

Age and Race Analysis of Block Groups within St. Paul, Minnesota, USA

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Abstract

The demographic composition of urban block groups has been shown to change from census to census. St. Paul, Minnesota, USA is no exception. This project utilizes U.S. Census information and Geographical Information Systems (GIS) to analyze demographic changes within block groups in St. Paul. Data from the 2000 and 2010 censuses will be analyzed to identify overall block group demographic characteristics. Age and race, the two variables that are examined, have demonstrated changes over time and can help describe the demographic make-up of a city.

Introduction

History of St. Paul

This research utilizes census information to analyze age and racial make-up within the city of St. Paul, Minnesota, USA by examining data from the 2000 Census and 2010 Census. These changes or consistencies will be displayed in visuals of areas that reflect this analysis.

St. Paul, Minnesota, situated along the Mississippi River and located in Ramsey County contains the state capital. It spans approximately 52 square miles in the east central part of the state.

St. Paul contains around 279 block groups. These block groups are divided among 17 different planning districts (Figure 1). Block groups make up neighborhoods that can be unique from one another in terms of demographic make-up and are useful to examine for this study. These planning districts are important in determining funding

allocation influenced by demographics and local needs.

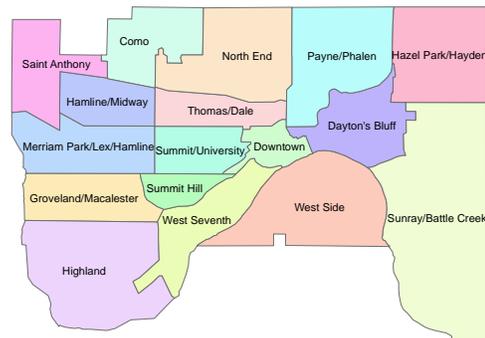


Figure 1. St. Paul Planning Districts.

The first known inhabitants of St. Paul were members of the Ojibwe and Sioux tribes. Fur trading, livestock, and meatpacking, along with multiple railways led to immigration from European countries such as Sweden, Norway, Denmark, Germany, and most notably, Ireland (Lee, 2013).

Later waves of immigrants came from countries such as Somalia and Laos.

In fact, St. Paul has one of the highest Hmong populations of any urban area in the United States. The city's neighborhoods are showing increased diversity. It is estimated there are over eighty different languages spoken in St. Paul public schools (Lee, 2013).

For much of St. Paul's history, industrial manufacturing was the main industry. Currently, the largest employers in the city are government and healthcare. Ford motor company had an assembly plant in St. Paul, but production slowed during the 2000s and the plant eventually closed. St. Paul is also home to the corporate headquarters for 3M. Along with these industries, St. Paul has the second most higher-educational institutions per capita. St. Paul, once known for meat packing plants and livestock is now known for education and culture (Lee, 2013).

The U.S. Census is mandated by the Constitution to count every resident of the United States every ten years. The Census is important for cities such as St. Paul so it can receive its share of federal funding. This funding is spent on services such as schools, hospitals, emergency services, transportation, and other public works (U.S. Census Bureau, 2014).

The primary focus of this paper was to examine age and race from 2000 to 2010 by analyzing census data. According to Jurejevech and Plane (2009), people tend to move to different types of settings depending on their age or stage of life. For example, young adults tend to live in urban areas, while adults with children tend to live in suburban areas. When children are grown and move out of the house, these parents, now known as "empty nesters," tend to move back to more centralized areas, i.e. urban neighborhoods. Age analysis is an appropriate demographic to consider when studying urban neighborhoods.

Race is also an important factor to consider when analyzing demographics within St. Paul. Immigration is more likely to occur in urban areas and causes cities to become increasingly more ethnically diverse (Holloway and Martin, 2005).

This research examines how the age and race of St. Paul's block groups have changed from one decennial census to the next and whether St. Paul is following suit with trends that have been noted by studies at other locations. It will also show where higher concentrations of people fitting a particular demographic based on age and race inhabit in the city.

GIS (Geographic Information Systems) provide an excellent tool for demographic analysis. Combining census population data with TIGER/Line shapefiles (Topologically Integrated Geographic Encoding and Referencing) allows the opportunity to join raw census data with visual shapefiles and display them in map form (Briggs, Qiu, and Woller, 2003). Using GIS to analyze neighborhoods provides a multidimensional view using data that is visual and possibly interrelated (Talen, 2007).

Methods

Data Acquisition

Demographic data for this project were obtained from American FactFinder found on the U.S. Census website. The American FactFinder allows access to data about the United States from several different censuses. Map data was acquired through the use of TIGER/Line shapefiles. The U.S. Census Bureau describes TIGER products as spatial extracts from a Census Bureau database, containing features such as roads, railroads, rivers, as well as legal and statistical geographic areas. TIGER/Line shapefiles are the U.S.

Census's most comprehensive dataset designed for use with GIS and are the best options for most mapping projects. Age data was obtained by first selecting it from a list of topics provided on the FactFinder website. The same method was used for obtaining race data. Once the topic or topics were selected, the geographies were determined. In this case, block groups within Ramsey County were selected. When the topics and geographies were selected, numerous tables were created. These tables were examined to determine which were the most pertinent for this research. These tables were then formatted for use in ArcGIS and joined with TIGER/Line shapefiles. TIGER/Line shapefiles were found on the U.S. Census Bureau's website and were downloaded by selecting the required geographies. The shapefiles were then viewed in ArcGIS (Figure 2). Joining the census data to the shapefiles provided a clear visualization of the characteristics of each block group.

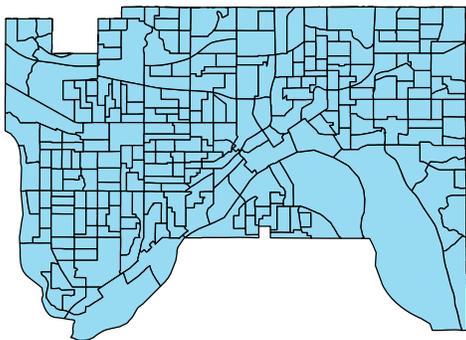


Figure 2. St. Paul block groups 2000 TIGER/Line Shapefile.

It should be noted there were some minor boundary changes to block groups within St. Paul from the 2000 to 2010 census (Figure 3). These changes did not seem to combine contrasting areas that would skew any of the demographic changes between the two censuses.

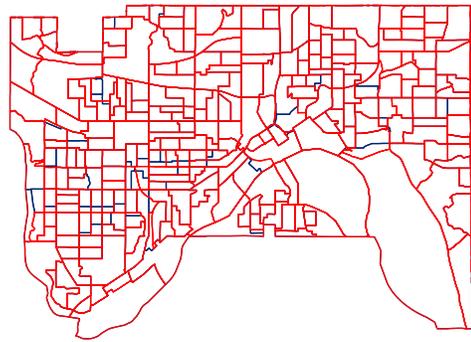


Figure 3. Block Group Boundaries 2000 (in red) and Changes to Boundaries in 2010 (in blue).

When performing a city-wide neighborhood analysis, block groups are the smallest area that can be examined and therefore are the most appropriate level to use here. Analyzing at the city level can provide overall demographics of the city, but it does not illustrate differences between specific neighborhoods (Schlossberg, 2003).

The U.S. Census defines block groups as statistical divisions of census tracts, generally defined to contain between 600 and 3,000 people, and are used to present data and control block numbering. St. Paul consists of 279 block groups.

This study examines the overall changes or consistencies in median age and racial make-up in St. Paul and examines how these changes are reflected among block groups. Rather than decomposing each block group by its particular demographic make-up, this project will provide holistic analysis of block groups to show how these block groups appear in each of the censuses.

Age and race data from both censuses were combined to form one table for each demographic variable. These tables were then normalized in ArcMap to clearly show visual changes from one census to the next. Changes were then classified based on significance.

Age data was further examined using a two-tailed paired samples t test in Microsoft Excel.

Results

St. Paul’s overall population decreased from 2000 to 2010 by a little over 2000 people (Table 1). This overall change was analyzed further based on age and race variables.

Table 1. Total Population of St. Paul for 2000 and 2010.

Year	Pop.	Change	% Chg.
2000	287151	-----	-----
2010	285068	-2083	-.73

Age Analysis

Median age is defined as the age that divides a population into two numerically equal groups. This means 50% of the people are younger and 50% are older. It is a single index summarizing the age distribution of a population. The overall median age in St. Paul increased by about 2 years from 2000 to 2010 (Table 2).

Table 2. St. Paul Median Age for 2000 and 2010.

Year	Median Age
2000	35.3
2010	37.2

Figure 5 depicts each block group throughout St. Paul classified by its own individual median age group based on data from the 2000 Census. No block groups had a median age over 66 years in the 2000 Census.

Figure 6 shows median age groups results for block groups from the 2010 Census. In 2010, no block groups contained a median age over 55 years.

The median age distribution throughout the city shows older populations (age groups within 35 to 66

years) living in block groups found around the outer edges of St. Paul. This trend was consistent in both censuses. The younger populations (age groups within 0 to 34 years) tended to live more frequently in block groups within the inner city. The majority of the youngest populations (age groups within 0 to 24 years) were found in clusters near downtown and areas around colleges or universities.

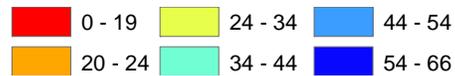
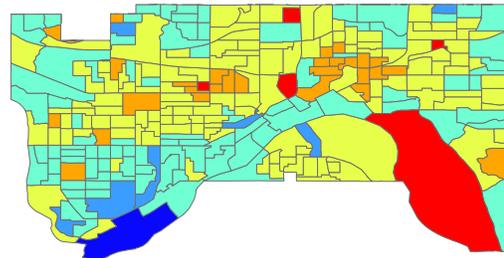


Figure 5. Median Age by Block Group – 2000.

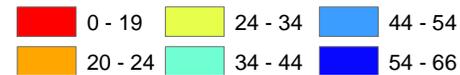
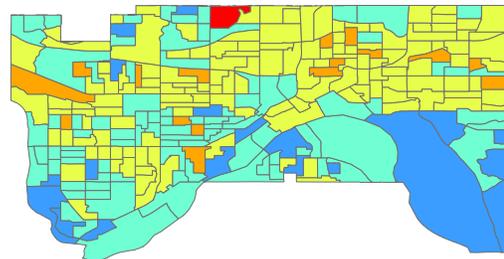


Figure 6. Median Age by Block Group – 2010.

Further analysis was conducted to examine the median age change among block groups. When comparing block groups from 2000 to 2010, there were only two block groups that did not experience change in median age. Figure 7 illustrates median age increase or decrease among block groups from the 2000 to the 2010 Census. Although block groups were found to be clustered together based on

either median age increase or decrease, there was, however, a relatively even distribution throughout the city.

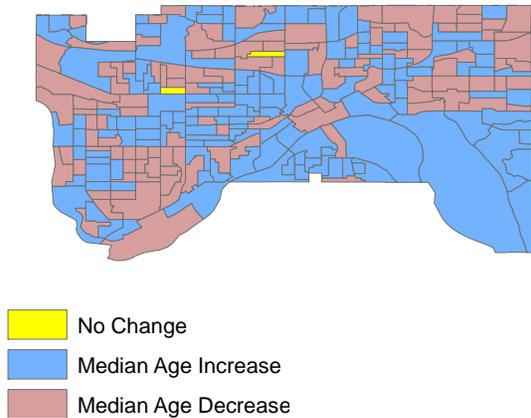


Figure 7. Block groups showing median age increase or decrease from 2000 to 2010.

Changes in the median age among block groups for the most part were fairly insignificant, i.e. less than 10 years. Changes of less than 10 years would reflect either the same people living in the block group from one census to the next or a consistent age group demographic moving to these areas. For example, block groups near colleges or universities would tend to hold a particular age group from census to census.

Block groups were subdivided further to determine the significance of their median age group changes (Figure 8). Based on this analysis, very few block groups underwent significant age group changes. There were some block groups that did show changes. These block groups in Figure 8 are highlighted in dark blue for significant age increase and dark red for block groups which had significant age decreases.

Age Statistical Analysis

A paired sample t test was performed to further examine statistical changes in age data from 2000 to 2010 among block

groups. A paired sample t-test was used to determine whether there was a significant difference between the average values of the same measurement made under two different conditions.

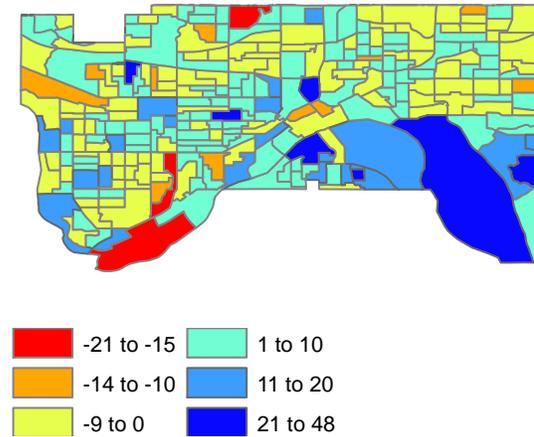


Figure 8. Significance of Median Age Group Change from 2000 to 2010 Census in Years.

In this case, the means of the median ages from 2000 and 2010 were examined to see if there was any statistical significance. The null hypothesis made in this case was that median ages in 2010 were equal to median ages in 2000. The alternative hypothesis was that median ages from each census were not equal, or more specifically, median ages from 2010 were higher than those from 2000. Median ages from 2010 for each block were used as the first variable while median ages from 2000 were used as the second. The testing was conducted for “0” difference. The necessary information was calculated using data analysis in Microsoft Excel. The data showed a t statistic of 2.95 which meant that the results are occurring 2.95 standard errors away from the mean. The critical t value needed to reject the null hypothesis was 1.97. The t statistic was higher in this case; therefore the null hypothesis was rejected. In other words, the means are not equal and median ages from 2010 were higher (Table 3).

Table 3. Paired sample t test results.

	Median Age 2010	Median Age 2000
Mean	33.63	32.20
Variance	50.47	45.54
Observations	279	279
Degrees of Freedom	278	
t Statistic	2.95	
P(T<=t) two-tail	.0034	
t Critical two-tail	1.97	

Race Analysis

The U.S. Census describes its racial categories as a reflection of the social definitions of race rather than an attempt to define race (U.S. Census, 2014). This can lead to people describing their race differently from census to census. The Census Bureau complies with the 1997 Office of Management and Budget (OMB) standards on race.

St. Paul showed signs of greater diversity in the 2010 Census (Table 4).

Table 4. Percent of Total St. Paul Population for 2000 and 2010.

Race	2000	2010
White	67.0%	63.5%
Black	11.7%	18.0%
American Indian or Alaska Native	1.1%	2.4%
Asian	12.4%	16.0%
Hawaiian and other Pacific Islander	0.1%	0.2%
Some Other Race	3.8%	4.6%

The percentage of people who classified themselves as White decreased by 3.5%. In turn, people identifying themselves as Black increased significantly from 11.7% in 2000 to 18% in 2010. Those identifying as Asian or some other race also saw an increase. American Indian or Alaska Native and Hawaiian and other Pacific Islanders saw their percentages double from 2000 to 2010.

Block groups were analyzed to determine which areas had the greatest concentrations of each race and which areas showed signs of increase or decrease of each particular race. Figure 9 shows block groups based on which race held the highest percentage of the population from the 2000 Census. Only White, Black, and Asian races were found to hold a majority percentage of the population in block groups.

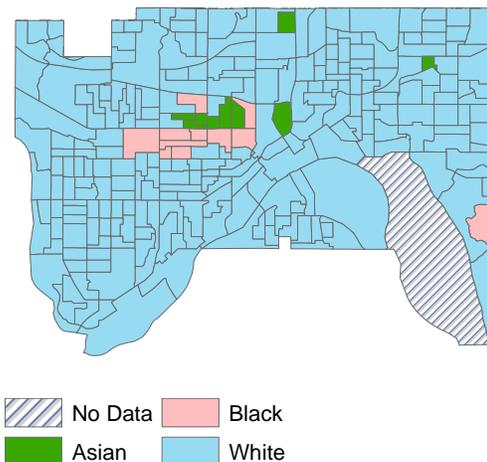


Figure 9. Block Groups by Race Holding Highest Percentage of the Population, 2000.

Most of the block groups showed White groups as holding the highest percentage of the population. Black groups showed the highest percentage in a cluster of block groups located near the center of the city. Block groups with high percentages of Asian groups were spread throughout the city with the exception of one area of block groups located near the

cluster of block groups with a high percentage of Black groups. This signifies the most diverse area of St. Paul and is found within what is known as the Midway section of the city.

In 2010, White, Black, and Asian were again the only race categories to hold a majority percentage of the population within block groups (Figure 10). Once again, White groups held the majority of the block groups. Block groups with high percentages of Black groups shifted toward the Western edge of the city. Asian groups made up the highest percentage in blocks groups spread sporadically throughout the north and central parts of the city.

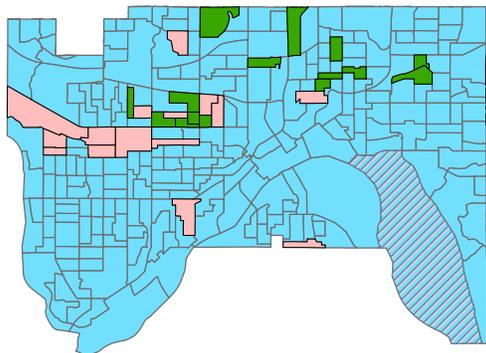


Figure 10. Block Groups by Race Holding Highest Percentage of the Population, 2010.

Further analysis was conducted to determine how each racial category fared throughout each of the block groups. Maps were created to portray which block groups gained or lost in percentage of each racial category. Figure 11 shows how block groups changed in percentage of White either increasing or decreasing from 2000 to 2010.

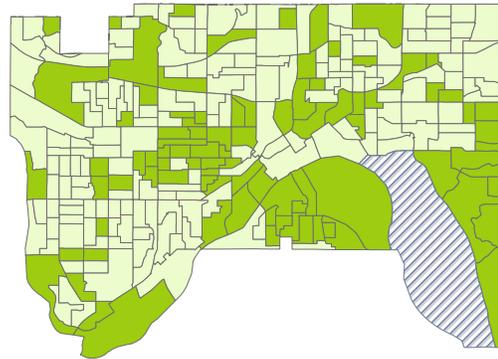


Figure 11. Block Group Change in Percent White from 2000 to 2010.

When compared to other racial categories, percentages of White groups within block groups showed a decrease more often. Areas of increase were clustered together as well as areas of decreased percentage.

Figure 12 depicts Black groups. Black groups showed an increase in percentage in more block groups than not. Once again, areas of increase or decrease were clustered together based on similarity. The areas that showed an increase in Black group percentages reflect inversely the areas showing decrease in White group percentages.

Figure 13 shows percentage increase in block groups for American Indian or Alaska Native. The percentage of this racial category doubled throughout the entire city of St. Paul. This increase in percentage is spread among block groups throughout the city. The patterns of increase and decrease are similar to the patterns shown with Black groups.

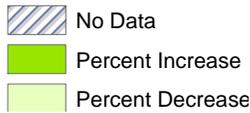
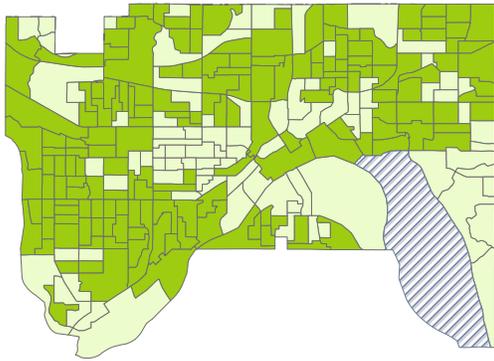


Figure 12. Block Group Change in Percent Black from 2000 to 2010.

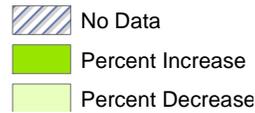
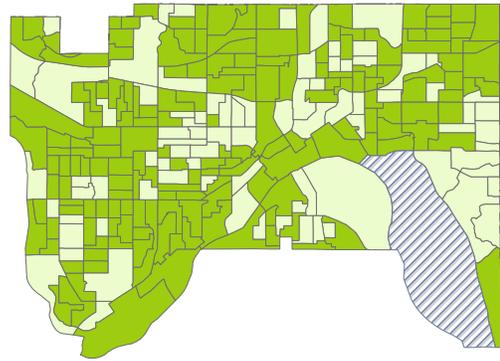


Figure 14. Block Group Change in Percent Asian from 2000 to 2010.

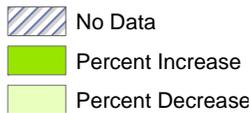
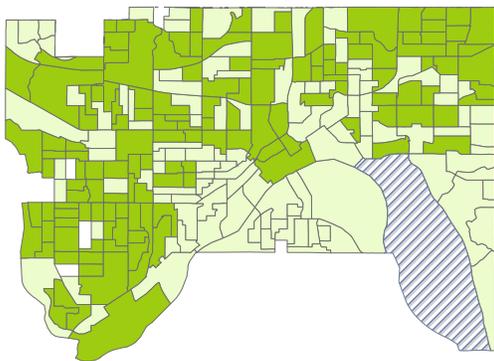


Figure 13. Block Group Change in Percent American Indian or Alaska Native from 2000 to 2010.

Figure 15 shows data for Native Hawaiian or Other Pacific Islanders. This particular racial category comprised a very small portion of the overall population (.1% in 2000 and .2% in 2010). There were block groups that displayed no change from 2000 to 2010.

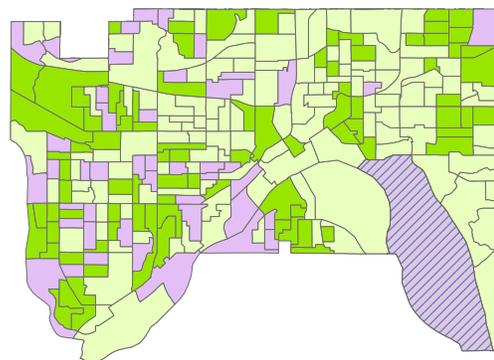


Figure 15. Block Group Change in Percent Native Hawaiian or Other Pacific Islander from 2000 to 2010.

Figure 14 shows how Asian groups changed within block groups from 2000 to 2010. These changes are also similar to the changes found in the Black and American Indian or Alaska Native groups.

These block groups have no Native Hawaiian or Other Pacific Islander groups making up their population. It is important to note however, the overall percentage within St. Paul, though quite small doubled over the ten-year period.

The final figure displays percentage changes in those who identify themselves as some other race (Figure 16). Block groups showing increased or decreased percentages among this racial category were similar to the patterns shown among the other minority racial groups with the exception of Native Hawaiian and Other Pacific Islander groups.

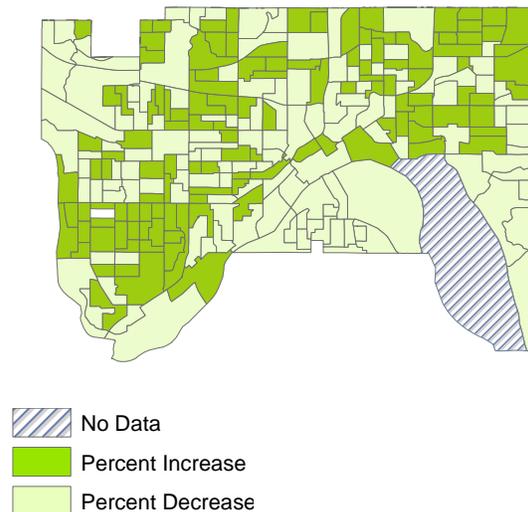


Figure 16. Block Group Change in Percent Some Other Race from 2000 to 2010.

Conclusions

St. Paul is a dynamic and changing city. This research shows the city's composition based on age and race at the block group level. The results of this research have raised other questions as well. Why have certain block groups undergone significant changes in age and racial composition? In block groups around colleges and universities the median age showed a trend of rising from the 0 to 19 age group in

2000 to the 20 to 24 age group in 2010. Does this reflect a change in demographics among higher education institutions? Were block groups that showed a significant increase into the eldest age groups a result of retirement communities arising in these areas? Block groups that showed an increase in residents ages 0 to 19 years may indicate families are having more children in those areas.

In analyzing the racial composition it was found that block groups where the percentage of white groups decreased, the other race groups increased. Research has shown that minority groups tend to live in more integrated areas while white groups tend to live in more segregated areas (Clark, 2009). This trend was noted in this analysis.

Further analysis may include, but not limited to looking at different variables within block groups in St. Paul. Variables such as income level, drive time to work, and owner versus rental properties are all important in describing the people who live in the city of St. Paul.

Additional research might also include further examination of the block group demographic make-up based on age and race and looking at what external factors may be contributing to any changes or consistencies found among the city. It would be interesting to look back throughout earlier censuses to see how demographic changes compare to the research in this project. Knowledge of demographics is important to city policy makers so they can plan accordingly when allocating funds within each of the planning districts. Block group analysis is important to understand the composition of the city on a small scale.

GIS has proven to be an effective tool in analyzing block groups. When looking at the high number of block groups in St. Paul (279) it is much more

effective to visualize changes on a map rather than looking at the raw data in tables.

Acknowledgements

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