Crime Impact on Real Estate Prices in Grand Rapids, Michigan

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Abstract— Understanding the relationship between crime and real estate pricing is a key factor in making informed investment decisions, particularly for real estate professionals. This project investigates the impact of crime patterns on neighborhood property values in Grand Rapids, Michigan. We designed interactive and exploratory visualizations that address specific tasks grounded in the goals of our user persona—a real estate investor and consultant. Using data from the Grand Rapids Police Department (GRPD), Zillow, and shapefiles of neighborhood boundaries, we constructed visual analytics across six focused tasks. Tools including Python, R, and Tableau were used to process, map, and present the data. Each visualization was tailored using visual encoding principles to support tasks such as identifying crime trends, locating hotspots, comparing property values, and assessing investment potential based on price volatility and growth. Our results highlight key spatial and temporal patterns that directly support real estate decision-making and demonstrate how visual design can empower data-informed insights in urban planning and property investment.

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1 Introduction

Crime and housing markets are closely linked, with neighborhood safety significantly impacting real estate value. Real estate agents and investors must understand how crime influences home prices, neighborhood appeal, and long-term investment potential. This project, "Crime Impact on Real Estate Prices in Grand Rapids, Michigan," addresses this relationship through a visualization-first approach.

To support our user persona Alex, we designed six tasks, each grounded in visual exploration. These tasks span temporal crime and property value trends, spatial hotspot detection, offense-level impact analysis, and investment evaluation using volatility and growth. We processed open data sources using R and Python and visualized them in Tableau. Each task adheres to information visualization principles, offering Alex flexible ways to explore, compare, and make confident investment recommendations.

2 Target Persona

Name: Alex Carey
Age: 32
Occupation: Real Estate Investor & Consultant
Goals:

- Helps clients invest in neighborhoods with growth potential.
- Use data to guide buyers on safety
- Understand long-term value
- Balance price, safety and volatility.

Pain Points:

- Struggles to explain price differences caused by safety.
- Lacks clear visual on crime distribution and trends.
- Unsure which crimes impact property values more significantly.

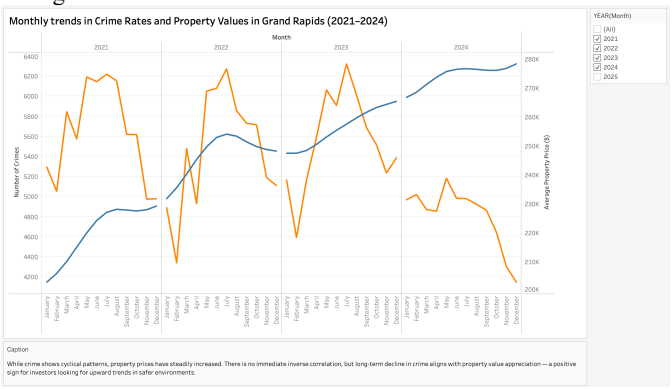
3 Tasks and Visual Designs

3.1 How have crime rates and real estate prices changed over time in Grand Rapids?

We began by extracting monthly crime data from the Grand Rapids Police Department (GRPD) and monthly property prices from Zillow between January 2021 and December 2024. After cleaning and aggregating the datasets, we created a dual-axis line chart using Tableau to illustrate the monthly trends of both variables.

Design Rationale: Dual-axis line charts enable the simultaneous comparison of two metrics with different scales. Crime count was plotted on the primary Y-axis and average sale price on the secondary Y-axis, with time on the X-axis. This allowed user to examine the co-variation of the two variables month by month.

Insights: The visualization revealed that while crime rates showed a seasonal pattern with an overall downward trend, property values steadily increased over the same period. This provided Alex with a strong overview of the market, supporting data-backed investment timing decisions.

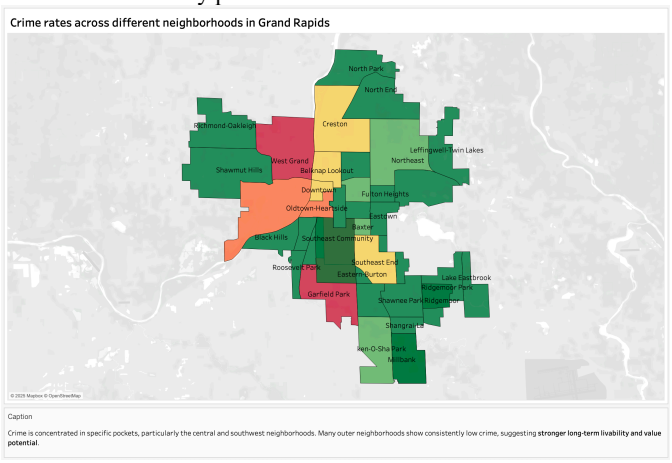


3.2 How do crime rates vary across different neighborhoods in Grand Rapids?

To assess neighborhood-level safety, we used service area classifications from GRPD and aggregated the crime data by these areas. This spatial data was visualized using a choropleth map in Tableau.

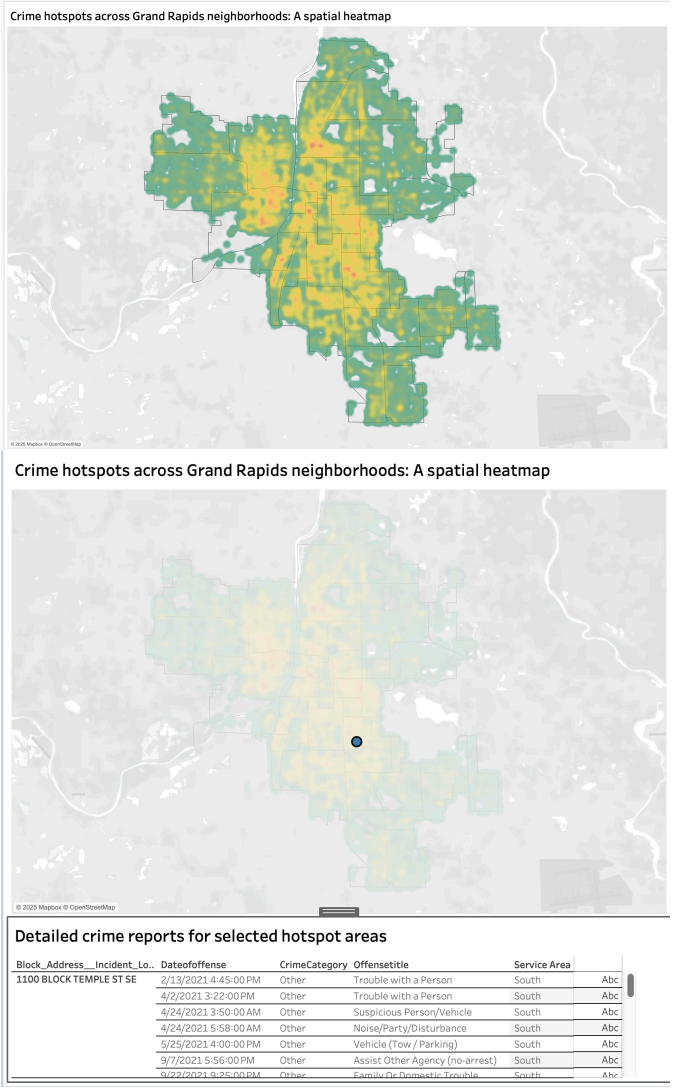
Design Rationale: Choropleth maps are ideal for geographic comparisons. We used a gradient color encoding based on total crime count, making it easy for Alex to visually assess the crime density in each region.

Insights: The Central and Southwest service areas showed consistently higher crime rates, while outer regions were relatively safer. These findings allowed Alex to narrow down neighborhoods based on client safety preferences.



3.3 Identify crime hotspots in Grand Rapids and explore specific incident details to better evaluate neighborhood safety

We plotted all geocoded crime incidents from GRPD on a density heatmap over a base map of Grand Rapids. Unlike sampling approaches, this task involved the full dataset (~280K records), allowing for high-fidelity spatial resolution. A heatmap overlay with red-yellow intensity was used to indicate crime density.
Design Rationale: A density heatmap allowed us to identify crime hotspots across the city. The color intensity (from yellow to red) corresponded to incident concentration. We added an interactive table on the dashboard that displayed details such as offense title, location, and date for any selected point.
Interaction Table: To support user exploration, we included a dynamic panel that displays incident-level details such as address, offense type, and date upon clicking a point (address) on the map. This details-on-demand feature enhances usability and supports deeper insights.
Insights: The map allowed Alex to zoom into neighborhoods or streets with high crime density and use the interaction panel for deeper analysis. This fine-grained tool supported decisions for clients needing specific safety evaluations.

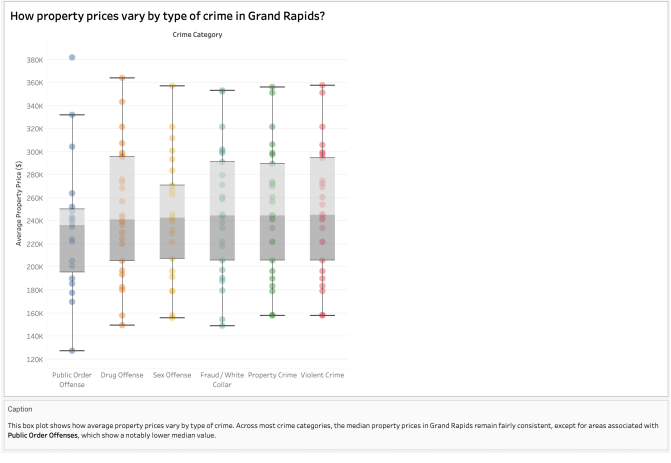


3.4 How are property values distributed in relation to crime hotspots?

We merged regional property price data from Zillow with GRPD crime totals, standardizing region names across both sources. A scatter plot was then created in Tableau to analyze their relationship.
Design Rationale: The scatter plot visualized crime counts on the X-axis and average property price on the Y-axis. Color and shape encoded quadrants segmented by midline values. This segmentation—Low Price–High Crime, High Price–Low Crime, etc.—helped Alex assess neighborhood dynamics.
Insights: The visualization showed certain neighborhoods with both high crime and high property prices, which could reflect gentrifying areas. Others with high crime and low price were clearly less desirable. Segment-based clustering helped Alex communicate nuanced insights to clients.

3.5 Are there specific types of crimes that have a more significant impact on real estate prices?

To address this question, we classified 512 unique offense titles into meaningful categories such as Violent Crime, Property Crime, Drug Offense, Sex Offense and Other, using Python. This classification was then used to aggregate property prices accordingly.
Design Consideration: A box plot was selected to compare price distributions across categories. Skewness analysis showed minimal distortion, allowing use of average prices; however, box plots were sorted by median for better clarity. We excluded the overly broad "Other" category to reduce noise.
Outcome: While most categories hovered around the same average price, Public Order Offense tended to show slightly lower property values, revealing actionable patterns for the agent.

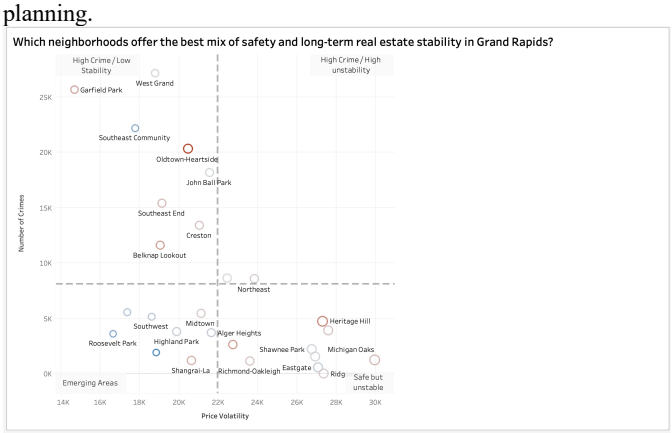


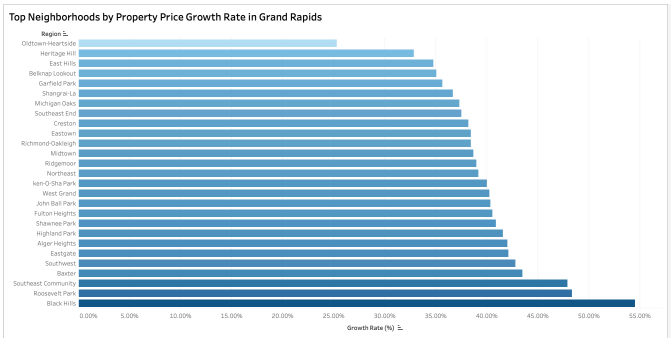
3.6 Which neighborhoods offer the best combination of long-term price stability and safety for real estate investment?

For this task, we calculated four key metrics per neighborhood: average property price, crime count, price volatility (standard deviation of monthly prices), and growth rate (percentage change in average property values over time - from 2021 to 2024). These metrics were visualized in a composite dashboard.

Design Rationale: We created a scatter plot with volatility on the X-axis and crime count on the Y-axis. Bubble size represented average price and color denoted growth rate. This allowed Alex to compare risk and return across neighborhoods. A supporting bar chart was created to list neighborhoods with high growth rates for easy comparison.

Insights: The chart helped identify neighborhoods like Black Hills and Roosevelt Park, which offered strong growth and low volatility—ideal for long-term investment. The color gradient representing growth clarified neighborhood performance, and quadrant segmentation reinforced risk assessment. This dashboard was the most comprehensive support for strategic real estate planning.





4 Visual Encoding Choices

Choropleth Maps: Used in Tasks 2 and 3 for geographic comparisons.

Scatter Plots: Used in Tasks 4 and 6 for relationship and segment visualization.

Line Charts: Task 1 used dual-axis lines to show time-series trends.

Box Plots: Task 5 explored category-wise price distributions.

Heatmaps & Tables: Task 3 combined macro and micro insights effectively

5 Conclusion

Through this project, we demonstrated how thoughtful data visualization can address complex, real-world challenges faced by real estate professionals. Our design was anchored in the needs of Alex Carey, a real estate investor who requires nuanced understanding of how crime affects neighborhood desirability and housing prices. Each of the six tasks was designed to support a specific goal—from observing long-term trends, to identifying crime hotspots, to assessing neighborhood investment quality.

The visualizations were crafted using Tableau, R, and Python, with data sourced from GRPD and Zillow. By employing diverse visual encodings like dual-axis line charts, choropleth maps, density heatmaps, scatter plots, and box plots, we were able to capture spatial and temporal dimensions of both crime and pricing data. Interactivity was embedded throughout the dashboards, especially in Task 3, where incident-level details supported deeper exploration. In Task 6, advanced metrics like growth rate and volatility offered strategic perspectives on long-term investment.

Throughout the project, we intentionally applied key principles from the field of information visualization. Cleveland and Tufte's rules informed our choices for minimal chart junk, maintaining high data-ink ratios, and using direct labelling to reduce viewer interpretation time. For large datasets, such as 280,000 crime incidents in Task 3, we employed heatmaps and dynamic filters to manage cognitive overload. Our visualizations were designed around Schneiderman's mantra: **overview first, zoom and filter, then details-on-demand**. By matching task types to suitable encodings, we ensured low visual complexity and high interpretability for our user persona.

References

[1] Ceccato, V., & Wilhelmsson, M. (2020). The impact of crime on apartment prices: evidence from Stockholm, Sweden.

[2] Buonanno, P., Montolio, D., & Raya-Vílchez, J. M. (2013). Housing prices and crime perception.

[3] Sharma, R., & Dronavalli, M. (2024). Crime Data Analysis Across US Cities: Correlations with Socioeconomic Factors.

Appendices

- Tableau workbook with all visualizations
- R/Python scripts for geocoding, aggregation, and preprocessing
- GRPD crime data
- Zillow neighborhood housing data