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Project for ArcGIS

Mapping Housing Cost Burden in Los Angeles County

HOUSING AFFORDABILITY ANALYSIS IN LOS ANGELES COUNTY

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PPD 631: *Geographic Information Systems for Policy, Planning, and Development*

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PPD 631 Project

Housing Affordability Analysis in Los Angeles County

Executive Summary

This report examines housing affordability challenges in Los Angeles County using Geographic Information Systems (GIS). Spatial analysis identifies high-priority areas like South and East Los Angeles, where affordability issues are most severe. Findings reveal spatial disparities in housing cost burdens, income levels, and poverty rates, underscoring the urgent need for targeted interventions. Policy recommendations include zoning reforms, expanding affordable housing, and promoting transit-oriented development to foster equity and sustainability.

I. Introduction

Los Angeles County faces a deepening affordable housing crisis, with escalating rents, limited housing supply, and displacement of vulnerable populations converging to create a complex challenge. Over 55% of renters are cost-burdened, spending more than 30% of their income on housing (California Housing Partnership, 2023; U.S. Census Bureau, 2024). This is fueled by restrictive zoning policies, inadequate transit-oriented development, and historical inequities that disproportionately impact low-income and marginalized communities (Urban Displacement Project, 2023). The consequences include increased homelessness, financial strain on households, and widening socioeconomic disparities (National Low Income Housing Coalition, 2024).

This crisis is particularly acute in areas like South and East Los Angeles. For example, in Florence-Firestone, the poverty rate exceeds 20%, with a median household income below $50,000, coupled with limited housing options, leading to severe overcrowding and economic instability. Over 70% of renters in such neighborhoods can be cost-burdened, struggling to meet basic needs (California Housing Partnership, 2023). These spatial disparities underscore the urgent need for equitable and sustainable solutions.

Geographic Information Systems (GIS) provide a powerful platform to address these challenges. By integrating spatial and demographic data, GIS enables the visualization of housing affordability patterns, uncovering disparities in cost burden, income levels, and housing supply. ArcGIS, for instance, allows us to map areas with high concentrations of cost-burdened renters, overlaying this data with layers showing income levels, housing costs, and access to transportation. This reveals the spatial relationships between these factors and pinpoints areas needing urgent intervention.

This project utilizes the spatial analysis capabilities of GIS to identify high-priority areas and inform targeted policy interventions aimed at increasing housing affordability, promoting equitable development, and fostering community resilience in Los Angeles County. Analyzing these spatial patterns allows us to develop data-driven strategies to enhance affordability, equity, and sustainability in Los Angeles County.

II. Project Objectives

The primary objective of this project is to analyze and address housing affordability challenges in Los Angeles County using spatial analysis and data-driven approaches. The study focuses on identifying geographic disparities in housing affordability, income levels, and poverty rates (Smith, 2020). By pinpointing neighborhoods with acute affordability challenges, the project aims to guide targeted policy interventions and equitable resource allocation. Additionally, it highlights opportunities for higher-density housing to balance supply and demand, promoting sustainable urban growth (Brown & Green, 2019). Through these efforts, the project seeks to provide actionable insights to inform equitable urban planning, address housing inequities, and foster economic mobility across the county.

Research Questions

1. Which areas in Los Angeles County face the most severe affordability challenges?
2. How do these challenges correlate with income levels and poverty rates?

III. Data and Methodology

1. Data Sources

The data for this project is sourced from reliable and publicly available datasets to ensure comprehensive and accurate analysis. The primary sources include:

- **U.S. Census Bureau (ACS Data):**
  - Median Household Income (Table B19013)
  - Median Gross Rent (Table B25064)
  - Median Home Value (Table B25077)

Format: CSVs

- **Geospatial Shapefiles:**
  - Administrative and geographic boundaries, including:
    - tl_2024_06_place.shp
    - tl_2024_us_county.shp
    - tl_2024_us_state.shp

Format: Shapefiles

- **Zillow and Redfin:**
  - Housing market data, including average rents, median home prices, and housing availability. These datasets also provided a means for cross-validation with ACS data.

Format: CSVs

- **ArcGIS Enrichment Tool:**
  - Enhance ACS data with additional variables such as population density and transit proximity.

  Format: Shapefiles

2. Data Preparation

Preparing the data was essential to ensure it was clean, compatible, and ready for GIS analysis. The process included the following steps:

Data Cleaning and Integration:

- **Excel Preprocessing**: Raw datasets were cleaned in Excel by removing outliers, addressing missing values, and standardizing formatting.

- **ArcGIS Enrichment**: The ArcGIS Enrichment Tool was used to add contextual variables, such as transit proximity and population density.

- **Attribute Table Refinement in ArcGIS:**
  - **Header Standardization**: Renamed column headers for clarity and consistency.
  - **Handling Missing Data**: Filled missing entries by cross-referencing related datasets or using averages from neighboring census tracts.
  - **Ensuring Consistency**: Reviewed tables to ensure uniform formatting, including consistent numerical precision, units, and text labels.

Data Analysis and Visualization:

- **Calculated population density using the formula:**
  - Population Density = Population / Total Area

- **GIS Tools and Workflow:**
  - Merged multiple layers using the **Join** tool.
  - The **Clip** tool was employed after cleaning the data to ensure accuracy and consistency in the analysis.
  - **Buffer Tool:** Analyzed transit proximity.
  - **Summary Statistics and Creta Table.**
  - More tools were used and explained throughout the project, including the Export Tool, Enrichment Tool, Calculate Geometry and more.

- **Thematic Mapping:**
  - Created thematic maps to visualize variables such as population, density, housing availability, and poverty rates.
  - Designed maps to highlight variations in population density, housing affordability, and related metrics.

- **Layer Management:**
  - Saved each layer separately to maintain data integrity and facilitate reuse in future analysis.
  - Utilized ArcGIS bookmarks for efficient navigation between datasets and analysis layers.

- **Outputs and Presentation:**

- Exported maps as high-resolution PDFs to ensure clear visualization and professional presentation.

- **Summary Table Creation:**
    1. Compiled summary statistics for population, land area, and water area.
    2. Created a summary table for California's population and density metrics to support additional analysis.

- **Symbology Application:**
    - Applied Unique Value Symbology to visually distinguish California from other states.

3. Map Design and Presentation

To ensure clarity and professional presentation, each map included essential design elements and careful attention to aesthetics:

Map Elements:

- All maps include a scale bar, legend, and north arrow.
- Cleaned and processed data were utilized to create comprehensive population density and other metrics visualizations.

Symbology and Aesthetics:

- Symbology was carefully chosen using ArcGIS tools to maximize legibility and clarity.
- A light pastel color palette created a calm and professional aesthetic.
- Color gradients were employed, with lighter shades representing lower values and darker shades indicating higher values.

Classification and Labeling:

- Ten classification classes were used to reveal subtle geographic variations in population and housing patterns.
- Simplified visuals by removing labels from smaller highlighted areas to reduce clutter.

IV. Results

California's Population in 2022

California, the most populous state in the U.S., had an estimated **39.2 million** residents in 2022. The population was concentrated primarily in two regions: the Greater Los Angeles Area and the San Francisco Bay Area. These metropolitan areas accounted for the highest population densities in the state, driven by their economic, cultural, and logistical significance. In comparison, Texas, the second-most populous state, had over **30 million** residents with an average density of 114 people per square mile. Texas's urban population was more evenly distributed across major cities, including Houston, Dallas-Fort Worth, Austin, and San Antonio, whereas California's population was more concentrated in its major metropolitan regions.

The state's average population density was approximately **253 people** per square mile, but this varied significantly between urban and rural areas:

- **Greater Los Angeles Area:** The most populous metropolitan region, accounting for a substantial share of California's residents. Los Angeles County alone had an estimated 9.8 million residents, making it the most populous county in the nation.

- **San Francisco Bay Area:** Despite being geographically smaller, it maintained one of the highest population densities, particularly in San Francisco, which had over 18,000 people per square mile.
- **Orange County**: As part of the Greater Los Angeles Area, Orange County had an estimated **3.2 million residents** in 2022. Its population density, at approximately **4,000 people per square mile**, was significantly higher than the state average. Significant cities like Santa Ana, Anaheim, and Irvine were key urban hubs, contributing to the county's economic and cultural importance. Despite its high density, Orange County maintained a distinct suburban-urban mix compared to the more urbanized Los Angeles County and the compact San Francisco Bay Area.

An analysis of California's three most populous regions in 2022 reveals the following distribution:

- **Los Angeles County:** 26% of the state's total population, representing the largest share (70%) among these three major population centers.
- **Orange County:** 8.1% of the state's total population, comprising 23% of the population within these three key regions.
- **San Francisco Bay Area:** 17.3% of the state's total population (approximately 6.8 million residents across its nine counties), making up the remaining portion of the population among these three areas.

In Los Angeles County, nearly half the population resided in a small portion of the county, emphasizing significant disparities in housing availability and affordability:

Median Household Income: Income levels varied significantly across the county, with affluent neighborhoods such as Beverly Hills reporting median incomes above $120,000, compared to lower-income areas like South Los Angeles, where the median income was below $40,000.
Poverty Rates: Approximately 12.3% of Los Angeles County’s population lived below the poverty line, exceeding the state average of 11.4%.
Housing Inequities: In 2022, the median home price in Los Angeles County surpassed $750,000, compared to the state average of $685,000. This disparity has contributed to the rising homelessness crisis and challenges related to housing affordability.

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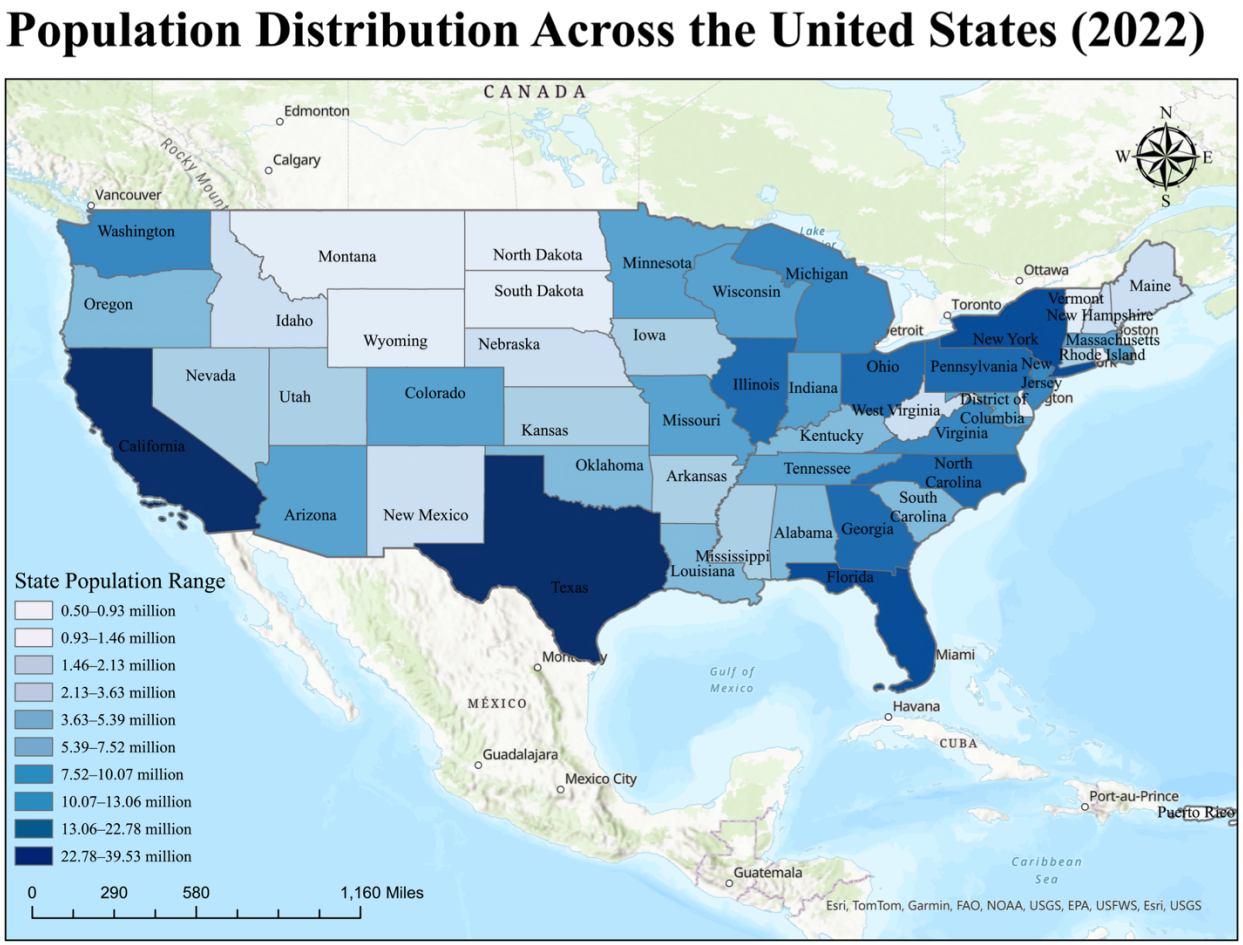
Map 1: Population Distribution Across the United States
This map provides an overview of population trends across U.S. states, focusing on California's unique challenges. California, the most populous state, has a population of 39.53–40 million, followed by Texas in a similar range. In contrast, less populated states like Wyoming and Vermont have populations below 1.14 million.

The map includes a detailed legend and annotations to explain key patterns and variations in population density. By comparing densely populated states like California with sparsely populated ones, the map highlights national trends that influence housing challenges. California's large population drives high housing demand, particularly in urban areas, leading to affordability and land-use pressures.



Map 1: Population Distribution Across the United States

Map 2: Focused View of California and Los Angeles County

Map 2 presents a focused view of the United States, with California highlighted to emphasize its significance. The map includes detailed statistical data, noting California's population of 39 million and a density of 253 people per square mile. The map effectively draws attention to California's demographic prominence by using a single color for all other states and dark blue for California. The purpose of this design is to highlight California's unique position in terms of population and density compared to the rest of the country.

Map 2: U.S. Map Focusing on California

Map 3: Comparative Population Analysis (Los Angeles, Orange County, and San Francisco)

The map compares population distribution in Los Angeles County, Orange County, and San Francisco, showcasing demographic trends and population density variations. Los Angeles County is highlighted as the most densely populated area, offering insights into California's urban population patterns. The purpose of this map is to visually analyze and compare the population concentration in these key regions, providing a clearer understanding of urban density dynamics and their implications for housing, infrastructure, and resource allocation in California.

Comparative Population Analysis: Los Angeles County, Orange County, and San Francisco (2022)

Map 3: Comparative Population Analysis (Los Angeles, Orange County, and San Francisco)

Chart 1: Population Distribution Comparison (Los Angeles, Orange County, and San Francisco)

This pie chart illustrates the population distribution across Los Angeles County, Orange County, and San Francisco. Los Angeles County accounts for a dominant 70% of the total population among these three regions, underscoring its status as the most populous area. Orange County follows with a notable share of 23%, while San Francisco contributes 6.1%, reflecting its compact urban footprint and comparatively smaller population size. The chart is designed with clear labels and a well-defined legend, ensuring straightforward interpretation of the data. The stark differences in population distribution are visually emphasized, with Los Angeles County's significant concentration standing out in contrast to the smaller shares of Orange County and San Francisco.

This chart and accompanying map provide a concise visual summary of population disparities among these regions. It highlights the need for region-specific urban planning and policy responses to address challenges such as infrastructure demands, housing affordability, and resource allocation tailored to the unique needs of each area.

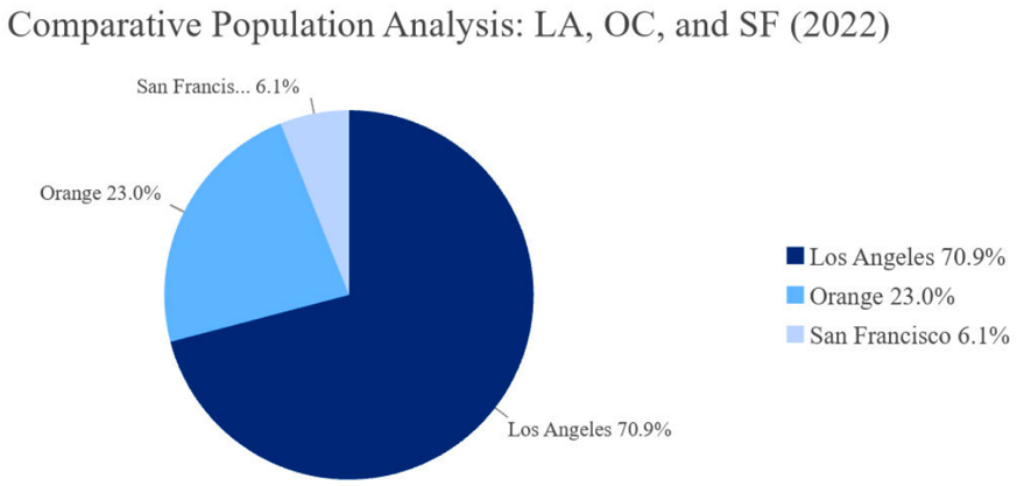
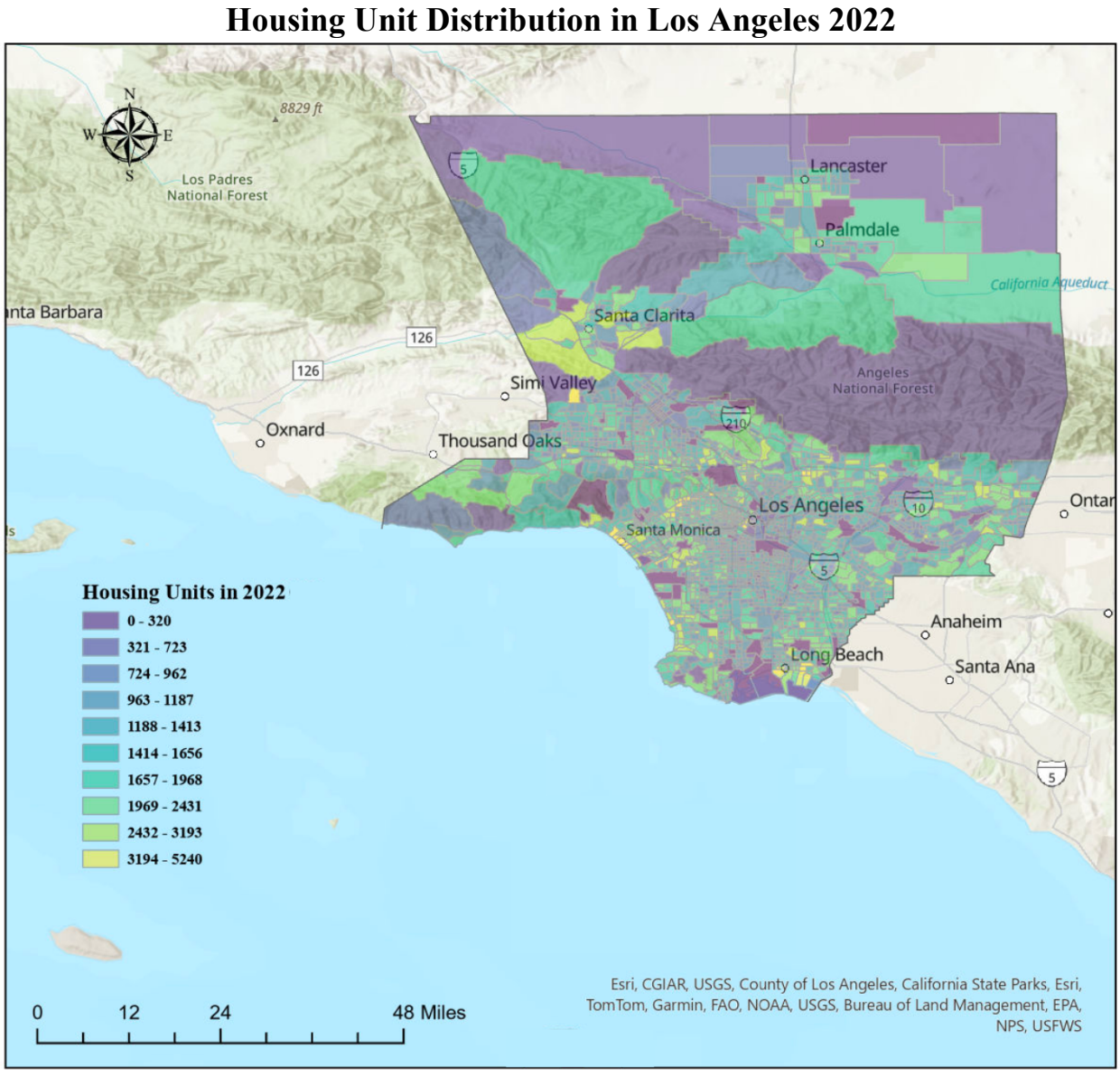


Chart 1:Population Distribution Comparison: Los Angeles County, Orange County, and San Francisco

Map 4: Housing Unit Distribution in Los Angeles

The Housing Unit Demand in Los Angeles County, 2022 map, based on the Census_2022_SRR_and_Demographic_Characteristics dataset, shows clear disparities in housing distribution and demand across the county. Urban areas like Downtown Los Angeles and the Westside have many multi-family housing units but still face high demand, driving up costs and worsening affordability. Suburban and rural areas, primarily single-family homes, offer fewer housing options, putting more pressure on urban centers. This imbalance leads to overcrowding, rising costs, and limited housing access for middle- and lower-income families. To address these issues, solutions include Building more affordable housing, Changing zoning laws to allow higher-density housing, and Encouraging transit-oriented development to spread housing demand more evenly. This map serves as a tool for understanding housing patterns and informing policies to achieve more balanced and sustainable housing development in Los Angeles County.

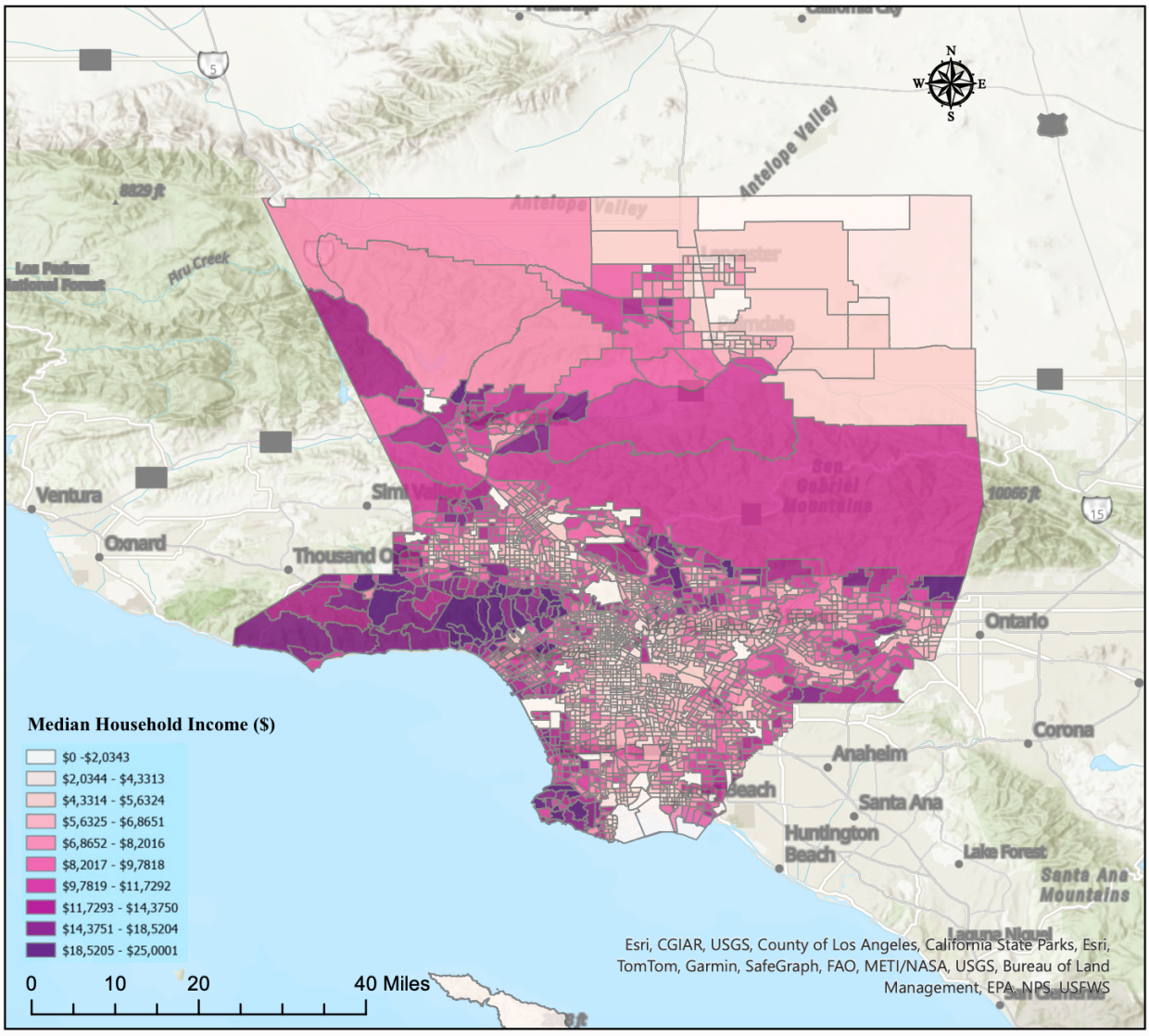


Map 4: Housing Unit Distribution in 2022

Map 5: Median Household Income in Los Angeles County

This map illustrates the distribution of median household income across Los Angeles County in 2022, emphasizing stark economic disparities. High-income areas, such as Beverly Hills, San Marino, and Manhattan Beach, show median household incomes exceeding $150,000. Conversely, neighborhoods like South Los Angeles, Huntington Park, and parts of East Los Angeles report median incomes below $50,000. The 2022 data is visually represented with a color gradient, where darker shades indicate higher incomes and lighter shades represent lower incomes. A detailed legend and annotations enhance clarity, allowing for an in-depth analysis of economic inequality. The purpose of this map is to analyze and visualize the spatial distribution of economic inequality across Los Angeles County. Identifying high- and low-income areas helps uncover socioeconomic disparity patterns that can inform policy-making and urban planning. This analysis is critical for addressing income inequality and ensuring equitable allocation of resources, housing, and services to underserved communities.

Median Household Income in Los Angeles County (2022)



Map 5: Median Household Income in Los Angeles County (2022)

Summary Table: Summary of Median Household Income and Population Analysis in Los Angeles County

A summary table was created based on the map **Median Household Income in Los Angeles County**, organizing cities by population to identify those with total households exceeding 650,352. The analysis revealed five cities surpassing this threshold, emphasizing areas with higher population densities and diverse income distributions. These populous cities exhibit notable economic disparities, as reflected in their varying median household incomes. The table includes key indicators such as poverty percentage, total population, total households, median household income, and average personal income. It also highlights data for the sixth-largest city by total households in Los Angeles County in 2022, providing valuable insights for understanding income inequality and guiding resource allocation efforts.

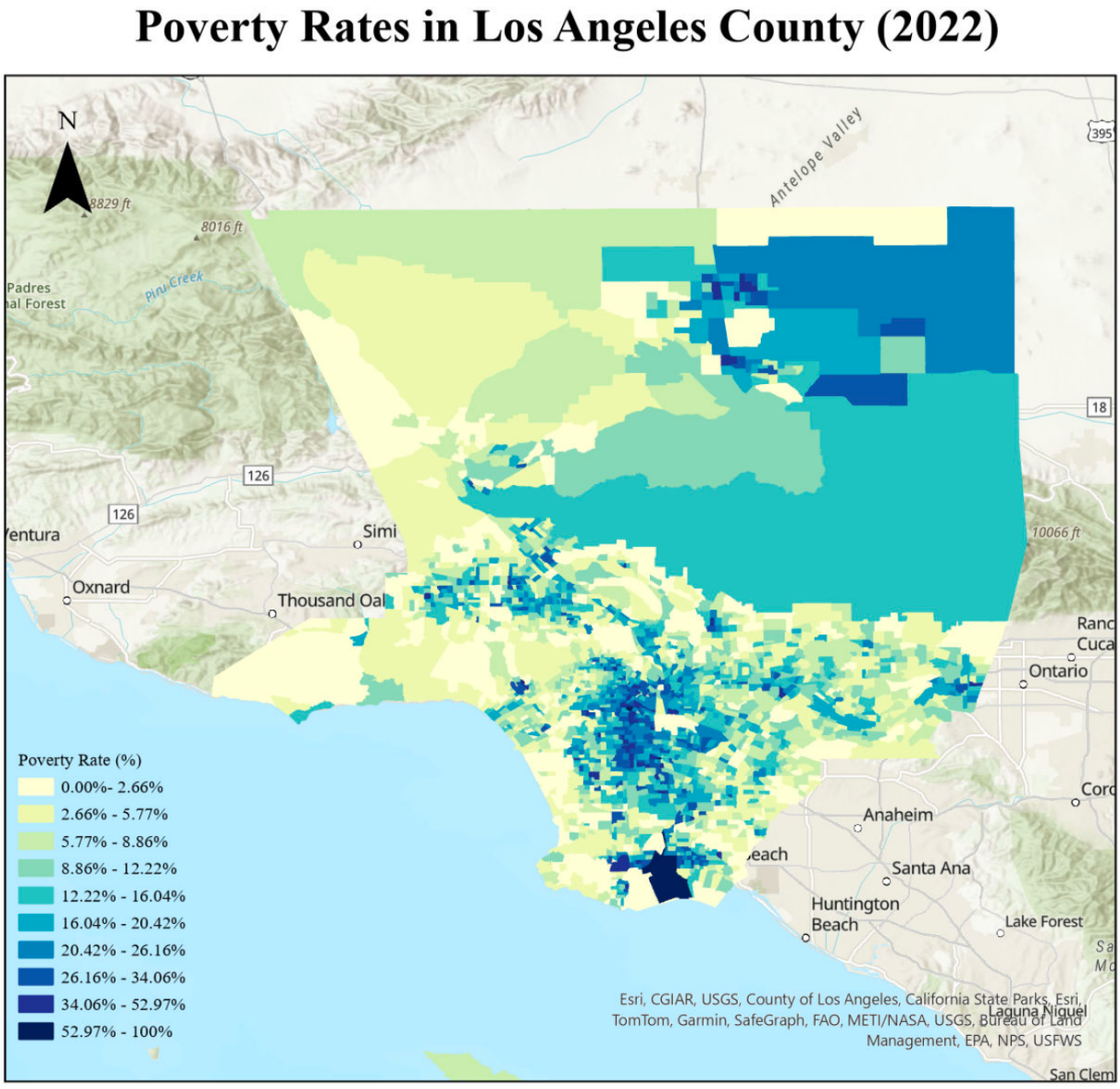
Summary of Median Household Income and Population Analysis in Los Angeles County

California County_NAME	Total Population	Persons in Poverty (%)	Total Households	Average Household Size	Median Household Income (dollars)	Average Personal Income
Los Angeles County	9,721,138	12.9	3363093	2.89	83411	41847
Orange County	3,151,184	9	1066286	2.96	109361	50683
Riverside County	2,473,902	11.2	749976	3.3	84505	35356
San Bernardino County	2,193,656	15.1	659928	3.32	77423	31348
San Diego County	3,276,208	9.7	1149157	2.85	96974	46957
Santa Clara County	1,870,945	9.4	650352	2.88	153792	73017

Table 1:Summary of Median Household Income and Population Analysis in Los Angeles County

Map 6: Poverty Rates in Los Angeles County

This map visualizes poverty rates across Los Angeles County in 2022, highlighting the percentage of individuals and families living below the poverty line in different neighborhoods. High-poverty areas, such as South Los Angeles, East Los Angeles, and parts of the San Fernando Valley, are marked with darker shades, indicating concentrated economic hardship, limited access to well-paying jobs, and greater reliance on public assistance programs. In contrast, low-poverty areas, including Beverly Hills, Santa Monica, and parts of the Westside, are represented with lighter shades, reflecting greater economic stability and access to resources. By geographically illustrating socioeconomic disparities, this map provides valuable insights into how poverty correlates with income, housing availability, and population density. These insights can guide policy decisions to allocate resources effectively, reduce poverty, and address inequities, helping vulnerable communities achieve greater economic stability and upward mobility.



Map 6: Poverty Rates in Los Angeles County (2022)

Chart 2: Histogram of Poverty Rates in Los Angeles County (2022)
The histogram of poverty rates in Los Angeles County (2022), with a median of **12.67%**, illustrates the distribution of economic hardship across the region. Most neighborhoods cluster around the median, indicating moderate poverty levels in many areas, while a smaller number of neighborhoods exhibit significantly higher poverty rates, highlighting concentrated socioeconomic challenges. The distribution suggests disparities in poverty, with specific areas requiring targeted interventions. This visualization complements the map by providing a quantitative perspective, emphasizing the uneven spread of poverty and the areas most in need of policy focus.

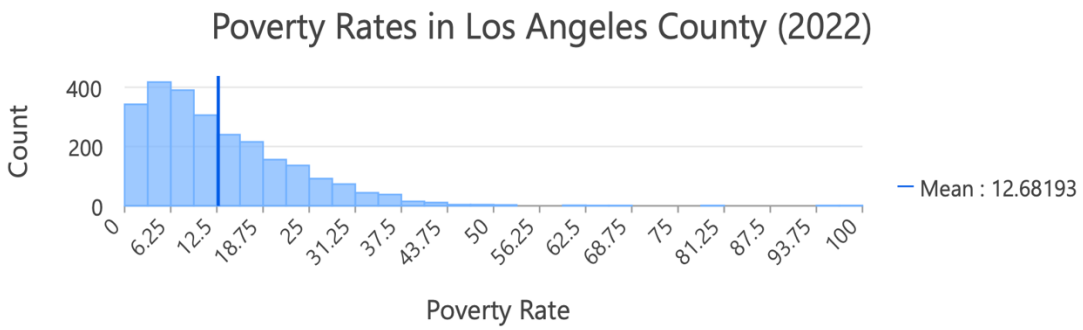


Chart 2: Histogram of Poverty Rates in Los Angeles County (2022)

V. Data Limitations

This study had several limitations that affected the analysis. One key issue was using 2022 data for housing metrics like rent, home values, and income. Although this data provided a solid foundation, it might reflect something other than recent market changes or economic shifts after 2022. This highlights the need for updated housing data to ensure accuracy in policy analysis, especially in a fast-changing market like Los Angeles County.

Technical challenges also created constraints. Importing Excel data directly into ArcGIS was difficult due to compatibility issues, so alternative formats like shapefiles were used. However, this limited the ability to include some corrected or cleaned data from Excel, showing a need for better tools to handle different data formats in spatial analyses.

Another area for improvement was the quality of some datasets, which had errors or missing values. Cleaning this data in Excel took time, and sometimes, the corrected data could not be imported into ArcGIS due to software problems. As a result, the analysis relied on the original data, which may have been less accurate. Using census tract boundaries also meant the analysis was done at a broader level, which may have missed smaller, localized housing trends. Relying only on public data meant detailed private datasets, like housing market trends or eviction records, were unavailable.

Finally, time and system performance issues affected the workflow. Tasks that should have taken minutes, like uploading data or running geospatial tools, often took hours due to system delays, which slowed progress and limited the ability to test other methods or dive deeper into the analysis.

Accuracy and Time Limitations:
If I had more time, I would expand the analysis by incorporating additional localized details, dynamic market trend modeling, and advanced predictive tools to enhance the findings. Moreover, I would leverage more of the capabilities available in ArcGIS Pro to perform more profound and more precise analyses. However, due to time constraints and software limitations, I had to summarize some analyses to prioritize the most critical components.

Despite these challenges, the study successfully identified important trends in housing affordability in Los Angeles County. Future research could benefit from updated datasets, improved system performance, and access to more detailed or private data to strengthen the findings.

VI. Policy Implications

To alleviate the housing crisis in Los Angeles County, policymakers should focus on expanding affordable housing through tax credits and density bonuses to increase supply in high-cost areas (California Housing Partnership, 2023). Zoning reforms that allow higher-density, mixed-income developments can address housing shortages and reduce socioeconomic segregation (Schuetz, 2022). Prioritizing transit-oriented development near transit hubs can enhance accessibility and support sustainable growth (Smith & Zuk, 2021). Additionally, enhancing rental assistance and tenant protections is critical to alleviating cost burdens for low-income households (U.S. Census Bureau, 2024). Finally, investing in infrastructure and community services in underserved areas is essential for long-term economic stability (California Housing Partnership, 2023). By implementing these strategies, a more equitable and sustainable housing landscape can be created, improving living conditions for all residents.

VII. Conclusion

This study highlights significant disparities in housing affordability across Los Angeles County, with neighborhoods like South and East Los Angeles facing acute challenges due to high poverty rates, low incomes, and severe housing cost burdens. Utilizing Geographic Information Systems (GIS) enabled a comprehensive analysis of these issues, revealing critical spatial patterns and identifying high-priority areas for intervention. By integrating demographic, economic, and housing data, GIS demonstrated its value as a tool for evidence-based policymaking, offering insights to guide zoning reforms, expand affordable housing, and promote transit-oriented development. These strategies not only address immediate housing inequities but also align with broader goals of equity and sustainability, fostering inclusive growth and building resilient communities for the future.

VIII. Proofreader

1. Bonnie Shrewsbury
2. Professor Barry Waite

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