

Final Report: Public Housing Developments Data Analysis Dashboard

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Project Title: Public Housing Developments Data Analysis Dashboard

Live Dashboard: <https://edefang.shinyapps.io/House/>

1. Introduction / Project Overview

Public housing plays an important role in supporting low-income families, seniors, and people with disabilities across the United States. Because public housing operates on a national scale, it is important to understand how developments are distributed, who they serve, and how income and rent relate to housing conditions.

This project focuses on building an **interactive dashboard** that allows users to explore public housing data in a simple and practical way. Instead of static tables, the dashboard lets users filter by state, compare trends, and examine relationships between income, rent, unit size, and demographics. The goal is to make the data easier to understand and more useful for analysis.

2. Data Source and Dataset Description

The analysis uses the **HUD Public Housing Developments** dataset provided by the U.S. Department of Housing and Urban Development (HUD).

- **Dataset Link:** <https://hudgis-hud.opendata.arcgis.com/datasets/HUD::public-housing-developments-1/about>
- **Metadata and Field Definitions:**
<https://www.arcgis.com/sharing/rest/content/items/5c96143f79c940a0a8cedae99a1ac562/info/metadata/metadata.xml?format=default&output=html>

Each row in the dataset represents a single public housing development. The location shown for each development is based on the building with the largest number of units. This keeps the data consistent while protecting resident privacy.

The dataset includes information on total and vacant units, vacancy rates, household income, rent contributions, income sources, household composition, and demographic characteristics. This makes it possible to analyze both national trends and state-level differences.

3. Data Preparation

Before creating the dashboard, the data was cleaned to make sure the analysis was accurate and consistent.

Key steps included:

- Converting income and rent values into usable numeric formats
- Removing records with missing or unreliable values
- Reviewing extreme values so they would not distort summary statistics
- Making sure all variables were properly formatted for filtering and visualization

These steps helped ensure the dashboard results reflect realistic patterns in the data.

4. Dashboard Design and Features

The dashboard is organized into multiple tabs, with a **state filter** that applies across all visualizations. Users can view data for a specific state or for all states combined.

4.1 Housing Development (Landing Page)

The landing page gives a high-level overview of public housing developments.

It includes:

- Summary metrics showing average, median, highest, and lowest values for selected variables
- A **Top 10 States** comparison for metrics such as rent contribution, vacancy rate, total units, income, and total residents
- A minority representation chart showing the distribution of Black, Asian, Hispanic, and Native American residents

This page helps users quickly understand national patterns and identify differences between states.

4.2 Finance Tab

The Finance tab focuses on affordability and income.

It shows how household income varies by bedroom size, the distribution of unit sizes across developments, and income comparisons for the top states. The results highlight that most public housing residents have low incomes and rely heavily on fixed or non-wage income, which explains why income-based rent policies are necessary.

4.3 Demographics Tab

The Demographics tab looks at who lives in public housing.

It includes information on households with children, age distribution of household heads, and household composition (one adult vs. two adults). The data shows that public housing supports a wide range of people, including families, seniors, and minority populations.

4.4 Statistics Tab

The Statistics tab allows users to run simple regression models to understand what affects rent, income, and occupancy rates.

One key result is a strong positive relationship between household income and monthly rent contribution, which supports the idea that rent levels are tied to a household's ability to pay. Other models help show how unit size and demographics relate to housing outcomes.

5. Key Takeaways and Conclusion

This project shows how an interactive dashboard can make public housing data easier to explore and understand. The analysis confirms that public housing mainly serves low income and vulnerable populations, and that rent contributions increase as income increases.

Overall, the dashboard provides a practical tool for exploring housing data at both the national and state level. It also demonstrates how data visualization and basic statistical analysis can be combined to support clearer insights and better decision-making.

6. References

- U.S. Department of Housing and Urban Development (HUD). *Public Housing Developments Dataset*. <https://hudgis-hud.opendata.arcgis.com/datasets/HUD::public-housing-developments-1/about>
- HUD Public Housing Metadata and Field Definitions. <https://www.arcgis.com/sharing/rest/content/items/5c96143f79c940a0a8cedae99a1ac562/info/metadata/metadata.xml?format=default&output=html>
- Chang, W., et al. *Shiny: Web Application Framework for R*.

This report reflects the design and findings of the live dashboard available at <https://edefang.shinyapps.io/House/>.

<https://github.com/edefang/Housing-development->