

PALS: Neighborhood Identification, City of Frederick, Maryland

David Boston

Razia Choudhry

Chris Davis

Under the supervision of Chao Liu

University of Maryland

School of Architecture, Planning & Preservation

URSP688L: Recent Developments in Urban Studies: Planning Technologies

Fall, 2014

PALS—Partnership for Action Learning in Sustainability

A National Center for Smart Growth initiative at the University of Maryland

Gerrit Knaap, Executive Director

Uri Avin, PDC Director



Contents

Executive Summary	3
Introduction	3
Research Questions	4
Process Overview	5
Data Collection	6
Grouping Analysis	7
Methodology	7
Results	9
Survey Instrument	9
Recommendations	10
Appendix	11
Figure 1: Grouping analysis output at the block group level	11
Figure 2: Grouping analysis output at the Census tract level	12
Figure 3: Union of the block group and Census tract grouping analyses	13
Figure 4: Union output with aesthetic and contextualizing map elements	14
Figure 5: Grouping analysis report variable summary box plots	15
Figure 6: Grouping analysis report variable details and distribution	16
Figure 7: Individual variable output on median household income	17
Figure 8: Individual variable output on percentage of renters	18

Executive Summary

This report aims to address questions on changing socio-economic and physical conditions in Frederick and how those conditions could be formulated into a new neighborhood identification system. This report recommends that Geographic Information Systems (GIS) mapping, online surveys and photo sharing applications are some solutions for creating such a neighborhood identification system. While these planning technologies provide multiple ways or “layers” to define neighborhood boundaries, survey distribution is necessary to contextualize the quantitative results of the analysis.

Introduction

This study focuses on the ways in which different planning methods can be used to develop and improve a neighborhood identification system in The City of Frederick. Our three-student group developed this project during the Fall, 2014 semester as a part of a graduate level course in the Urban Studies and Planning Program at the University of Maryland. The course, Planning Technologies, explored several established and developing technologies that planners are increasingly using within the field. These technologies include Geographic Information Systems (GIS), online surveys and social media platforms such as Twitter and Facebook.

In considering the inquiry from the City of Frederick to create a neighborhood identification system, our student group founded its study approach based on a site visit to Frederick. At the beginning of our project, our group attended a bus tour hosted by City of Frederick planners that illustrated the demographic change underway. For example, southwestern areas of the City like the Golden Mile have seen a large increase in Latino and Hispanic populations. With this awareness of change the project was designed predominantly to focus on GIS planning technology.

Research Questions

To further research these changes in the City, our research questions focused on examining the City's change over time using US Census Bureau data. Specifically, research questions were, "How has the City of Frederick changed from 2000 to 2010?" Also, "How do we begin to create a neighborhood identification system for the City?" Finally, a third question revolved around thinking beyond the GIS analysis and more about the people and places of Frederick. This question was, "How do people perceive their neighborhoods?"

To answer these questions, our group used GIS to not only analyze the changing conditions in Frederick based on a number of US Census variables, but we also used the GIS Grouping Analysis tool to create a neighborhood identification system. The Grouping Analysis tool operates by grouping geographic areas based on similarities and also on differences from other geographic areas. When referring to similarities and differences, we are referring to data from US Census variables. GIS takes into account all of the variables examined, and creates spatial groupings based on the data.

While our group considered Grouping Analysis to be an advantageous tool in conceiving neighborhood identification, we also recognized the value of acquiring more qualitative data, to understand how people perceive space and their neighborhood. Throughout the project, our group continually dealt with the questions of, "Do people in Frederick understand their physical neighborhood in different ways? How do they define their neighborhood? Is it their block? Is it their street?"

Process Overview

Since the class dealt primarily with GIS, our project followed with an emphasis on spatial analysis. The process started with collecting data collection and preparing it for processing. Initially, we chose four variables to analyze—tenure, race, vacancy and household income. The purpose of choosing only four variables was twofold. We hypothesized that, given the City’s demographic changes mentioned in the site visit, the chosen variables might be the best indicators of such change between 2000 and 2010.

More importantly, the effort of choosing only four variables initially allowed us to work through some data processing errors that often arise when using large datasets. For example, when importing datasets through Microsoft Excel spreadsheets into GIS, it is sometimes challenging to find matching fields in the imported data set and the map shapefiles. These are the subtle nuances that are part of the process of analyzing data in GIS. Through the iterative process of importing variable data and working through errors, we became more comfortable adding more variables.

The survey took form toward the end of the semester. As a part of our class curriculum, our group learned about surveying and strategies to elicit public participation in surveys. For example, we learned that monetary rewards attached to surveys can be incentives for responding. For our particular survey, we planned to distribute online surveys through the City website or social media pages of Frederick nonprofit organizations. However, and as noted earlier, because of time constraints, we were unable to conduct the survey online or in person. However, our group believed that the survey could aid in the GIS analysis by directly engaging people instead of data. For example, survey questions included, “How long have you lived in Frederick? Have you attended any neighborhood events in the last year? How do you define your neighborhood?” These questions were all multiple-choice and were closed-ended, offering no “other” option or opportunities to further explain answers. This was done so respondents could easily answer the survey. While we did not engage people with the survey, our group believed that such a

survey could help the City in their effort to identify neighborhoods, but more importantly, it would include people in the planning process.

Data Collection

The data used to analyze the neighborhood changes in The City of Frederick was gathered from various sources. The parcel data used to delineate City boundaries was provided directly from The City of Frederick and distributed through the Enterprise Learning Management System (ELMS). Our group downloaded the polygon files for block groups and census tracts through the US Census Bureau's TIGER interface. We downloaded the data used in our analysis through the US Census Bureau's American FactFinder interface.

Multiple variables were used to conduct the analysis. From block group data, we used vacancy, tenureⁱ and race. From census tracts, we chose: educational attainmentⁱⁱ, whether the resident lived in the same house one year ago, the percentage of foreign born residents, the unemployment rate, median household income and the percentage of individuals living below the poverty level. The combination of these variables helped analyze how City neighborhoods have changed between 2000 and 2010.

There was also a limited amount of anecdotal survey response data collected from residents. In total, we received three responses, and only one of the respondents actually lived within The City of Frederick municipal boundaries. So, for the purpose of our analysis, these data were not used.

ⁱ This is measuring whether the residential unit is rented or owner-occupied.

ⁱⁱ This is the percentage of residents with a Bachelor's degree or higher.

Grouping Analysis

Methodology

Grouping analysis is a relatively new tool included in version 10.1 of ArcMap. It allows researchers to include a wide variety of significant variables in the identification of spatial “groups,” and to create boundaries based on those variables. The boundaries are calculated to delineate groups that are as similar as possible internally and as different as possible from the other groups, based on the variable values included in the analysis.

In this type of analysis, it is immediately apparent that linking data to smaller geographic units allows the grouping analysis to be more specific about where the boundaries are drawn, thereby giving more accurate results. For this reason, our group started with data that could be extrapolated at the block group level.

To begin, we downloaded block group shapefiles from the US Census Bureau for Frederick County from both 2000 and 2010, to show change over time. We then added these layers to ArcMap and clipped the shapefiles based on the polygon layer comprising all parcels within the municipal boundaries of The City of Frederick, a layer provided by the City. We saved these new layers, which included only 2000 and 2010 block group boundaries within the City limits, and excluded all other Frederick County block groups, into a geodatabase created for and used throughout this project.

Variable data available at the block group level are relatively limited in scope, and we used vacancy, tenureⁱⁱⁱ, and race. We cleaned the formatting of variable data downloaded through the US Census Bureau’s American FactFinder interface in Microsoft Excel to ensure that it would not create errors in ArcMap. We then joined

ⁱⁱⁱ This is measuring whether the residential unit is rented or owner-occupied.

the Excel files that included variable data from both 2000 and 2010 to the block group polygon layers in ArcMap.

To run the grouping analysis, we used ArcMap’s “Grouping Analysis” tool. We included the three block group variables, set the grouping analysis to work even without contiguous boundaries^{iv} and generated a map and a report of analysis results. The map creates as many groups as the user specifies, each in a different color^v. The colors are meaningless, as these groups are nominal in nature.

The grouping analysis methodology also included US Census Bureau data collected at the tract level. Our method for tract level data was the same as our method for block group data, but with a more expansive scope. We were able to collect data on educational attainment^{vi}, whether the resident lived in the same house one year ago, the percentage of foreign born residents, the unemployment rate, median household income and the percentage of individuals living below the poverty level. We then ran a grouping analysis for these data as well^{vii} and generated a separate grouping analysis report.

With both of our grouping analyses completed, we used the “Union” tool in ArcMap in order to merge the two neighborhood identification methods into an output that represented spatially contiguous neighborhoods with different values from the surrounding areas in either the block group or the Census tract level. The resulting output looks less like an academic exercise and more like the representation of actual neighborhoods^{viii}.

^{iv} This was necessary, because the City includes several noncontiguous areas due to both patterns of annexation and gaps between parcels in ArcMap as a result of wide transportation right-of-ways.

^v Please see Figure 1 in the Appendix.

^{vi} This is the percentage of residents with a Bachelor’s degree or higher.

^{vii} Please see Figure 2 in the Appendix.

^{viii} Please see Figures 3 and 4 in the Appendix. Figure 4 shows the same output, but with some aesthetic and contextualizing elements added to the map in order to make the output more viewer-friendly.

Results

One of the most interesting parts of the grouping analysis is the report generated with the map results. The map shows how the area is split into groups that were the most internally similar and externally different, but the report shows why the groups split in the way they did by identifying which variables drive groups apart^{ix}. It highlights what makes City neighborhoods different, how the individual variables are split between neighborhoods^x and what the character of each individual group actually is.

From the reports, we concluded that median household income and tenure are the variables most influential in the grouping analysis, indicating sharp divides between different areas of the City. The grouping analysis report helped identify variables that were more spatially significant in dividing the City than other variables, and the report can be used to create aesthetically interesting and intuitive outputs showing how the City is broken up based on both median household income^{xi} and housing tenure^{xii}.

Survey Instrument

While the survey was not a large part of our project, it should be a large part of the City's neighborhood identification system in the future. The grouping analysis is a powerful and interesting tool, breaking the City into different areas based on quantitatively measurable variables. However, not everything is quantitatively measurable, something that any quantitative researcher has to recognize. It is essential that grouping analysis findings are complemented and reinforced by the qualitative public input on how and where they perceive their neighborhoods. While the grouping analysis may very well be able to pinpoint similar areas and draw rough boundaries based on those characteristics, the fine determination of where

^{ix} Please see Figure 5 in the Appendix.

^x Please see Figure 6 in the Appendix.

^{xi} Please see Figure 7 in the Appendix.

^{xii} Please see Figure 8 in the Appendix.

exactly neighborhoods start and end may exist solely in the spatial imaginations of City residents.

A [survey](#) instrument was designed to gather some of this qualitative information^{xiii}. The City may use this survey if they choose, or they could alter it to more specifically serve their needs before distributing it to the public.

Recommendations

The project team recommends that The City of Frederick use techniques as described in this report to determine which areas form cohesive neighborhoods with distinct senses of place. The City could use these neighborhood definitions when organizing future planning efforts to identify how needs vary in different neighborhoods.

We recommend the City integrate different types of technological tools to observe the demographic changes in Frederick's neighborhoods. For instance, the City could offer photo-sharing opportunities for its residents, such as Flickr. On its website, the City can dedicate space where people can upload pictures of their neighborhoods from both the past and present, to highlight the ways in which the City has changed over time. This way, the City government can get a sense of how people view their neighborhoods, and the changes that have occurred over time.

In addition to distributing a survey, the project team recommends gathering other sorts of qualitative data to contextualize and refine the results of the grouping analysis further. Information could include walkability, connectivity and urban form. Qualitative information multiplies the value of the grouping analysis and the survey, and could combine to form meaningful and legitimate boundaries useful for a wide array of planning efforts.

^{xiii} The survey can be found at the following link: <http://goo.gl/forms/UQp5iyxP6l>

Appendix

Figure 1: Grouping analysis output at the block group level

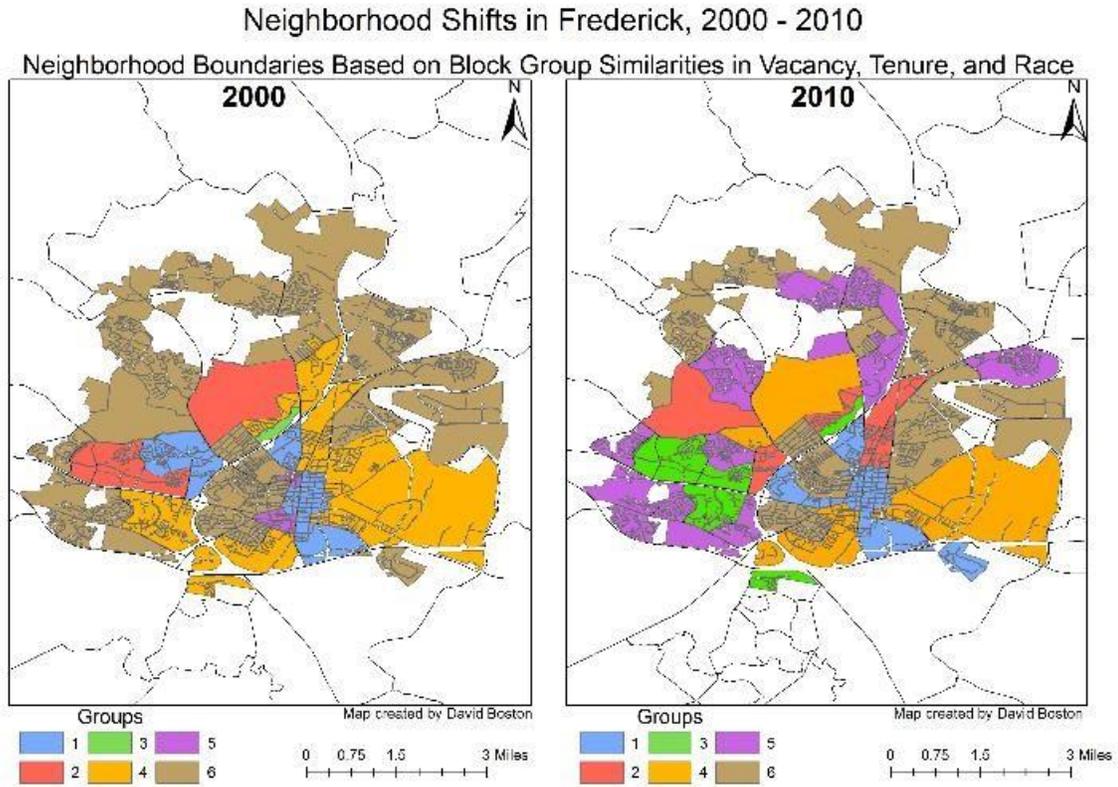


Figure 2: Grouping analysis output at the Census tract level

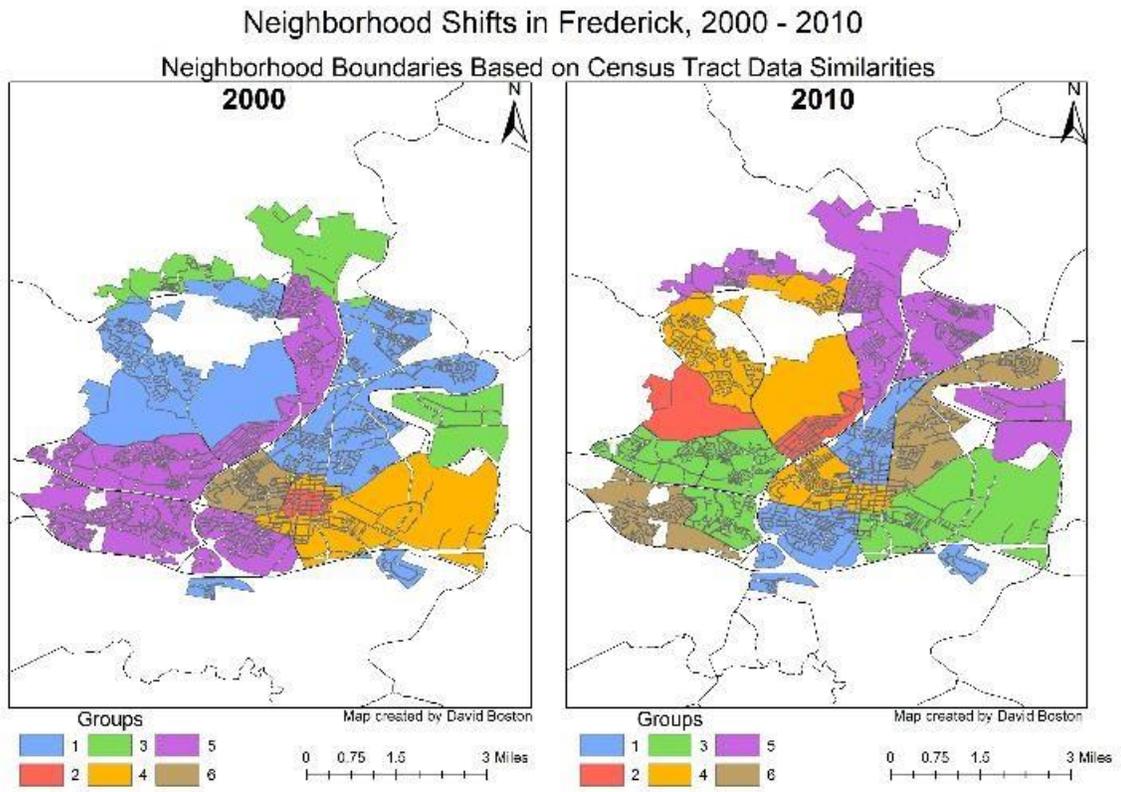


Figure 3: Union of the block group and Census tract grouping analyses

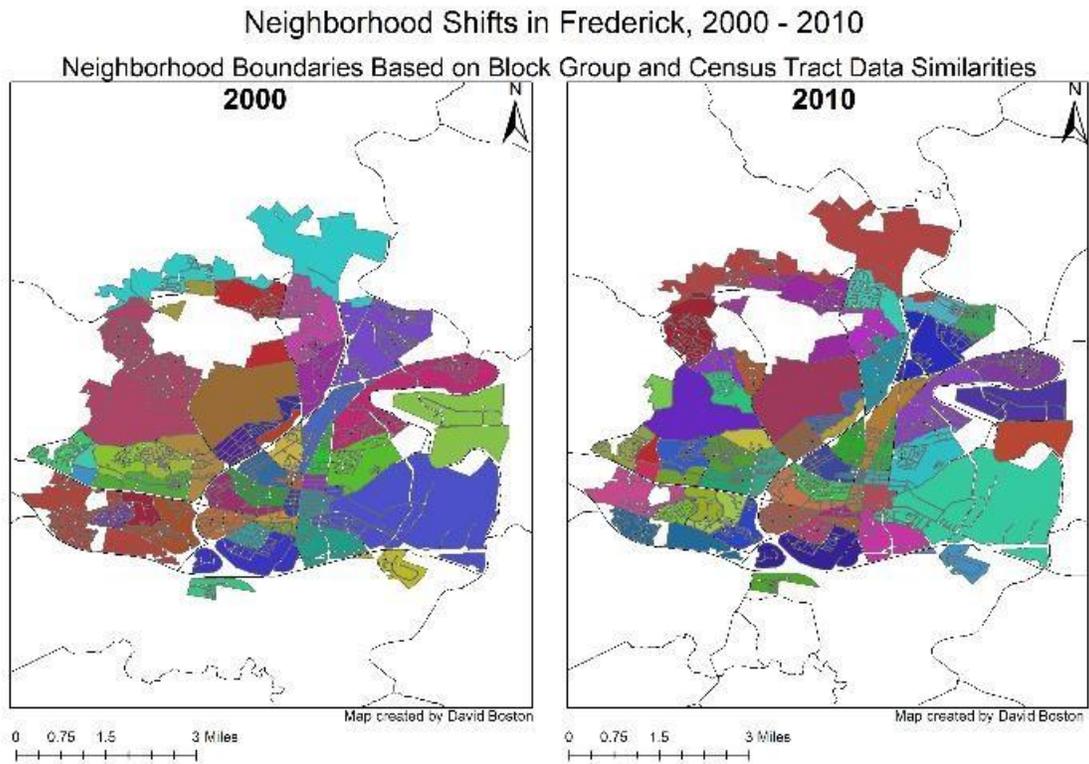


Figure 4: Union output with aesthetic and contextualizing map elements

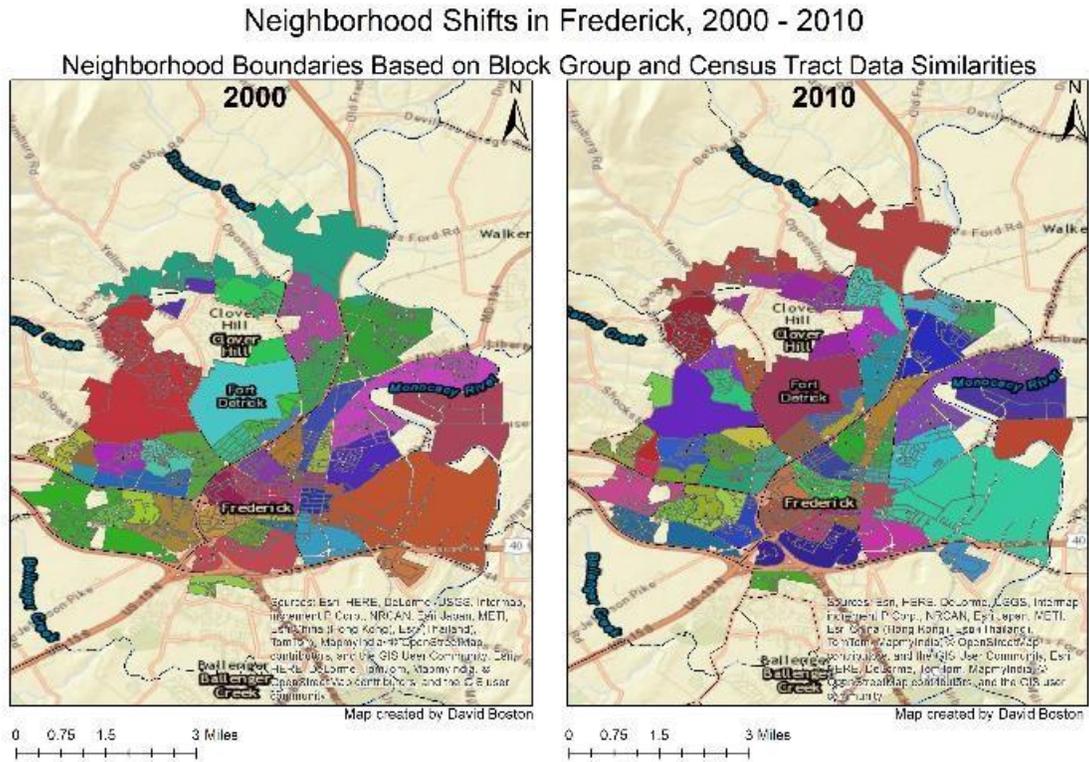


Figure 5: Grouping analysis report variable summary box plots

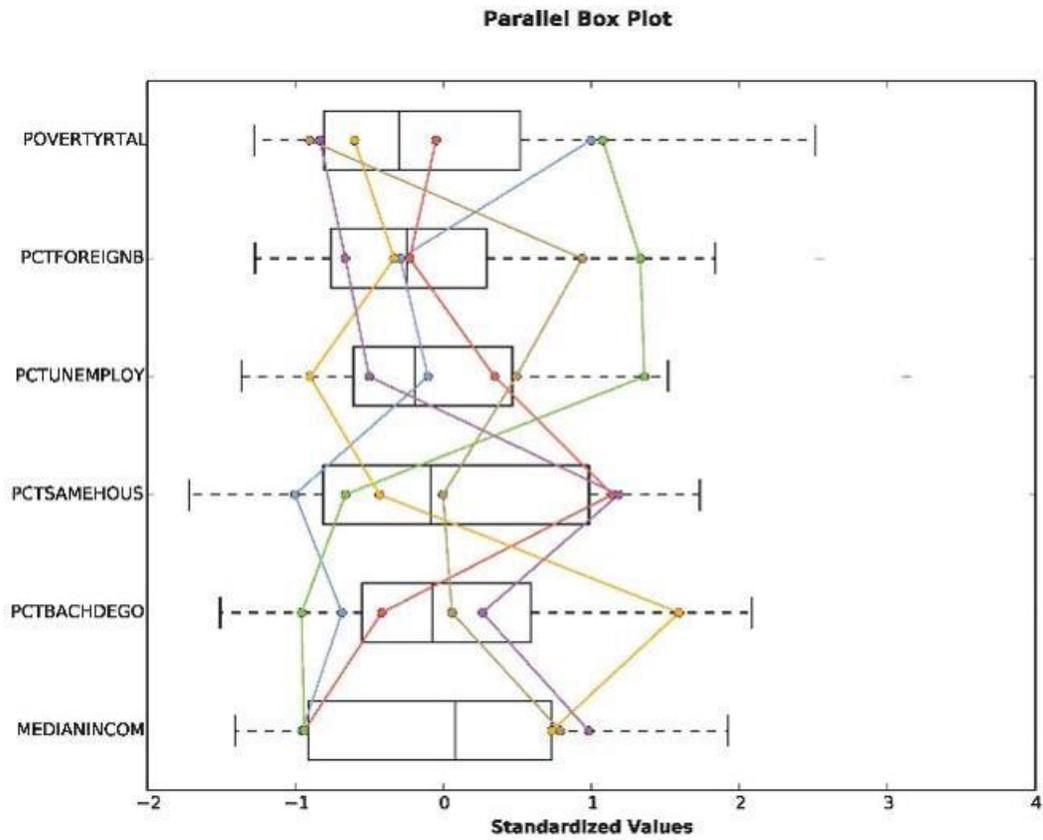


Figure 6: Grouping analysis report variable details and distribution

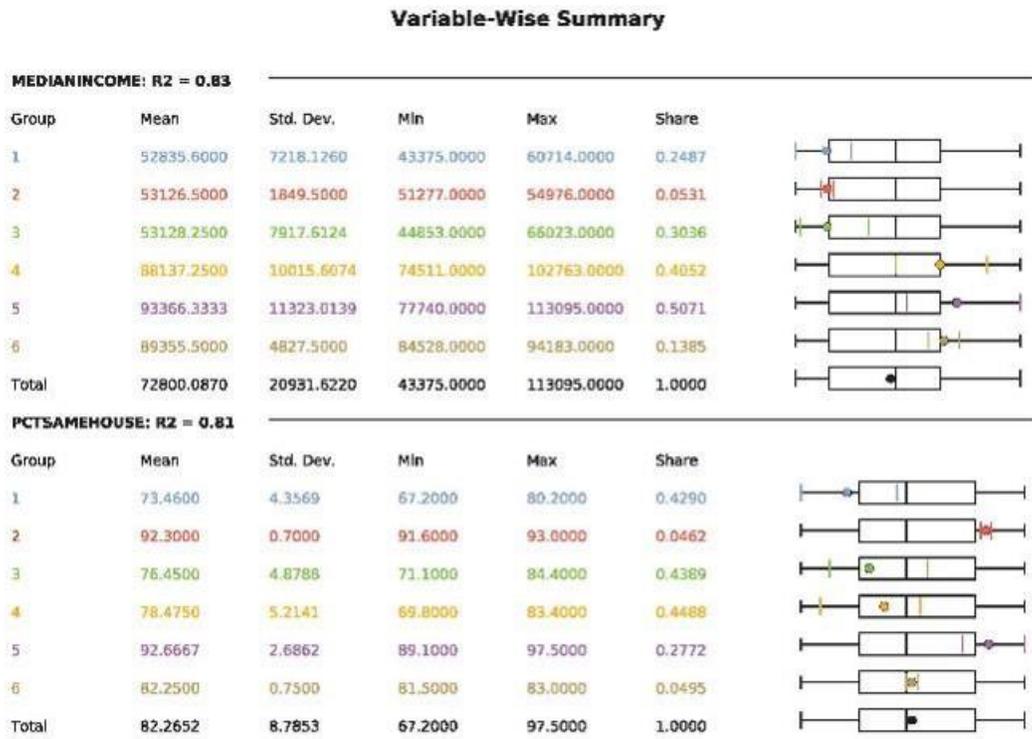


Figure 7: Individual variable output on median household income

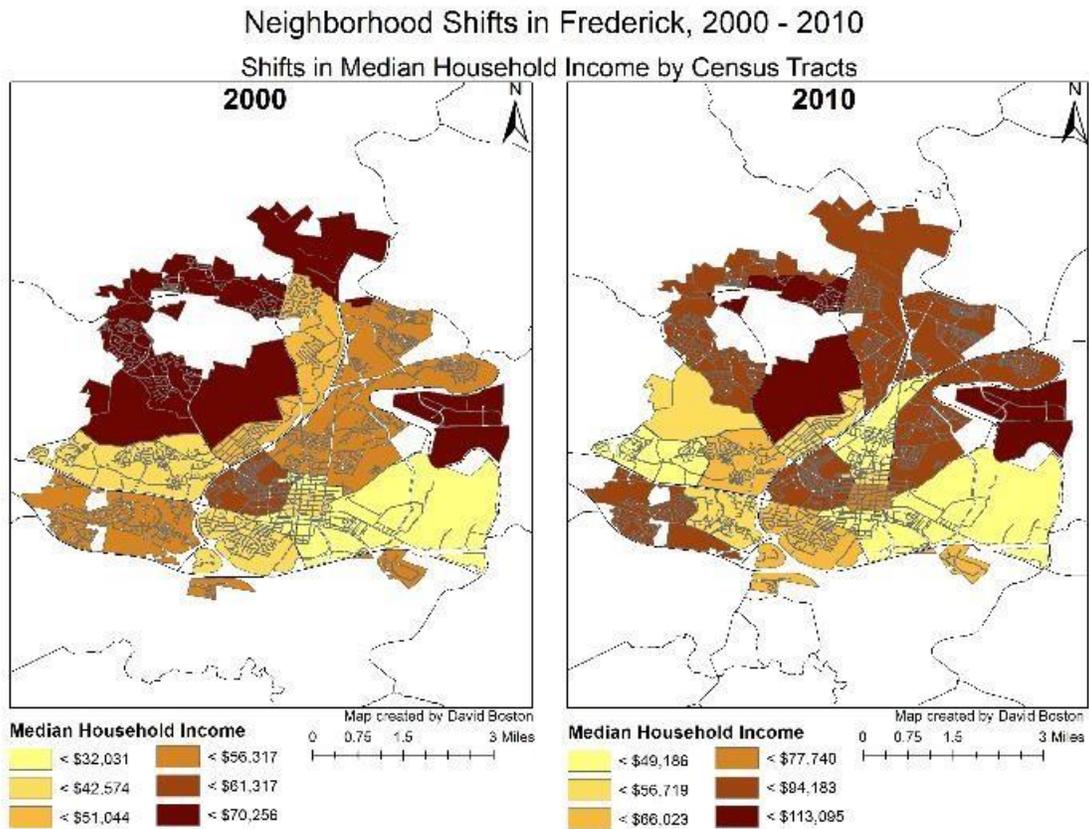


Figure 8: Individual variable output on percentage of renters

