air pollution control district
SANTA BARBARA COUNTY

2025 Network Assessment of the Santa Barbara County Air Pollution Control District Ambient Air Monitoring Network

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Final

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1.0 Introduction

This report was prepared by the Santa Barbara County Air Pollution Control District (District) as an assessment of the ambient air monitoring network in Santa Barbara County. Title 40, Part 58, Section 10 of the Code of Federal Regulations (40 CFR 58.10) requires that an assessment be performed every 5 years to determine if the network meets the monitoring objectives described in this title. There are three basic monitoring objectives:

1) Provide air pollution data to the general public in a timely manner;
2) Support compliance with ambient air quality standards and emissions strategy development; and,
3) Support for air pollution research studies.

To support the air quality management work indicated in the above objectives, the network is designed with a variety of monitoring station types. There are six general types:

1) Stations located to determine the highest concentrations expected to occur in the area covered by the network;
2) Stations located to measure typical concentrations in areas of high population density;
3) Stations located to determine the impact of significant sources or source categories on air quality;
4) Stations located to determine general background concentration levels;
5) Stations located to determine the extent of regional pollutant transport among populated areas; and in support of secondary standards; and,
6) Stations located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts.

The assessment is also required to help determine if new stations are needed, existing stations can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network. The current air monitoring network meets or exceeds the minimum monitoring requirements as set forth in 40 CFR 58 Appendix D. Details of these minimum monitoring requirements are discussed in the 2025 Annual Air Monitoring Network Plan for Santa Barbara County.

2.0 Santa Barbara County Setting

Santa Barbara County is located on the Pacific Coast of California bordered to the north by San Luis Obispo County and to the east by Ventura County. The Pacific Ocean forms the west and southern borders of the county. The Santa Ynez mountain range, which runs east/west parallel to the southern coast of the county is one of the predominant land features that physically divides the northern and southern portions of the county.

Local air quality is highly dependent upon the climate and meteorology of the area. Meteorological conditions control the transport and diffusion of emitted pollutants through diurnal and specific weather conditions, while climate is a long-term average of daily and seasonal weather trends. Understanding the climate of Santa Barbara County helps to explain annual cycles of countywide air quality, while meteorological data aids in explaining shorter term variations in local air quality.

2.1 Climate of Santa Barbara County

Santa Barbara County has a Mediterranean climate characterized by warm, dry summers, and cooler, relatively damp winters. Mild temperatures occur throughout the year, particularly near the coastline. Maximum summer temperatures average 70 degrees Fahrenheit near the coast and the high 80s to low 90s inland. During winter, average minimum temperatures range from the 40s along the coast to the 30s inland.

The climate of Santa Barbara County is strongly influenced by a persistent high-pressure area which lies off the Pacific Coast. As a result, sunny skies are common throughout most of the county. Rainstorms periodically occur and are most frequent from October to April. Annual rainfall amounts range from 10 to 18 inches along the coast, with more substantial amounts in higher elevations. On occasion, tropical air masses produce rainfall during the summer months.

Cool, humid marine air causes frequent fog and low clouds along the coast, generally at night and in the morning hours throughout late spring and early summer. The fog and low clouds can persist for several days at a time until they are broken up by a change in weather patterns.

2.2 Meteorology of Santa Barbara County

Meteorology deals with shorter time periods and smaller spatial scales than climate. Being cognizant of the interaction between local meteorology and emitted pollutants is essential to understanding how elevated levels of pollutants can occur in the atmosphere. This relationship between local meteorology and elevated pollutant levels is necessary in evaluating the design of an ambient air monitoring network.

2.2.1 Surface Winds

The air flow around the county plays an important role in the movement of pollutants. In northern Santa Barbara County (north of the ridgeline of the Santa Ynez Mountains), the sea breeze (from sea to land) is typically northwesterly throughout the year. During summer months, these northwesterly winds are stronger and persist later into the night. At night, as the sea breeze subsides, the air adjacent to the surface cools, and the cool air descends the coastal mountains into the valleys. This results in light land breezes (from land to sea). This land-sea breeze cycle, combined with the local topography, greatly influences the direction and speed of the winds. The alternation of the land-sea breeze cycle can sometimes produce a "sloshing" effect, where pollutants are swept offshore at night and are subsequently carried back onshore during the day. This effect is exacerbated during periods of low windspeeds.

Topography also plays a role in wind patterns experienced in the county. Point Conception (Point) is the western most point on the continental United States and it changes the orientation of the coastline in Santa Barbara County. The coastline north of the Point is north-south. The coastline south of the Point is east west. This change in the coastline, combined with the topography adjacent to Point Conception, can cause counterclockwise circulations, or eddies, to form east of the Point. These eddies fluctuate in timing and location but often result in highly variable winds along the southern coastal strip. Point Conception also marks the change in the prevailing surface winds from northwesterly north of the Point to southwesterly south of the Point.

Another type of wind regime that influences air quality in Santa Barbara County is the "Santa Ana" wind condition. Santa Ana winds are dry northeasterly winds that occur throughout Southern California, primarily during the fall and winter months. These winds descend the slopes of mountain ranges and typically are associated with warm and dry conditions. Wind speeds associated with Santa Ana events are generally 15-20 miles per hour, though they can reach speeds in excess of 60 miles per hour. During Santa Ana conditions, pollutants emitted in Santa Barbara County, Ventura County, and the South Coast Air Basin (the Los Angeles region) are moved out to sea. These pollutants can then move back onshore into Santa Barbara County (via the Santa Barbara Channel) in what is called a "post-Santa Ana condition." Not all post-Santa Ana conditions lead to high pollutant concentrations.

2.2.2 Upper-Level Wind and Temperature

Upper-level winds in the atmosphere are critical to the air quality of Santa Barbara County. The winds at 1,000 feet and 3,000 feet are generally from the north or northwest throughout the year. Occurrences of southerly and easterly winds are most frequent in winter, especially in the morning. Upper-level winds from the southeast are infrequent during the summer months, though they are usually associated with periods of higher ozone (O_3) levels. As with the surface winds, upper-level winds can move pollutants that originate in other areas into the county.

Another factor that affects the concentration of pollutants in the air is the stability of the atmosphere. Atmospheric stability regulates the amount of air exchange or “mixing” both horizontally and vertically. Restricted mixing and low wind speeds are generally associated with higher pollutant concentrations. These conditions are typically related to temperature inversions where temperature increases with height essentially trapping the pollutants that are below or within them.

Surface inversions (0-500 ft.), as measured at Vandenberg Space Force Base, are most frequent during the winter, and subsidence inversions (1000-2000 ft.) are most frequent during the summer. Generally, the lower the inversion base height and the greater the rate of temperature increase from the base to the top, the more pronounced effect the inversion will have on inhibiting dispersion. The subsidence inversion is very common along the California coast and is one of the principle causes of air stagnation.

Poor air quality is often associated with "air stagnation" (high stability/restricted air movement). Therefore, there are higher frequencies of pollution events in the southern portion of the county where light winds are common, as opposed to the northern portion where the prevailing winds are strong and persistent. However, the wind patterns have the opposite effect when taking particulate entrainment within the atmosphere into consideration.

2.3 Santa Barbara County Population Distribution

The population of Santa Barbara County is estimated to be 442,648 based on the California Department of Finance July 2024 estimate[1]. The distribution of population by race, ethnicity, and age (from the 2020 U.S. census) is presented in Table 2-1 below. Note that the census considers race and ethnicity as separate traits. The census considers Hispanic/Latino as an ethnic trait, not a race, so an individual that is identified White or Black may also be identified as Hispanic/Latino.

Table 2-1
Santa Barbara County Distribution of Population by Race and Age

Santa Barbara County Population Distribution by Race and Ethnicity (2020 US Census)							
Caucasan/ White	Afican American/ Black	Indigineous	Asian	Pacific Islander	Other	Multiple	Hispanic/ Latino
41.20%	1.40%	0.40%	5.70%	0.10%	0.50%	3.70%	47%

Santa Barbara Population Distribution by Age (2020 US Census)								
0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80+
12%	15%	17%	12%	11%	10%	10%	8%	4%

The population is concentrated in the areas surrounding the cities of Carpinteria, Santa Barbara, Goleta, Lompoc, Santa Maria, Guadalupe, and the Santa Ynez Valley. The remaining areas of the county are very scarcely populated, especially the large area of National Forest in the northeastern section of Santa Barbara County.

[1] https://dof.ca.gov/forecasting/demographics/estimates/

3.0 Air Monitoring Network

As required by the 1970 Clean Air Act, the District and the California Air Resources Board (CARB) began installing State and Local Air Monitoring Stations (SLAMS) to measure the air quality within the populated urban areas of Santa Barbara County. These stations were used to determine Santa Barbara County's compliance with the National Ambient Air Quality Standards (NAAQS). Between the mid-1970s and the mid-1980s, the number and location of monitoring stations did not change.

Several changes occurred in the early- to mid-1980s that resulted in an expansion of the monitoring network. The District adopted its New Source Review and Prevention of Significant Deterioration (PSD) rules, as required by the federal Clean Air Act Amendments of 1977, Part D. These rules have been revised over the years, and they serve to guide the District's air quality permitting program.

The District expanded its monitoring network in the early 1980s due to unprecedented plans for oil and gas development in Santa Barbara County. New oil and gas processing facilities were permitted in the 1980s with the new facilities' permits to operate requiring ambient monitoring downwind from the facilities. Additionally, some of the larger new facilities' permits to operate also required ambient monitoring across the region in order to assess the cumulative impact of these new sources. The monitoring required by these permits requires the facilities to continue operation of the monitoring station (and comply with District Monitoring Protocol) for the life of the facility.

During 2018 and 2019, the District worked with CARB and EPA to modify the monitoring network to streamline resources from redundant and non-essential monitors while maintaining one of the most extensive air monitoring networks in the state. In February 2019, the District received EPA approval to shut down some monitors, change some Industrial monitors approved for shutdown to non-NAAQS compliant (removing CARB and EPA oversight), and change the ozone monitors at Paradise Road, Carpinteria, and Las Flores Canyon #1 from Industrial to SLAMS monitors. Additionally, the District agreed to develop a transition plan to take responsibility for the operation of the Santa Barbara and Santa Maria SLAMS monitoring stations that were historically operated by CARB. The District took responsibility for the Santa Barbara station in January 2020. CARB shut down their Santa Maria site in February 2021, and the District started operating a new Santa Maria site location in October 2022.

Pursuant to District Rule 364, adopted by the District's Board on May 21, 2020, the District initiated efforts to install and maintain a refinery-related community air monitoring system downwind from the Santa Maria Asphalt Refinery. This monitoring system is collocated with the Santa Maria SLAMS station, and monitors the following pollutants: H_2S, SO_2, Benzene, Toluene, Ethylbenzene, and Xylene. The Santa Maria monitoring station relocation delayed operation of these community monitors until early 2023.

In response to public requests, the District installed a new $PM_{2.5}$ monitor in Carpinteria in October 2023. This monitor is operating initially as a Special Purpose Monitor (SPM) monitor to assess the range of $PM_{2.5}$ concentrations and wildfire smoke impacts from this site. Additionally, in the District's 2024 Annual Network Plan, the District included a request to EPA to designate the $PM_{2.5}$ SPM at the Santa Ynez monitoring station as a SLAMS site, and in October 2024, EPA formally approved the designation request.

The air monitoring network in Santa Barbara County consists of SLAMS and Non-NAAQS compliant Industrial monitors. These monitors are operated by the District or private contractors. The Industrial monitors are designed to measure regional air quality in addition to criteria pollutants and odorous compounds from these permitted industrial facilities. A monitoring station can serve a dual purpose when its location satisfies more than one objective. Most of the SLAMS and Industrial stations also include meteorological monitors. The meteorological conditions measured include wind speed, wind direction and temperature. The meteorological data from these stations are used to characterize the transport of pollutants in the air and can help to identify the source of the pollutants measured.

The network of SLAMS and Industrial monitors is detailed below in sections 3.1 and 3.2.

3.1 SLAMS Stations

There are eight ambient air monitoring stations with SLAMS monitors operating in Santa Barbara County. Figure 3.1 shows the location of the SLAMS stations on a map of Santa Barbara County. Table 3.1 lists the sites in Santa Barbara County and identifies the station's EPA AQS identification code, type of station, and operator. These stations are operated for different objectives. The stations with SLAMS monitors are sited to measure the typical concentrations in areas of high population density and/or to measure the highest values for a pollutant.

Figure 3-1
Map of the SLAMS Monitoring Network in Santa Barbara County for 2025

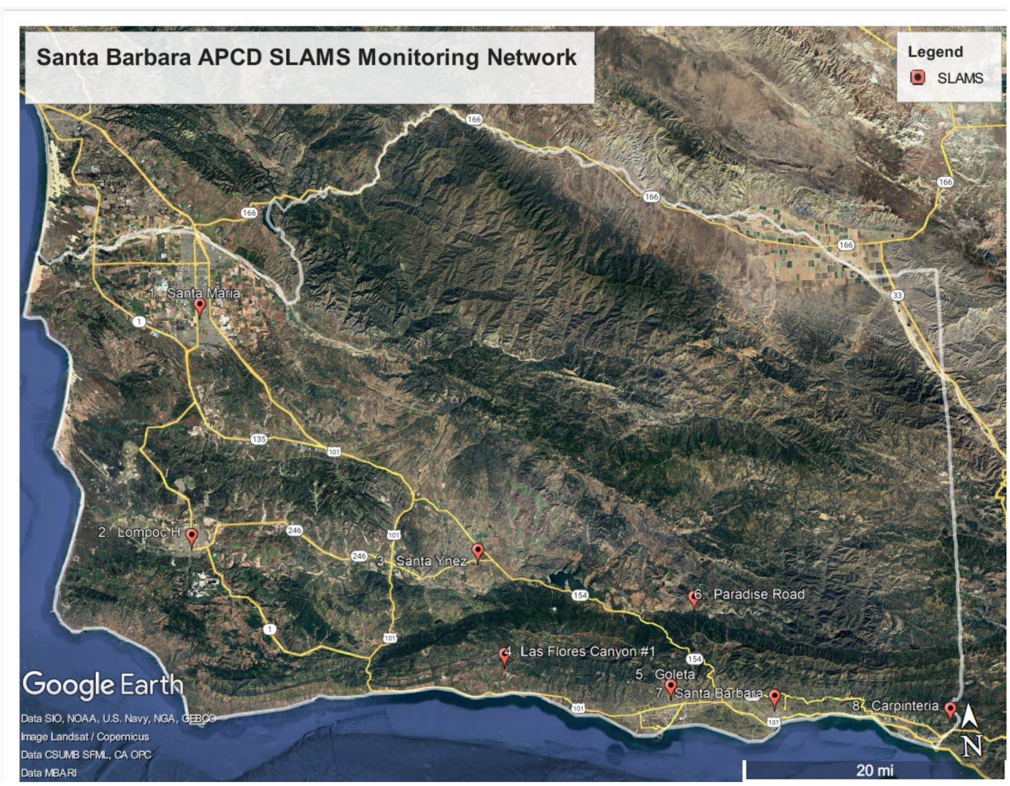


Table 3-1
SLAMS Monitoring Network in Santa Barbara County for 2025

No.	Name	Site Code	Type	Operator
1	Santa Maria	060831009	SLAMS[1]	District
2	Lompoc H Street	060832004	SLAMS	District
3	Santa Ynez	060833001	SLAMS	District
4	Las Flores Canyon #1	060831025	SLAMS[1]	District
5	Goleta	060832011	SLAMS	District
6	Paradise Road	060831014	SLAMS[1]	Contractor
7	Santa Barbara	060830011	SLAMS	District
8	Carpinteria	060831021	SLAMS[1]	District

[1] *Ozone monitors at these locations are SLAMS; other monitors at these sites are Industrial.*

3.2 Industrial Stations

There are seven stations containing Industrial monitors. These monitors are designed to measure maximum pollutant concentrations, regional air quality, background levels, or transport emissions. These monitors are required by operating permits issued to stationary emission sources. These Industrial monitors are not utilized for comparison to national ambient air quality standards, are not counted in assessing minimum SLAMS monitoring requirements, and are considered secondary monitors by EPA. All Industrial monitors measuring criteria pollutants are required to be EPA approved monitors and are operated to meet the same quality control requirements as the SLAMS monitors.

Two of the Industrial stations are sited to measure odorous compounds that could potentially be emitted from certain industrial facilities and are required by permits issued to these facilities. These stations typically measure hydrogen sulfide, total reduced sulfur, wind, and temperature. The odor stations are Las Flores Canyon Odor and Lompoc Odor. The Las Flores Canyon Odor monitoring site was temporarily shut down in July 2018 due to the associated oil and gas processing plant being shut down; the odor station restarted operation in March 2025. The odorous compounds measured at these stations are not criteria pollutants, therefore they are not included in the evaluation of data in this report.

Figure 3-2
Map of the Industrial Air Monitoring Network in Santa Barbara County for 2025

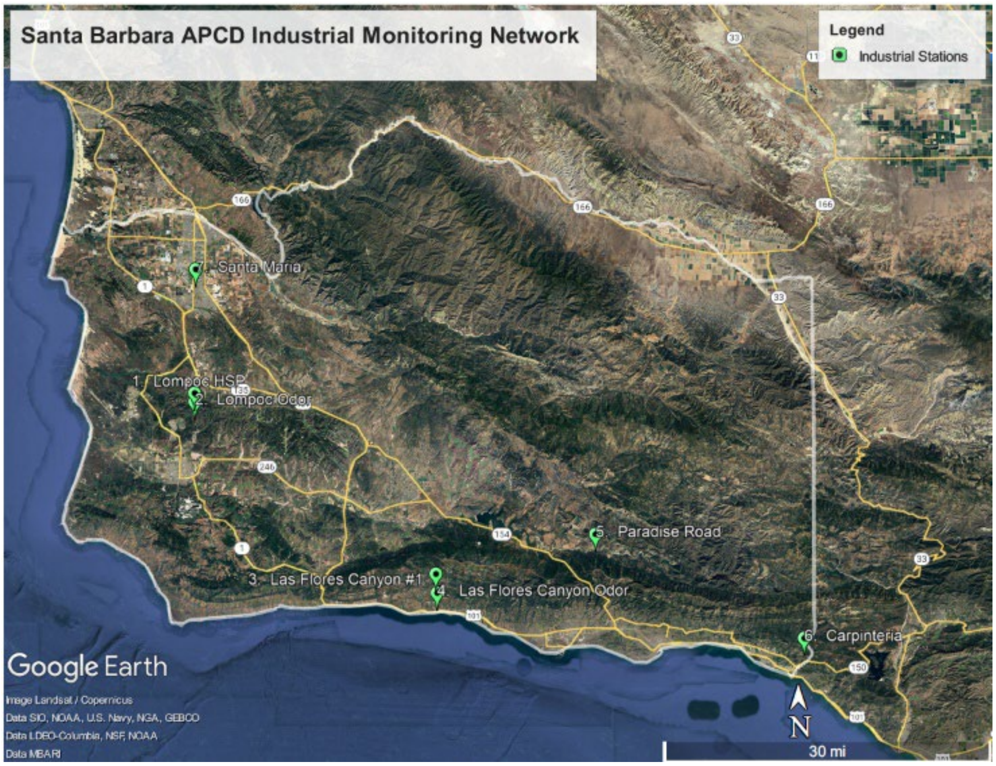


Table 3-2.a
Industrial Monitoring Network in Santa Barbara County for 2025

No	Site Name	Type	Operator
1	Lompoc HSP	Industrial	Contractor
2	Lompoc Odor	Industrial	Contractor
3	Las Flores Canyon #1	Industrial[1]	District
4	Las Flores Canyon Odor	Industrial	District
5	Paradise Road	Industrial[1]	Contractor
6	Carpinteria	Industrial[1]	District
7	Santa Maria Asphalt Refinery Community Monitoring	Industrial[2]	District

[1]*Ozone at these sites are SLAMS monitors, all other monitors are Industrial.*
[2]*Ozone, PM_{10}, $PM_{2.5}$ at this site are SLAMS monitors, all other monitors are Industrial/Community.*

Table 3-2.b
Industrial Monitoring Network Pollutants Measured

Parameter	O_3	NO_2	SO_2	THC	CO	H_2S	TRS	PM_{10}	BTEX[1]
Lompoc HSP	X	X	X	X					
Lompoc Odor						X	X		
Las Flores Canyon #1		X	X	X	X			X	
Las Flores Canyon Odor						X			
Paradise Road		X							
Carpinteria		X							
Santa Maria Asphalt Refinery Community Monitoring			X			X			X

[1] BTEX is Benzene, Toluene, Ethylbenzene, and Xylene

4.0 Pollutants Monitored and Analysis of Data

EPA has established a set of air quality standards known as the National Ambient Air Quality Standards, or NAAQS. The standards were established to protect human health and welfare. They include O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$. These pollutants are measured at several monitoring station locations to determine whether the District meets, or attains, the air quality standards. Other pollutants are also monitored, and other monitoring sites are located in Santa Barbara County for the following reasons: compliance with California Ambient Air Quality Standards, safety, District rule and permit requirements, and for special studies and research. These pollutants include hydrogen sulfide, total reduced sulfur, total hydrocarbons, and BTEX. Wind speed, wind direction, and temperature are also measured at most stations to help characterize the source of the measured pollutants. This report includes an evaluation of the pollutants that are measured for comparison with the NAAQS.

EPA has created an application named NetAssess[2] to help organizations analyze their air monitoring data and generate the graphical displays used in this section. The NetAssess application retrieves data from EPA's Air Quality System (AQS), the U.S. Census, and the U.S. Centers for Disease Control and Prevention to produce the analytical products.

4.1 O_3 Monitors

O_3 is monitored for NAAQS comparison at eight locations in the county. The Santa Barbara, Goleta, Lompoc H Street, Santa Maria, and Santa Ynez monitors are in the major populated areas of the county for population exposure. The Carpinteria, Paradise Road, and Las Flores Canyon #1 monitors are in areas with a low population density but have historically measured some of the highest concentrations of O_3 in the county. Paradise Road is north of the Santa Ynez mountain range and represents air in the northern portion of the county, while Las Flores Canyon #1 and Carpinteria are south of the Santa Ynez mountain range and are representative of the foothill region of the southern portion of the county.

4.1.1 Analysis of O_3 Measurements

Summary statistics were compiled for these monitors and summarized in Table 4-1. The fourth-highest eight-hour O_3 value was determined for each year from 2022 through 2024. These fourth-highest values were averaged for each monitor and compared with the NAAQS standard of 0.070 ppm. The monitors were ranked based on their percentage of the standard.

[2] https://rconnect-public.epa.gov/NetAssess2025/

Table 4-1
O_3 Summary

AQS #	Monitor	2022 4th Max ppm	2023 4th Max ppm	2024 4th Max ppm	3 year Avg. ppm	% of Std 0.070 ppm	Rank
06-083-1014	Paradise Road	0.060	0.062	0.065	0.062	88.6%	1
06-083-1025	Las Flores Canyon #1	0.058	0.055	0.054	0.055	78.6%	2
06-083-3001	Santa Ynez	0.058	0.054	0.054	0.055	78.6%	3
06-083-0011	Santa Barbara	0.052	0.051	0.048	0.050	71.4%	4
06-083-2011	Goleta	0.054	0.047	0.050	0.050	71.4%	5
06-083-2004	Lompoc H Street	0.048	0.048	0.048	0.048	68.6%	6
06-083-1009	Santa Maria	0.00*	0.049	0.046	0.043	61.4%	7
06-083-1021	Carpinteria	0.041	0.034	0.033	0.036	51.4%	8

** Data Completeness for the year was not met*

There were no stations that exceeded the standard for the 2022-2024 period examined. The Paradise Road monitor was the highest, with a measured value that is 88.6% of the current O_3 standard.

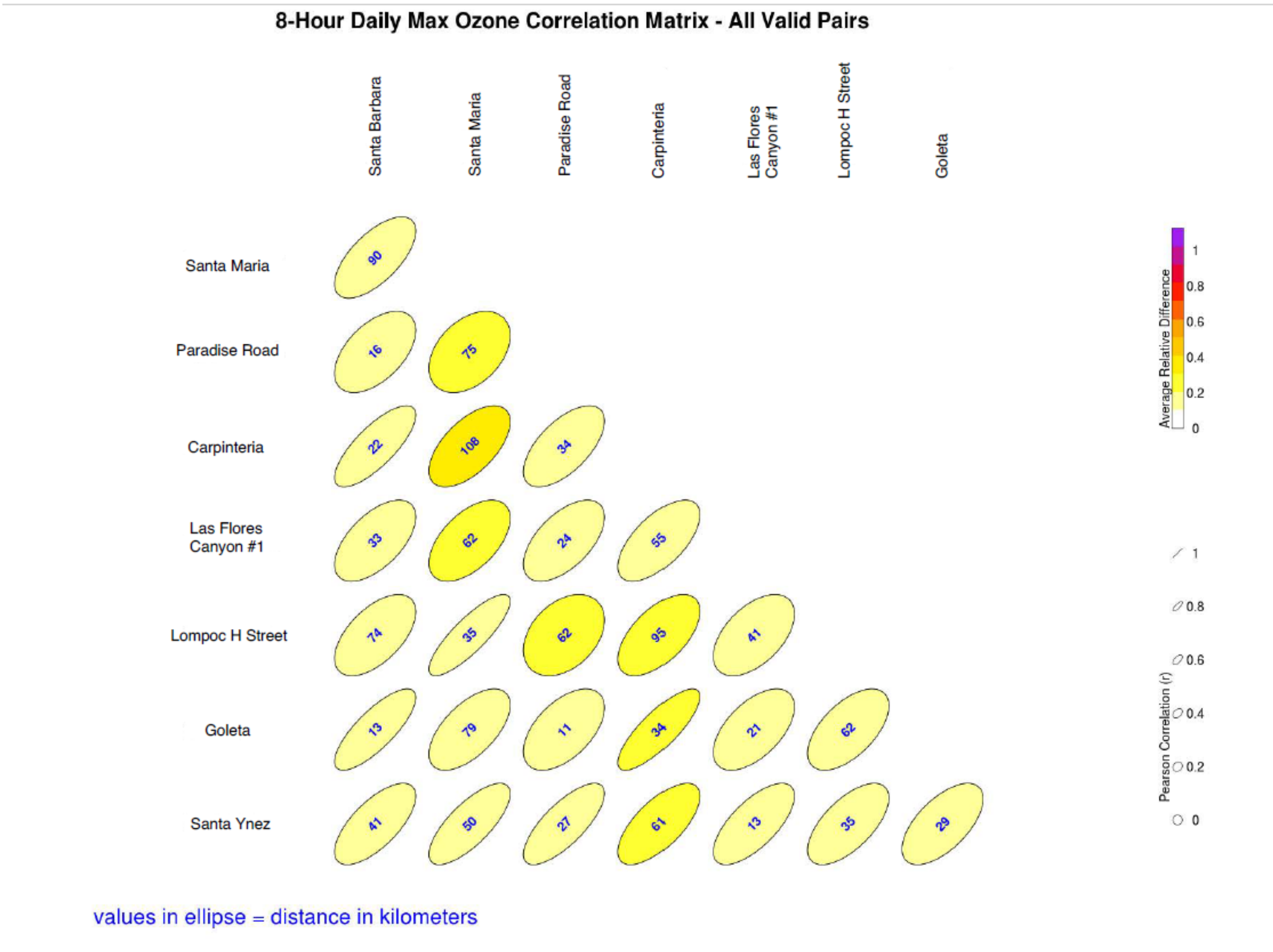
4.1.2 Correlation Analysis of O_3 Measurements

The Correlation Matrix tool calculates and displays the correlation, relative difference, and distance between pairs of sites within a selected set of air monitoring sites. This tool provides a means of determining possible redundant sites that could possibly be removed.

The graphical display summarizes the correlation, relative difference and distance between pairs of monitoring sites. The shape of the ellipses represents the Pearson correlation between sites. Circles represent zero correlation and straight diagonal ones represent a perfect correlation. The color of the ellipses represents the average relative difference between sites. The average relative difference between the two sites is an indicator of the overall measurement similarity between the two sites. Site pairs with a lower average relative difference are more similar to each other than pairs with a larger difference. Both the correlation and relative difference between sites are influenced by the distance by which site pairs are separated. The distance between site pairs in the correlation matrix graphic is displayed in kilometers in the middle of each ellipse.

The two monitor pairs with the strongest correlation are Goleta-Santa Barbara and Santa Ynez-Paradise Road. This is not surprising, as both pairs of monitors are sampling from the same airshed and are located near each other. The coastal monitor located at Lompoc H Street has the weakest correlation with the inland and elevated monitors of Paradise Road, Carpinteria, and Las Flores Canyon #1.

Figure 4-1
O_3 Correlation Analysis



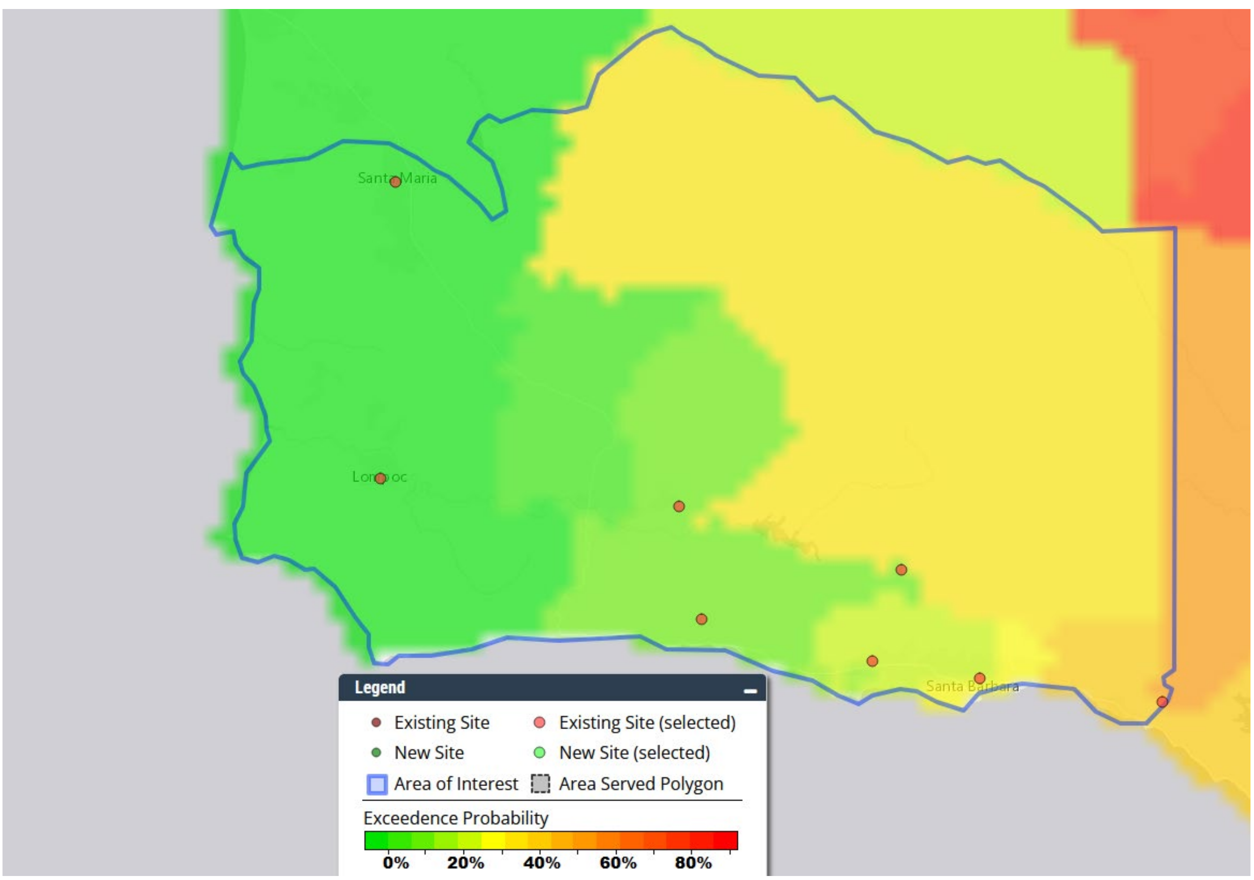
4.1.3 O_3 Exceedance Probabilities Analysis

A significant goal of the network assessment is to determine whether new monitors are needed. To make that decision, it is helpful to have an estimation of the extreme pollution levels in areas where no monitors currently exist. The Exceedance Probability Maps can be used to make spatial comparisons regarding the probability of daily values exceeding a certain threshold. These maps were generated by calculating estimates of ground level O_3 for the centroid of each census tract. These are statistical estimates from "fusing" photochemical modeling data and ambient monitoring data using Bayesian space-time methods.

The map below is intended to be used as a spatial comparison, and not for probability estimates for a single geographic point or area. This information, along with demographic and emissions data, could be used in a weight of evidence approach for proposing new monitor locations. The probability estimates displayed on the map alone should not be used to justify a new monitor; they should be used in conjunction with existing monitoring data.

Figure 4-2 plots the probability of exceeding the current 8-hour O_3 standard of 70 ppb. This analysis shows a low probability of exceeding the current O_3 standard across Santa Barbara County.

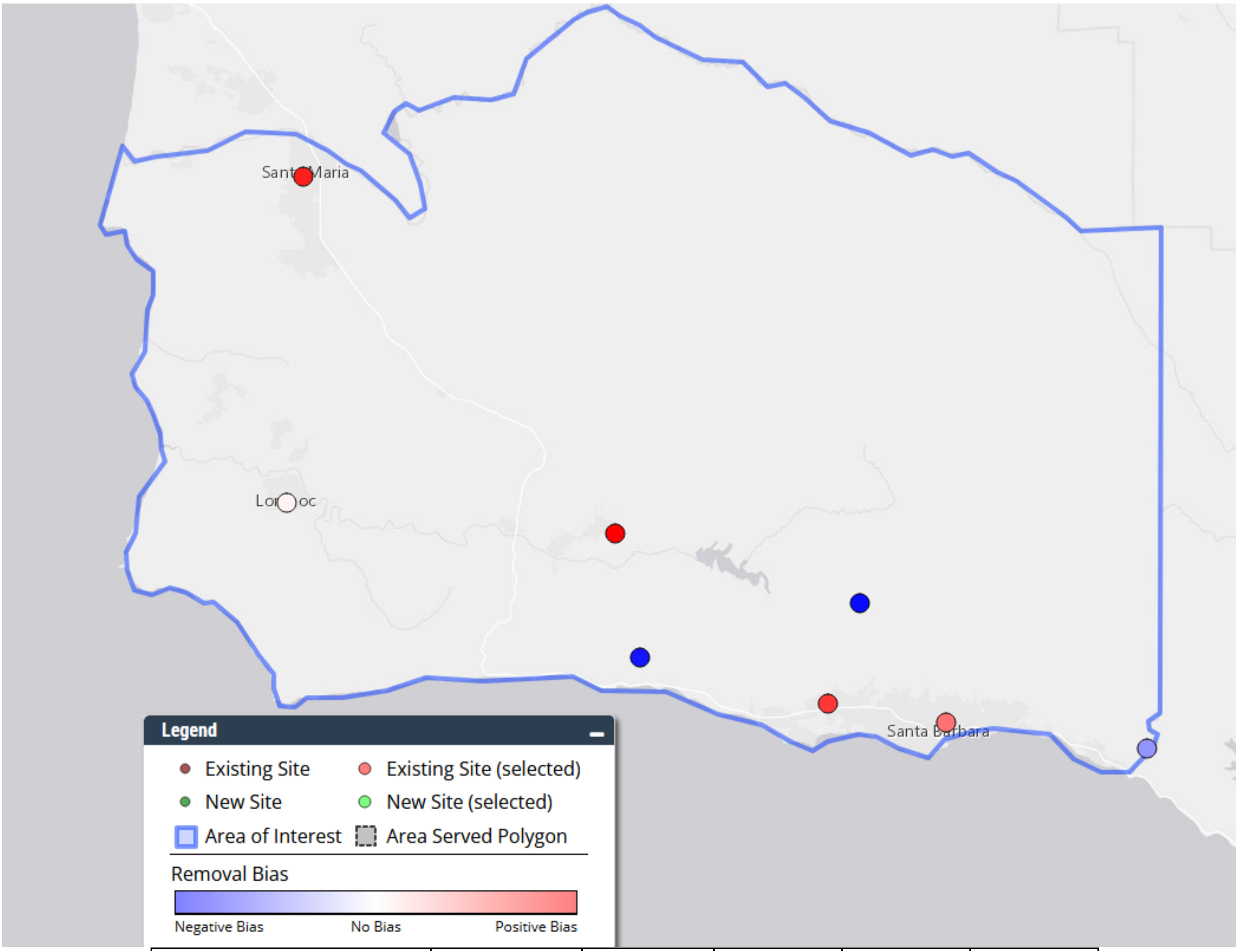
Figure 4-2
Surface Probability Plot for Exceeding the Existing O_3 Standard



4.1.4 O_3 Removal Bias Analysis

The removal bias analysis is a tool used to determine possible redundant monitors. The bias estimation uses the nearest neighbors to each monitor to estimate the concentration at the location of the monitor, if the monitor had never existed. This is done using the Voronoi Neighborhood Averaging algorithm with inverse distance squared weighting. The squared distance allows for higher weighting for concentrations at monitors located closer to the monitor being examined. The bias was calculated for each day at each monitor by taking the difference between the predicted value from the interpolation and the measured concentration. A positive average bias would mean that if the monitor being examined was removed, the neighboring monitors would indicate that the estimated concentration would be larger than the measured concentration. Likewise, a negative average bias would suggest that the estimated concentration at the location of the monitor is smaller than the actual measured concentration. A monitor with no bias indicates that the estimated concentration at the location of the monitor matches the actual measured concentration. Monitors with little to no bias are monitors where removal could be considered. However, the analysis results indicate that using estimates from nearby monitors in lieu of any existing monitor would introduce significant bias. One exception is the Lompoc H Street monitor, which is located in an area of dense population. Figure 4-3 below presents the removal bias for O_3 monitors.

Figure 4-3
O_3 Removal Bias Analysis



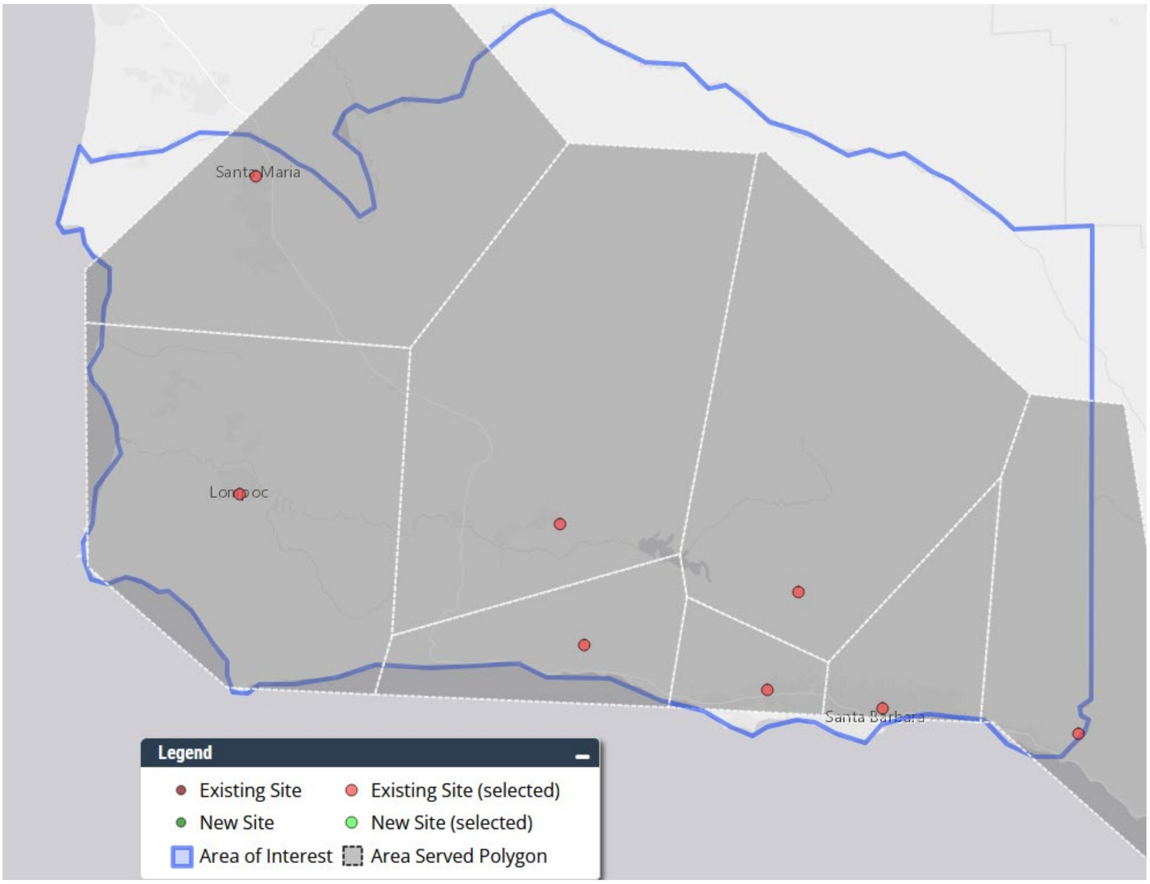
Monitor	Neighbors Included	Mean Removal Bias	Mean Relative Bias (%)	Min Relative Bias (%)	Max Relative Bias (%)
Santa Barbara	4	0.0029	10	-20	156
Santa Maria	4	0.0046	15	-11	89
Paradise Rd	7	-0.005	-10	-52	46
Carpinteria	5	-0.0022	-4	-44	71
Las Flores Canyon #1	5	-0.0048	-10	-51	57
Lompoc H Street	10	0.0003	2	-35	99
Goleta	5	0.0041	13	-30	153
Santa Ynez	5	0.0052	16	-27	165

4.1.5 O_3 Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitor. The shape and size of each polygon depends on the proximity to the nearest neighboring monitor. This technique provides an easy way to understand the general area and demographics represented by a monitor. It is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. The complex topography of Santa Barbara County introduces significant errors in the determination of the area served by each monitor. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can help to ensure that a monitor is not removed from a location that serves a historically underserved segment of the population, or from an area with a high proportion of sensitive population such as children and the elderly.

Figure 4-4 represents the results of this analysis for O_3. Overall, the racial and gender proportions for most of the monitor locations mirror the overall county demographics (See Appendix A). The Santa Maria monitor serves a slightly higher proportion of ethnically Hispanic/Latino, and the Lompoc H Street monitor serves a slightly higher proportion of Black residents than the overall County demographics. Additionally, Lompoc H Street and Santa Maria serve a slightly higher percentage of children and Paradise Road serves a higher proportion of elderly than the countywide age distribution. With the extensive O_3 monitoring network in Santa Barbara County, this analysis shows that O_3 monitoring covers all demographic groups, including the underserved and the most sensitive groups.

Figure 4-4
O_3 Area Served Analysis



4.2 NO_2 Monitors

NO_2 is monitored for NAAQS comparisons at one location in the county. NO_2 is often sited in conjunction with O_3 monitors to characterize the precursors to O_3.

In February of 2010, a new 1-hour NAAQS was set at 100 ppb for NO_2. The form of the standard is based on the three-year average of the 98th percentile of the daily maximum 1-hour average.

4.2.1 Analysis of NO_2 Measurements

Table 4-2 shows the summary of the county's NO_2 concentrations from 2022 – 2024 compared with this new standard. The Lompoc H Street monitor did not come close to exceeding the standard.

Table 4-2
NO_2 Summary

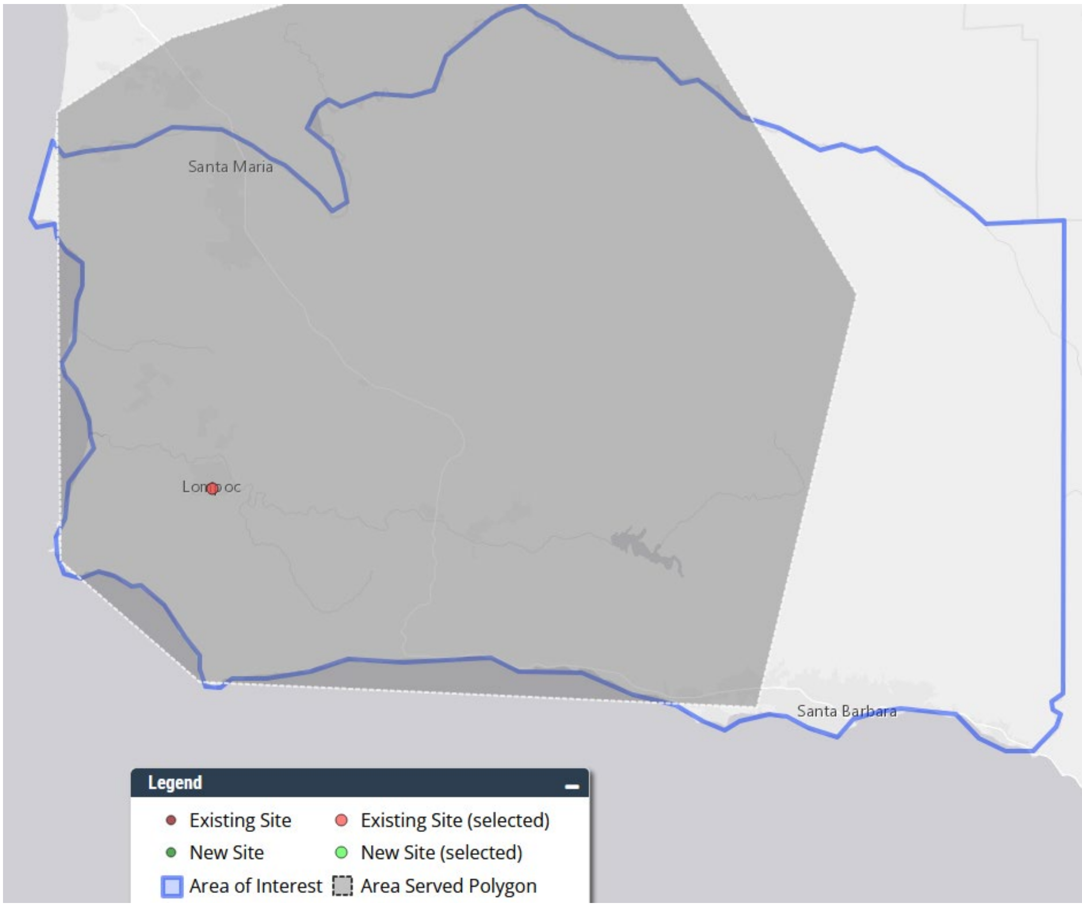
AQS #	Monitor Name	2022 98th ppb	2023 98th ppb	2024 98th ppb	3 Yr Avg 98th ppb	% of Std 100 %	Rank
06-083-2004	Lompoc H Street	20.0	18.0	19.0	19	19%	1

4.2.2 NO_2 Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitor. The shape and size of each polygon depends on the proximity to the nearest neighboring air monitor. This technique provides an easy way to understand the general area and demographics represented by a monitor. It is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can help to ensure that a monitor is not removed from a location that serves a historically underserved segment of the population, or Froman area with a high proportion of sensitive population such as children and the elderly.

Figure 4-5 represents the results of this analysis for NO_2. Because of the low number of monitors, the analysis tool used seems to indicate that the portions of Santa Barbara County farthest from any NO_2 monitor are not served. Because historical NO_2 measurements across the area have never measured concentrations anywhere near the level of the NO_2 NAAQS, this lack of coverage of the NO_2 monitoring network does not justify the amount of resources necessary to locate and operate another NO_2 monitor. The area served demographics shows that NO_2 monitoring in Santa Barbara County covers all demographic groups, including the underserved and the most sensitive groups.

Figure 4-5
NO_2 Area Served Analysis



4.3 SO_2 Monitors

SO_2 is measured for NAAQS comparison only at Lompoc H Street. Lompoc H is in an urban area and is also nearby an industrial source that has the potential to emit SO_2. As previously noted, EPA approved the shutdown of SO_2 monitors, based on an analysis that showed a very low likelihood of ever exceeding the NAAQS for any of the monitors approved for shutdown.

In June 2010, EPA established a new 1-hour NAAQS standard of 75 ppb for SO_2. The standard is in the form of a 3-year average of the 99^{th} percentile of the annual distribution of daily maximum 1-hour average concentrations.

The District is not impacted by the SO_2 Data Requirements Rule proposed on May 13, 2014 because emissions in Santa Barbara County are not sufficient to trigger this requirement.

4.3.1 Analysis of SO_2 Measurements

Table 4-3 presents the Lompoc H Street SO_2 concentrations from 2022-2024 as compared to the June 2010 standard. The Lompoc H street monitor did not come close to exceeding the standard.

Table 4-3
SO_2 Summary

AQS #	Monitor Name	2022 99th ppb	2023 99th ppb	2024 99th ppb	3 Yr Avg ppb	% of Std 75 ppb	Rank
06-083-2004	Lompoc H Street	2	2	2	2	3%	1

4.4 CO Monitors

CO is monitored for NAAQS comparisons solely at the Lompoc H Street site.

4.4.1 Analysis of CO Measurements

Table 4-4 compares the county concentrations from 2022-2024 with the 1-hour standard for CO that is set at 35 ppm. The form of the standard is not to exceed more than once per year. Table 4.4 compares the 2^{nd} maximum daily hourly maximum value for years 2022-2024. The Lompoc H Street monitor did not come close to exceeding the standard.

Table 4-4
CO Summary

		2022 2nd Max	2023 2nd Max	2024 2nd Max	3 Year Avg 2nd Max	% of Std 35 ppm	
AQS #	**Monitor Name**	**ppm**	**ppm**	**ppm**	**ppm**	**%**	**Rank**
06-083-2004	Lompoc H Street	0.9	0.5	0.8	0.7	2.1%	1

4.4.2 CO Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitor. The shape and size of each polygon depends on the proximity to the nearest neighboring air monitor. This technique provides an easy way to understand the general area and demographics represented by a monitor. It is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can help to ensure that a monitor is not removed from a location that serves a historically underserved segment of the population or from an area with a high proportion of sensitive population such as children and the elderly.

Figure 4-6 represents the results of this analysis for CO. Because of the low number of monitors, the analysis tool used seems to indicate that the portions of Santa Barbara County farthest from any CO monitor are not served. Because historical CO measurements across the area have never measured concentrations anywhere near the level of the CO NAAQS, this lack of coverage of the CO monitoring network does not justify expending additional resources to locate and operate another CO monitor. The area served demographics in Appendix A show CO monitoring in Santa Barbara County covers all demographic groups, including the underserved and the most sensitive groups.

Figure 4-6
CO Area Served Analysis

4.5 PM_{10}

PM_{10} is currently being measured for comparison to NAAQS at four locations in the county. All monitors used for PM_{10} measurements are continuous samplers. All four of these monitors are in urban areas with high population density.

4.5.1 Analysis of PM_{10} Measurements

The standard for PM_{10} is based on the daily averages. The 24-hour PM_{10} average must exceed 150 µg/m^3 to be an exceedance. If data is not present for all days in the year, an algorithm is used to estimate the number of exceedances for that year. The 24-hour primary and secondary standards are attained when the expected number of exceedances per year at each monitor is less than or equal to one. Table 4-5 compares the PM_{10} data collected from 2022-2024 in the county. All monitors are below the standard.

Table 4-5
PM_{10} Summary

AQS #	Monitor Name	2022 Exceed Count	2023 Exceed Count	2024 Exceed Count	3 Year Avg Count	% of Std Count	Rank
06-083-0011	Santa Barbara	0	0	0	0	0%	1
06-083-2011	Goleta	0	0	0	0	0	2
06-083-2004	Lompoc H Street	0	0	0	0	0%	3
06-083-1009	Santa Maria	0 *	0	0	0	0%	4

** Denotes data completeness for the year was not met.*

4.5.2 PM_{10} Area Served Analysis

This analysis uses a spatial analysis technique known as Voronoi or Thiessen polygons to approximate the area served by a monitor. The shape and size of each polygon depends on the proximity to the nearest neighboring monitor. This technique provides an easy way to understand the general area and demographics represented by a monitor. It is important to understand that the polygons constructed by this analysis are based only on the distance to the nearby monitors. The constructed polygons do not represent the area of representativeness for the monitor's data. However, understanding the general area represented by the constructed polygons and the demographic distribution surrounding a monitor can help to ensure that a monitor is not removed from a location that serves a historically underserved segment of the population or from an area with a high proportion of sensitive population such as children and the elderly.

Figure 4-7 represents the results of this analysis for PM_{10}. The analyses show that most monitors represent the same racial/age proportions as the county (see Appendix A), with Lompoc H Street serving a slightly higher proportion of Black. With the existing monitoring network in Santa Barbara County, this analysis shows that PM_{10} monitoring covers all demographic groups, including the underserved and the most sensitive groups.

Figure 4-7
PM_{10} Area Served Analysis

4.6 $PM_{2.5}$

$PM_{2.5}$ is currently measured at five locations to assess compliance with the NAAQS. All locations currently utilize continuous $PM_{2.5}$ monitors. All five of these monitors are in urban areas with high population density. The Santa Ynez monitor was initially installed as a SPM to evaluate smoke impacts from wildfire, prescribed and agricultural burns, as well as to provide more data about $PM_{2.5}$ emissions throughout the county. In 2024, EPA approved the designation of this monitor as a SLAMS monitor, for comparison to the NAAQS for $PM_{2.5}$.

4.6.1 Analysis of $PM_{2.5}$ Measurements

The 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard of 35 µg/m^3. Table 4-6 compares the concentrations from 2022-2024 to this standard. All monitors were well below the standard.

Table 4-6
$PM_{2.5}$ Summary

AQS #	Monitor Name	2022 98th µg/m^3	2023 98th µg/m^3	2024 98th µg/m^3	3 YEAR AVG. 98% µg/m^3	% of Std 35 ppm	Rank
06-083-0011	Santa Barbara	16.2	16.2	16.1	16.2	46.2%	1
06-083-2004	Lompoc H Street	14.3	18.9	12	15.1	43%	2
06-083-2011	Goleta	12.6	15.9	13.9	14.1	40.4%	3
06-083-1009	Santa Maria	13.3 *	12	12.7	12.7	36.2%	4
06-083-3001	Santa Ynez	0*	0*	9.7*	9.7	27.7%	5

** Denotes data completeness for the year was not met.*

As displayed in Table 4-6.a the $PM_{2.5}$ monitoring network greatly exceeds the minimum monitoring requirements for $PM_{2.5}$ monitors.

Table 4-6.a
Minimum Monitoring Requirements for $PM_{2.5}$ Monitors

MSA	County	Pop. (year)	Annual Design Value (years[1])	Annual Design Value Site	Daily Design Value (years)	Daily Design Value Site	# Required SLAMS Sites	# Active SLAMS Sites[2]	# Additional SLAMS Sites Needed
Santa Barbara – Santa Maria, Ca	Santa Barbara County	442,648 (2024)	7.7 ug/m^3 2022 – 2024	Santa Barbara 06-083-0011	16 ug/m^3 2022 - 2024	Santa Barbara 06-083-0011	0	5	0

[1] *DV Years = the three years over which the design value (DV) was calculated (e.g., 2022-2024).*
[2] *Only SLAMS sites are counted for minimum monitoring requirement.*

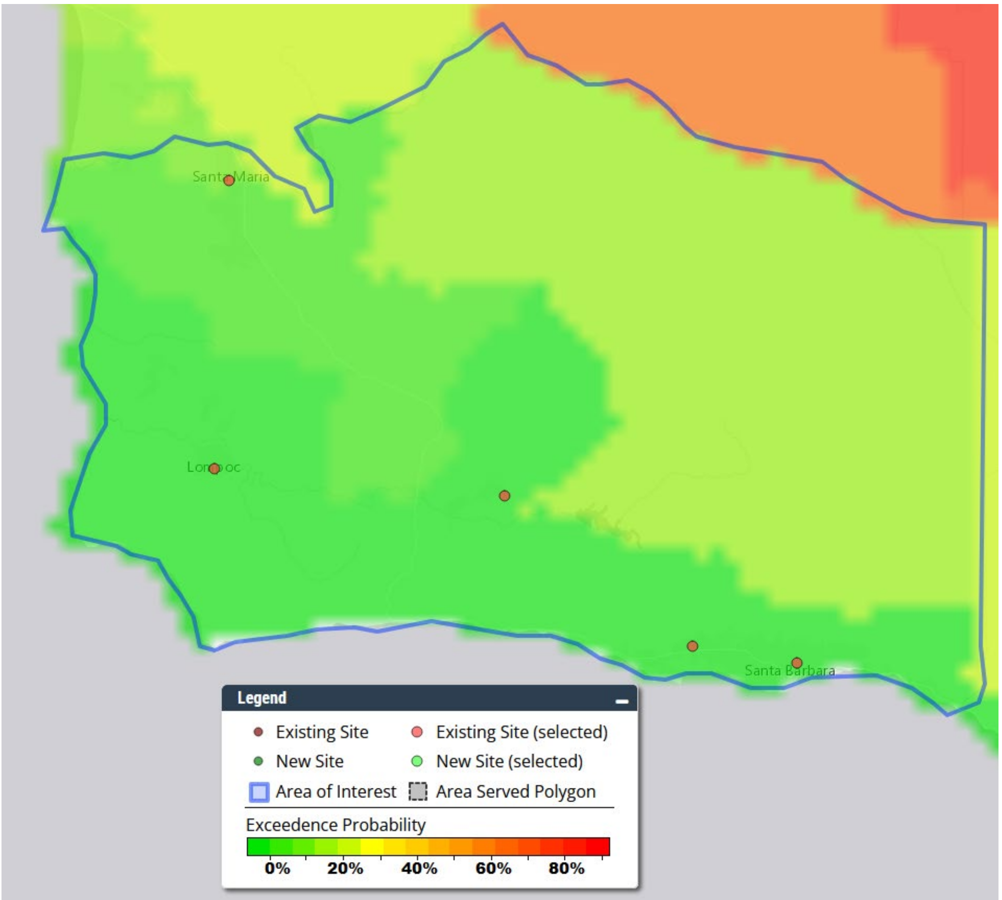
4.6.2 $PM_{2.5}$ Exceedance Probabilities Analysis

A significant goal of the network assessment is to determine whether new monitors are needed. To make that decision, it is helpful to have an estimation of the extreme pollution levels in areas where no monitors currently exist. To assist in understanding the probability of exceedances occurring in areas where no monitors exist, surface probability maps were generated. These maps were generated by calculating estimates of $PM_{2.5}$ for the centroid of each census tract. These are statistical estimates from "fusing" photochemical modeling data and ambient monitoring data using Bayesian space-time methods.

The map below is intended to be used as a spatial comparison and not for probability estimates for a single geographic point or area. This information, along with demographic and emissions data, could be used in a weight of evidence approach for proposing new monitor locations. The probability estimates displayed on the map alone should not be used to justify a new monitor; they should be used in conjunction with existing monitoring data.

Figure 4-8 plots the probability of exceeding the $PM_{2.5}$ daily standard of 35 $\mu g/m^3$. This analysis shows a low probability of $PM_{2.5}$ NAAQS exceedances across all of Santa Barbara County.

Figure 4-8
Surface Probability Plot of Exceeding the Existing $PM_{2.5}$Standard



4.6.3 $PM_{2.5}$ Area Served Analysis

The NetAssess App used to create the Area Served Analysis for the $PM_{2.5}$ monitors only included two of the five $PM_{2.5}$ monitors in Santa Barbara County in its analysis. Aside from the Santa Ynez monitor, all other $PM_{2.5}$ monitors used to determine compliance with the NAAQS are co-located with the PM_{10} monitors discussed in Section 4.5.2. Please refer to Section 4.5.2 for a relevant discussion of the Area Served Analysis of the co-located monitors.

5.0 Data Users

Data is collected from all the monitoring stations and stored in a database by a central data acquisition system (DAS) located at the District office. Internet connections are used for all stations to allow the DAS to poll data every minute. This data is screened for outliers before being reported to the public and other end users of the air quality data.

Every hour, data is sent to several outside agencies. Some data is used for reporting air quality data to the public and some data is used by researchers and scientists. O_3, PM_{10}, $PM_{2.5}$, wind, and temperature data are posted to the District website every hour. This data is posted as AQI values and engineering units. The data is also sent to the AirNow system on an hourly basis for AQI reporting on a national scale. All hourly values are sent to CARB's AQMIS system for reporting data on a statewide level. Wind and temperature data are made available to other users such as the National Weather Service and Naval Weapons Group.

On a monthly basis, a quality assurance review is performed on the data. The final data is then submitted to EPA's AQS database as required by the NAAQS. CARB retrieves data from the AQS database to determine compliance with the California Ambient Air Quality Standards, which are typically more stringent than the NAAQS. Periodically throughout the year, the District also receives Public Records Act data requests from various external stakeholders.

6.0 Conclusions and Future Changes

The air monitoring network in Santa Barbara County meets the objectives discussed at the beginning of this report. Air quality data is reported to several end users on an hourly basis. Quality-assured data is submitted for compliance purposes and data is readily available and utilized for research and for general air quality purposes.

EPA regulations specify the minimum number of locations at which state and local air agencies must deploy monitors. Santa Barbara County meets or exceeds EPA's minimum requirements. In practice, state and local agencies find they need to deploy more monitors than required by the law. The additional monitors are needed to fulfill state and local monitoring needs. Several monitors are required by operating permits issued to stationary emission sources. Monitors are also used to keep the public informed of the air quality conditions where they live and work. Due to the complex topography and meteorology in Santa Barbara County, more monitors than the minimum required by EPA are needed to properly characterize the air quality in different areas of the county. The District operates a very robust network of air monitoring stations throughout Santa Barbara County, and greatly exceeds EPA's minimum monitoring requirements for criteria pollutants, as displayed in Table 6-1.

Table 6-1
Criteria Pollutant SLAMS Monitors Exceeding Minimum Monitoring Requirements

Pollutant	Min. # Monitors Required	# SLAMS Monitors Active	# Monitors Exceeding Min.
Ozone	2	8	6
Carbon Monoxide	0	1	1
Nitrogen Dioxide	0	1	1
Sulfur Dioxide	0	1	1
PM_{10}	0-1	4	3
$PM_{2.5}$	0	5	5

The analysis in this report for the O_3 network shows that all measured concentrations are currently below the existing O_3 NAAQS standard. Based on the overall analysis of the O_3 monitoring network, no new monitors are warranted at this time. The analysis in Section 4.1, coupled with the number of ozone monitors in Santa Barbara County exceeding the minimum monitoring requirements, suggest that the District could remove some O_3 monitors without impacting the ability to meet the network goals outlined in Section 1 of this document. At this time, the District is currently evaluating the future removal of the Carpinteria O_3 monitor. As shown in Table 4-1, the Carpinteria O_3 monitor recorded the lowest maximum O_3 concentrations of the eight ozone monitors in Santa Barbara County and was well below the NAAQS standard for the years 2022-2024. If it is determined that the monitor is no longer needed to meet the monitoring objectives of Santa Barbara County, the District will work with EPA to request removal of the Carpinteria O_3 SLAMS monitor.

The NO_2, SO_2, and CO networks meet the network goals outlined in Section 1. These monitors measure concentrations significantly below the NAAQS standard at all stations.

Both the PM_{10} and $PM_{2.5}$ monitoring networks meet the network goals outlined in Section 1. In 2024, the District received EPA approval to transition the $PM_{2.5}$ monitor located at the Santa Ynez station from a SPM to a SLAMS monitor that is comparable to the NAAQS. In the future, the District will also consider requesting EPA approval to transition the $PM_{2.5}$ SPM located in Carpinteria to a permanent SLAMS monitor whose measurements will be used for NAAQS comparison.

No other new monitors are being considered at this time as the District's overall monitoring network measurements are well below the NAAQS, and the O_3 and $PM_{2.5}$ exceedance probability analyses demonstrate a low probability for other locations' measurements exceeding the NAAQS.

Lastly, the District's budget and Long-Range Fiscal Strategy are key factors that need to be considered for any future changes to its monitoring network. In years past, the District has been successful in securing grant funds to help operate and maintain its monitoring network. However, if federal grant funds were to decrease, that could impact the District's ability to be able to operate and maintain its robust air monitoring network. Additionally, the District is reliant on regulated industry to help fund its monitoring network. In the past decade, changes in the oil and gas sector have led to a significant decrease in fees paid by that industry, and the District anticipates an additional decline in revenue over the next few years as well as increased uncertainty. In conclusion, there are many factors to consider when deciding whether to add or remove stations from a monitoring network and financial stability and long-range fiscal planning are important aspects that must be considered.

APPENDIX A
Area Served Demographic Figures

Figure A-1
Santa Maria O_3 Area Served Analysis Gender and Age

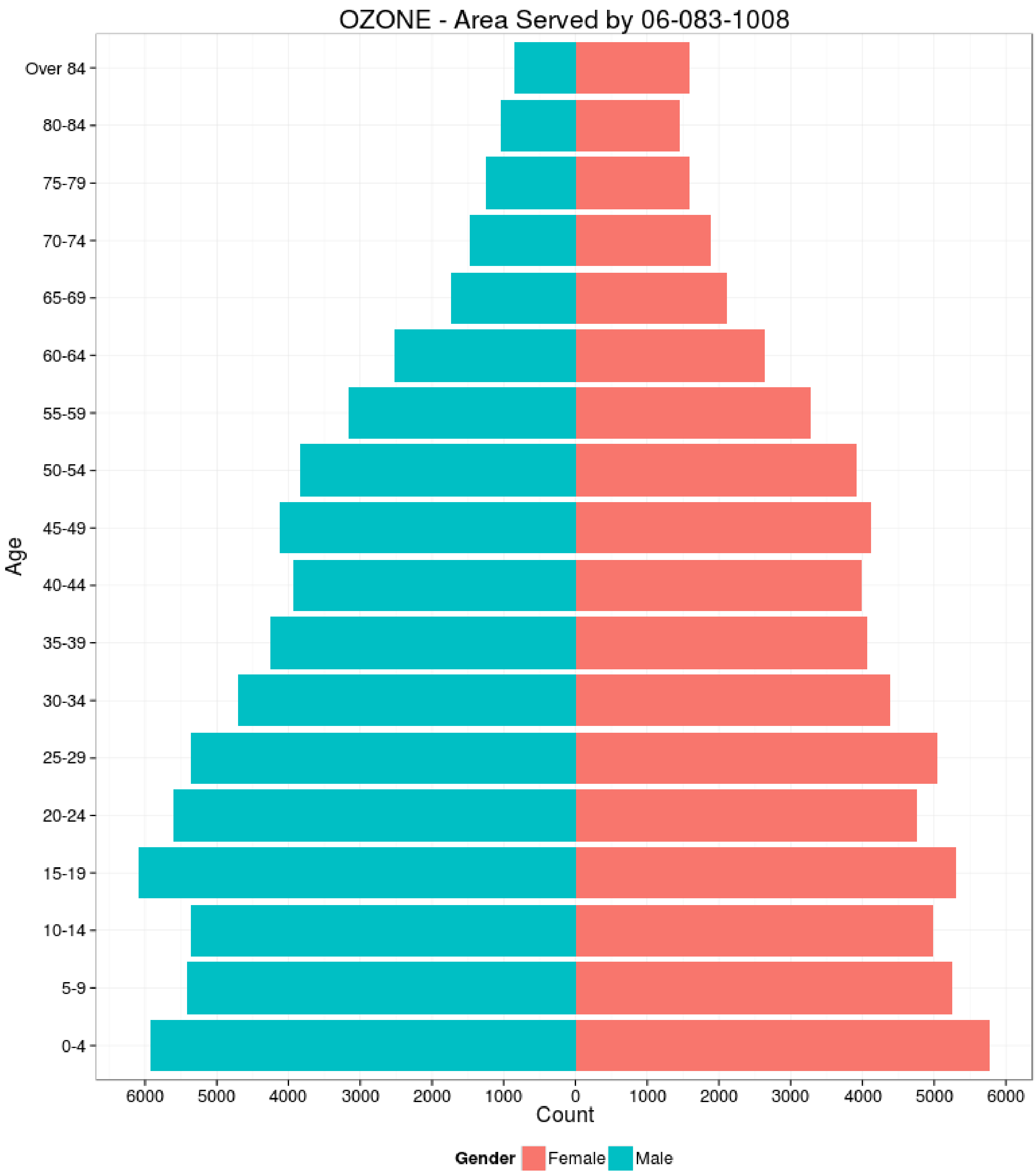


Figure A-2
Santa Maria O_3 Area Served Analysis Race and Population

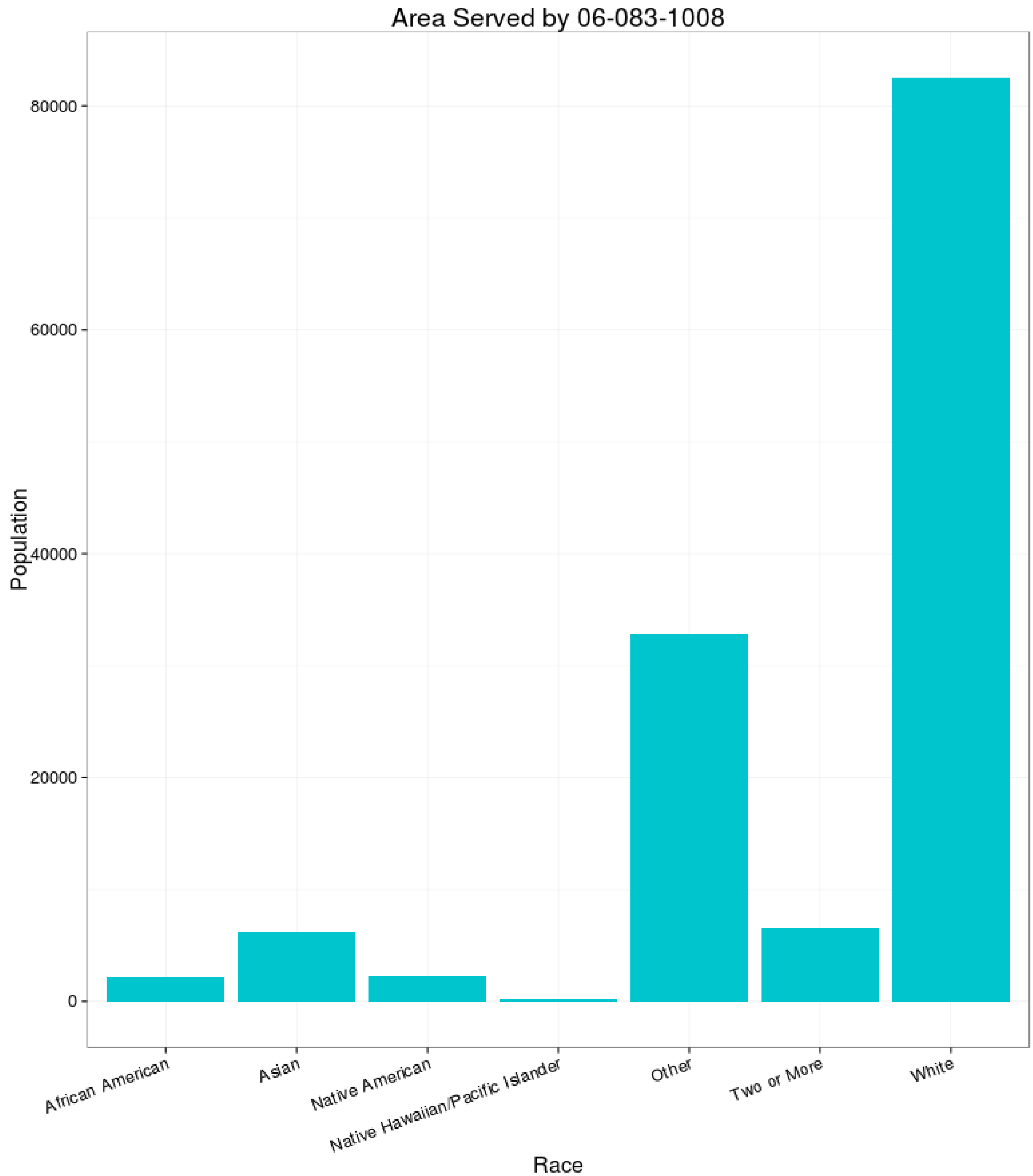


Figure A-3
Paradise Road O_3 Area Served Analysis Gender and Age

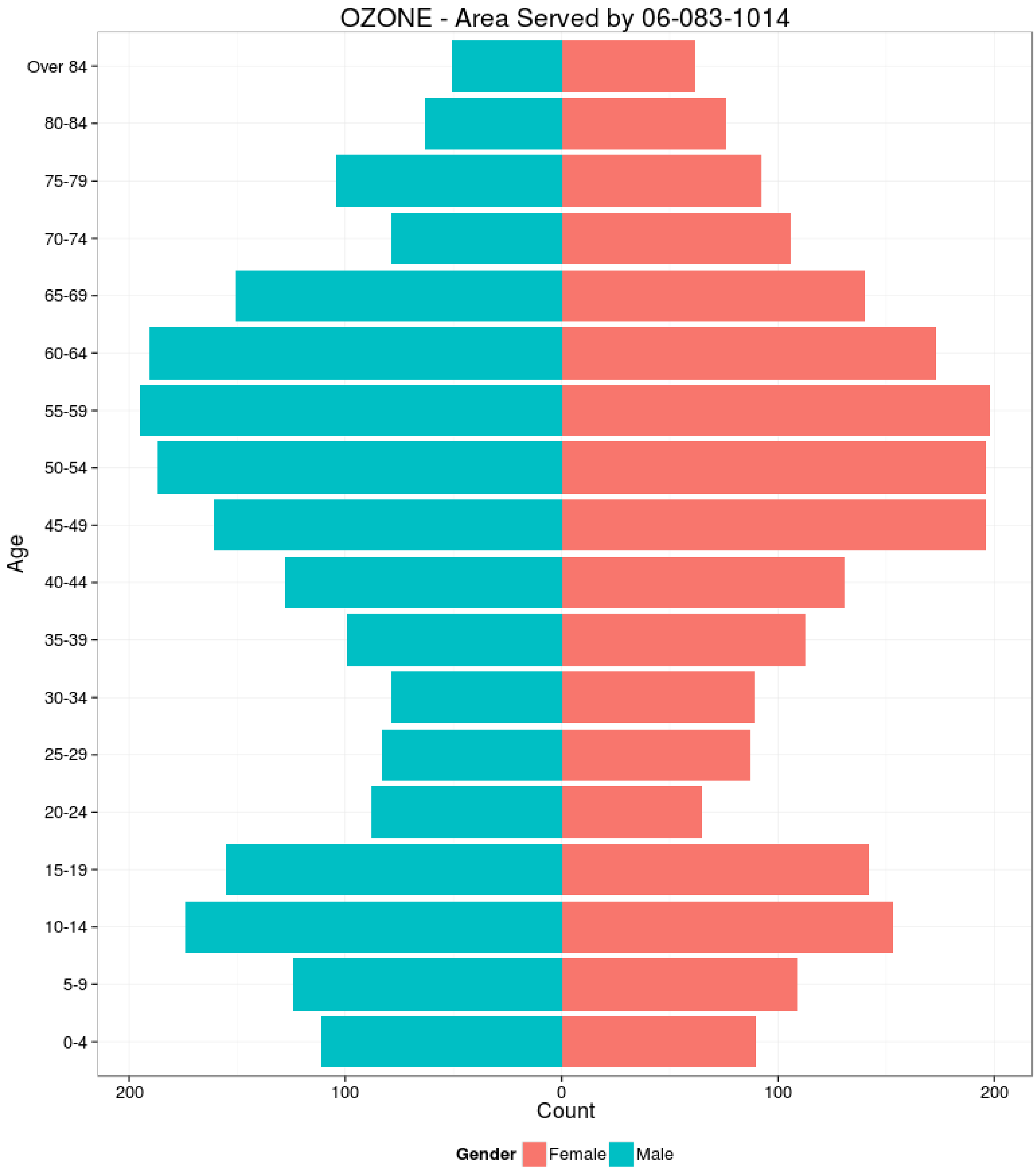


Figure A-4
Paradise Road O_3 Area Served Analysis Race and Population

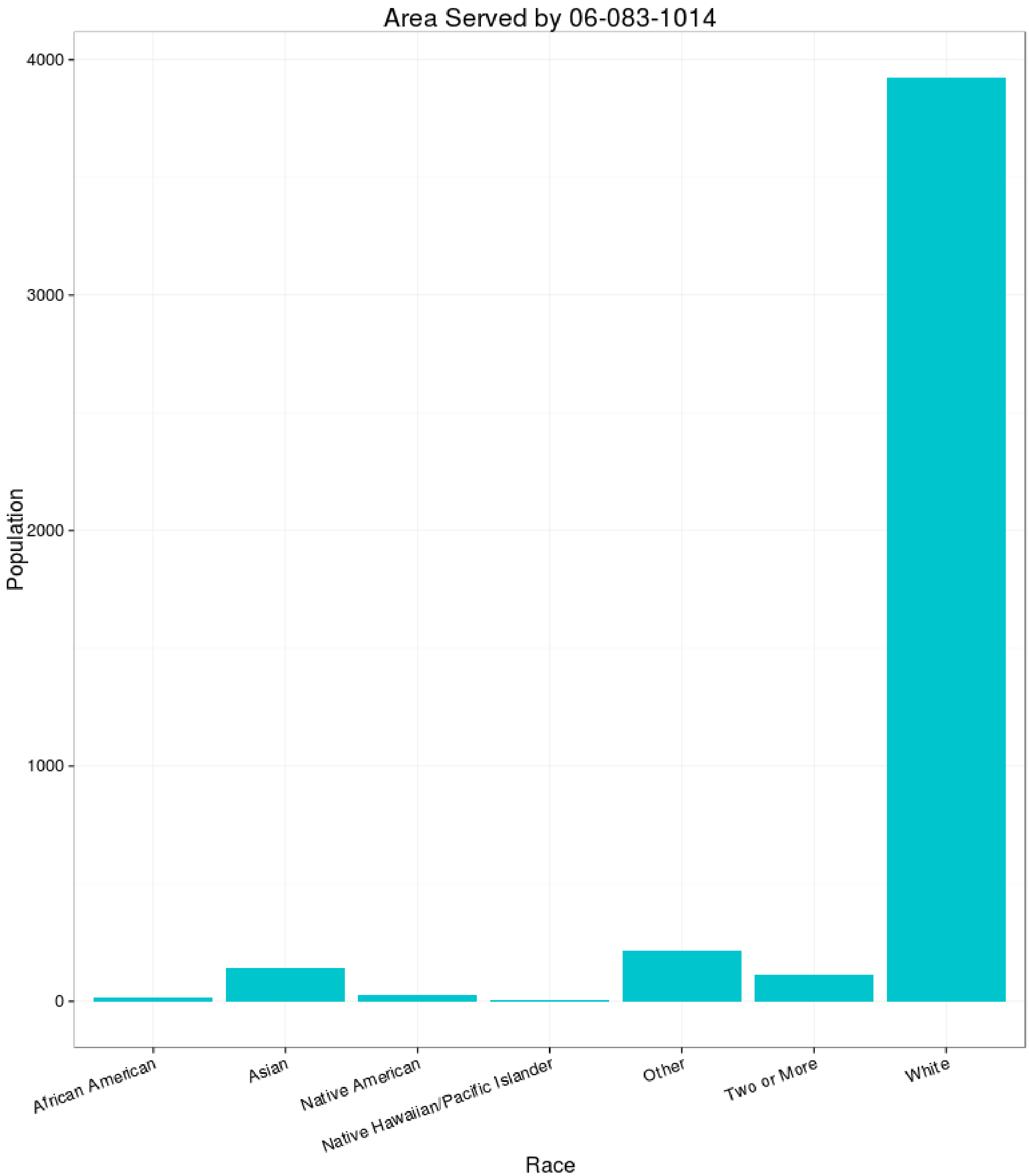


Figure A-5
Carpinteria O_3 Area Served Analysis Gender and Age

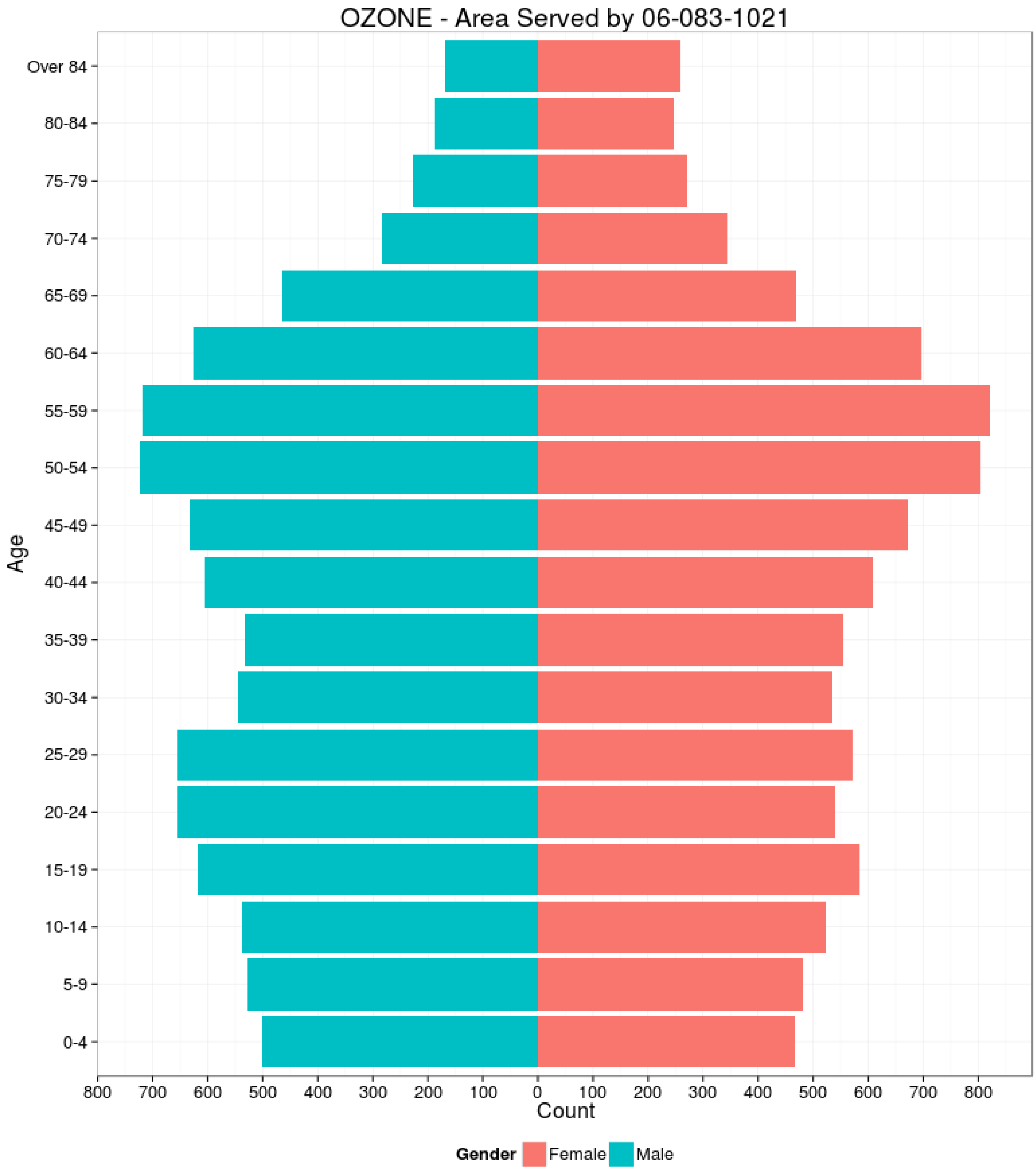


Figure A-6
Carpinteria O_3 Area Served Analysis Race and Population

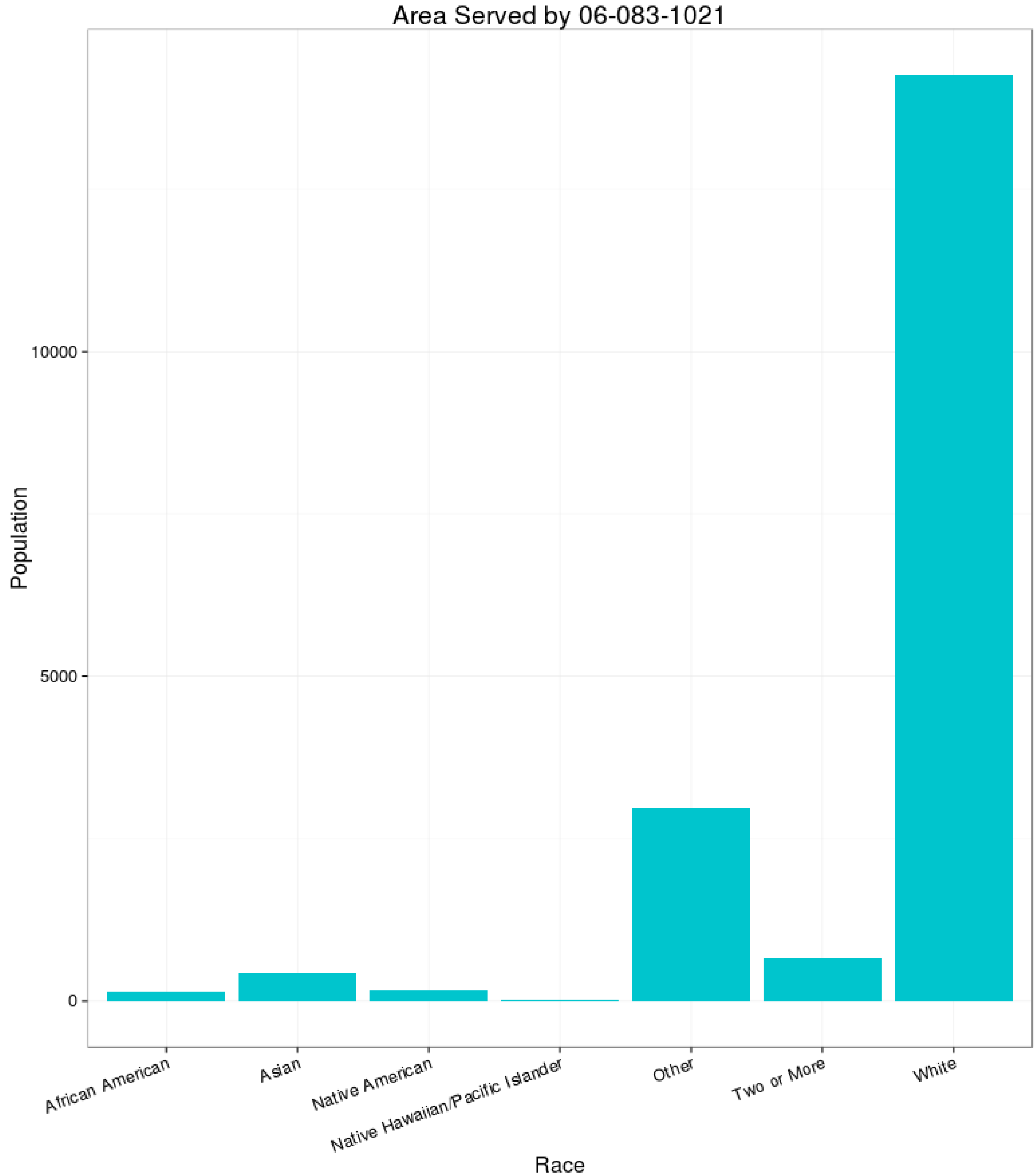


Figure A-7
Las Flores Canyon #1 O_3 Area Served Analysis Gender and Age

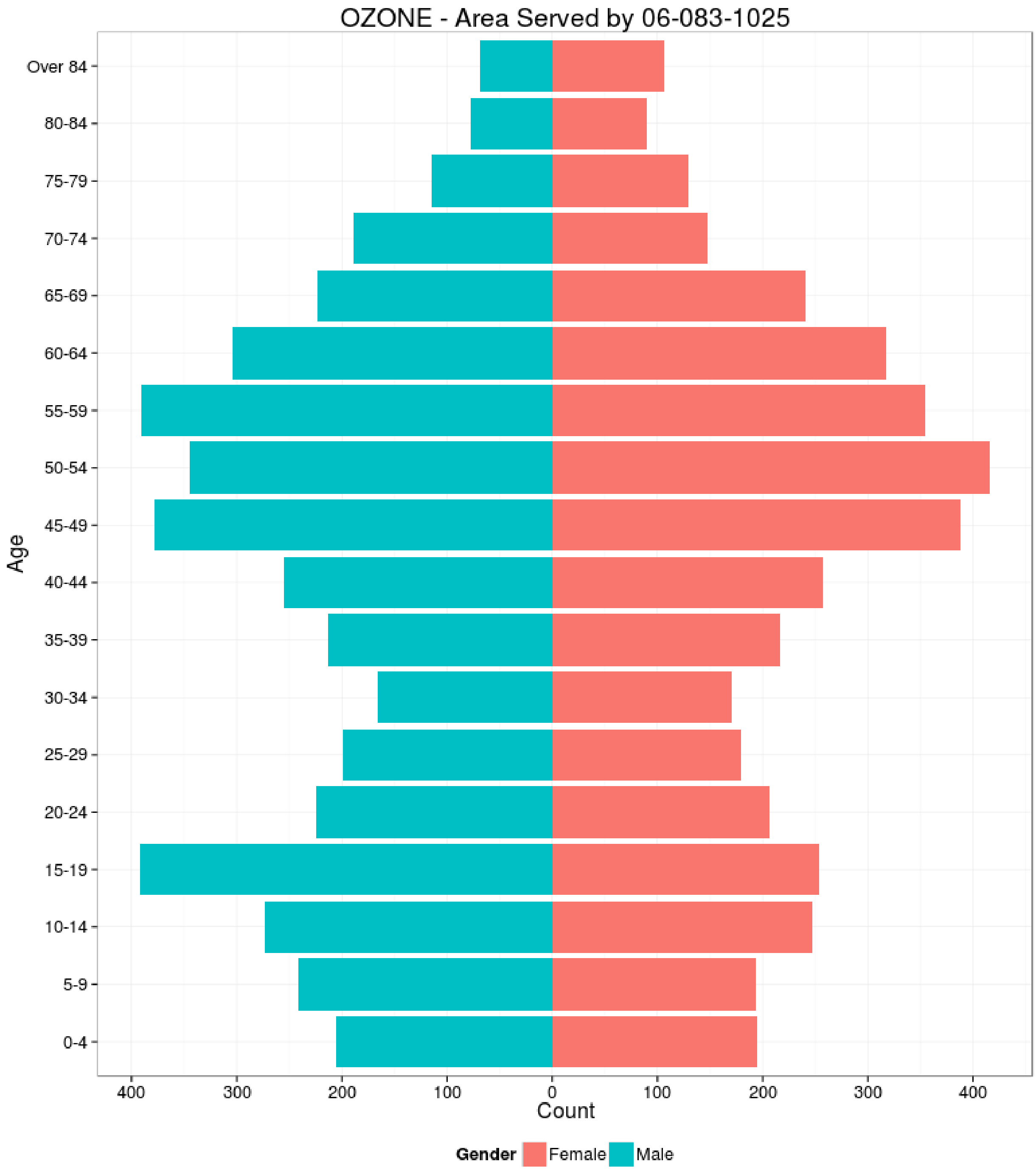


Figure A-8
Las Flores Canyon #1 O_3 Area Served Analysis Race and Population

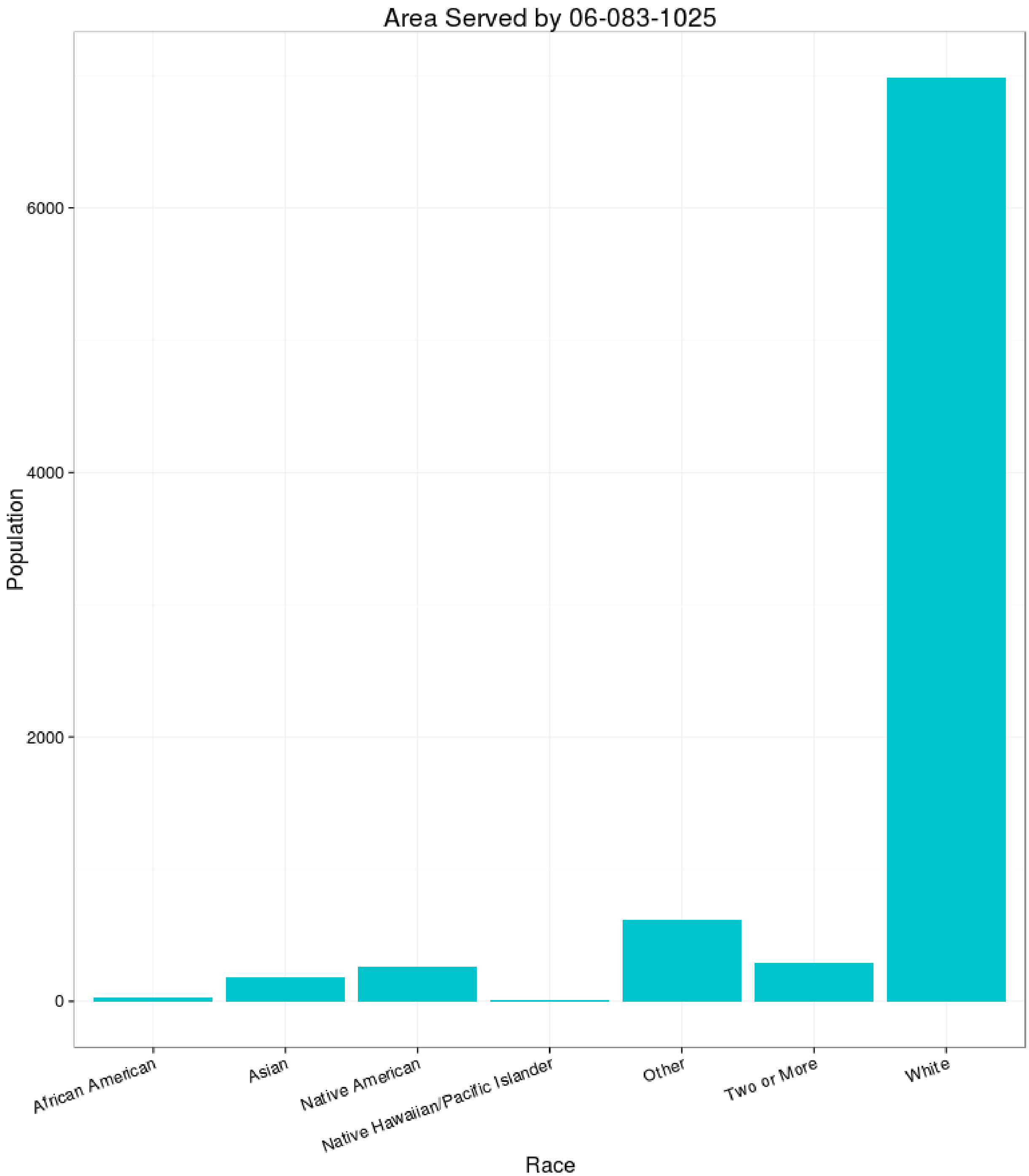


Figure A-9
Lompoc H Street O_3 Area Served Analysis Gender and Age

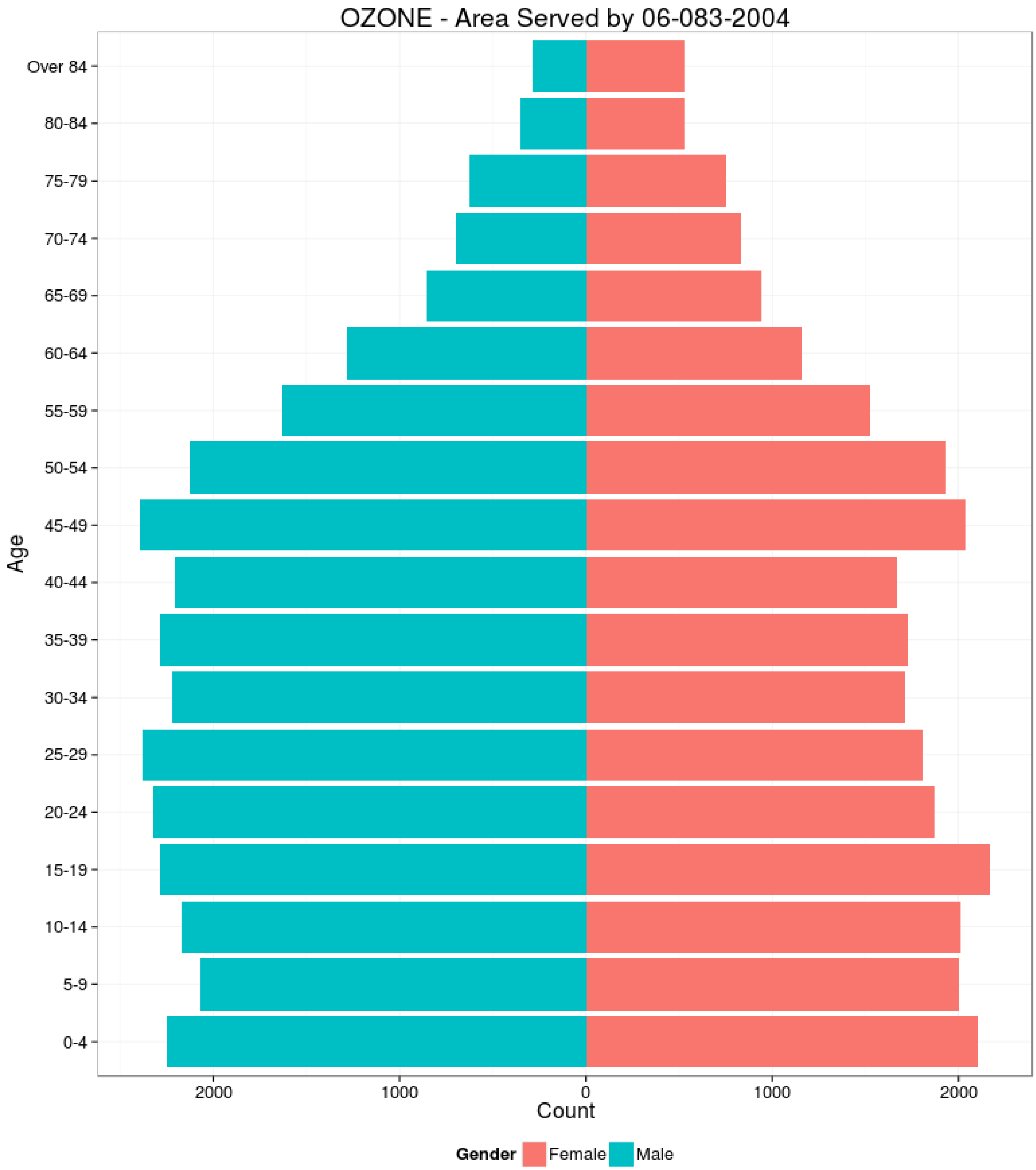


Figure A-10
Lompoc H Street O_3 Area Served Analysis Race and Population

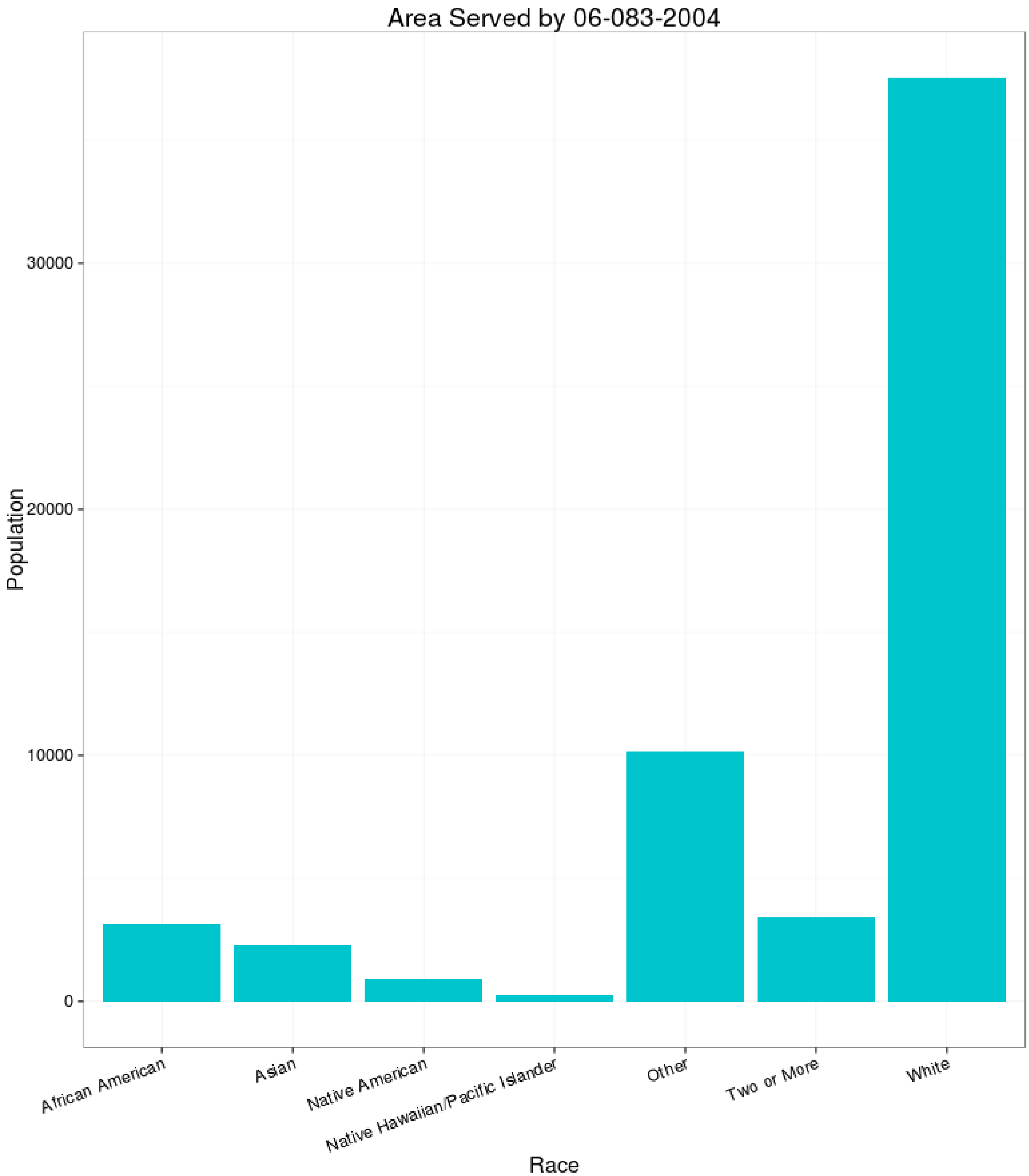


Figure A-11
Goleta O_3 Area Served Analysis Gender and Age

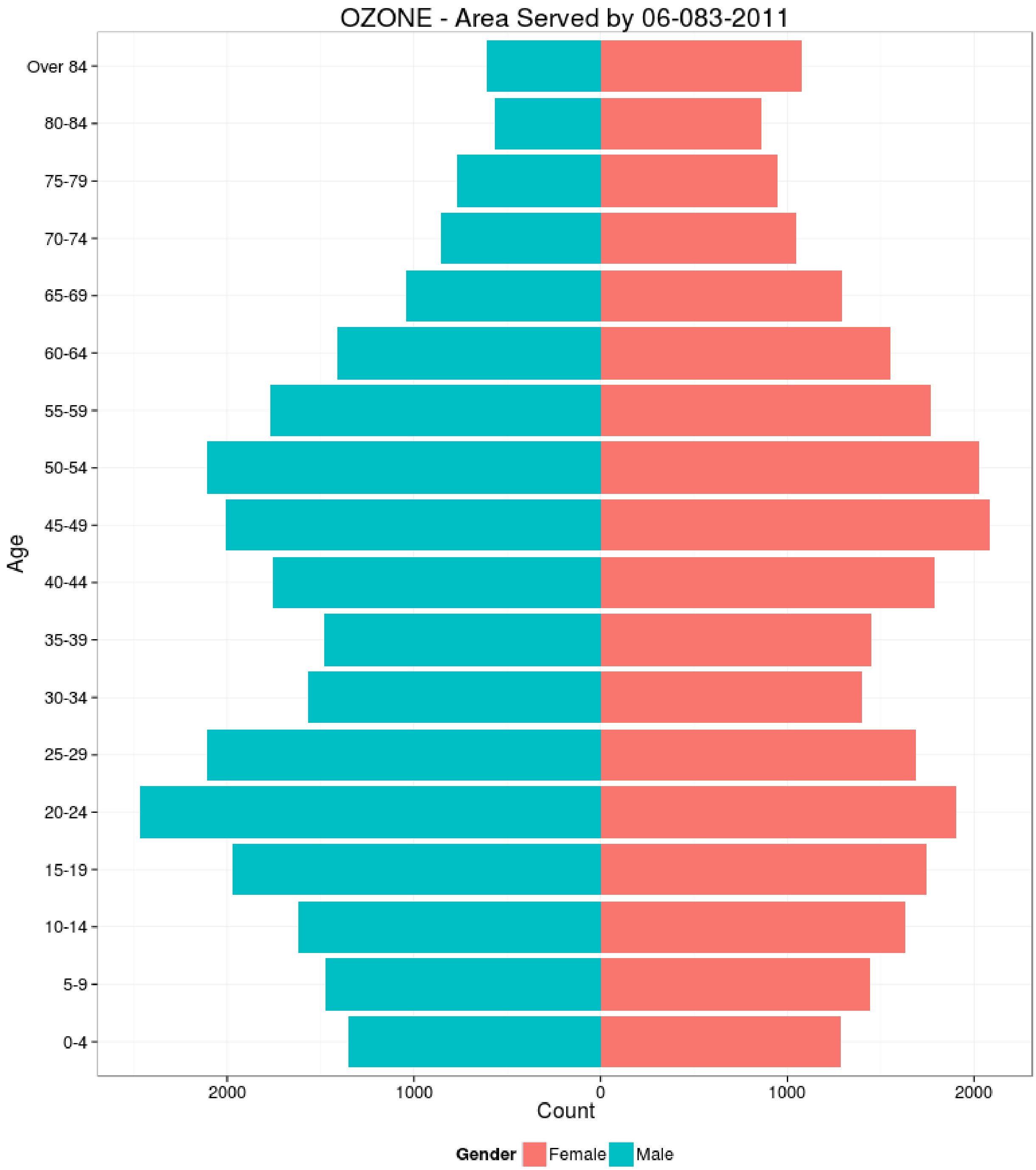


Figure A-12
Goleta O_3 Area Served Analysis Race and Population

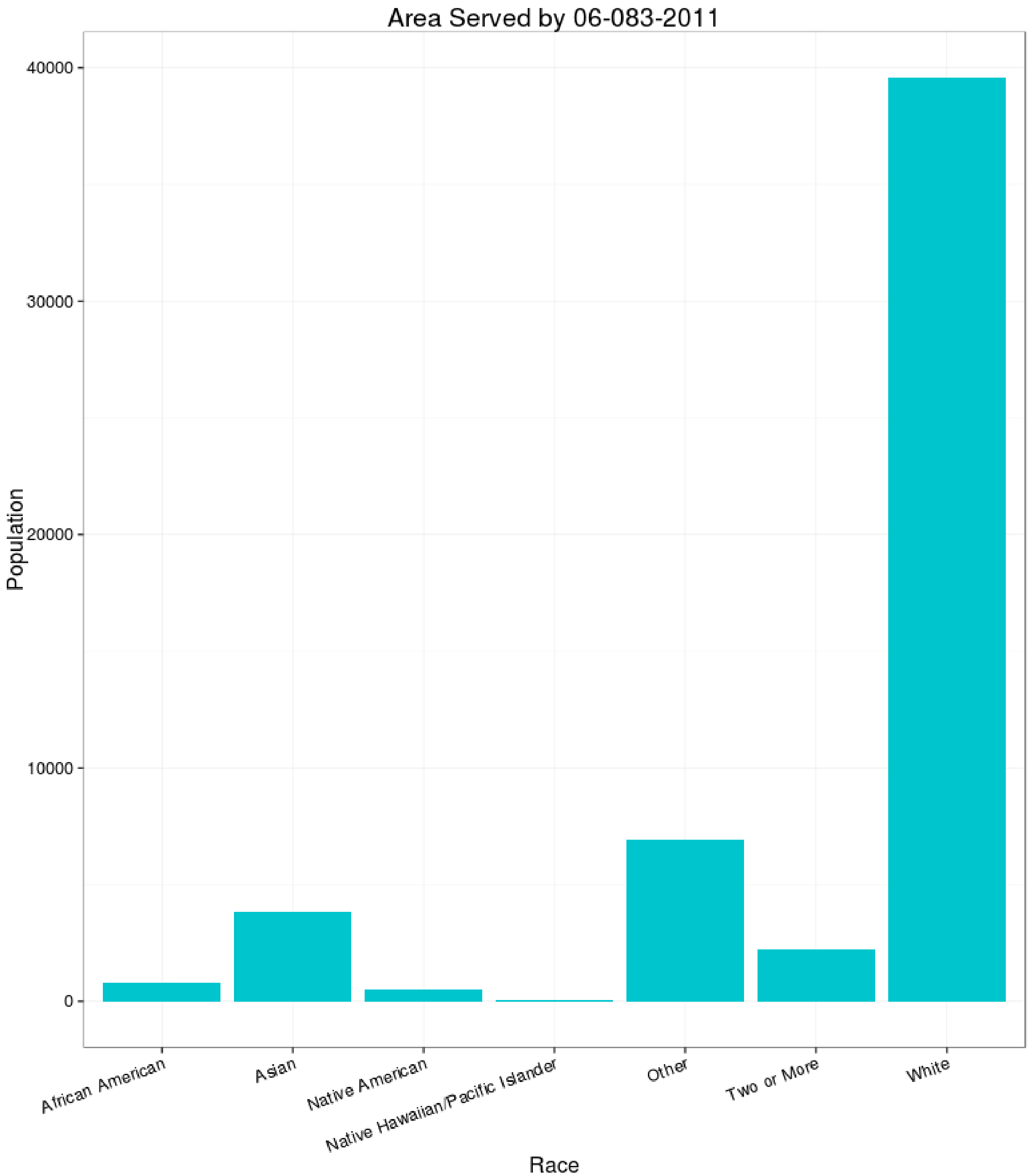


Figure A-13
Santa Ynez O_3 Area Served Analysis Gender and Age

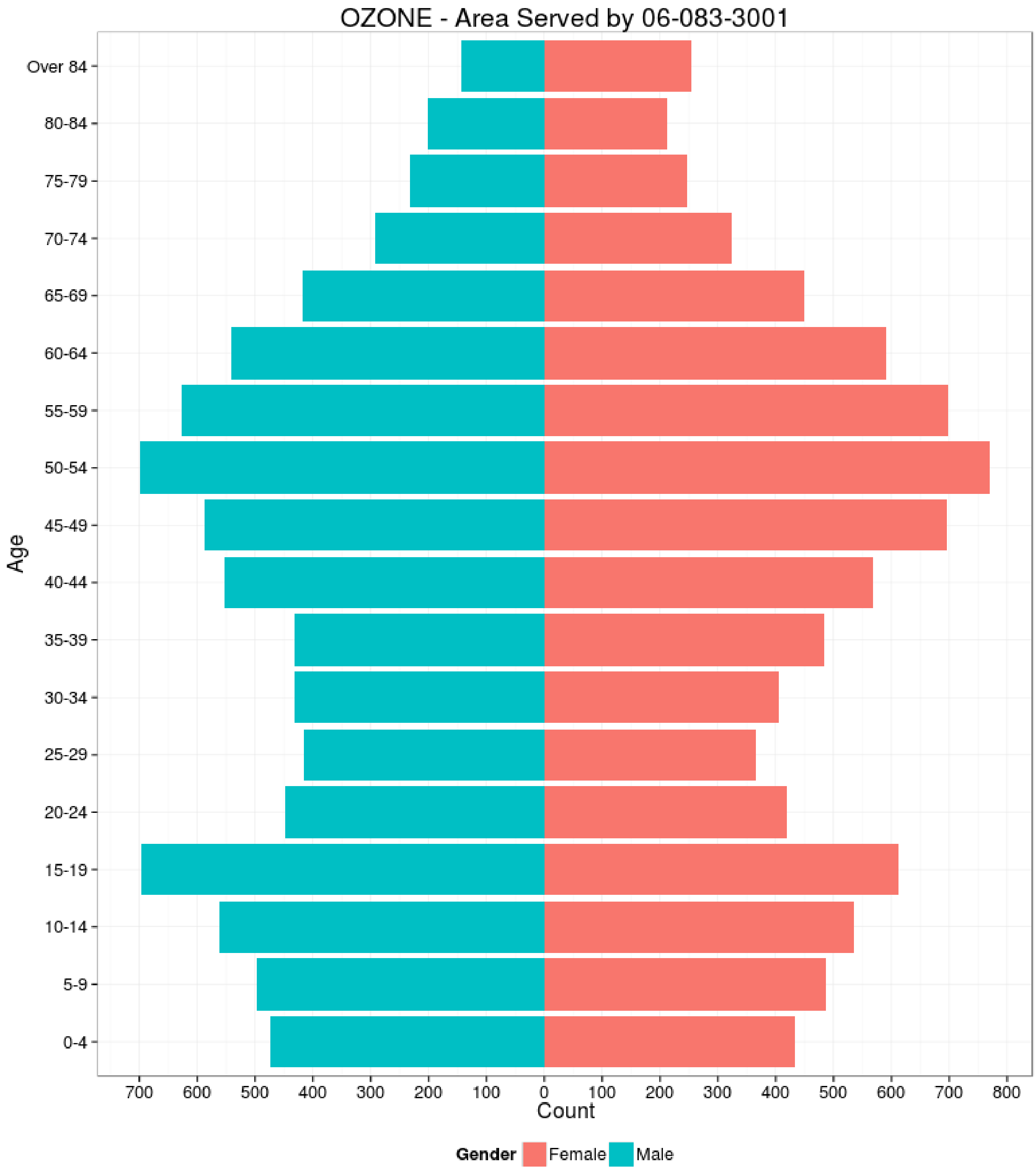


Figure A-14
Santa Ynez O_3 Area Served Analysis Race and Population

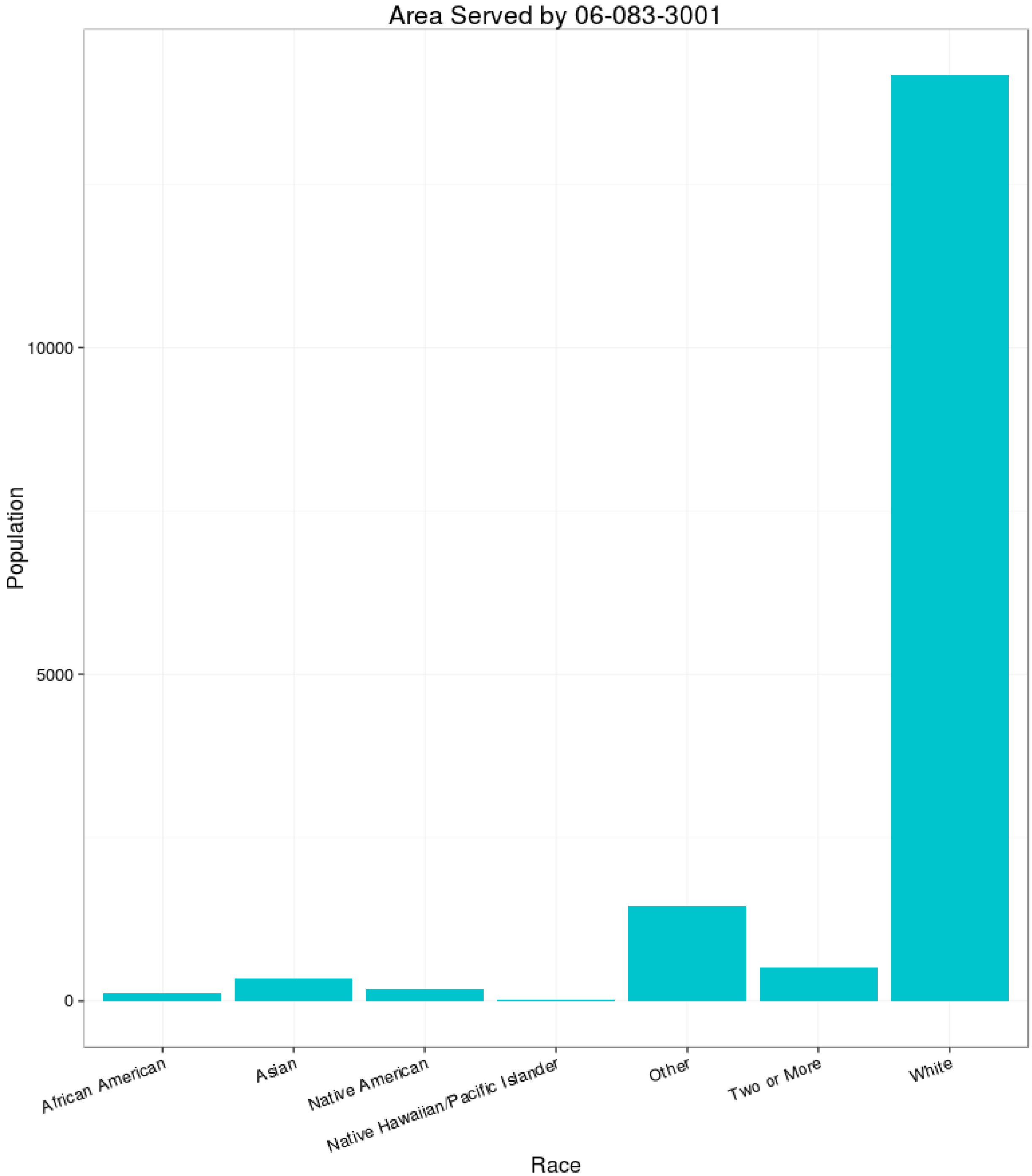


Figure A-15
Santa Barbara O_3 Area Served Analysis Gender and Age

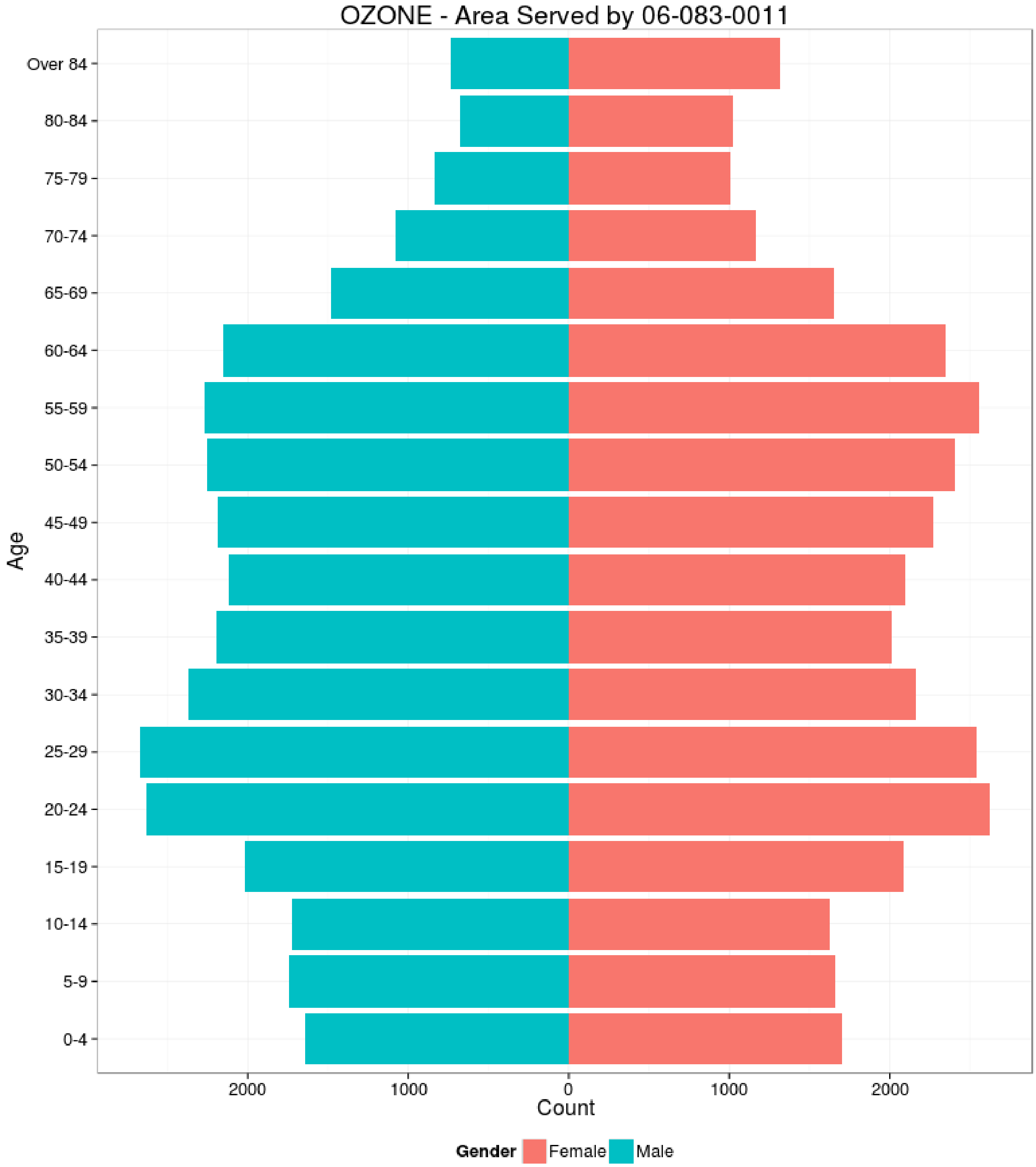


Figure A-16
Santa Barbara O_3 Area Served Analysis Race and Population

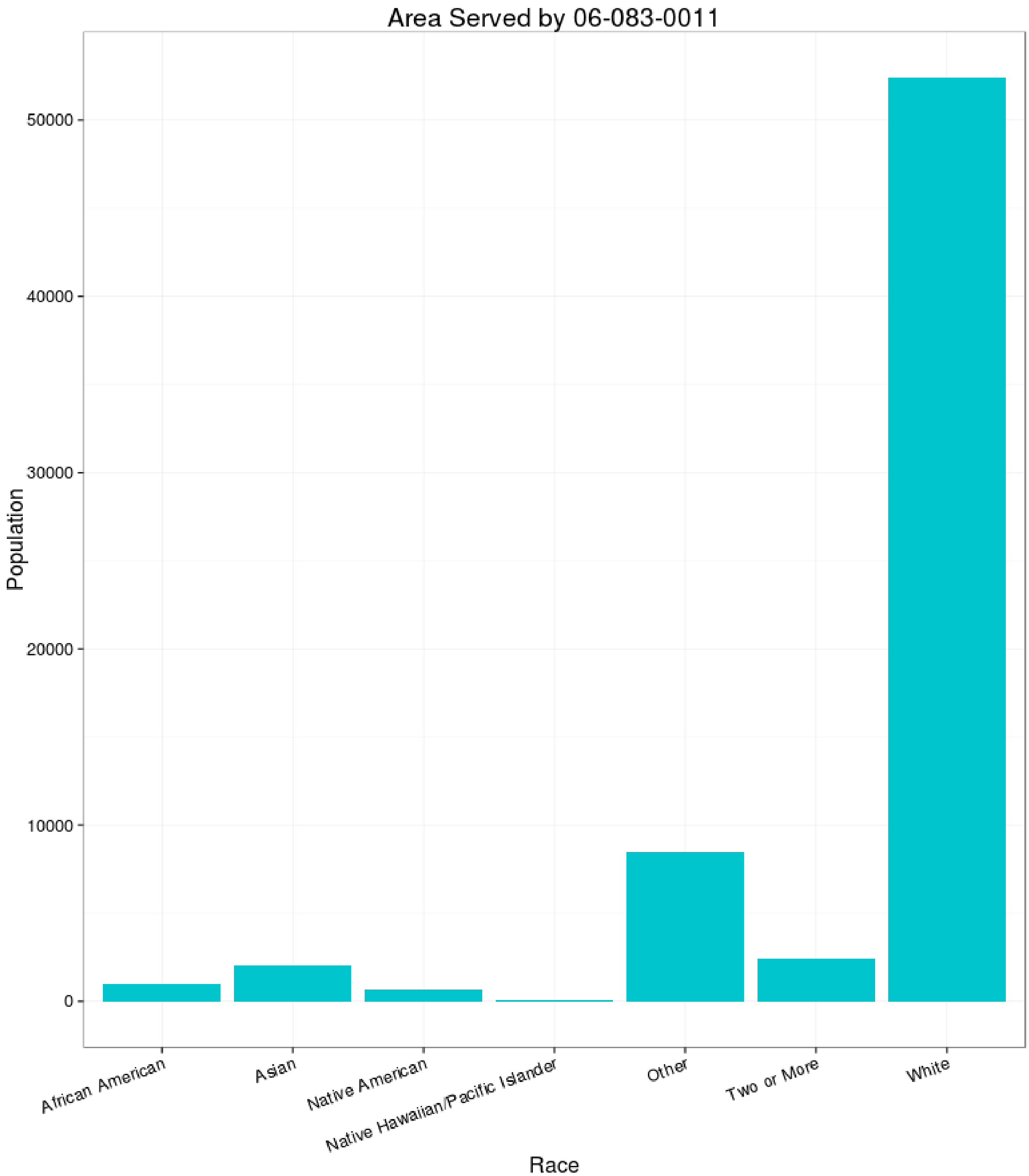


Figure A-17

Lompoc H Street NO_2 Area Served Analysis Gender and Age

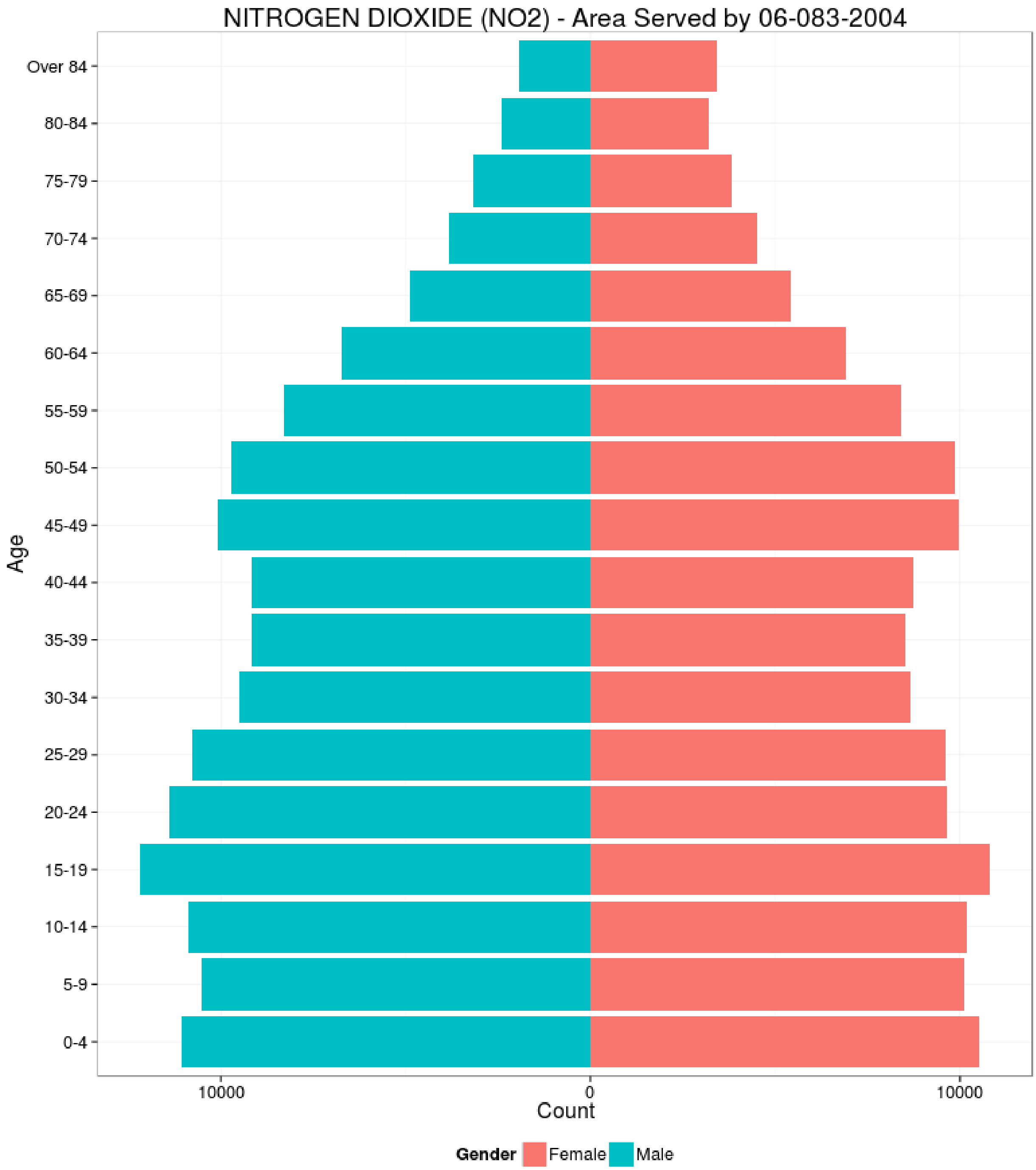


Figure A-18

Lompoc H Street NO_2 Area Served Analysis Race and Population

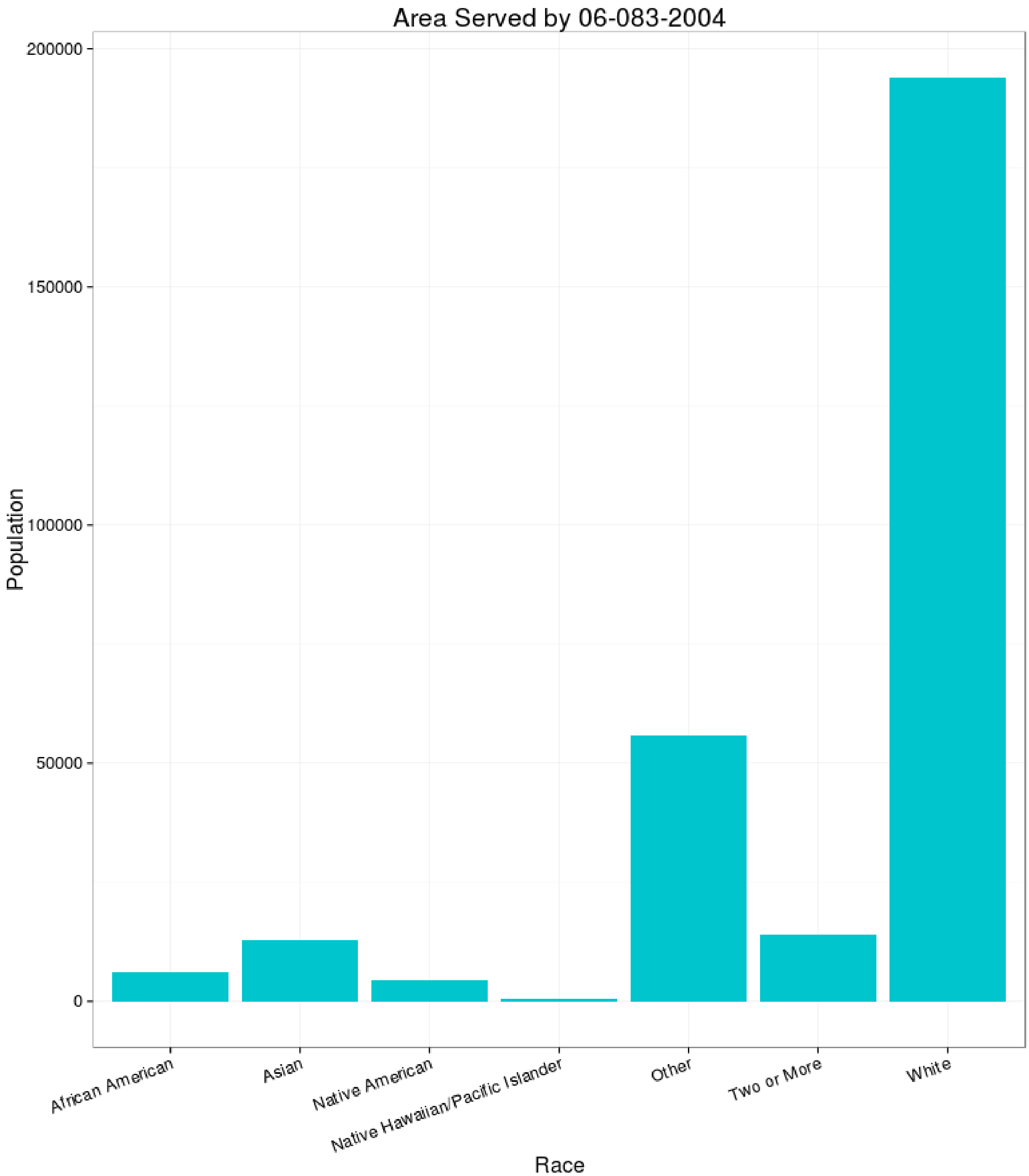


Figure A-19
Lompoc H Street CO Area Served Analysis Gender and Age

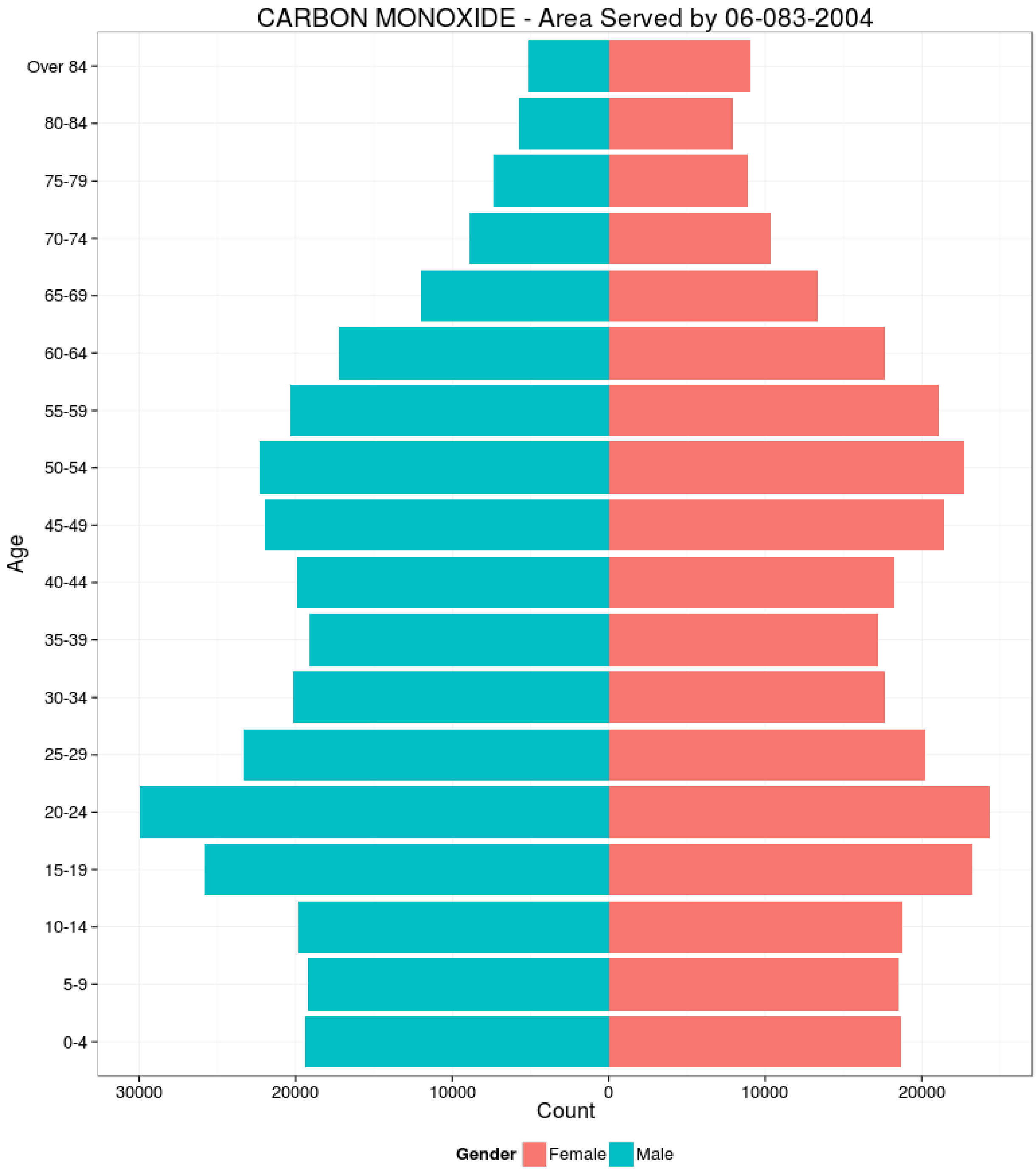


Figure A-20
Lompoc H Street CO Area Served Analysis Race and Population

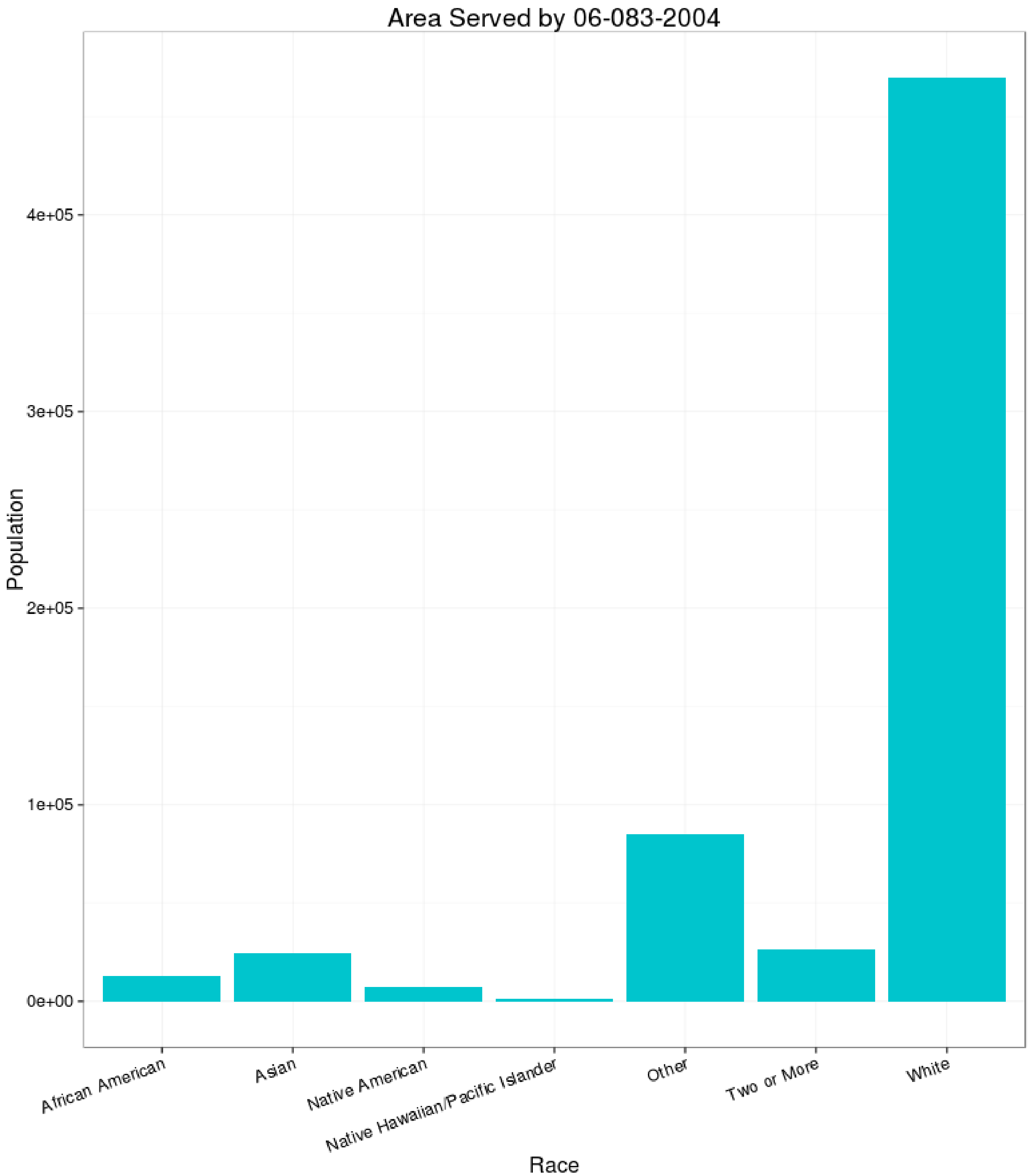


Figure A-21
Santa Maria PM_{10} Area Served Analysis Gender and Age

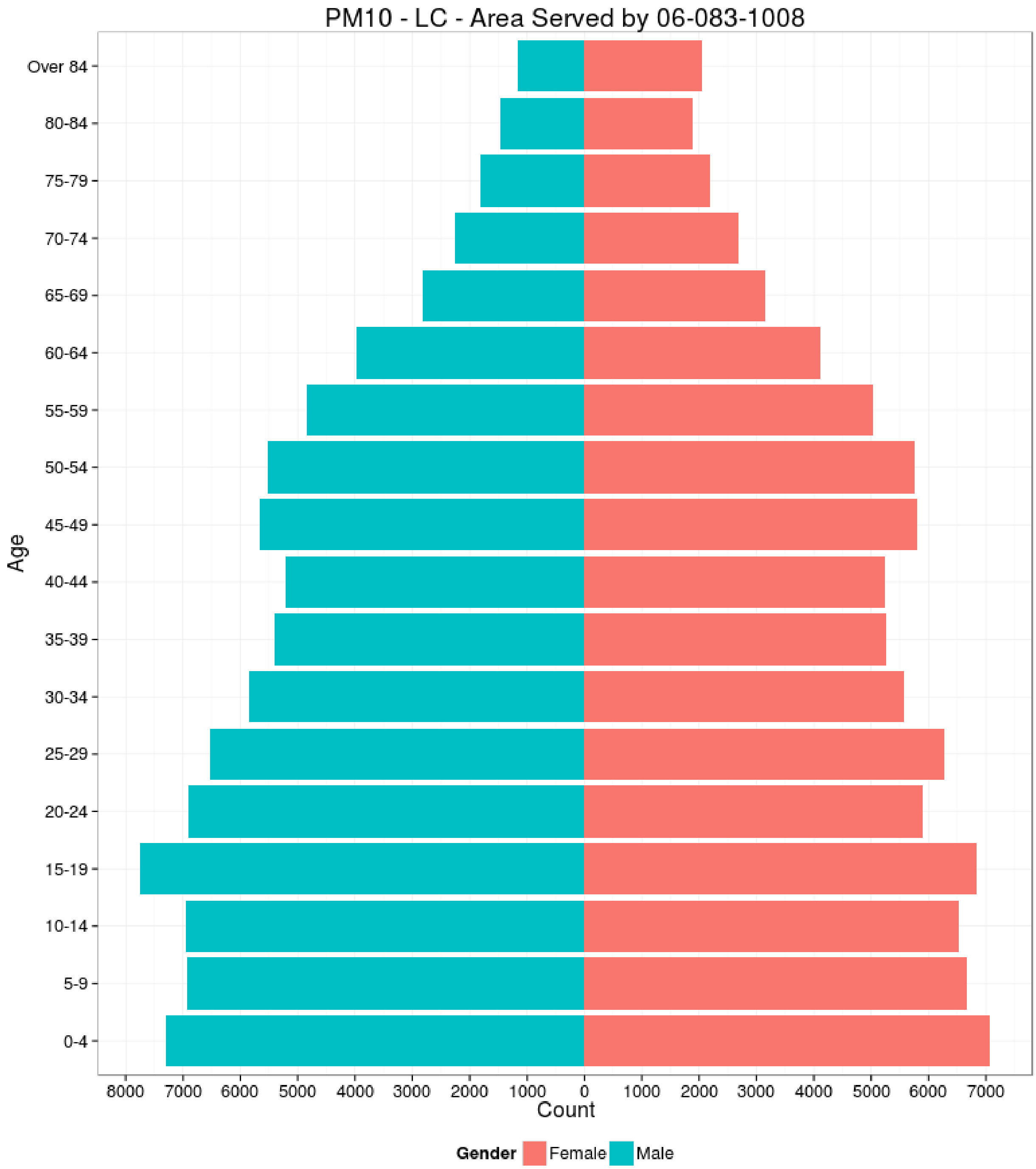


Figure A-22
Santa Maria PM_{10} Area Served Analysis Race and Population

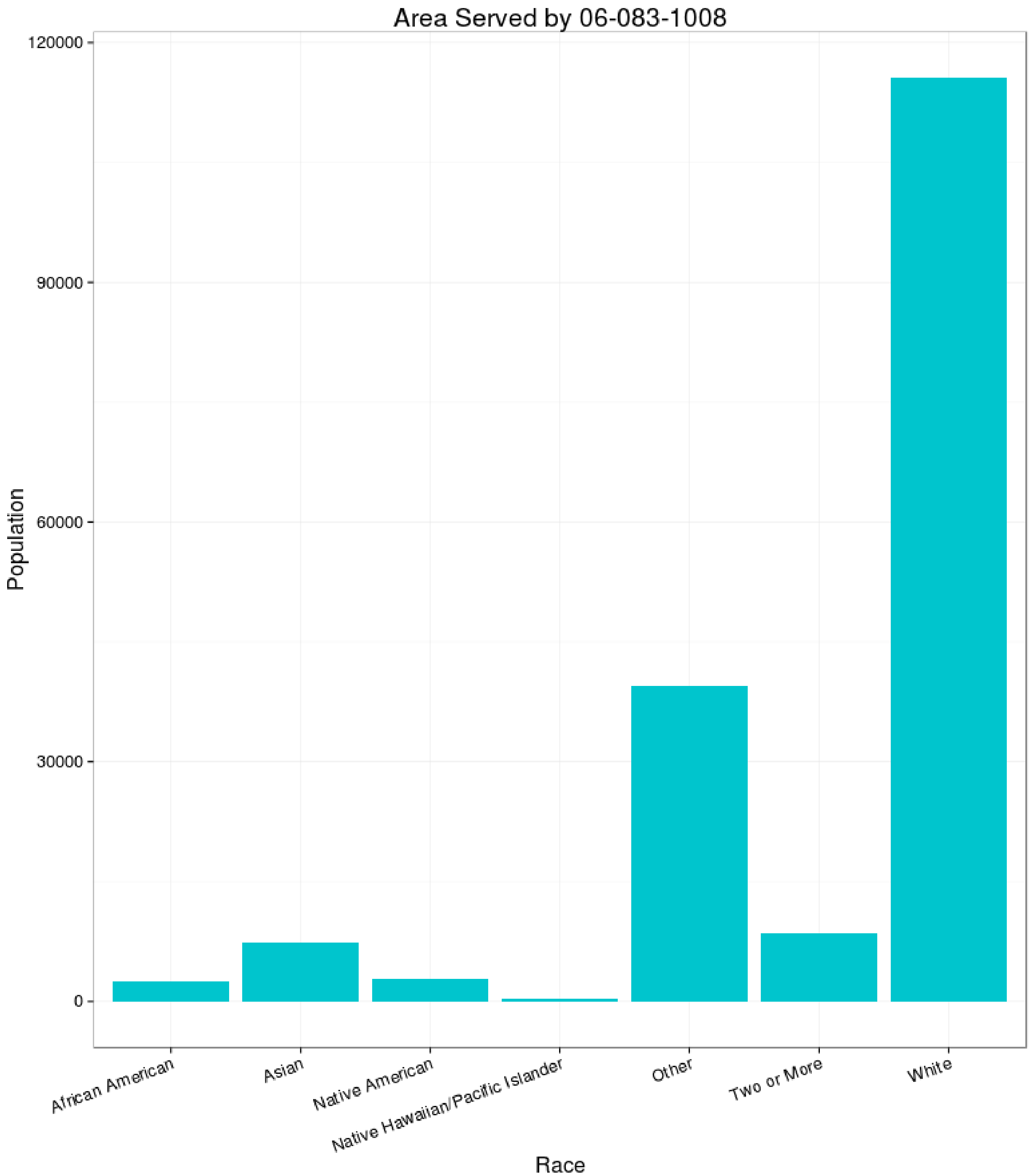


Figure A-23

Lompoc H Street PM_{10} Area Served Analysis Gender and Age

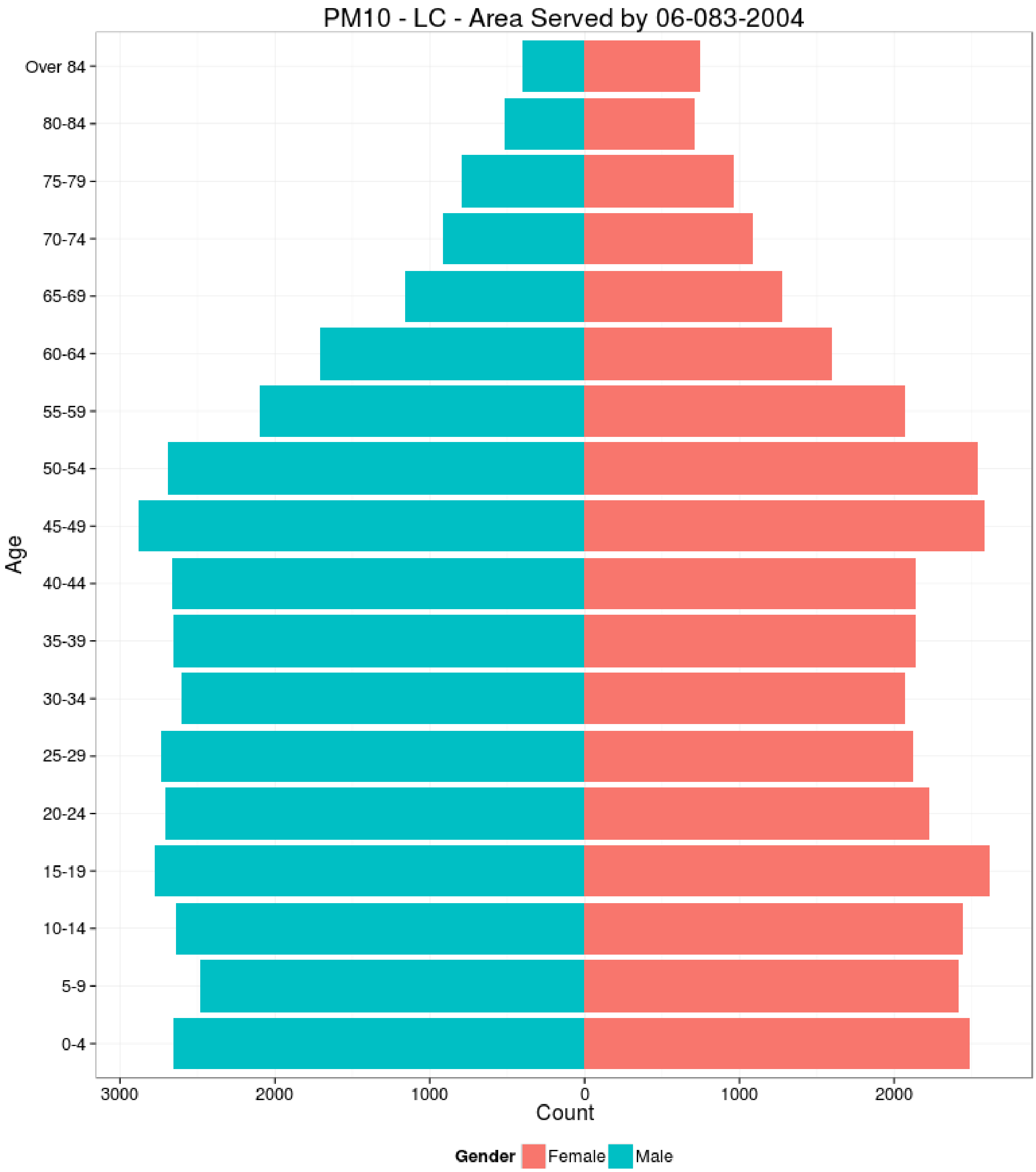


Figure A-24
Lompoc H Street PM_{10} Area Served Analysis Race and Population

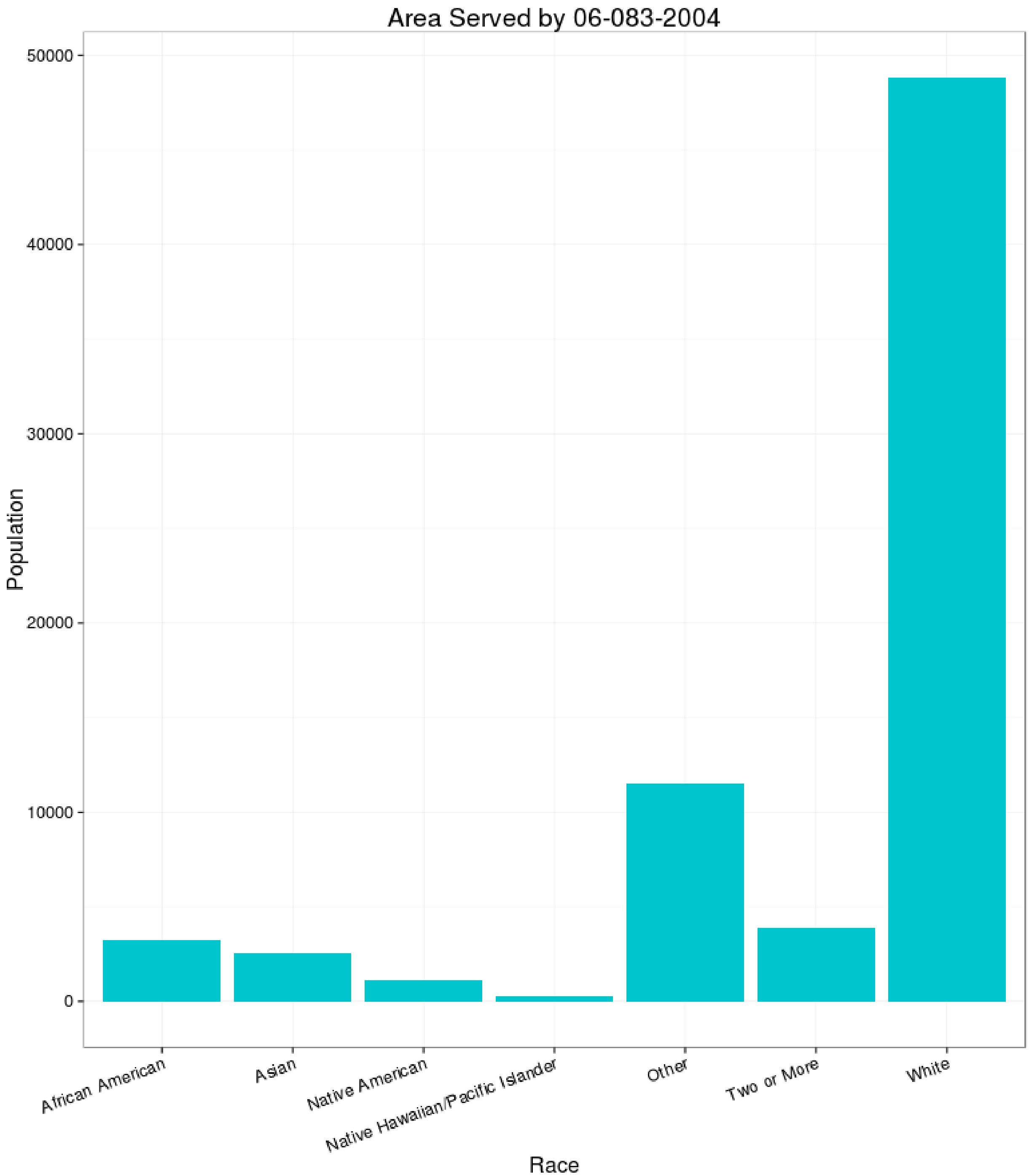


Figure A-25
Goleta PM_{10} Area Served Analysis Gender and Age

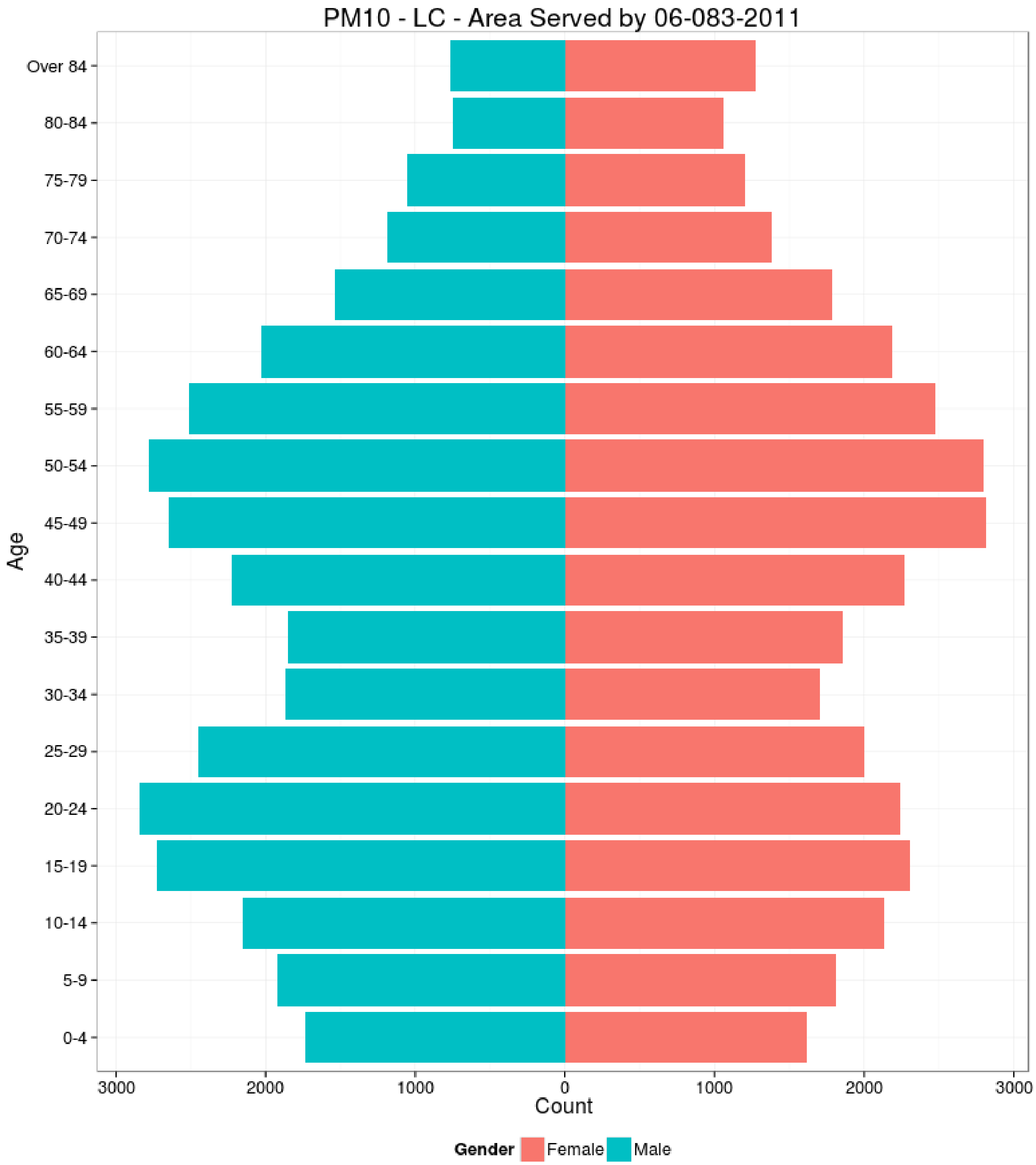


Figure A-26
Goleta PM_{10} Area Served Analysis Race and Population

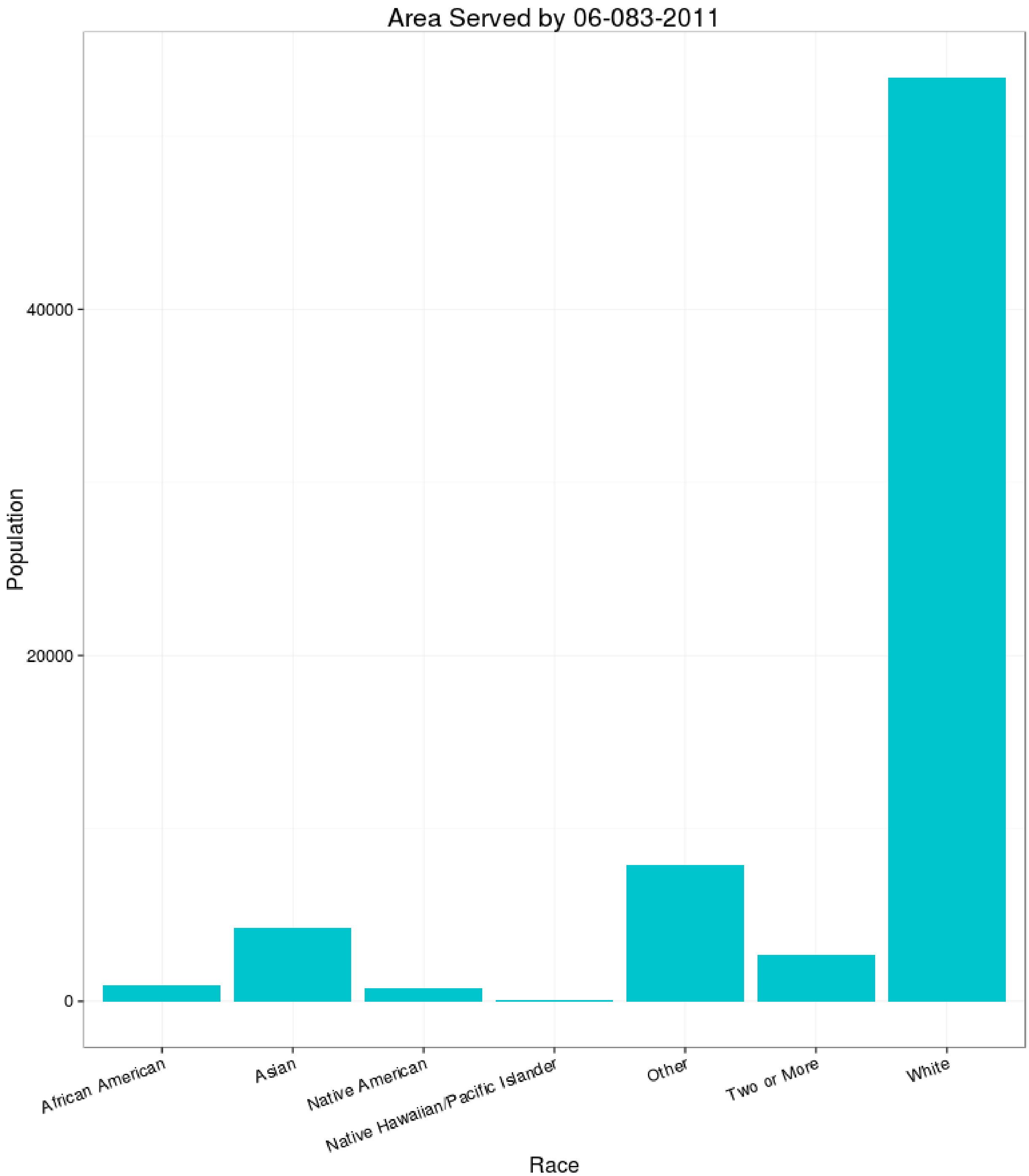


Figure A-27
Santa Barbara PM_{10} Area Served Analysis Gender and Age

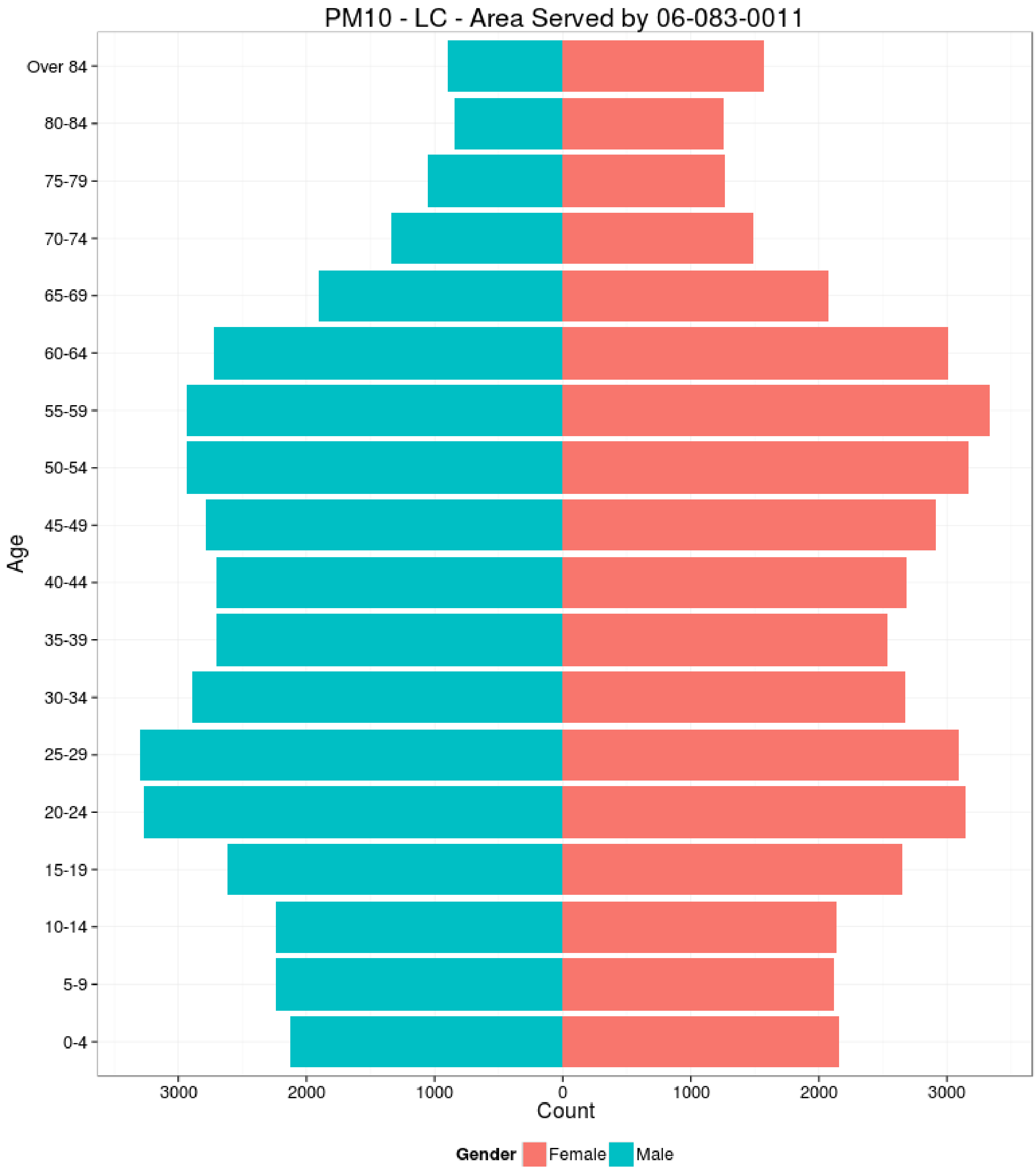


Figure A-28
Santa Barbara PM_{10} Area Served Analysis Race and Population