Examining the Relationship between Homesteaded Properties, Home Values, Building Types and Police Calls for Service in the City of Prior Lake, Minnesota

James Bunning and Jon McHaney
Department of Resource Analysis, Saint Mary's University of Minnesota, Minneapolis, Minnesota 55404

Keywords: City of Prior Lake, Law Enforcement, GIS, Crime Analysis, Residential Properties, Regression Analysis, Homestead, Property Value, Townhome, Twin Home, Single Family Home

Abstract

This research analyzes several variables to determine relationships between police calls and residential properties within the City of Prior Lake. Examinations were undertaken to ascertain the correlation between neighborhood market values, percentage of owner occupied residences, and housing types. GIS based spatial and statistical analyses were applied to 2009 City of Prior Lake police calls for service. The data were analyzed by subdividing the City into neighborhoods and housing types. Neighborhoods and housing types were then compared.

Introduction

This project focuses on the impact residential housing has on police resources in the City of Prior Lake, Minnesota. All crimes and calls for police service to residential addresses were examined. Part I Crimes are defined by the FBI's Uniform Crime Report as homicide, rape, robbery, aggravated assault, burglary, larceny, motor vehicle theft, and arson (FBI, 2011). Many common police calls such as domestic disturbances, drug offenses, vandalism, and noise complaints are not included in the Part I Crimes. These lesser offenses affect the livability of neighborhoods and consume police resources. All crimes and calls were examined because they impact the quality of life in neighborhoods as well as police department staffing.

The variables of homestead status, property value and property type (single family, townhome, twin home or multi-housing) in relation to police calls for service were examined.

One of the first steps of this project was to create a simple point crime map of all of the calls for service. Crime mapping is a valuable tool for directing the department's resources and providing information to the public, police and city leadership and patrol officers. New York City used maps to analyze crime as far back as 1900 (Harries, 1999). Crime mapping provides visual communication that allows data to be seen in an easily understandable format (Harries, 1999).

James Bunning and Jon McHaney. 2011. Examining the Relationship between Homesteaded Properties, Home Values, Building Types and Police Calls for Service in the City of Prior Lake, Minnesota. Volume 13, Papers in Resource Analysis. 11pp. Saint Mary's University of Minnesota Central Services Press. Winona, MN. Retrieved (date) from http://www.gis.smumn.edu

After creating the single point crime map, all of the calls for service were associated with a location. They were then divided by neighborhoods and housing types for analysis.

Background

The City of Prior Lake (Figure 1) has an estimated 2009 population of 23,335 people and 8,653 households. The average household size was 2.69 people while the county average was 2.86. The 2000 census data showed that 93.93% of the population was White. It covers an area of 18.3 square miles (Metropolitan Council, 2011).

The median income was $89,400 and the 13 County Minneapolis-St. Paul Metropolitan Service Area (MSA) median was $65,100. Metropolitan Council 2009 estimates show 5,803 single family detached, 1909 townhomes, 202 duplex, tri-plex and quad, and 1033 multifamily (five units or more). The 2005 data showed 29% of generalized land use was for residential purposes (Metropolitan Council, 2011).

Software

The gathering, aggregation, analysis and formatting of data required several software products. Police calls for service data were downloaded with Microsoft Access utilizing an Open Database Connectivity (ODBC) connection to Scott County's New World System's records management module. Microsoft Excel was used to analyze and organize the calls for service and IBM's Statistical Package for the Social Sciences (SPSS) was used for statistical analysis. The geographic analysis, geocoding, aggregation, and summarization of the data were completed with ESRI ArcGIS Desktop 9.3.1 with an ArcView license.

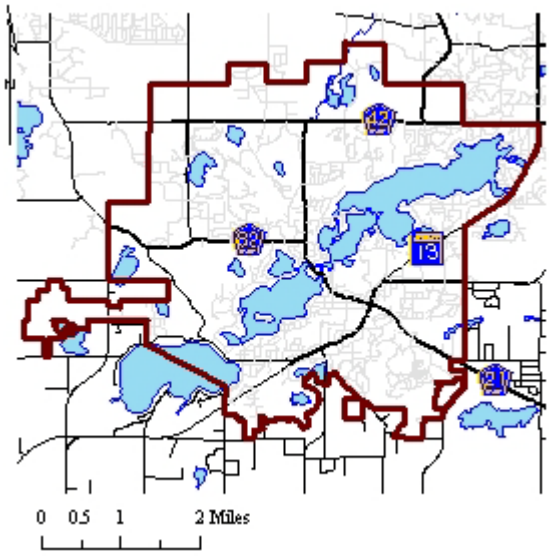

Figure 1. Prior Lake, MN.

Data

City Feature Data

The parcel polygons, Scott County street centerlines, proprietary street centerlines (The Lawrence Group (TLG) centerlines), lakes, streams and taxation data were obtained from the Scott County GIS Department and are maintained in the Scott County projection. The parcel data was clipped to the City of Prior Lake municipal boundary. Unique neighborhoods were created within the City based upon plat name.

Police Calls for Service Data

The police calls for service data were acquired from Scott County's New World System's records management module. Utilizing Microsoft Access, an ODBC connection was created and a SQL query

was run to extract only 2009 Prior Lake police calls for service. The data retrieved were date, ORI (originating police agency), incident number, incident type, house number, street name, street type, street direction, cross street number, cross street name, cross street type, and cross street direction.

10,047 records were returned and of those records, 1641 were intersection addresses. Figure 2 shows the 10,047 calls Prior Lake Police responded to in 2009.

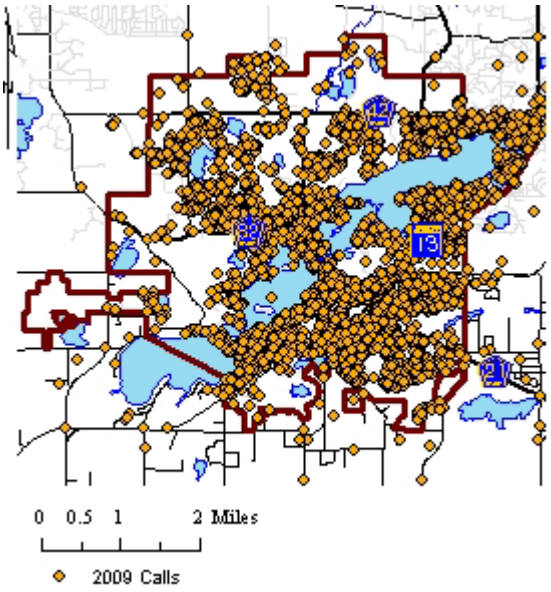

Figure 2. All Calls in 2009.

Figure 3 shows the 4,581 police calls for service to residential properties.

Taxation Data

Taxation data were acquired at the parcel level with unique Property Identification Numbers (PINs) allowing data to be joined to the parcel polygons. The following fields were included: property address, plat name and number, current year estimated market value total (CYEMVT), homestead status, land use classification, architecture code, and architecture description. These fields were utilized to create neighborhoods, total value per neighborhood, percent homesteaded (owner occupied), and residential classification.

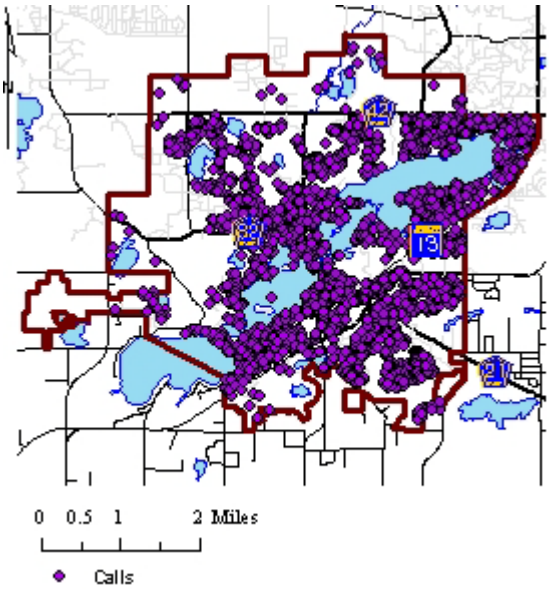

Figure 3. Calls to Residential Properties.

Preparation of data

Analysis was conducted by neighborhoods to help assure that analysis would compare similar house types, values, and ownership. Scott County does not maintain neighborhood information thus neighborhoods were created for this analysis. Utilizing the plat names that were assigned in the initial development of the land, parcels were manually sorted and assigned a unique number. The parcels were summarized by the unique number to create neighborhoods.

Each neighborhood was analyzed based upon percent homestead, average CYEMVT and total number of police calls for service. Total count of homesteaded properties divided by total parcel count

within a neighborhood gave percentage homesteaded. The values were summarized and then divided by total number of parcels in the neighborhood to determine average CYEMVT.

Police calls for service that were associated with intersections were not included in this study. Only calls for service that were clearly associated with a residential parcel were. The geocoded calls were summarized by the unique neighborhood code to determine the total number of police calls for service to each neighborhood.

Architecture descriptions were utilized to filter residential properties with homes. After the residential properties were extracted, they were further divided by architecture code to determine single family, duplex – triplex, townhome, twin home and multifamily housing. By dividing the residential properties by architecture code, potential correlation of the police calls for service to homesteaded homes and CYEMVT was undertaken. Figure 4 shows Single Family Residential properties; Figure 5 illustrates Townhome residential properties; Figure 6 shows Twin home and Duplex – Triplex residential properties.

Geocoding

An ODBC connection to Scott County's New World System's records management module was used to access police calls for service. Utilizing Microsoft Access, an ODBC connection was created and a SQL query was run to extract 2009 Prior Lake police calls for service. After the calls for service data were extracted, they were geocoded.

Scott County and TLG centerlines were used to create two US Streets with Zone address locator services. The Scott County parcels were clipped to the City of Prior Lake municipal boundary and another address locator service was created. From these three address locator services, a composite address locator service was created using parcels first, Scott County centerlines second, and TLG centerlines last.

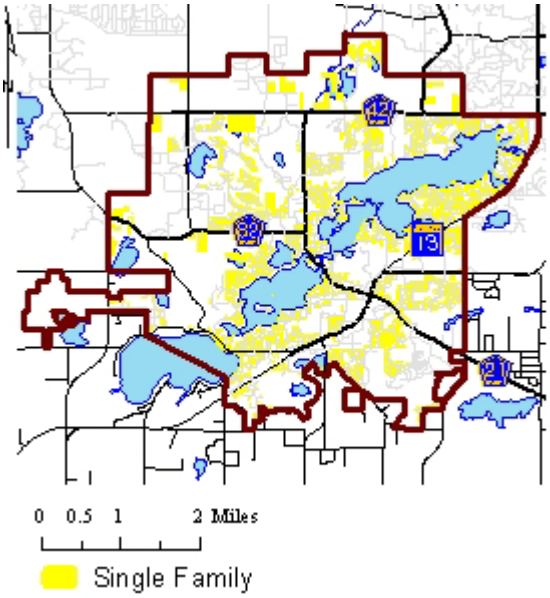

Figure 4. Single Family Residential Properties.

The geocoding process can be summarized by 5 basic steps. Preparing the data, specifying parameters, geocoding, reviewing results and finally determining whether the results are accurate enough or if another geocode is necessary (Geocoding in Law Enforcement, 2000).

The police calls for service data were received in a single address or intersection format.

The composite address locator service was able to match 98% of police calls for service.

Both centerline locators were offset 75 feet so that the calls would be

associated to a specific parcel. A large number of calls (490) for service did not fall within city boundaries. These calls were examined and determined to be support calls to other agencies and were excluded from this study.

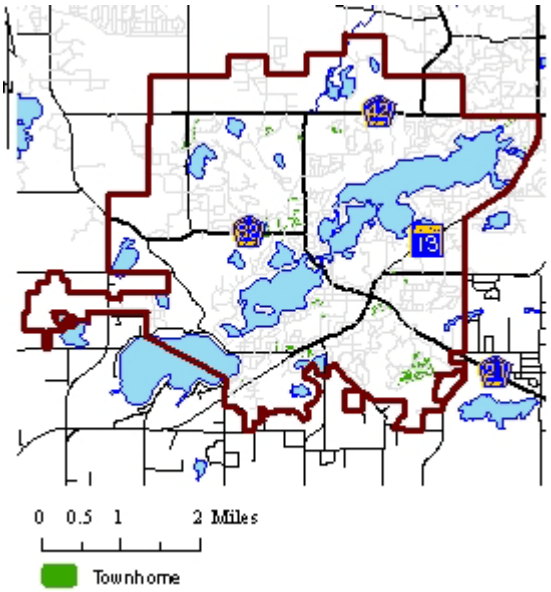

Figure 5. Townhome Residential Properties.

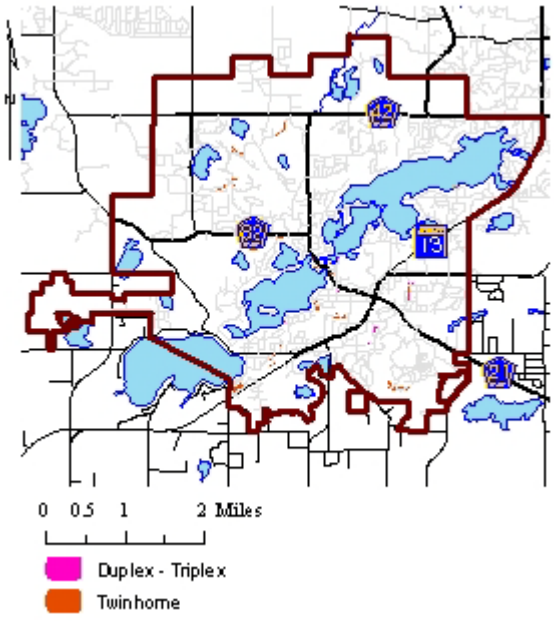

Figure 6. Twin homes, Duplex – Triplex Residential Properties.

The centerline datasets were not clipped to the city's boundaries. If the centerline data were clipped to the city's boundaries then the 490 geocoded police calls for service that fell outside the boundaries would not have geocoded and would not have achieved the 98% match. The goal was to reach a 95% match. According to Geocoding in Law Enforcement (2000), a 95% match is acceptable.

Unmatched Calls

99 of the unmatched calls were intersections. Some of the intersection locations were not intersections. They contained streets that did not intersect. Other unmatched intersections contained correct information but still did not geocode correctly. Since the study examined police calls for service to residential housing, these latter intersection incidents were not further examined. The majority of the remainder of the unmatched calls consisted of incomplete or invalid addresses such as “17400 BLK PANAMA”, “9150 169” and “FALCON CIR NW | DEAD END EAST”.

During the geocoding process, two building complexes were identified that needed to be manually corrected. Those were on Fawn Meadow Curve (Figure 7) and Tower Street (Figure 8).

The Fawn Meadow Curve’s issue was a spelling error. The spelling error caused the composite geocoder to use a centerline locator and not the parcel locator. After correcting the spelling error, the addresses geocoded correctly with the parcel locator.

The error with the Tower Street

area was that it was a multi-housing complex and did not follow a conventional numbering pattern. The police records management module used individual unit numbers for individual units. The county parcel records used one number for all units. The number discrepancy caused the composite geocoder to use a centerline locator and not the parcel locator. Also complicating the addressing issue, the addressing for Tower Street was not consistent with city addressing. In some cases odd and even numbers were on the same side of the street. To correct this error, the affected addresses were selected and exported to a new shape file. A new address field was added containing the single parcel address as listed in the county tax records. The new addresses were then geocoded and appended to the original shape file of police calls for service.

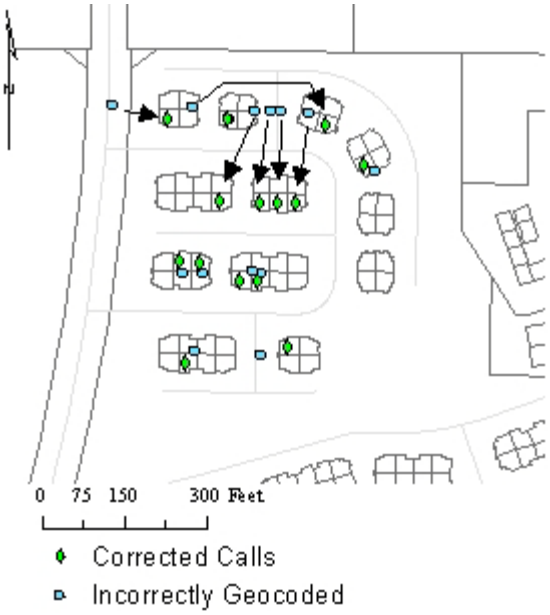

Figure 7. Fawn Meadow – Calls.

A significant amount of time was consumed formatting police calls for service prior to geocoding. The police records management system stores each address element in a separate field and had multiple street fields for an intersection. The first step was to concatenate parcel address elements into a single address field. Then, using if-then statements to identify intersections vs. parcel addresses, a final address field was created for geocoding.

Data Collection and Assembly

Scott County parcels were joined to taxation information to create neighborhoods, to group by architecture code, to determine ownership and finally to subdivide by property values.

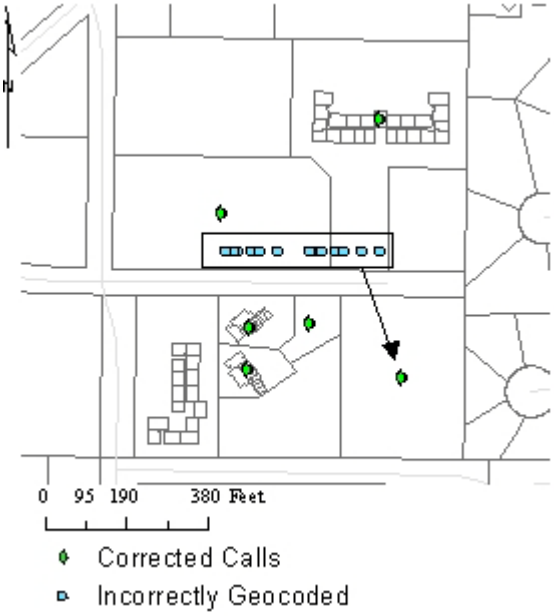

Figure 8. Tower Street – Calls.

Utilizing the parcel plat name and number, parcels were aggregated into 249 neighborhoods. This was achieved through a manual process of finding unique subdivision names and assigning a unique number and then summarizing the parcels

with this unique number for 249 neighborhoods (Figure 9).

Next residential parcels were subdivided by architecture code. Four categories, single family, townhomes, twin homes and multifamily were used for analysis.

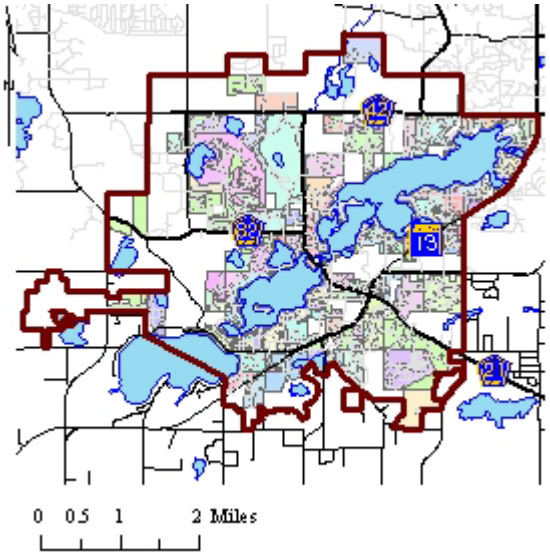

Figure 9. Prior Lake Neighborhoods.

Homestead status was used to determine owner occupied housing. One hypothesis was that police calls may be dependent upon whether the owner lived in the home or not.

Finally neighborhoods were used to determine the average home value (CYEMVT) per neighborhood. CYEMVT was summed and divided by the total number of parcels in each neighborhood.

When all variables were derived, it was possible to find the number of properties per neighborhood, types of dwellings per neighborhood, percent owner occupied per neighborhood and finally average value per neighborhood. Lastly, spatially matched calls per property were created and these then were able to be used to determine the number of calls per neighborhood.

Descriptive Statistics

Correlation and Regression

Single Residential Data Set

This data set included all parcels that contained homes and were classified as either residential or seasonal residential. The data set was subdivided into 200 neighborhoods based on how the parcels were platted during initial development. The numbers of homes in each neighborhood ranged from one to 295.

Correlation analysis showed there was no correlation between the average market value of the homes in a neighborhood and the number of police calls per parcel in the neighborhood. The correlation was ($r = -.041$) and ($p = .566$).

Correlation analysis also showed there was no correlation between the percentage of the neighborhood homesteaded and the number of police calls per parcel ($p = .610$).

Townhome Data Set

This data set included all parcels that contained townhomes. All parcels that were commonly owned by a home owners association were removed leaving only the buildings that were classified as townhomes. The data set was subdivided into 41 neighborhoods based on how the property was platted during initial development. The number of townhomes in each neighborhood ranged from one to 229. The average value of the individual townhomes by neighborhood ranged from $81,993 to $738,000.

Correlation analysis showed the

correlation was not significant between average market value of townhomes in a neighborhood and number of police calls per parcel containing a housing unit in the neighborhood (p = .374, r = -142).

Analysis showed there was a correlation between the percentage of the neighborhood homesteaded and the number of police calls per housing unit in the neighborhood (p = .001, r = -.483, r^2 = .233). As the percentage of townhomes homesteaded in a neighborhood increased, the calls per unit decreased. The r^2 value of .233 indicates the level of homesteading explained 23.3 percent of police calls (Figure 10).

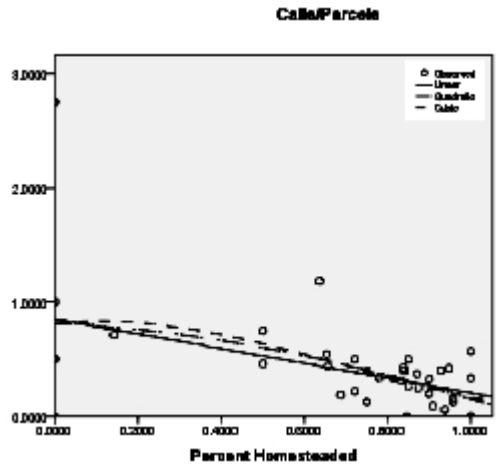

Figure 10. Townhome Calls.

Twin Home Data Set

This data set included all parcels that contained twin homes. All parcels that were commonly owned by a home owners association were removed leaving only the buildings that were classified as twin homes. The data set was subdivided into 21 neighborhoods by how the property was platted during initial development. The number of twin homes in each neighborhood ranged from one to 43. The average value of the individual twin home by neighborhood ranged from $126,700 to $708,550.

Correlation analysis showed the correlation was not significant between the average market value of the twin homes in a neighborhood and the number of police calls per parcel containing a housing unit (r = .145, p = .532). Analysis showed there was no correlation between the percentage of the neighborhoods homesteaded and the number of police calls per parcel containing a housing unit (p = .298, r = -239).

Multi-Housing

This data set contained all multi-housing buildings with more than seven units. It was analyzed two different ways, by building and by complex. The by building analysis viewed all the buildings individually. In the by complex analysis buildings that were part of the same complex were grouped together. There were 19 complexes with a total of 29 buildings.

A correlation analysis of police calls and the total number of units in a complex showed no significance (p = .212) (Figure 11).

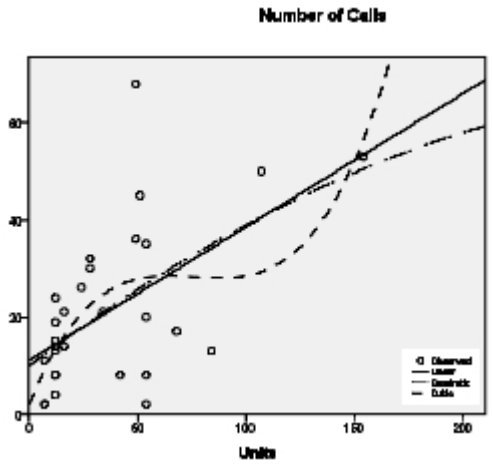

Figure 11. Multi-Housing Calls.

The correlation analysis of police calls and the total number of units by building showed significance (p = .002, r = .562). The r^2 of = .316 indicates building size explains 31.6% of police calls.

Analysis of Variance

The data set used for this analysis were all single family homes, townhomes and twin homes, and the number of police calls to each (Table 1).

Table 1. All Calls.

	N	Mean
Single	5786	0.510543
Town	1544	0.385363
Twin	302	0.470199
Total	7632	0.483622

The ANOVA showed significant differences in the means shown in the table above (p <= 0.0005).

The Tukey post hoc test showed single vs. townhouse were significantly different (p < 0.0003), single vs. twin home were not significant (p = 0.82) and townhome vs. twin home were not significantly different (p < 0.45).

T-tests

Data sets used for this analysis were all single family homes, townhomes and twin homes, and the number of police calls to each.

The test was used to compare the number of police calls for service to homesteaded and non-homesteaded properties (Table 2). The t-test showed there was a significant difference between these two groups (p < 0.00001). The mean number of police calls for service to a homesteaded property was 0.45 and 0.73 to a non-homesteaded property.

A t-test was also used to compare the market value of homesteaded and non-homesteaded properties (Table 3). There was no significant difference in market value between the two groups (p = 0.42).

Table 2. Homesteaded vs. Non-Homesteaded.

Group Statistics				
	Homestead	N	Mean	Std Dv
Count	Not Homesteaded	915	0.73	1.636
	Homesteaded	6717	0.45	1.029

Table 3. Homesteaded vs. CYEMVT.

	Homestead	N	Mean
CYEMVT	Not Homesteaded	915	303990.9
	Homesteaded	6717	309581.3

Correlation Between Property Values and the Number of Calls

A correlation analysis was also conducted between home values and police calls. The analysis showed no significant correlation (p = 0.84) (Table 4).

Conclusion

Analysis of single family neighborhoods showed no significant correlation between police calls for service and homestead status or the average value of the home. Analysis of twin home neighborhoods showed the same result.

Table 4. Property Values vs. Number of Calls.

		CYEMVT	Count
CYEMVT	Pearson Correlation	1	-0.00234
	Sig. (2-tailed)		0.837992
	N	7632	7632

The analysis of townhome neighborhoods showed there was correlation between the percentage of the neighborhood homesteaded and the number of police calls per housing unit in the neighborhood. The correlation was not significant between the average market value of the townhomes in a neighborhood and the number of police calls per parcel containing a housing unit in the neighborhood.

When evaluating single residential homes, twin homes, and townhomes as one group and using Analysis of Variance, there was a significant difference in the number of police calls for service between townhomes and the other two groups of housing (single residential and twin homes).

A t-test was used to compare all homesteaded and non-homesteaded properties. There was a significant difference between the mean number of police calls for service. Homesteaded properties had fewer calls. A t-test also showed there was not a significant difference in property value between these two groups.

There was also no significant correlation between property value and police calls for service.

In analyzing multi-housing, results were different when examining individual buildings and entire complexes made up of several buildings. Correlation analysis of complexes and police calls for service did not show significant correlation but analysis using individual buildings did show significant correlation.

Errors

There were 2 neighborhoods with a single twin home listed. This error lies with the taxation information. One twin home neighborhood has one of the twin homes listed as a townhome and the other neighborhood is a townhome neighborhood with one parcel incorrectly listed as a twin home.

There are two neighborhoods with a single townhome listed. The first was the same error as the above twin home. The second erroneous neighborhood had a twin home incorrectly listed as townhome. Both errors in neighborhood data were taxation information errors.

Suggestions for Further Study

This research has raised many questions that could be used for further study. One such future study could examine why one neighborhood has more calls than a neighborhood of similar make up. One would assume that neighborhoods of similar make up would receive the same number of calls yet in this study, this was not found true. Another example for further study would be to determine if it is

the geography or the people who make the difference between the number of calls per neighborhood. Elements such as race, income, homesteaded, or family size might increase or decrease the number of calls to a particular type of neighborhood. Finally another potential study could be one of examining properties with calls only utilizing homestead vs. non-homestead. The study of ownership versus rental property alone could fill a research paper.

References

FBI. 2011. *Uniform Crime Reporting Summary Reporting*. Retrieved February 24, 2011, from http://www.fbi.gov/about-us/cjis/ucr/frequently-asked-questions/ucr _faqs08.pdf.

Geocoding in Law Enforcement. August 2000. The Crime Mapping Laboratory, Police Foundation. US Department of Justice, Office of Community Oriented Policing Services.

Harries, K. 1999. *Mapping crime: principle and practice*. Retrieved February 24, 2011, from http://www.ncjrs. gov/pdffiles1/nij/178919.pdf.

Metropolitan Council. 2011. *Community Profile of Prior Lake*. Retrieved February 24, 2011, from http://stats.metc. state.mn.us/profile/detail.aspx?c=02396284.

.