.
L11	Factories and Farms	25, 37, 42, 53, 56	This group represents rural life from small towns and villages to farms. Employment in manufacturing and agricultural industries is typical across America's breadbasket. Population change is minimal, and the profile is classic. Most have families, either married couples or with children. Median household income is on the lower end, $37, 716. Most own their homes and lifestyles reflects their locale, emphasizing home and garden care, fishing and hunting, pets and membership in local clubs.
L12	American Quilt	26, 31, 41, 46	Location in America's small towns and rural areas links the four segments in *American Quilt*. Unlike *Factories and Farms*, this group represents a

			more diverse microcosm of small-town life, including the largest segment of Tapestry Segmentation, *Midland Crowd*. Aside from manufacturing and agricultural work, they also work in local government service, construction, communications, and utilities. *Rural Resort Dwellers*, an older population that is retiring to seasonal vacation spots, and *Crossroads*, young families who live in mobile homes. The median household income is $41, 953 and more are homeowners. The rural lifestyle is strong with preferences for fishing, hunting, powerboats, pickups, and country music.

(*Source*: Esri.com/Tapestry, 2014)

2.2 The Tapestry Segmentation Platform's ZIP+4 Level

Esri has built a ZIP+4 model using list-based household data. Their approach is novel because it uses addresses instead of ZIP+4 boundaries (Esri.com/Tapestry, 2014). The list-based household data is overlaid with information acquired from a variety of different lists from both public and private sources. Some 120 to 130 million households are used for the model and give more complete coverage both in terms of sources and validation data (Esri.com/Tapestry, 2014). The ZIP+4 was updated in 2014 with the U.S. Census Bureau's latest TIGER/Line® shapefiles and the latest Address Information System ZIP+4 National Dataset published by the U.S. Postal Service (Geolytics.com, 2014). ZIP+4 offers significant advantages for profiling customers and markets. Incomplete addresses can be assigned to the area centroid of the ZIP+4 with latitude/longitude coordinates and the 2010 census block, census block group, census tract, and county identification numbers/FIPS codes if the ZIP+4 record is available (Geolytics.com, 2014). In addition, a user of Esri's Tapestry Segmentation platform can download the database and append any geographic or demographic data to ZIP+4 records allowing more accuracy in the resulting market segmentation.

To move forward with completing this model, Esri uses the InfoBase-X data from Acxiom Corporation (Acxiom, 2014) collected through public real estate information, data

purchased from catalogs, auto dealerships, consumer surveys, publications, product registrations, and telephone directories (Esri.com/Tapestry, 2014).

Table 4 Urbanization Summary Groups included in Esri's Tapestry Segmentation platform

Urbanization Summary Group Code	Name	Segment Code	Description
U1	Principal Urban Centers I	08, 11, 20, 21, 23, 27, 35, 44	This group represents the most affluent populations of the country's largest metropolitan areas, those with population of 2.5 million or more. Big-city residents live in apartments or single-family homes and take public transportations instead of driving. Big city life allows them to cease opportunities like high-paying jobs. They also pay higher rents and mortgages. They are young and just as likely to be single as married. Take frequent vacations to visit family and friends. Foreign travel is important to foreign-born population in this group. Embrace drinking coffee at Starbucks, visiting museums, dancing, dining out, working out, and jogging. Own the latest in electronics and go online for everything. Because they would rather go out than stay in, home improvements and furnishings aren't as important to them.
U2	Principal Urban Centers II	45, 47, 54, 58, 61, 64, 65	They represent the aspiring populations of the country's largest cities. This is the youngest (median age of 30.1 years) and most diverse population among the Urbanization groups including many recent arrivals in large "gateway" cities such as New York, Los Angeles, and Chicago. The search for affordable housing has moved these residents away from high-rises and into row houses, duplexes, and relatively lower-density buildings. Their lifestyle is characterized not only by their locale, but also by their youth and nascent socioeconomic status. Median household income is $26, 004. They are more likely to use public transportation, less likely to own homes, and families are more common. They are more likely to buy baby goods and groceries than electronic gadgets.
U3	Metro Cities I	01, 03, 05, 09, 10, 16, 19, 22	These are upscale homeowners who live in densely populated cities. They choose to live in single-family homes in metropolitan cities, embracing both city and suburban lifestyle. Most are older than 35 years and approximately 60% of the households are married couples with and without children. They are avid readers, especially of novels. Active in financial investments, health conscious, and enjoy gardening as well as traveling domestically and abroad. They are also avid shoppers, buying everything from electric tools and small household appliances to women's shoes and clothing.
U4	Metro Cities II	28, 30, 34, 36, 39, 52, 60, 63	Third most densely populated found in larger cities and densely populated neighborhoods. The eight segments in *Metro Cities II* are neighborhoods in transition that include young starter households and retirees, single-person households, and families. The young population remains mobile. Most rent in apartments in multiunit buildings. Many are enrolled in college; most are still trying different jobs. Median household income is $38, 402. They look for economy and convenience when it comes to purchasing. They prefer to drive four-door sedans, eat fast food, and shop at convenience stores. Because many rent, few are interested in gardening and home

			improvements.
U5	Urban Outskirts I	04, 24, 32, 38, 48	This group lives in higher-density suburban neighborhoods spread across metropolitan areas. Many of these neighborhoods are part of the main hub of social, cultural, and economic activity within the metro area. Median household income is $51,313 and the median age is 34.1 years. As in established suburban communities, housing is dominated by single-family dwellings, but include rental apartments to accommodate younger households with growing incomes. Owners will tackle do-it-yourself home improvement projects as well as gardening. They walk and swim for exercise. They also go bowling, fishing, and play golf.
U6	Urban Outskirts II	51, 55, 57, 59, 62	The settlement density and housing preferences of *Urban Outskirts II* are similar to *Urban Outskirts I*. However, the homes are older and the population is younger with a median age of 30.9 years. Homes can be single-family or multi-unit dwellings and nearly half of the housing units were built before 1960. They are less affluent, with household income approximately half that of the national median. They prefer Folger's coffee to Starbucks, current consumption to saving, and shopping at discount retailers instead of patronizing high-end stores.
U7	Suburban Periphery I	02, 06, 07, 12, 13, 14, 15	Moving away from the epicenters of city living, this group represent lower-density housing development located in metropolitan and micropolitan statistical areas throughout the country. They are also the largest Urbanization summary group in Tapestry Segmentation, with the most population and households, in addition to the highest annual growth. Married-couple families dominate, approximately half with children, primarily living in their own single-family homes with two cars. They are more likely to employ a lawn and gardening service, and invest in home remodeling and improvement projects. This well-educated group not only shares the top rank for current household income with *Metro Cities*, but also has accumulated the most wealth. They own a variety of securities investments via online and financial consultation. They upgrade to the latest technology including big-screen TVs, computers, and necessary software and peripherals. Domestic travel is part of their lifestyle and they watch CNN at home.
U8	Suburban Periphery II	18, 29, 33, 40, 43, 53	This group is similar to Suburban Periphery I, but more likely to be found in urban clusters of smaller cities in metropolitan areas. More than half are married families and 25% are singles who live alone. Although the median household income and home value are below the US median, their median net worth is higher. This is the oldest Urbanization summary group in Tapestry Segmentation, with a median age of 41.1 years. They are the highest concentration of householders who are older than 65 years. They watch a variety of sports, news, or documentaries and occasionally watch a movie or primetime drama. They prefer domestic sedans and to read newspapers.
U9	Small Towns	41, 49, 50	*Small Towns* represent the ideal in American communities – affordable, close-knit, and apart from the hustle and bustle of city life. Active members of their communities, residents participate in public activities, fund-raising, and public meetings. They make a modest living, with a median household income of $35, 561, but their earnings are sufficient to afford a single-family or mobile home. Most of the labor force is employed in the manufacturing, construction, or retail sectors; many are already retired. *Heartland Communities* is well settled, but *Small Towns* welcomes the ongoing migration of younger *Crossroads* and older *Senior Sun Seekers*. They are less likely to own a credit card. Technology is not an integral part of life

			for this group. Many still use a dial-up Internet connection and because of their location, satellite TV is preferred. Many do not subscribe to cable or satellite TV.
U10	Rural I	17, 25, 26, 31	Small, nonfarm settlements, some of which are developing in suburban fringe areas, characterize the neighbors in *Rural I*. Married-couple families, many with grown children who have left home, work hard in blue-collar occupations. Some are self-employed with small businesses or farms. The median age is 41.9 years and median income of $51, 381. This allows them to enjoy the comforts of large single-family homes with ample land and invest in major home improvement projects. They embrace their country lifestyle and favorite pastimes of hunting and fishing. They drive domestic pickup trucks.
U11	Rural II	37, 42, 46, 56	*Rural II* countryside is the extreme opposite of urbanization. Low population density characterizes life in the country with its inconveniences such as the need for multiple vehicles and advantages such as affordable single-family homes with land. Most of the population lives in rural farm areas. The median age is 41.3 years and some are already retired. Many are homeowners. Family and home are central in their lives. Their lifestyles reflect a preference for comfort and practicality – western or work boots to dress shoes, kerosene heaters to espresso/cappuccino makers, recliners to patio furniture, garden tillers to trash compactors.

(*Source*: Esri.com/Tapestry, 2014)

These data are important because they also reveal SES in each region by looking deeper into the demographics. InfoBase-X data uses data acquired from life events that trigger consumers to buy and allows businesses to more accurately target those consumers who are likely to purchase a new product (Acxiom.com, 2014). Acxiom filters and connects data by pinpointing recent changes within a household, enabling businesses to reach ready-to-buy customers and ultimately, to better target those prospective buyers. Some of the event triggers include: a child nearing high school graduation, a recent college graduate, a recent empty nester, a child entering adulthood, an expectant parent, a recent new car buyer, a recent mover, newlyweds, a new parent, a recent home buyer, and a recent mortgage borrower (Acxiom.com, 2014). These "triggers" give a better insight because they record how customer's subscriptions, tastes, and trends change.

Subsequently, Esri assigns a Tapestry Segmentation code to each ZIP+4 from the aggregated household attributes. Using the census data with these other data improves data

quality and helps to validate the 65 distinctive markets distinguished with the Tapestry Segmentation platform (Table 2) (Esri.com/Tapestry, 2014).

A market segmentation system must be able to distinguish new consumer behaviors such as lifestyle choices and should ultimately mirror the consumer's SES. Consumer surveys from GfK MRI are used to check the efficacy of the Tapestry Segmentation descriptions. GfK MRI's Survey of the American Consumer® provides a detailed view of the 226 million adult consumers in the U.S. such as media choices, demographics, lifestyle and attitudes, and is comprised of nearly 6,000 product and service brands in 550 categories, as well as readership of hundreds of magazines and newspapers, Internet usage, TV viewership by channel and program, radio listening, and use of Yellow Pages (GfKMRI.com, 2014). GfK MRI uses a high-resolution methodology. Data are collected in person, with in-home, face-to-face interviews to fill the gaps for missing demographic groups, such as the 15% of U.S. adults who have no Internet access, or the 26% who have not used the Internet in the past 30 days, and the 22% of U.S. adults who do not have landlines, and cannot be reached by telephone survey recruiters (GfKMRI.com, 2014).

2.3 Tapestry Segmentation Success Stories

GIS platforms like Tapestry Segmentation can provide rich and helpful information about consumer habits and trends. Therefore, this makes it a valuable tool for various types of organizations, both public and private. Understanding the target data and being able to accurately delineate small areas only improves and enhances the utility of this product for these organizations. The easy and free access to this web platform also allows individuals to check their ZIP code and see what kind neighborhood they live in. It is useful for people who want to move into a new neighborhood and/or learn more about the kinds of people who reside in specific communities and neighborhoods.

2.3.1 Business Organizations

The main objective of any business is to gain and grow profit. GIS technology can fuel the process by helping businesses to geographically visualize and thus understand their market. Tapestry Segmentation allows businesses to create more accurate customer profiling for media targeting, direct mailing, and site analysis (Esri.com/Tapestry, 2014). The address records will further refine customer behaviors and preferences. With customer buying data, businesses can target different demographics, improve the satisfaction of current customers (i.e. via loyalty programs), create direct marketing campaigns, and other types of advertising to reach the most responsive customers. The Tapestry Segmentation platform provides actionable information.

Another thing to consider that is crucial in the success of a business is location. Selecting the best location can influence and, in some cases, determine a business' success or failure. Consumer data is important and can be analyzed and used to make better decisions. In retail, most stores face competition from mall stores, department stores, boutiques, discounters, big-box stores, mail-order catalogs, and even online stores (Esri.com/Tapestry, 2014). This directly relates to the modern consumer's continually changing tastes and related trends. In a savvy technology-based culture, it is not enough to just know where the targeted customers live; one also needs to anticipate trends and their underlying causes. Trends include changes in product preferences, geography, spending patterns, and SES. Esri's data and software solutions can execute this complete analysis to aid businesses to make more informed and profitable decisions (Esri.com/Tapestry, 2014). This is also what sets Esri's Tapestry Segmentation apart from the traditional marketing segmentation approach available through Esri's Business Analyst™ Desktop software for example.

An example of this in the real-world is a shoe chain store wanting to branch out to nearby

states. The store had collected several years of demographic data, but never used Esri's site suitability analysis through segmentation. Since Tapestry Segmentation codes were appended to the existing customer store location and file, the standard trade area can be delineated and used in prospective site analyses (Esri.com/Tapestry, 2014). The results for the shoe store example showed a few factors that made the existing stores successful such as proximity to a major shopping mall; five to seven competitors within the existing trade area; and the presence of the *Laptops and Lattes*, *Trendsetters*, and *Aspiring Young Families* segments (Tapestry Segmentation, 2012). Their growth strategy might therefore look for locations that afforded similar opportunities.

2.3.2 Public and Non-profit Organizations

Many public agencies and non-profit organizations such as fire departments, police stations, charity fundraisers, and similar organizations can benefit by using Tapestry Segmentation to help achieve their community goals. Organizations whose performance depends on quick response (such as police and fire stations) can benefit from the utilization of this tool. Being able to execute emergency response quickly as well as getting to the site is important for such organizations. Any possible delay or longer response time can have an adverse impact in terms of helping or aiding the victim. This corresponds to understanding the organization's local community and its attributes that make up the community (such as SES, population density, location and characteristics of hospitals, schools, etc.).

The Arlington Food Assistance Center (AFAC) in Arlington, Virginia, for example, was in need of finding new donors to support their funding to the poor in order to combat hunger in the area. AFAC is a non-profit organization that provides groceries to lower income families in the county. Approximately 1,200 families rely on their support and the demand for this service is

growing. AFAC uses a direct mail program to target existing donors, but it had limited success due to the lack of an appropriate marketing structure. The goal is to keep the direct mailing costs low and still target the most willing donors. AFAC asked Esri for assistance in identifying these new donors using Tapestry Segmentation. Esri suggested modifying their marketing strategy by sending out specially crafted appeal letters to targeted groups that were identified as the most likely to contribute using Tapestry Segmentation. Esri's Address Coder™ software was used to geocode the existing contributor list and a Tapestry Segmentation code was appended to each record. This process identified SES, which revealed neighborhoods where donors lived. This new finding allowed AFAC to better understanding donor lifestyle behaviors and other demographic traits in order to appeal to these likely contributors. Esri also made a recommendation that AFAC purchase a mailing list appended with Tapestry Segmentation codes from Acxiom Corporation. The result of this new direct mailing campaign showed a significant change in the amount of donations from new donors while keeping the cost of the direct mailing campaign in check. This is a great example of how an improved understanding of SES in a certain region can be used to achieve an existing or new goal.

The next chapter describes the methodology that was used to determine how well the Tapestry Segmentation platform describes the residents of the three LA County communities that were introduced in Chapter 1.

CHAPTER 3: METHODOLOGY

This chapter presents the methods, and aggregated data from the U.S. Census Bureau's ACS that were used to evaluate the integrity of Tapestry Segmentation's representation of the three communities. Tapestry Segmentation product reports the median household income, median age, and population density in addition to the percentages of residents included in Tapestry's market segments. The three aforementioned as well as several additional attributes were extracted from the ACS data at the block group level to look at what is gained and lost using Esri's Tapestry Segmentation product. This chapter describes the methods used to query and gather data from the two platforms, which is shown as a flowchart in Figure 6. The following sections will provide detailed steps and methods that were used to acquire products from Tapestry Segmentation and ACS Census data.

Figure 5: Flowchart showing methods used for thesis project.

3.1 Querying Esri's Tapestry Segmentation Product

To find out and learn more about a given community, Tapestry Segmentation provides a user-friendly approach for anyone to choose the desired ZIP code and obtain Summary Group descriptions along with median household income, median age, and population density estimates.

Figure 5 shows the main page where the user would enter a ZIP code to display an interactive map layer with which one could scroll and view the ZIP code's lifestyle and socioeconomic characteristics, which define that particular community.

Once the ZIP code is entered, a results page will be shown at the ZIP code unit level (Figure 6). The highlighted polygon shows the selected ZIP code and the popup on the left hand side shows Tapestry Segmentation's top three segments for the selected ZIP code. The top three segments can be clicked to show the full description of each segment. The percentages noted for the three segments show the relative proportions of these groups and may not add up to 100% in some instances. The three tabs to the right of Tapestry can be clicked to see the median

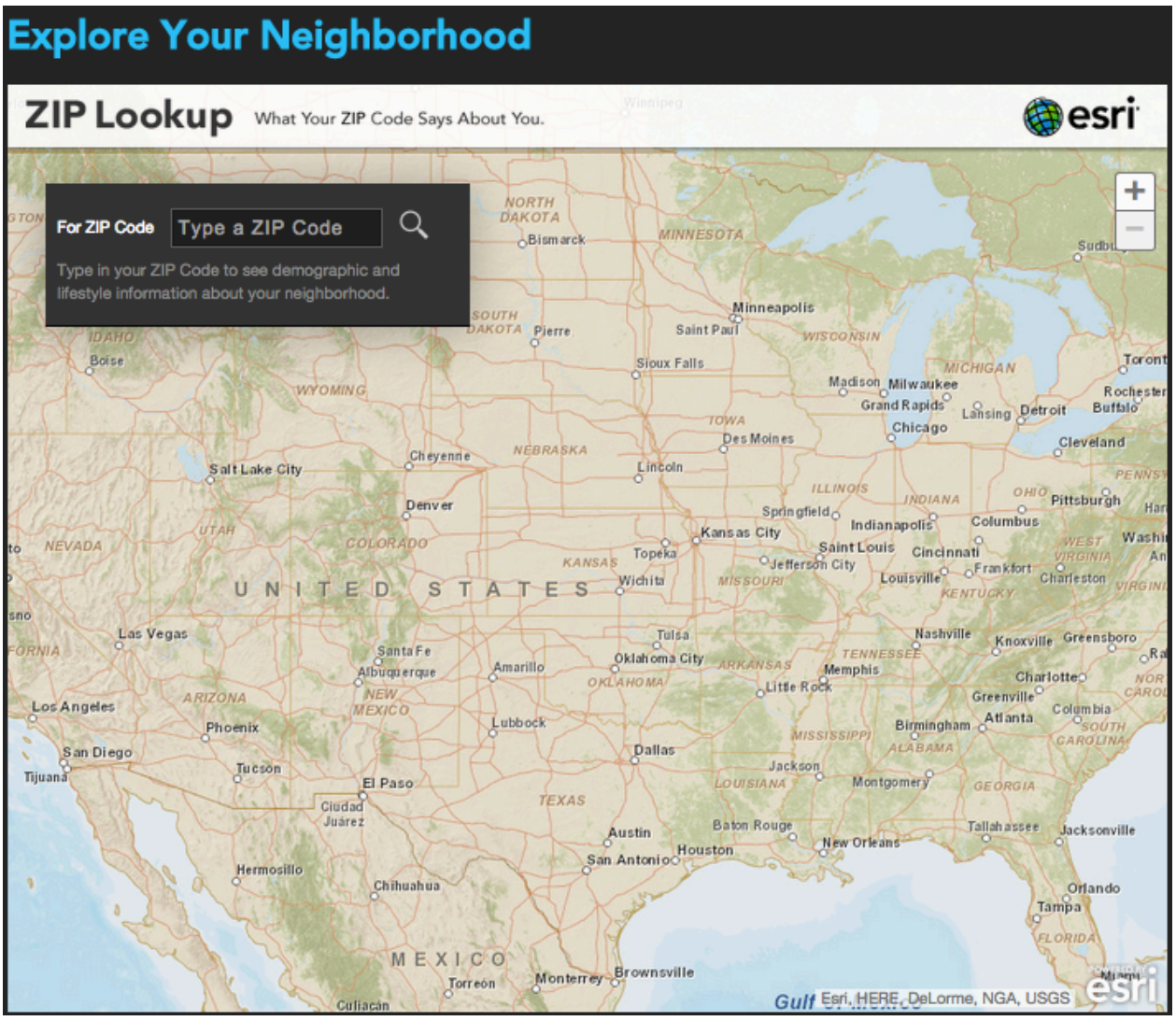

Figure 6: Main page of Esri's Tapestry Segmentation product on which a user can enter the desired ZIP code.

household income, median age, and population density estimates for the chosen ZIP code(s) as well as the county, state and U.S. as a whole.

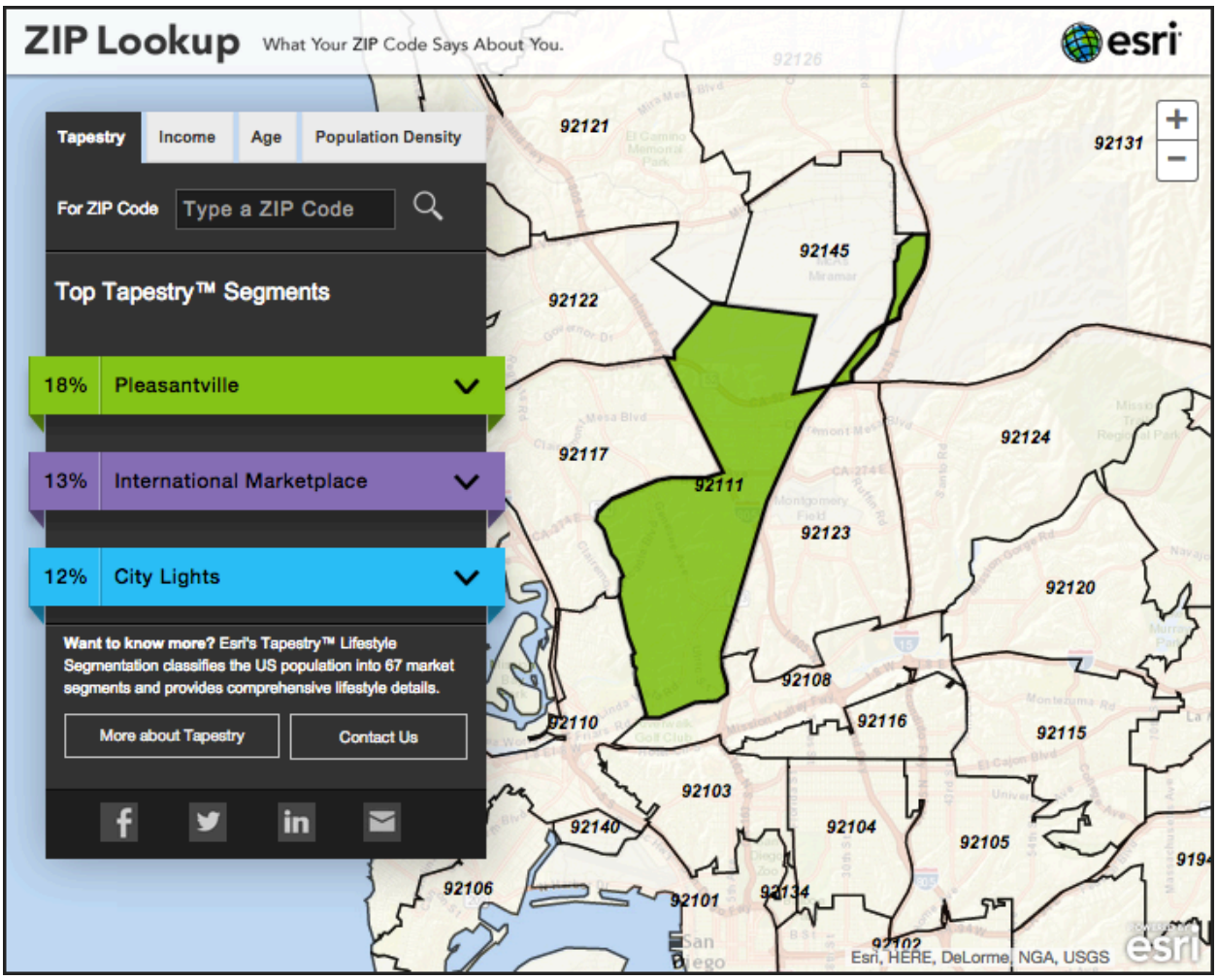

Figure 7: Results page showing the top three segments for the chosen ZIP code(s) and the three attribute tabs.

This same method was applied to assess how Tapestry Segmentation characterized the Manhattan Beach, Santa Monica, and Venice Beach communities.

3.2 Querying and Mapping the 2013 American Community Survey (ACS) 5-Year Estimates

The latest ACS 5-year estimates were obtained from American FactFinder in order to learn more about the three communities. The ACS surveys approximately 3.5 million housing units annually and the American FactFinder portal can be used to gather single year or five-year average

estimates. The five-year averages were used for this thesis project because the larger sample size makes for more robust and reliable estimates for small areas like census tracks and census block groups.

3.2.1 Querying the 2013 ACS Five-Year Estimates

The median household income, median age, and population density as well as some other attributes were gathered with the help of the Download Center (Figure 8). The Download Center provides a step-by-step guide and the five-year ACS estimates were selected for this study with the second 'Dataset' step (Figure 9). The census block group was chosen for the geographic unit of analysis at the third step (Figure 10).

The resulting ACS datasets (one per variable or attribute of interest) come as a zip file that contains the best estimates as well as estimates of the margin of error for each variable.

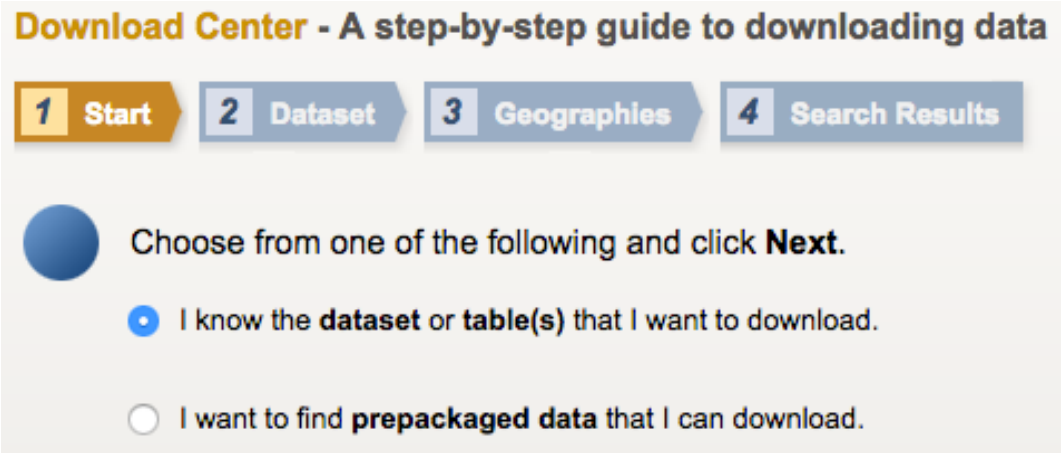

Figure 8: Dialogue box showing first step in acquiring ACS dataset.

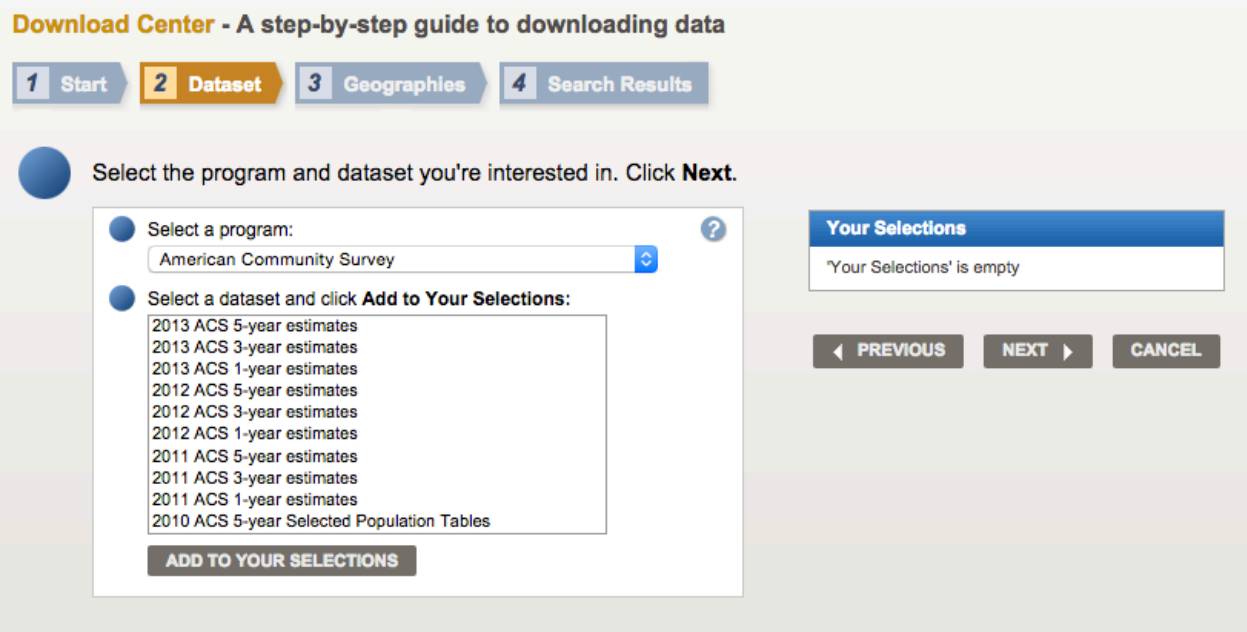

Figure 9: Dialogue box used to select the most appropriate ACS product (i.e. the 5-year ACS dataset).

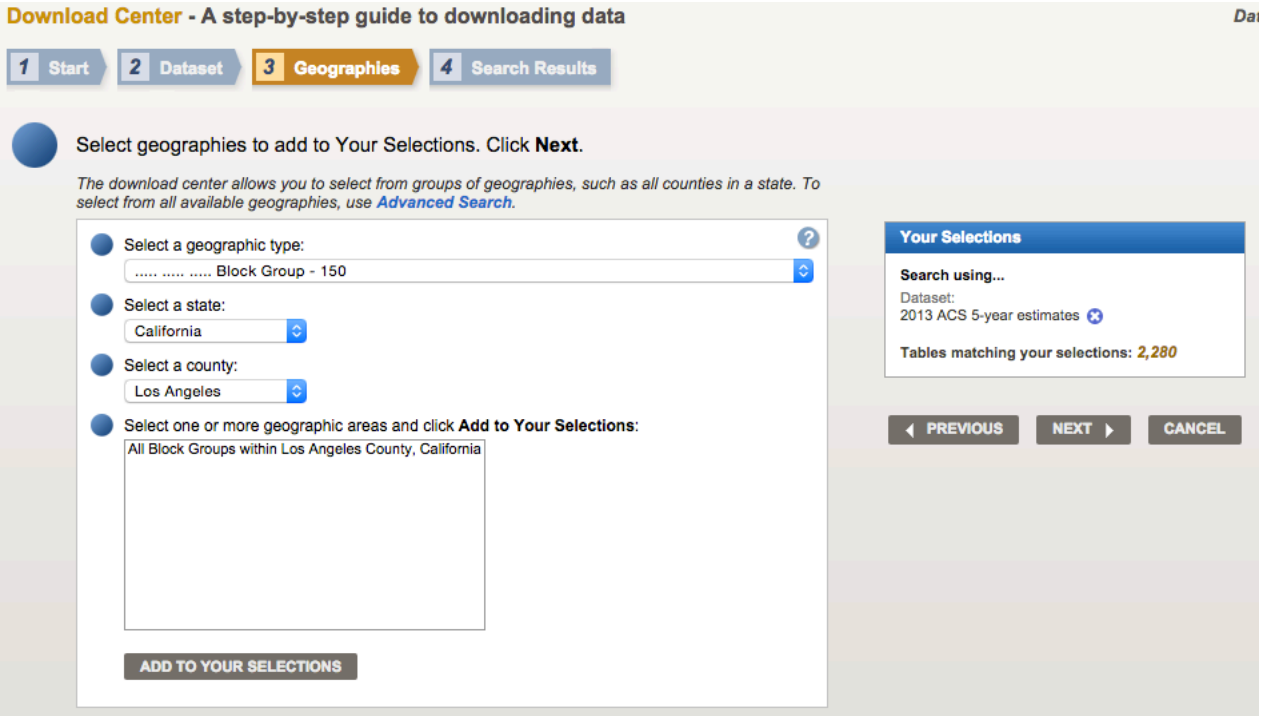

Figure 10: Dialogue box used to select the appropriate geographic region at the census block group scale (i.e. Los Angeles County).

The attribute names on the ACS dataset were adjusted so that ArcMap would properly capture and recognize these names. For example, the periods included in some of the variable names had to be converted to underscores because ArcMap does not recognize a period as a character. The name fields were abbreviated and/or coded names were renamed to more recognizable names as well. These tables (one for each variable or attribute) were then exported as comma separated value (CSV) files.

3.2.2 Mapping the 2013 ACS Five-Year Estimates

The census block group shapefile and the CSV files for the edited ACS datasets were then combined and used to map the variables of interest in ArcMap. Some additional work was needed to tidy up the data that was common to both tables. The extra zeroes appended in front of the digits used for each of the census block groups were deleted and the data type was changed from 'String' to 'Double' in the census block group boundary shapefile used for this thesis project.

An additional column was created in the census block group data table named 'GEO_id3' and populated with data. Right clicking on the census block group table, and selecting join and relate, the values shown in Figure 11 were used to join the two data sets and map each variable at the census block group level.

The various maps reproduced in Chapter 4 were rendered after choosing a classification method for each attribute that was to be mapped. The advantages and disadvantages of the four methods included in Esri's ArcMap are summarized in Table 5. The classification method was chosen by right clicking on the census block group layer under Table of Contents, and choosing the Symbology tab under Layer Properties.

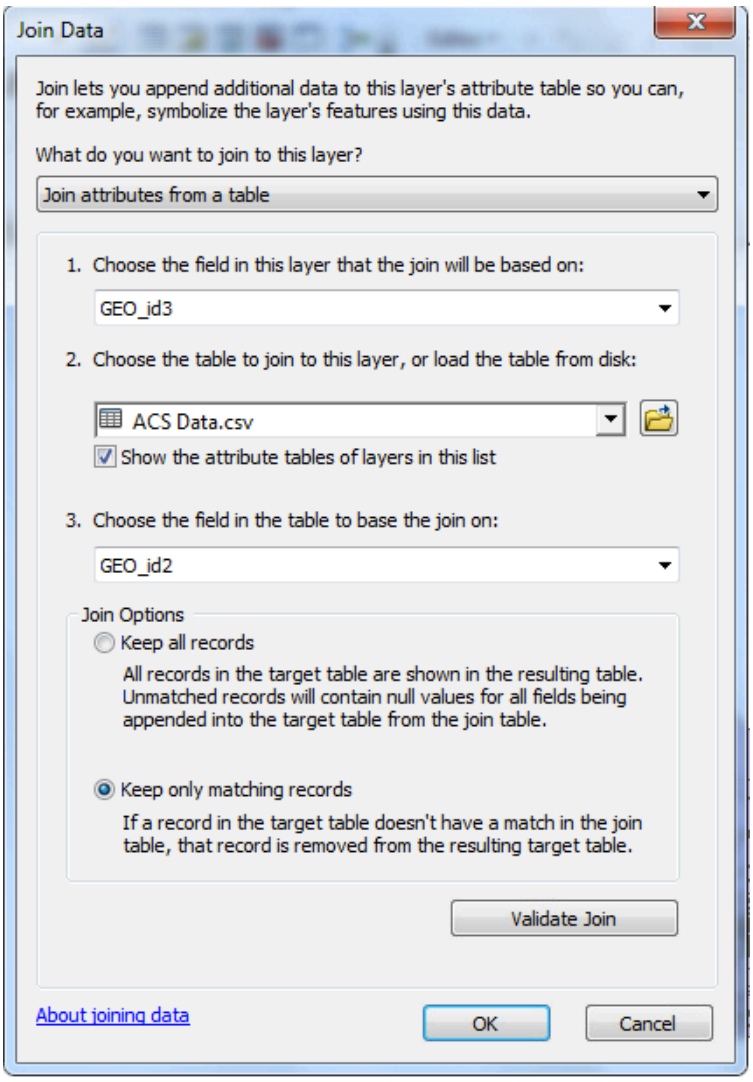

Figure 11: Dialogue box used to join the geographic features and attributes at the census block group level.

The Standard Deviation classification method was chosen for the work at hand because the overarching goal was to learn more about the variability of the three communities and whether or not this variability was captured in the Tapestry Segmentation descriptions.

The results are reported next in Chapter 4.

Table 5 Advantages and disadvantages of the four different classification methods included in Esri's ArcMap

Classification Method	Advantage	Disadvantage
Equal Interval	Groups values in equally sized ranges allowing for easy interpretation	May not show all the variations and miss all the variations
Quantile	Evenly distributions in values allowing convenience in mapping linearly distributed data. There are no empty classes or classes with too few or too many values.	Similar values may be places in separate classes and may create false illusion of diversity in data
Natural Breaks (Jenks)	Groups similar values into same class and separates dissimilar values	Large number of values may cluster into one or two classes and may be hard to interpret the data
Standard Deviation	Shows standard deviation of values from its mean	May be more difficult to interpret data if the user is not familiar with statistics

Source: http://resources.arcgis.com

CHAPTER 4: RESULTS

The results are described by community (i.e. Manhattan Beach, Santa Monica, and Venice Beach) and product (Tapestry Segmentation, ACS) in that order in the sections, which follow and the broader interpretation and significance of these results are taken up in Chapter 5.

4.1 Tapestry Segmentation Results for Manhattan Beach

The Tapestry Segmentation (TS) results for Manhattan Beach report that 46% of the residents belong to the *Top Tier* group, 25% belong to the *Laptops and Lattes* group, and 23% belong to the *Urban Chic* group (Table 6). The Tapestry Segmentation product also reported that residents of Manhattan Beach have a median household income of $142,000, a median age of 41.9 years, and a population density of 7,685 residents per square mile.

The 46 percent of the residents that belong to the *Top Tier* category have achieved their corporate career goals and successfully operate their own businesses. Most of them are married with older children. They spend freely on their lavish homes and lifestyles through a variety of contracted services. They shop at high-end retailers and enjoy services at upscale salons, spas, and fitness centers. They also travel frequently, taking luxury vacations or visiting their second homes. They enjoy attending opera, classical music concerts, charity dinners, and shopping. They rely on reading, Internet, radio, and newspapers to expand their knowledge.

The 25 percent of the residents that belong to the *Laptops and Lattes* group lack home ownership and/or child-rearing responsibilities. They enjoy the single life style in or near the big city either alone or with a roommate. The median age of this group is 37.6 years. Although most of the population in this category are white, Asians represent about 10.4 percent of the total population. They are reasonably affluent with a medium household income of $84, 612. They hold either a bachelor's or some type of graduate degree, and 90 percent have attended college.

More than 70 percent are over 25 years old. These residents are cosmopolitan, connected, and politically liberal. They rely heavily on web-enabled cell phones instead of laptops to communicate and review the latest news, arrange travel, and shop on sites such as Amazon. They enjoy various types of vacations such as backpacking, beach trips, or hiking and also, enjoy staying at upscale hotels and rent cars while on vacation. They prefer going to various entertainment venues to enjoy arts and live music. They watch foreign films or movie classics on DVD and news and music channels on cable TV. Exercising is a significant part of their life, and includes being a member of a health club, yoga, skiing, tennis, jogging, and biking. They tend to buy organic and low fat/high fiber food and take daily vitamins.

Table 6 Tapestry Segmentation results for the three communities

Community (Zip code)	Top Tapestry Segments	Median Household Income	Median Age	Population Density
Manhattan Beach (90266)	46% Top Tier 25% Laptops and Lattes 23% Urban Chic	$142, 000	41.9	7, 685
Venice Beach (90291)	36% Trendsetters 32% Laptops and Lattes 16% Metro Renters	$67, 000	38.6	11,452
Santa Monica (90401)	55% Metro Renters 34% Laptop and Lattes 11% Trendsetters	$46,000	38.6	7,970
Santa Monica (90402)	59% Top Tier 41% Urban Chic	$134,000	47.8	5,225
Santa Monica (90403)	76% Laptops and Lattes 13% Urban Chic 9% Trend Setters	$75,000	42.1	18,321
Santa Monica (90404)	81% Trendsetters 12% Laptops and Lattes 3% Downtown Melting Pot	$53,000	38	11,089
Santa Monica (90405)	45% Laptops and Lattes 27% Trend Setters 18% Urban Chic	$75,000	42	10,134
Santa Monica (Weighted Averages)	37.8% Laptops and Lattes 29.8% Trendsetters 14.8% Urban Chic 8.9% Top Tier 3.7% Metro Renters 0.7% Downtown Melting Pot	$76,811	41.7	11,580

The 23 percent of the residents who belong to the *Urban Chic* group live very sophisticated and exclusive lifestyles. More than half of these households are married-couple families; however, fewer than half of them have children. The median age is 42.7 years old and the median household income is $82,524. The residents are well-educated: 80 percent have attended college and 55 percent receive additional income from investments. Nearly two-thirds (63 percent) live in single-family housing. Their lifestyles are focused on living life rather than ambience. They enjoy extensive traveling, visiting museums, attending dance performances, upscale store shopping, and voluntary work. They stay fit by hiking, skiing, backpacking, biking, yoga, tennis, and lift weights. They drink imported wine and a good cup of coffee. Most own an Apple computer and use online to shop, travel, get the latest news, and check investment portfolios or stocks. They use credit cards, often charging more than $700 a month. This is one of Tapestry Segmentation's top segments for radio listening where the listeners are tuned to classical music, all-talk, and public radio. They are also avid readers of newspapers, books, and general news and entertainment, business, and home service magazines. They seldom watch TV, but their favorite channels are broadcast news programs and documentaries.

4.2 Tapestry Segmentation Results for Santa Monica

The results for the City of Santa Monica are a little more complicated because there are five ZIP codes. However, the variability across these five ZIP codes reported in Table 6 shows how the character of individual neighborhoods varies across this moderate-sized coastal city.

The leading groups in Santa Monica are *Lattes and Laptops* (37.8 percent), *Trendsetters* (29.8 percent), and *Urban Chic* (14.8 percent), which were determined by calculating the weighted averages across the five Zip codes. *Lattes and Laptops* ranked first or second in four of

five ZIP codes. *Trendsetters* ranked in the top three across four out of five ZIP codes and *Urban Chic* ranked in the top three in three of five ZIP codes.

Lattes and Laptops are characterized as being highly affluent and well-educated singles that hold professional positions (e.g. in business, finance, legal, computer and entertainment), as described in Section 4.1 above.

The approximately 30 percent of the City of Santa Monica residents belonging to the *Trendsetters* group are single, young, diverse, mobile, and at the cutting edge of urban lifestyles. They either live alone or with a roommate and the median age is 34.8 years old. Ethnically diverse, 13.7 percent of these groups are Asian and 23 percent are Hispanic on average. In socio-economical terms, the members of this group are educated professionals with median household incomes of $53,423 and many have various types of investments on the side as well. Three-quarters of these neighborhoods are located on the West Coast in communities like Santa Monica and Venice Beach (Table 6). Roughly two-thirds (68 percent) rent upscale apartment homes in older urban districts. The average gross rent is one-third higher than the US average. Single-family homes and townhouses comprise the remainder of the housing.

These residents are spenders; they shop in stores, online, and by phone. They are up-to-date with the latest fashion trends and enjoy stores such as Banana Republic, Gap, Nordstrom, and Macys. They are politically liberal and listen to variety of music genres. They own electronic gadgets and computers, and are highly health conscious and eat organic foods, take vitamins, and exercise frequently (e.g. yoga, hiking, skiing, running). They enjoy going to the movies, attend rock concerts, and read – especially non-fiction and biographies. For TV shows, they prefer to watch movie channels or MTV.

The third most frequent Segment group in the City of Santa Monica was the *Urban Chic* group, which was also described in Section 4.1.

The largest fraction of residents in ZIP code 90402 belong to the *Top Tier* group. These residents are married couples, with or without children, and have reached the top of the corporate ladder in their chosen fields. They either own their own business or work in a variety of consulting fields. They live very lavish lifestyles and rely on and/or use a variety of personal services to support their lifestyles.

The largest percentage of residents in ZIP code 90401 belong to the *Metro Renters* group. This group comprises young, mobile adults who are either working or still in school and live with roommates. Most are willing to take risks to get to the top of their professions and live close their jobs. They live in the city and rent either condos or apartments. They enjoy technological gadgets and keeping up with the latest trends. Some of their favorite stores to shop are Whole Foods, Trader Joe's, Banana Republic, Nordstrom, and Gap. Their hobbies include skiing, yoga, and Pilates.

The sixth and final group covers just 3 percent of the residents in ZIP code 90404. These residents belong to the *Downtown Melting Pot* group. This group is composed of married couples that reside in small and densely populated neighborhoods. These neighborhoods are dominated by Asians. Nearly half of the population are foreign born and does not speak English or English is their second language. They are more cautious about spending money and work in professional, sales, food, administrative, and personal service jobs. Hobbies include gambling, eating out, playing sports, and listening to sports radio.

4.3 Tapestry Segmentation Results for Venice Beach

The top three Tapestry Segmentation groups in Venice Beach – the *Trendsetters*, *Laptops and Lattes*, and *Metro Renters* groups, respectively – were already covered in Sections 4.1 and 4.2 because one or more of these groups was also prevalent in either the City of Manhattan Beach and/or the City of Santa Monica. The overlap in the presence of these groups across two or more of the three communities shows that they share some similarities in terms of both their locations as well as the kinds of residents that have chosen these communities as a place to spend parts of their lives.

4.4 Tapestry Segmentation Census Variables

The Tapestry Segmentation groups described in Sections 4.1, 4.2, and 4.3 are helpful in terms of the describing the kinds of people distributed across ZIP codes, but their precision and accuracy are difficult to evaluate because they are based on sophisticated statistical algorithms that cluster people (i.e. residents) using large numbers of disparate data sources. There was no opportunity to repeat this work here using smaller geographic units like census tracts and/or census block groups and as a consequence, the Tapestry Segmentation values for median household income, median age, and population density shown in Table 6 provide the focus for the remainder of this and the final chapter.

The median household income shows major variations across the three communities and seven ZIP codes (Table 6). The value for Manhattan Beach ($142,000) is the highest and nearly matched by the value for ZIP code 90402 ($132,000) in the City of Santa Monica. The five ZIP codes in Santa Monica show tremendous variability – from the high value of ZIP code 90402 to a low of just $46,000 in ZIP code 90401 and a weighted median household income of $76,811

for the city of Santa Monica as a whole. This last value is just a few thousand dollars more than the median household income reported for Venice Beach ($67,000) (Table 6).

The ages of the residents across the three communities and seven ZIP codes are much more similar. The youngest residents are found in Venice Beach (median age 38.6 years) and ZIP codes 90401 (median age 38.6 years) and 90404 (median age 38 years) in the City of Santa Monica. However, the weighted median age across all five ZIP codes in the City of Santa Monica (median age, 41.7 years) was raised by the older population in ZIP code 90402 (median age 47.8 years) and similar to that for the City of Manhattan Beach (median age 41.9 years).

The highest (18,321 residents per square mile) and lowest (5,225 residents per square mile) population densities occurred in ZIP codes 90403 and 90402 in the City of Santa Monica. The variability in these numbers and those for the three remaining ZIP codes in the City of Santa Monica are typical of medium-sized cities that offer a large number and variety of retail and other services as well as employment opportunities. The weighted average for the City of Santa Monica (11,580 residents per square mile) was similar to that for Venice Beach (11,452 residents per square mile) and higher than that for the City of Manhattan Beach (7,685 residents per square mile) (Table 6).

4.5 What does the U.S. Census tell us about the three communities?

The census block group (CBG) level was chosen to examine each community more closely. Manhattan Beach contained 36 CBGs, Santa Monica contained 77 CBGs, and Venice Beach contained 35 CBGs. In general, census block groups are more uniformly distributed in terms of the number of residents than cities or ZIP codes, and the block group level data are nearly 100% complete. The ZIP code data, on the other hand, are less than 70% complete (USA.com, 2014).

The census data provided an opportunity to look at the three communities more closely and to assess the Tapestry Segmentation descriptions of the three communities.

4.5.1 ACS Data for Manhattan Beach

The first attribute to look at is the median household income in the first three columns of Table 7. The first, fourth, and seventh columns in Tables 7-9 show the TS estimates aligned with the CBG classes shown in the second, fifth, and eighth columns in Tables 7-9. The counts in the final three columns (#3, #6, #9) report the numbers of CBGs falling in each of the ACS CBG classes.

These data show that two CBGs had median household incomes $44,000 to $63,000 below the TS estimate and that another nine CBGs had median household incomes $8,000 to $44,000 below the TS estimate. The last two rows, in contrast, show that 20 CBGs had median household incomes $32,000 to $108,000 above the TS estimate. The TS estimate then hides considerable variability in terms of the median household incomes present in the City of Manhattan Beach (Table 7).

The middle three columns in Table 7 show much less variability in terms of median age: the median age, for example, falls within 5 years of the TS estimate in 23 of the 36 CBGs and is 6-13 years lower and 5-11 years higher in six and seven CBGs, respectively.

The final three columns in Table 7 show that there is tremendous variation in population density from one CBG to the next in the City of Manhattan Beach. The presence of the beach as well as schools, parks, retail and other services at the CBG scale produces considerable variability in the areal estimates that partially obscures the residential densities in these CBGs because most of these other land uses prevent mixed use development and therefore represent areas with few if any residents.

Table 7 Comparison of median household income, median age, and population density estimates gathered from Tapestry Segmentation and ACS products for the City of Manhattan Beach

Median Household Income ($)			Median Age (Years)			Population Density (Residents per Square Mile)		
(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	79,070 98,438	2		29-36	6		372.6 1,824	4
	98,439 134,808	7		37-40	10		1,825 3,340	9
$142, 000	134,809 164,800	7	41.9	41-42	5		3,341 4,929	15
	164,801 214,167	9		43-46	8		4,930 7,604	6
	214,168 250,000	11		47-53	7	7, 685	7,605 11,150	2

1 – TS estimates; 2 – ACS ranges (low on top, high below); and 3 – CBG counts

The three maps reproduced in Figures 12-14 show the geographic variability that is evident across the 36 census block groups.

Figure 12, for example, shows that the CBGs with higher median household incomes are located in the western half of the City of Manhattan Beach close to the coast. Figure 13 shows the CBGs with younger populations are located along the coastline or in the southeast quadrant and Figure 14 shows that the CBGs with low population densities tend to occur along the coast and in the northeast quadrant and that the CBGs with higher densities tend to occur short distances from the beaches and related coastal amenities.

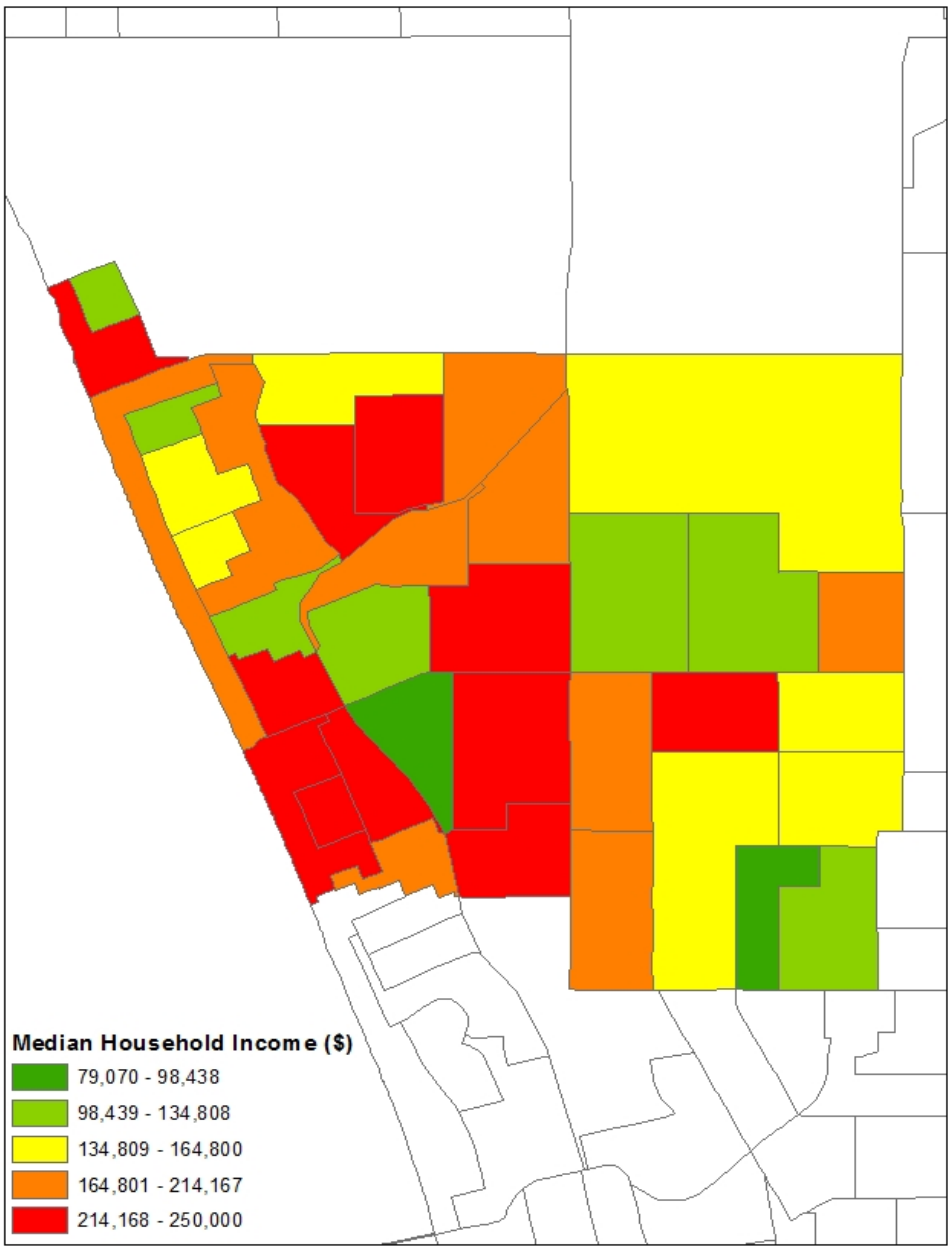

Figure 12: Median household income by census block group in the City of Manhattan Beach.

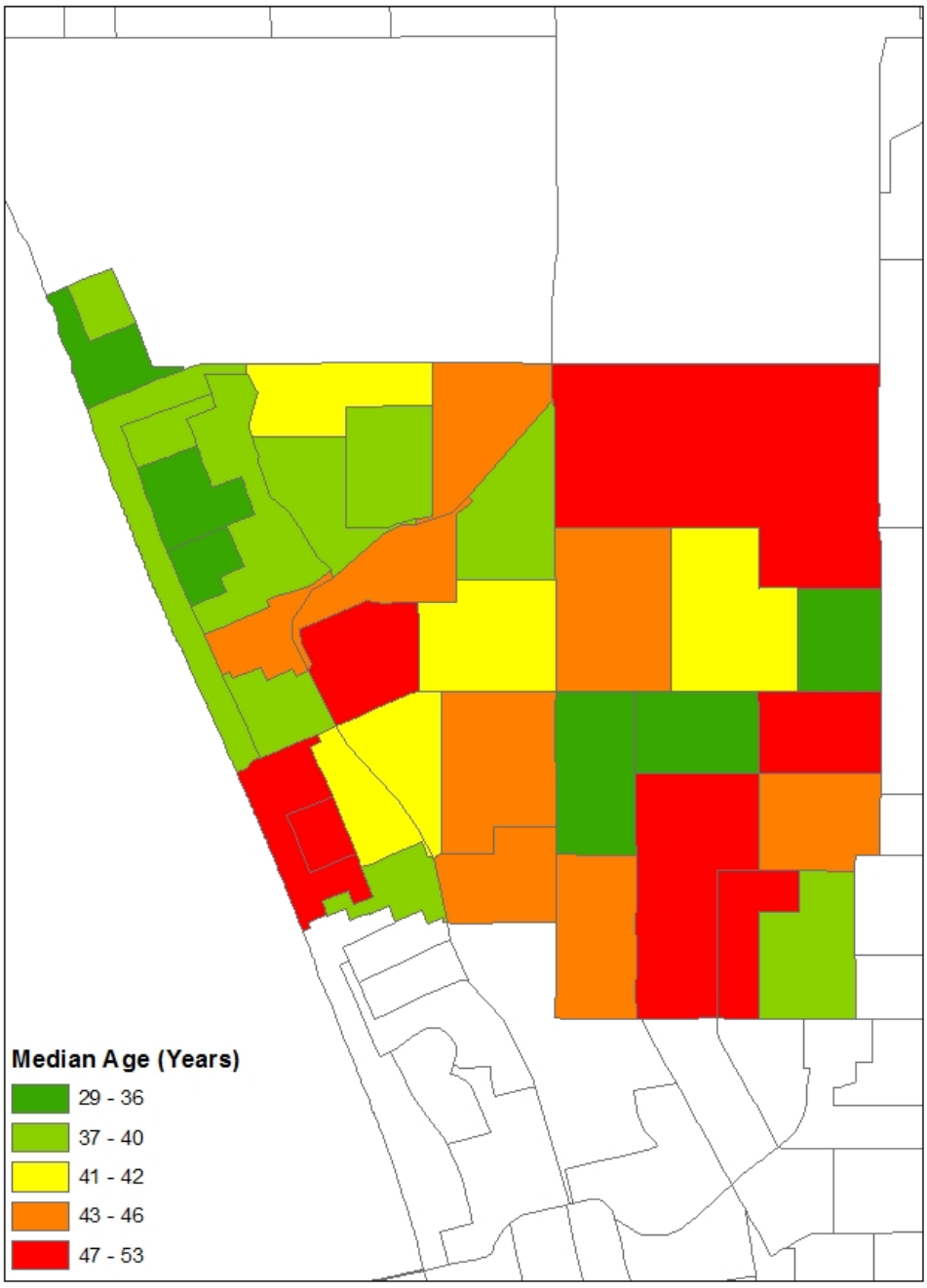

Figure 13: Median age by census block group in the City of Manhattan Beach.

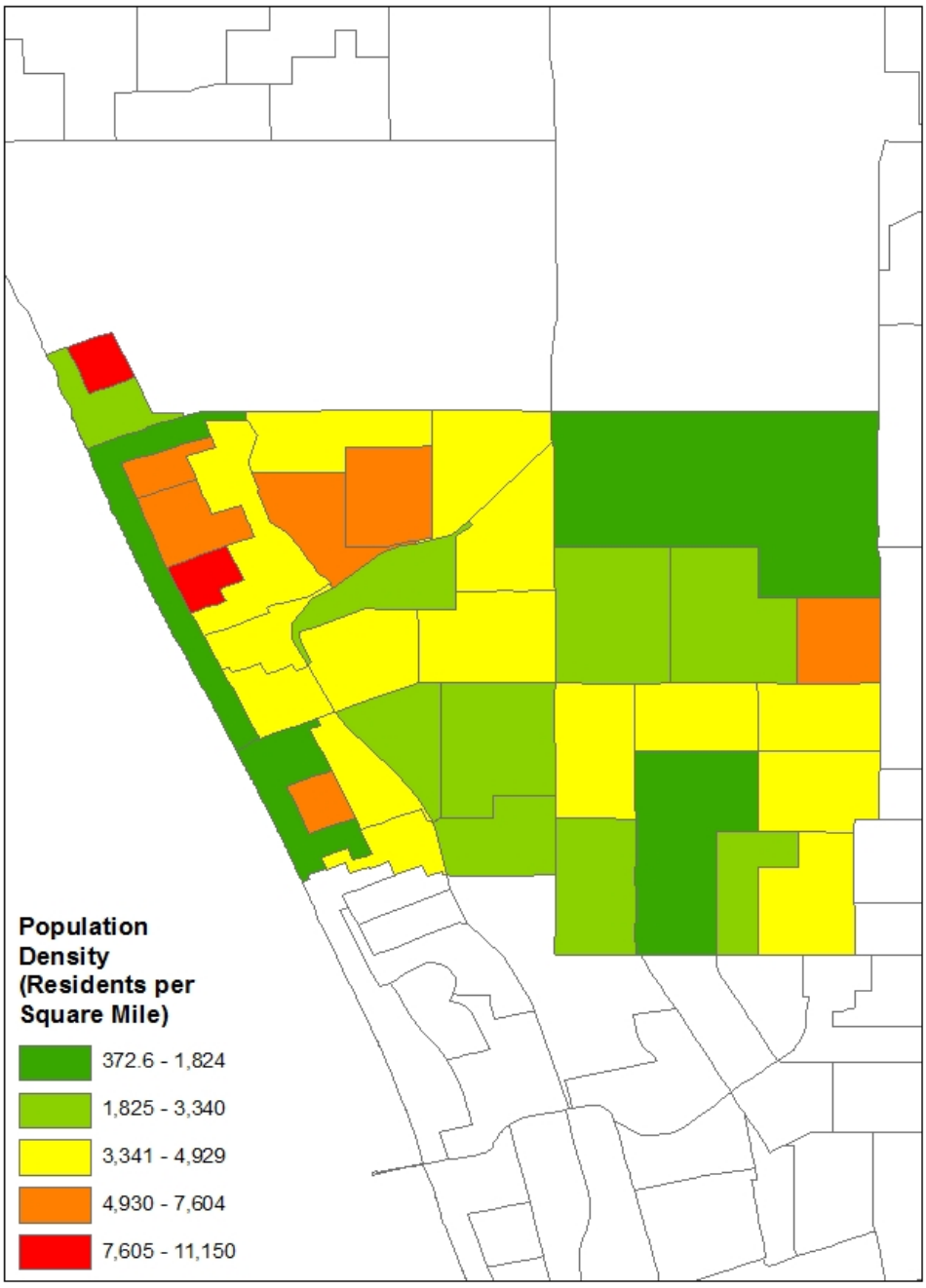

Figure 14: Population density by census block group in the City of Manhattan Beach.

4.5.2 U.S. ACS Data for City of Santa Monica

Weighted averages were calculated using the Tapestry Segmentation estimates for the five ZIP codes that span the City of Santa Monica and these are compared with the ACS estimates for the census block groups reported in Table 8 below.

The median household income data summarized in the first three columns of Table 8 show tremendous disparities across CBGs. Median household incomes are $4,000 to $52,000 lower in 10 of the 77 CBGs and more than double the TS median household income estimate of $67,000 in 32 of the 77 CBGs that comprise the City of Santa Monica. The median ages summarized in the three middle columns show less variability but the median ages in 18 of the 77 CBGs exceed the TS estimate by 10 years or more in 18 The population densities reported in the final three columns of Table 8 show that 64 of 77 CBGs had lower population densities than the TS estimate.

Table 8 Comparison of median household income, median age, and population density estimates gathered from Tapestry Segmentation and ACS products for the City of Santa Monica

Median Household Income ($)			Median Age (Years)			Population Density (Residents per Square Mile)		
(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	14,735 62,946	10		28-35	11		604 2,007	12
$67,000	62,947 90,469	16	38.6	36-41	32		2,008 3,704	19
	90,4701 20,192	19		42-47	16		3,705 5,337	12
	120,193 176,696	16		48-54	14		5,338 8,152	21
	176,697 250,000	16		55-63	4	11,452	8,153 15,120	12

1 – TS estimates; 2 – ACS ranges (low on top, high below); and 3 – CBG count

The median household income, median age, and population density maps for the City of Santa Monica reproduced in Figures 14-17 show a series of distinctive geographic patterns both within and across the five ZIP codes that span this medium-sized city.

Figure 15, for example, shows how all of the CBGs in ZIP code 90402 have very high median household incomes and how most of the CBGs with low median household incomes are clustered in the two ZIP codes (90401 and 90404) in the center of the City of Santa Monica.

Figure 16 shows that the variations in median age were more scattered geographically across the City of Santa Monica. The two CBGs with high median ages were scattered across all five ZIP codes and perhaps more importantly, the various median household income classes distinguished in Figure 15.

And finally, Figure 17 shows there were clear patterns in terms of the distribution of population densities across the City of Santa Monica. The most conspicuous is the low densities across all of the CBGs that comprise ZIP code 90402 at the northwestern end of the City of Santa Monica and the cluster of CBGs with high population densities in ZIP code 90403 which is located next to ZIP code 90402. There are numerous CBGs with relatively high and low population densities scattered throughout the remainder of the ZIP codes shown in Figure 17.

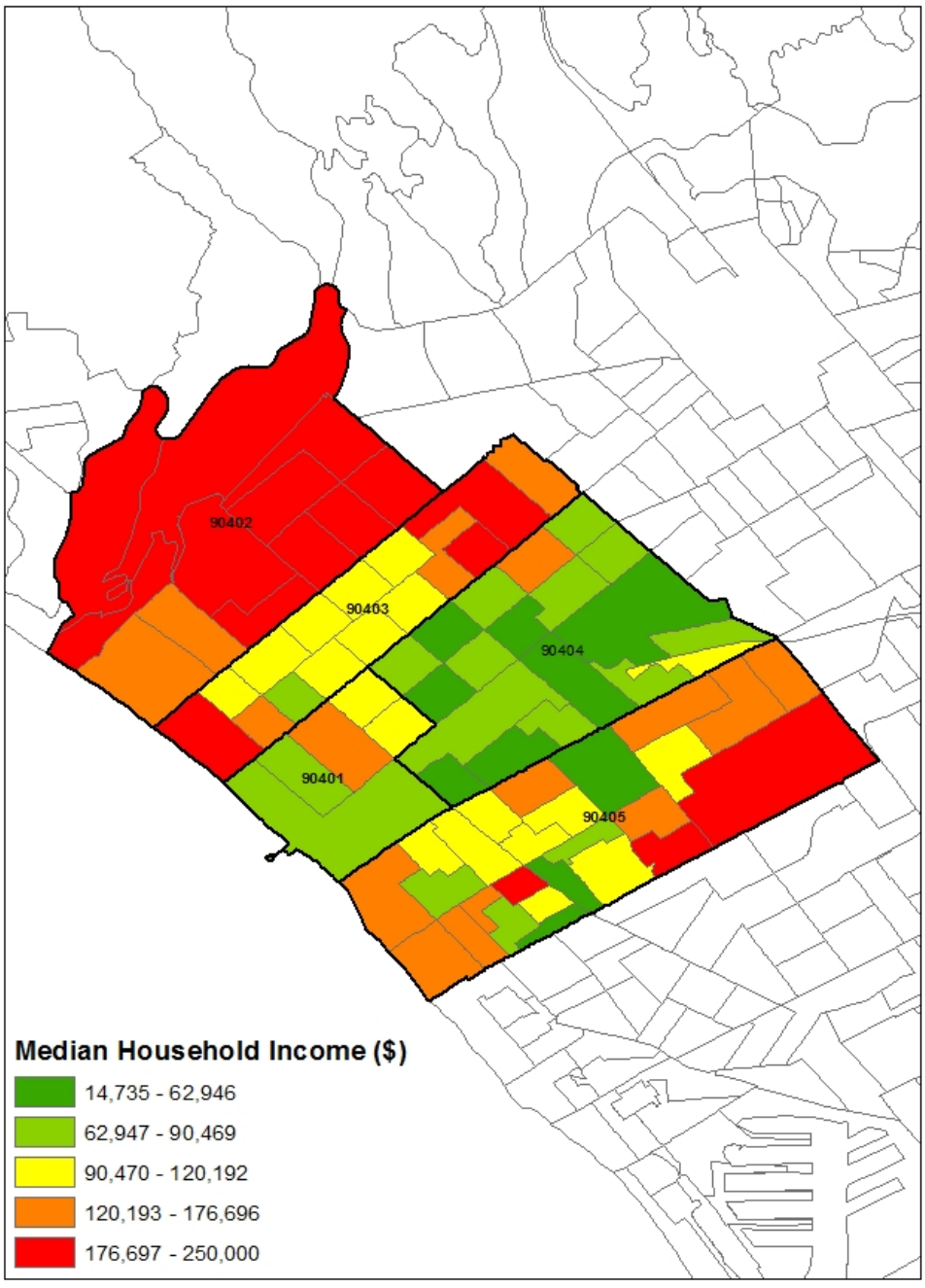

Figure 15: Median household income by census block group in the City of Santa Monica.

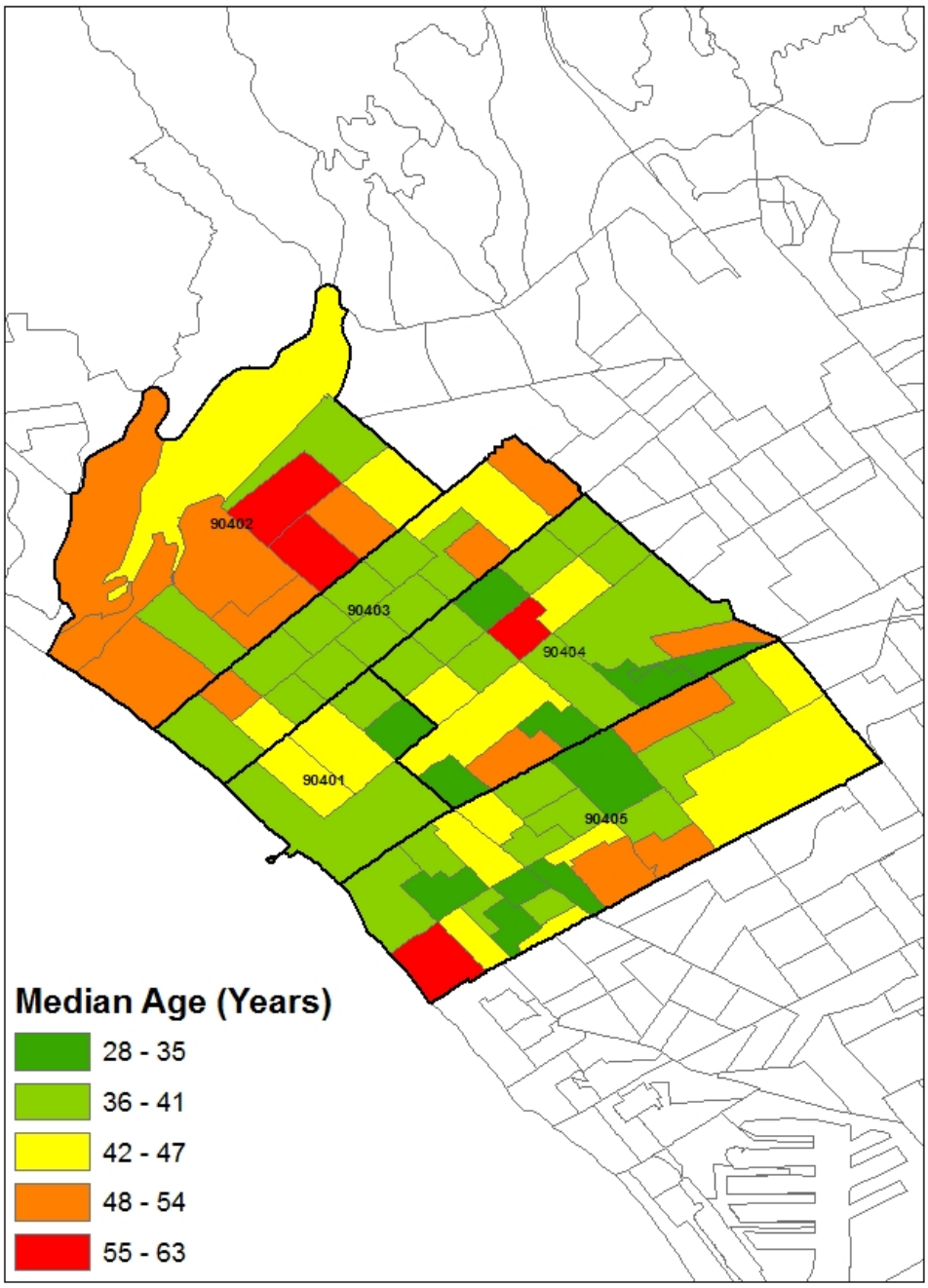

Figure 16: Median age by census block group in the City of Santa Monica.

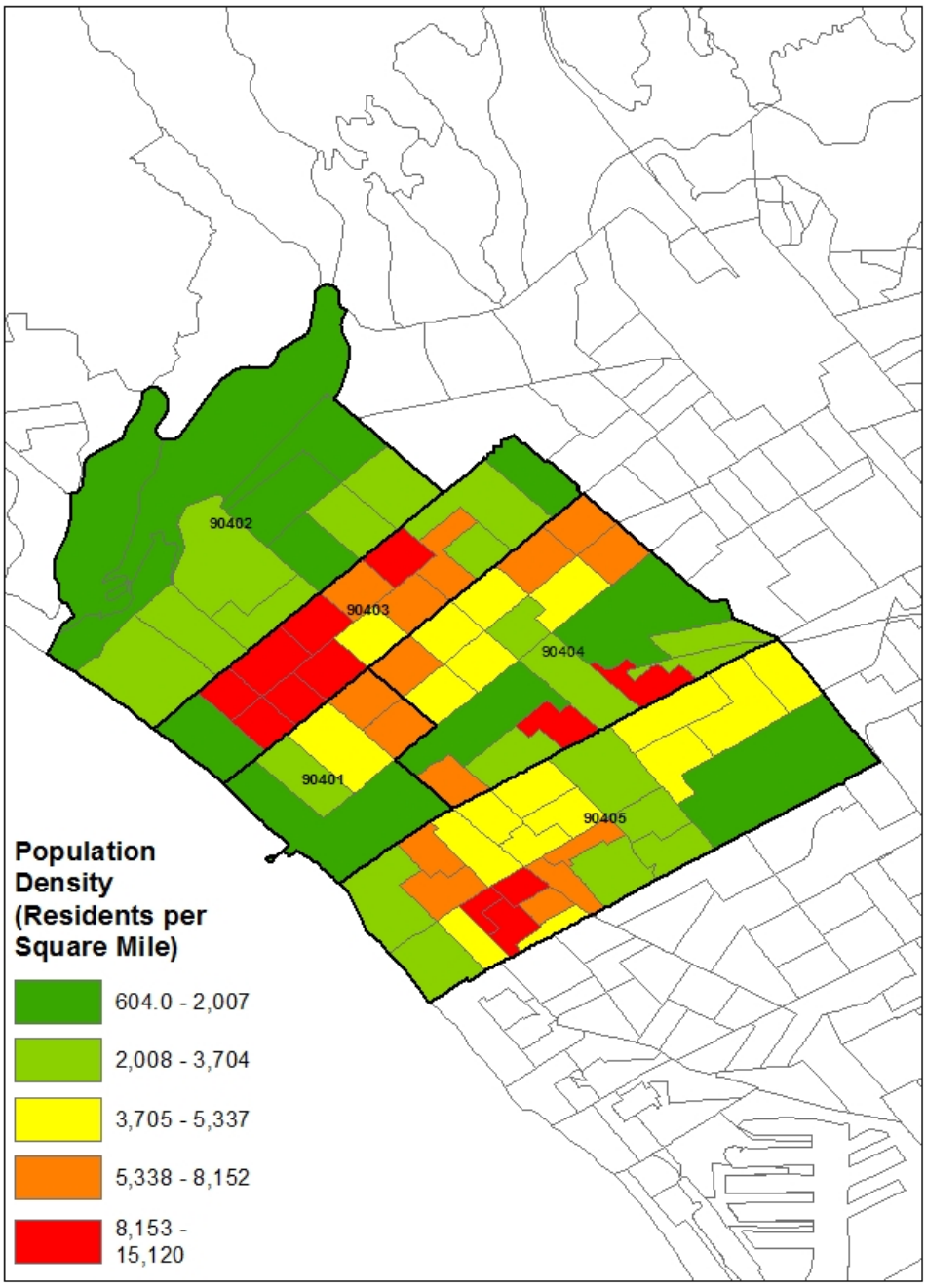

Figure 17: Population density by census block group in the City of Santa Monica.

4.5.3 ACS Data for Venice Beach

The distribution of the 35 census block groups across median household income, median age, and population density classes tell a similar story in the Venice Beach community (Table 9). Two of the CBGs out of 35 CBGs lacking sufficient numbers of households to generate reliable estimates reported zero for median household income but 18 of 35 reported median household incomes $17,000 or higher than the Tapestry Segmentation median household income estimate (i.e. $67,000). The median age by CBG showed less variation notwithstanding the fact that three CBGs reported median ages seven or more years lower than the TS estimate (38.6 years) and five CBGs reported median ages that were six or more years older than the TS estimate. The population densities showed tremendous variation with 35 CBGs reporting densities that were less than the TS estimate (11,452 residents per square mile), being the outlier for ACS data ranges.

Table 9 Comparison of median household income, median age, and population density estimates gathered from Tapestry Segmentation and ACS products for Venice Beach

Median Household Income ($)			Median Age (Years)			Population Density (Residents per Square Mile)		
(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	0	2		28-31	3		927 2,140	6
$67, 000	1 83,667	15		32-35	9		4,018 5,372	10
	83,668 114,219	7	38.6	36-40	11		4,018 5,372	11
	114,220 147,639	4		41-44	7		5,373 7,653	7
	147,640 250,000	7		45-48	5	11,452	7,654 13,281	1

1 – TS estimates; 2 – ACS ranges (low on top, high below); and 3 – CBG counts

The geographic distributions summarized in Figures 18-20 help to show the variability that occurs across the Venice Beach community. The seven CBGs with the highest median incomes follow the coastline and/or the canals that are located just north of Marina del Rey and west of Albert Kinney Boulevard for example. The one CBG with a zero value marks the retail core that faces the beach and is largely supported by visitors to Venice Beach and the CBGs with relatively low median family incomes follows the coastline and dominates the northwestern quadrant (Figure 18). The majority of the CBGs with relatively high median ages, on the other hand, dominate the eastern half of Venice Beach. The population densities vary considerably across the 35 CBGs and there is no consistent pattern but for the tendency for the CBGs with the higher densities to follow some of the major thoroughfares that traverse Venice Beach in all directions.

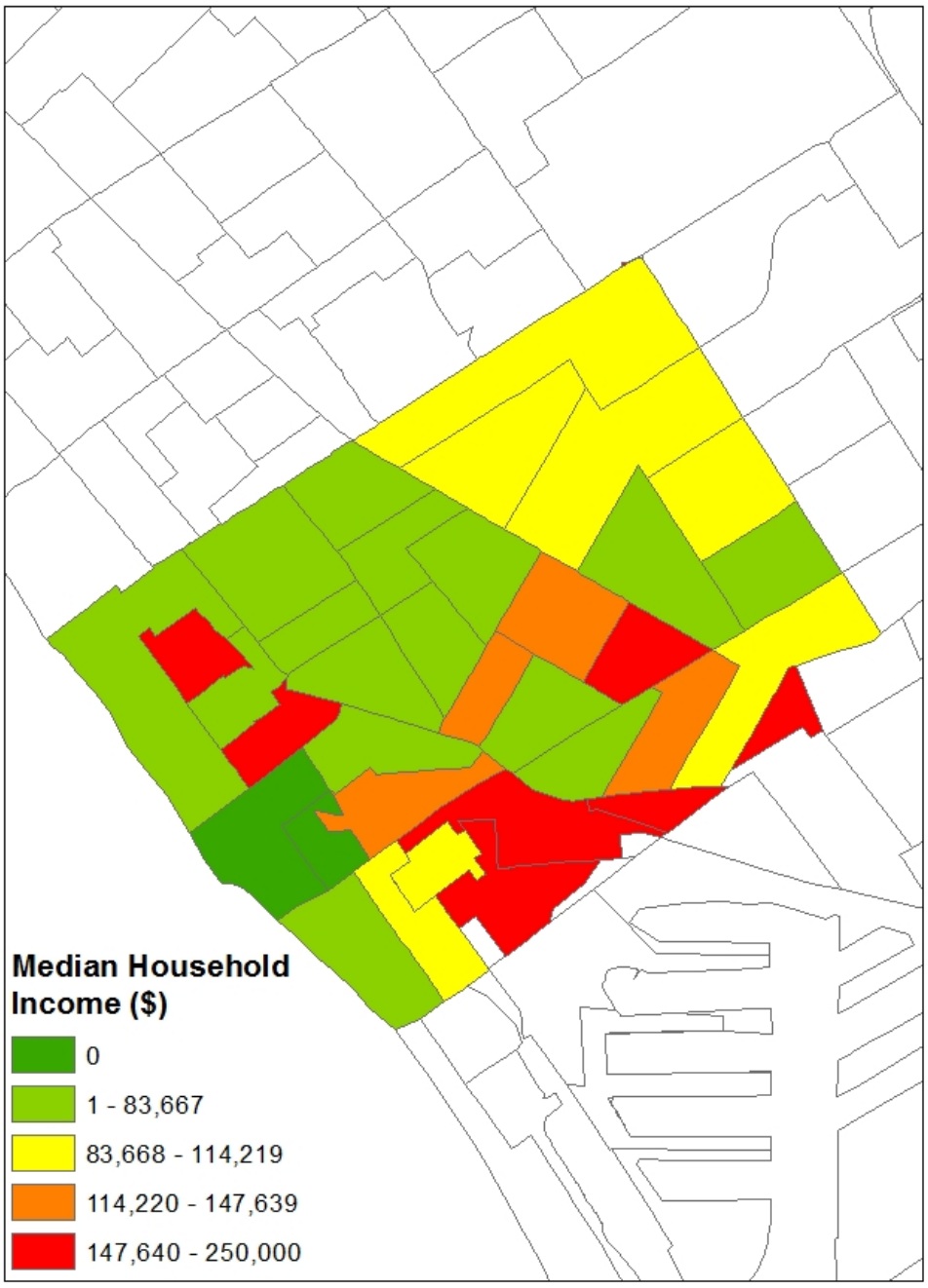

Figure 18: Median household income by census block group in Venice Beach.

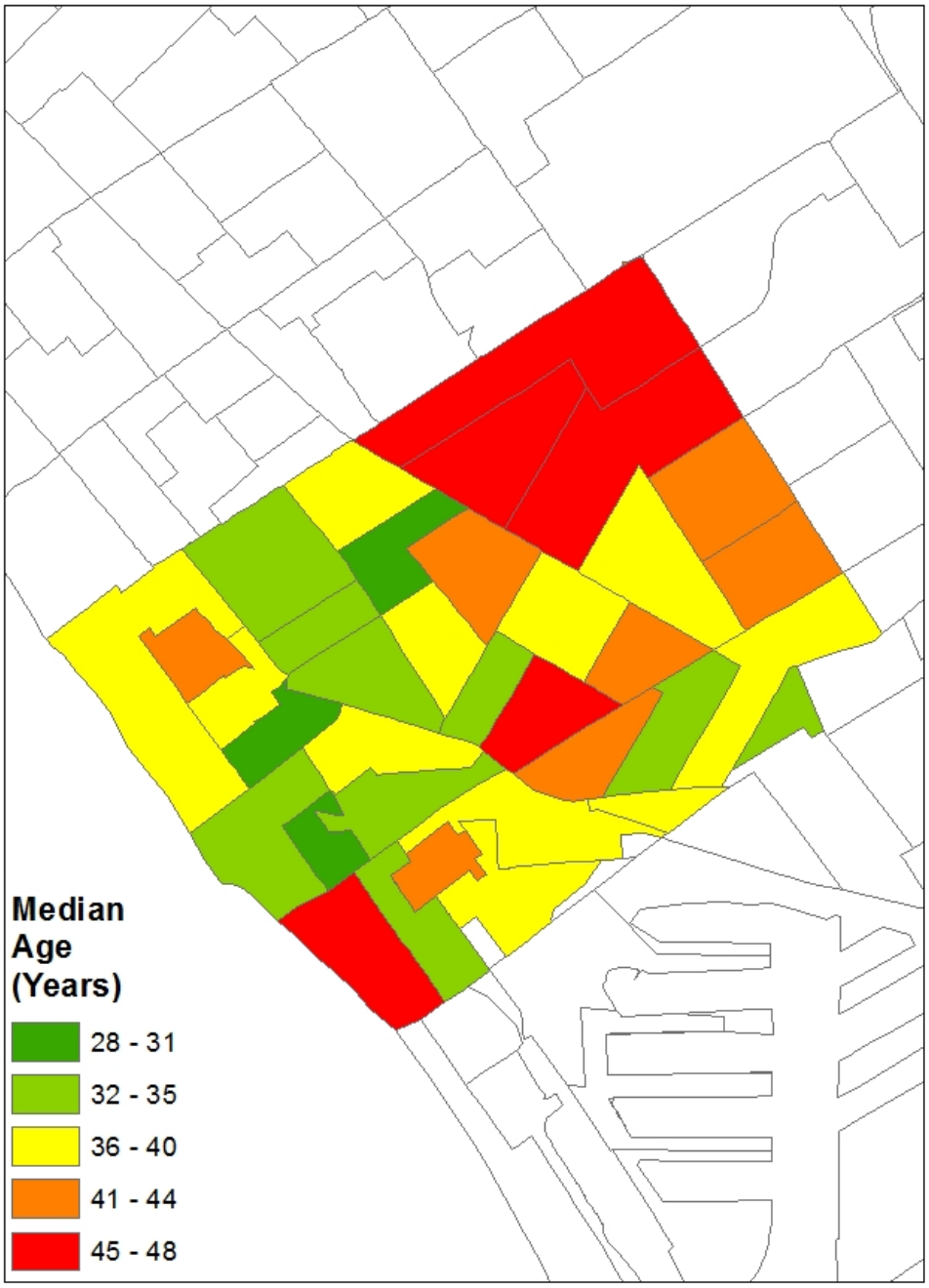

Figure 19: Median age by census block group in Venice Beach.

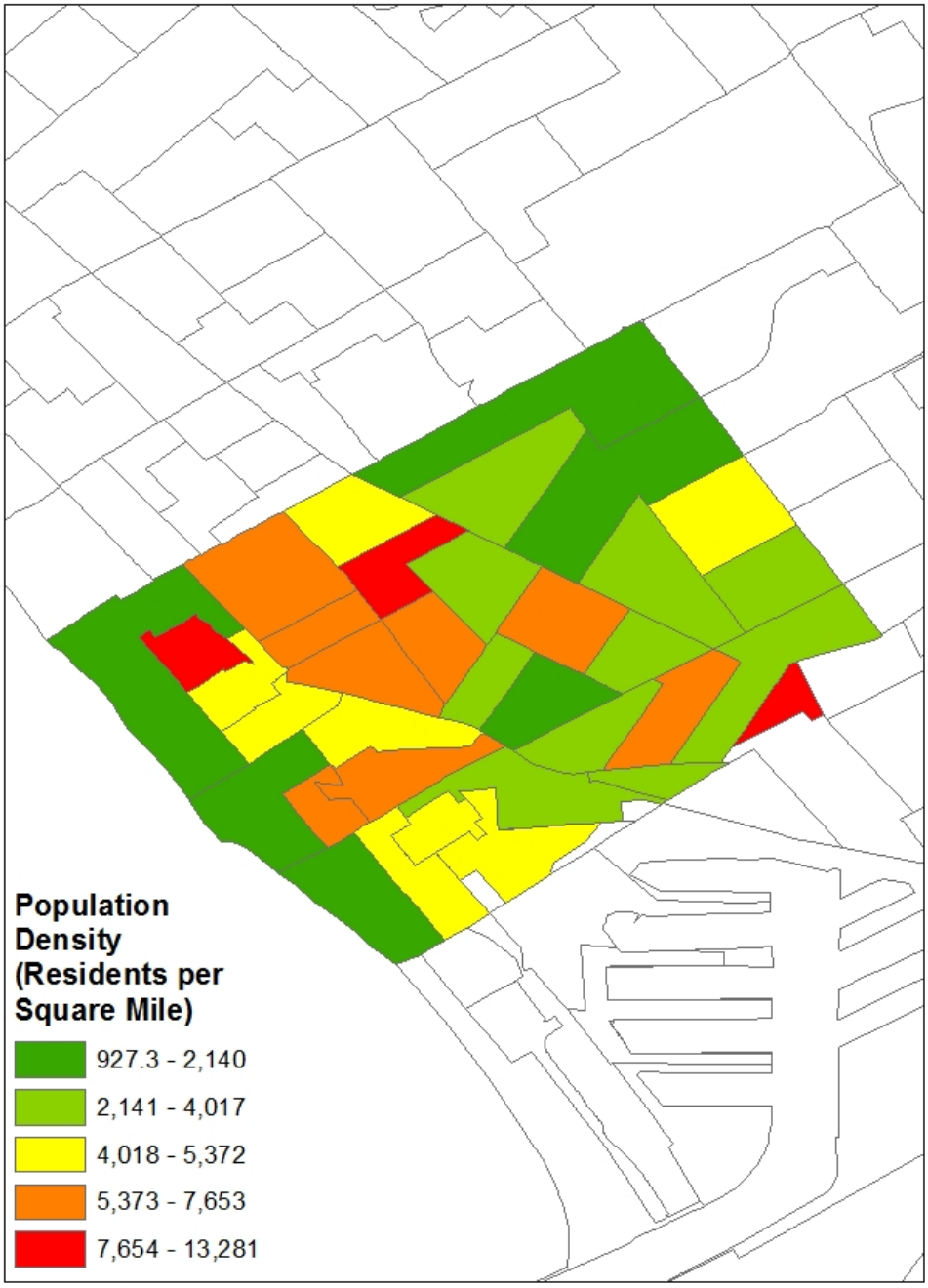

Figure 20: Population density by census block group in Venice Beach.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

Overall, there were some similarities as well as differences between the Tapestry Segmentation and ACS results. Even with a few different variations, there is much that can be learned from both assessments. There was an evident difference when geographic data was populated in different units such as ZIP code versus Census Block Group. The following sections will cover major findings, limitations, and ideas for future work.

5.1 Major Findings

It was easier to assess and analyze conditions on the ground when geographic data were divided into census block group rather than seeing the data lumped together at the ZIP code level. This can be tied to the modifiable areal unit issue that is commonly noticed in assessing data across various geographical scales. Therefore, choosing the appropriate geographic scale is paramount and should be tailored for any case study. The world can never be studied, modeled, or represented in all of its full detail and complexity. Scale is important in part because of the consequences it poses for the degree to, which geographic information is generalized (Montello, 2001).

The Tapestry Segmentation's grouping of the ZIP code as a whole can be useful for small communities like Venice Beach and Manhattan Beach, but for bigger communities such as Santa Monica it will be more difficult to lump units together due to the variation across the city. The advantages of Tapestry Segmentation are linked to the data synthesis and how these groups inform SES and community health. Understanding these segment groups can help a user get a clearer understanding of the community accompanying a given ZIP code in terms of socio-economic status (SES) and demographics. These discussions often start with SES, because it closely follows the economic development of a region that may be linked to a community's

health status (Gatrell and Jensen, 2009). In addition, Tapestry Segmentation can be understood as derivation from CBED, since each segment group data was aggregated from grouping clusters (Reid, Smith and Carroll, 2009). Tapestry Segmentation allows any level of user a more insightful way to understanding relationships among Census attributes. The 56 segment groups classified by Esri use language in a way that makes this possible for all users, especially to those who are not familiar with GIS.

5.2 Limitations

The results from Chapter 4 show how the choice of geographical scale (i.e. the unit of analysis) changes the assessment of community characteristics. The CBG and TP estimates did not necessarily correspond as expected. Choosing and using the same methods but different scales shows how the outcome will also be different in many cases. The choice of Census Tract as the scale for analysis would likely have given different results as well.

This lack of flexibility in scaling is a significant setback for a more experienced GIS user, who may want to conduct a more specific study. In this case, Esri should provide more options in choosing different levels of scale and/or resolution. In addition, there is currently only three variables (median household income, median age, and population density) that Tapestry Segmentation features on their web platform. It would be beneficial to feature more attributes such as race/ethnicity, a health index, and/or environmental factors. Another beneficial feature to add would be to show change over time that allows a user to trace back the history of what a community looked like or trace forward to see what it would look like if one or more trends were extended into the future.

5.3 Future Work

In addition to adding more features that may help better assess and understand a community, Esri's Tapestry Segmentation can be applied and used to explore new fields such as public health to learn more about and to support work to reduce health disparities, improve business marketing and targeting, and guide fire-rescue dispatch, among others.

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