

8-31-2016

A Spatial Analysis of Settlement, Accessibility, and Quality of Life of the Burmese Refugee Population in Bowling Green, Kentucky

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A SPATIAL ANALYSIS OF SETTLEMENT, ACCESSIBILITY, AND QUALITY OF
LIFE OF THE BURMESE REFUGEE POPULATION IN BOWLING GREEN,
KENTUCKY

A Capstone Experience/Thesis Project

Presented in Partial Fulfillment of the Requirements for

the Degree Bachelor of Science with

Honors College Graduate Distinction at Western Kentucky University

By:

Matthew J. Riggle

* * * * *

Western Kentucky University
2016

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ABSTRACT

Refugee populations face many challenges when relocating and settling into a new country. The Burmese refugee population in Bowling Green, Kentucky experiences unique challenges when trying to settle and be assimilated into a typical midsize city. This paper explores a variety of geographic and demographic characteristics of neighborhoods with high concentration of Burmese immigrants, seeking to characterize the neighborhoods by several quality of life metrics. These metrics include median household income, rental rates, educational attainment, and many others. The neighborhood characteristics are studied using recent data from the U.S. Census Bureau, specifically from the 2014 American Community Survey 5-year sample data. Additionally, accessibility to basic services such as grocery shopping or public transportation was analyzed for the neighborhoods. Finally, the last portion of the paper examines some of the challenges and limitations of using Census data for such a study, using on-site photographs and land use maps as evidence of such limitations.

Keywords: Burma, refugees, Bowling Green, Geographic Information Systems (GIS), accessibility, spatial analysis

Dedicated to Mom and Dad and Michael

ACKNOWLEDGMENTS

There are too many people who have contributed to this project and my education at WKU to list in this space, but I will mention as many as I can. First of all, I would like to thank my project advisor, Dr. Jun Yan. Your presence throughout the project as a source of ideas and inspiration is much appreciated, and I benefitted greatly from your guidance and expertise in working with GIS in the Bowling Green community. On that note, I would also like to thank Mr. Kevin Cary, for instilling a positive work ethic in me. I know that the valuable “real life” lessons that I learned in several of your classes will prove just as useful as the GIS skills I acquired. Finally, I’d like to thank the third member of my committee, Dr. Darlene Applegate. Although I didn’t make your acquaintance until very late in the process, your perspective and encouragement were no less valuable.

There are many other WKU faculty members who have particularly influenced me in one way or another in my four years, and have thus indirectly contributed to this project. Within the geography department, I’d like to thank Mr. Scott Dobler, for your refreshing honesty and commitment to worldly knowledge, Dr. Josh Durkee, for helping me through the curriculum advising process, and Dr. Katie Algeo and Dr. Chris Groves, for giving me an opportunity to get firsthand experience making maps for a research project. Within various other departments, I’d like to acknowledge Dr. Kelly Reames,

for making me a better writer and encouraging my pursuit of scholarly presentation, Dr. Melanie Autin, for working individually with me on my senior seminar project in mathematics, and Dr. Guy Jordan, who has imparted a wealth of knowledge and experience as an excellent quizbowl team advisor. All of you have left a noteworthy mark on my undergraduate career, and I truly appreciate it.

To my friends, I don't know how I would have done this without you. No matter how frequently our paths intersected, all of you taught me something new about the world, and I appreciated your collective encouragement as we struggled through college together. In a special way, I'd like to acknowledge the support I received from the community at the St. Thomas Aquinas Catholic Center, particularly from Father Mike, who definitely helped make me a better man.

Finally, to my family, thank you for your constant support from day one. I cannot express how much appreciation I have for everything you've done for me, but I'm glad I can always count on you.

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Groves, C., Algeo, K., Riggle, M., & Myers, L (2016, April). *Drainage to Mammoth Cave National Park*. Presented at the Mammoth Cave National Park Research Symposium, Mammoth Cave, KY.

FIELDS OF STUDY

Major fields: Geography and Mathematics

Minor field: Applied Statistics

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CHAPTER 1

INTRODUCTION

According to the 1951 Refugee Convention, a refugee is someone who “owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality, and is unable to, or owing to such fear, is unwilling to avail himself of the protection of that country” (UN High Commissioner for Refugees, 2016). Refugee movement is a form of human migration which involves involuntary movement, as contrasted with typically voluntary immigration. Whereas many immigrants are motivated by “pull factors”, which are factors that attract a person to move to a new location, such as job opportunities, refugees are usually motivated by “push factors”, which are factors that force someone to move out of a region, such as war, famine, or natural disaster (de Blij & Muller, 2000).

The country of Burma has faced a series of circumstances that has led to a relatively large population of refugees. Located in Southeast Asia in the crossroads between India and China, the country’s population is very diverse, containing eight major ethnic groups and over 130 subgroups (Barron et al., 2007). Much of the Burmese population is Theravada Buddhist, but there is a significant number of Christians as well (Barron et al., 2007). The economy is generally agrarian, with a significant portion of the

population making their living on rice farming (Barron et al., 2007). Since a 1962 coup, the country has been under military rule, leading to widespread civil war and ethnic strife (Barron et al., 2007). In a move symbolic of the military rule, the capital was officially (and, at first, secretly) moved to the new city of Naypyidaw in 2005, though the former capital of Yangon retains much cultural significance (New York Times, 2008). Though the nation is known as Myanmar in official foreign correspondence, the native population prefers to use the name “Burma” in order to protest the military occupation.



Figure 1.1. Location of Burma.

Although the violence in the country has forced many Burmese refugees to flee to nearby countries such as Bangladesh, India, or Thailand, as well as the United States, there are hopeful signs for the country. In the 2015 election, the National League for Democracy (NLD), fronted by Nobel Peace Prize winner Aung San Suu Kyi, won a landslide victory (BBC News, 2015). Although the current constitution prohibits Suu Kyi from holding the office of president, the NLD worked to create the position of State Counsellor in order to allow her to wield power (Cochrane, 2016). Though the new government undoubtedly has much work to be done, there are promising signs for increased freedom and peace for the Burmese people. Of course, this does not diminish the significance of the existing Burmese refugee populations who have already migrated out of the country.

In the last several years, one of the largest populations of refugees to come to the United States has been the Burmese. In the year 2009, refugees from Burma represented one of the three largest groups of refugees coming to the U.S., along with Iraq and Bhutan (Renaud, 2011), and the 14,577 Burmese refugees that came in 2014 were second only to Iraq (U.S. Department of Health and Human Services, 2015). The state of Kentucky in particular has mirrored the national trend, as the state saw 1,080 Burmese refugees come in the period from 2007 to 2009 (Renaud, 2011). A further 1,127 came between 2012 and 2014 (U.S. Department of Health and Human Services, 2015), indicating that the numbers have held relatively steady over the past decade. Many of these refugees have settled in Bowling Green, which is the focus of this study.

By studying the neighborhoods in which refugees tend to settle, the goal is to paint a picture of the population in the context of a city as a whole, in order to determine

how successfully the refugees are able to assimilate into society. Three major models of integration include Assimilation, Amalgamation, and Accommodation (Parrillo, 2003). Assimilation theory involves a group abandoning their minority culture outright in order to adopt the majority culture. Amalgamation theory, also known as the “melting pot” theory, involves a blending of majority and minority culture. Finally, accommodation theory, also known as pluralism, allows for several cultures to simultaneously coexist together in a single society. It is possible that a given refugee population may display traits of all three, but by studying the neighborhoods in which they initially settle, the level to which each model applies can be measured. This allows government and other public officials to better assist the refugee families in making the transition from their original homeland to the United States.

CHAPTER 2

DATA AND METHODOLOGY

This project involves a spatial analysis of the Burmese refugee resettlement neighborhoods in the context of Geographic Information Systems (GIS). GIS is a “computer system for capturing, storing, querying, analyzing, and displaying geospatial data” (Chang, 2012). Using GIS in this project allows each variable in the study to be associated with its particular location in space, and allows for layering of various attributes such as data from the U.S. Census Bureau. The capability to combine various data sources into one cohesive map or other graphic is what makes GIS such a powerful analytic tool, and one particularly suited for this purpose. This project in particular utilized Esri (Environmental Systems Research Institute) ArcGIS for Desktop Version 10.2.2.

The first portion of the project investigates a series of demographic and socioeconomic characteristics of the neighborhoods in Bowling Green in which Burmese refugees settled between 2008 and 2010, placing them in the context of the city as a whole. These neighborhoods were identified in previous research (Renaud, 2011), and represent initial settlement sites for the refugees. The settlement locations can be seen in Figure 2.1.

Burmese Refugee Initial Settlement in Bowling Green, Kentucky

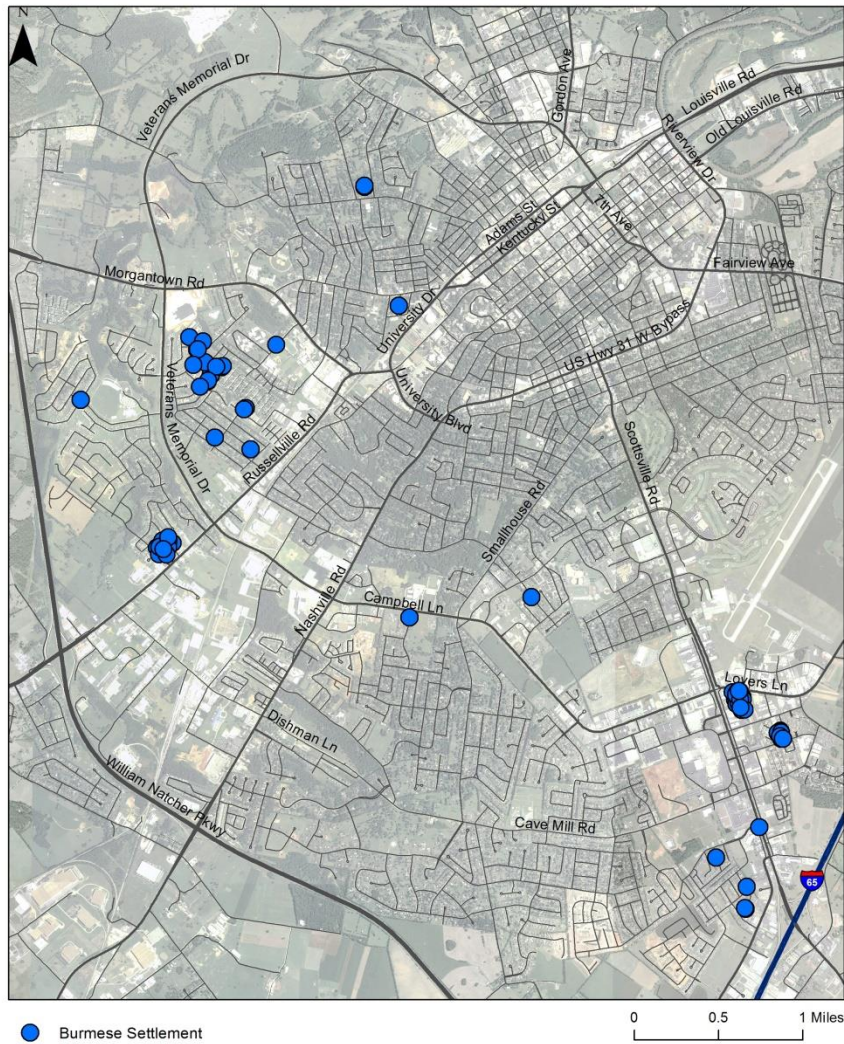


Figure 2.1: Initial Burmese Resettlement Sites (derived from Renaud, 2011).

These settlements can also be grouped into clusters, reflecting areas with high concentration of Burmese refugees. This has also been done previously, using a kernel density analysis (Renaud, 2011). Kernel density estimation involves a bivariate

probability density function, in which a smooth density surface of point events can be estimated across geographic space in a given study area (Chang, 2012). In this case, the study area is the city of Bowling Green, and the point events are the initial settlement locations of Burmese refugee families.

Figure 2.2 displays the results of the kernel density analysis (using three-dimensional modeling), Figure 2.3 displays the clusters of the Burmese refugees' initial residences. Primary clusters contain 20 or more families in a 1900 foot-wide vicinity, secondary clusters contain 10 to 19 families in the same vicinity, and tertiary clusters contain 4 to 9 families in the same vicinity.



Figure 2.2: Kernel Density Results (derived from Renaud, 2011).

Burmese Refugee Clusters in Bowling Green, Kentucky

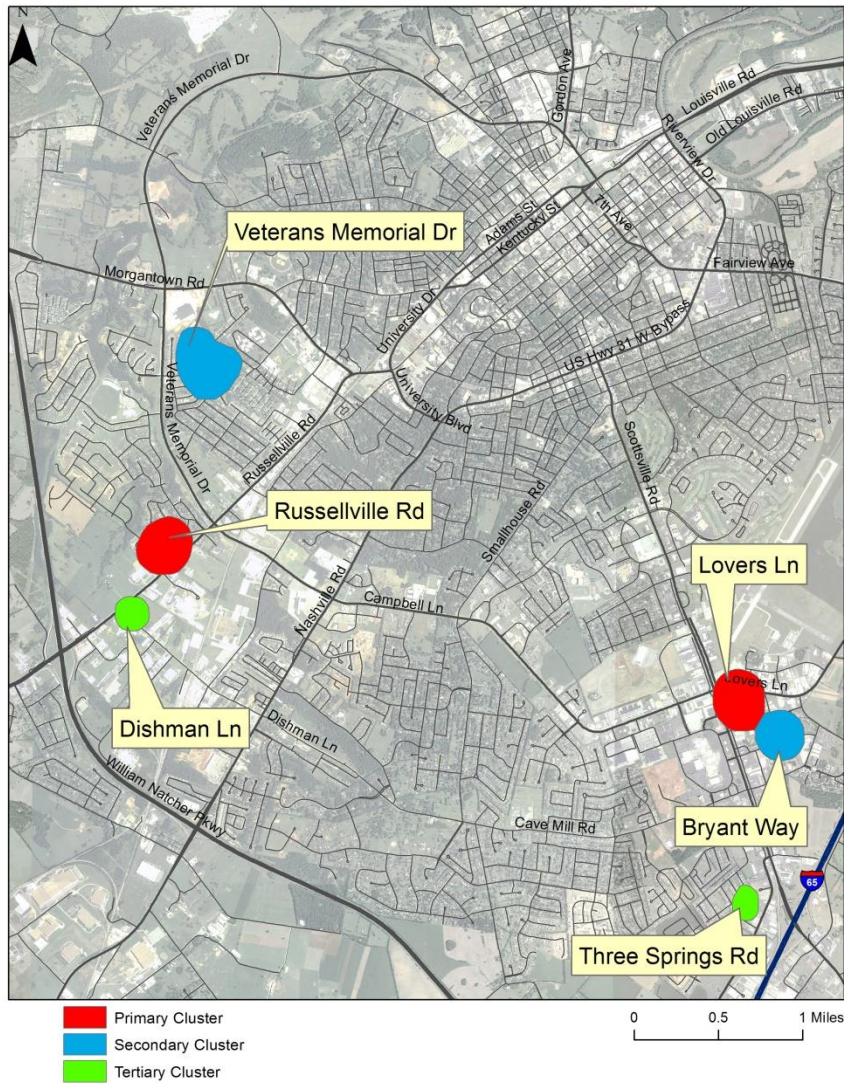


Figure 2.3: Burmese Resettlement Clusters (derived from Renaud, 2011).

The demographic and socioeconomic characteristics that are investigated come from data obtained from the U.S. Census Bureau, specifically from the American Community Survey (ACS). According to the program, the survey “collects and produces

information on demographic, social, economic, and housing characteristics about our nation's population every year" (U.S. Census, 2015a). Unlike the decennial census, however, ACS data samples only a portion of the population, so there is a margin of error associated with each of the statistics that it provides. ACS data is available at most geographic levels, though the most detailed data is sometimes withheld for reasons of privacy. The majority of the data used in this project is from the 2014 ACS at the block group level, which uses 5-year estimates based on the samples from 2010-2014. When available, full 2010 data at the block level is also used, to provide more specific information and allow for comparison.

The neighborhood characteristics of interest can be grouped into several broad categories. Demographic characteristics include population density and age. Ethnicity characteristics include percentage of individuals with minority (non-white) ethnicity, percentage of individuals with Asian ethnicity, and percentage of non-English speaking households. Education characteristics include the percentage of individuals with high school degree or GED and percentage of individuals with any college degree. Economic characteristics include median household income and percentage of individuals below the poverty line. Housing characteristics include housing density, persons per household, percentage of rented housing units, and percentage of vacant housing units. Commuting characteristics include the percentage of individuals who drive a car, walk, or take public transportation to work, respectively. A summary of these characteristics can be found in Table 2.4.

Category	Variables
Demographic	population density, age
Ethnic	% minority, % Asian ethnicity, % non-English speaking households
Education	% HS degree/GED, % college degree
Economic	median household income, % below poverty line
Housing	housing density, persons per household, % rented units, % vacant units
Commuting	% commuting by car/walking/public transportation

Table 2.4: Study Variables.

The second portion of the analysis can be broadly characterized as an accessibility analysis. This portion of the project considers the relative distance of the Burmese neighborhoods to basic services such as grocery stores and public transportation. This was done using network analysis techniques, such as service area analysis.

When considering the analysis, it is assumed that the majority of Burmese refugees will either walk or take public transportation. Thus, the first network that was considered contains simply the roads in Warren County (assuming that individuals walk along sidewalks or the side of the road). The roadway data was obtained from the Kentucky Transportation Cabinet.

A dataset of stores was created using data from the Yellow Pages. This includes traditional grocery stores, ethnic grocery stores, department stores, convenience stores, and pharmacies. To produce a usable GIS dataset, the addresses from the Yellow Pages were converted into point locations using the World Geocoding Service provided by Esri.

Though there were a handful of discrepancies in the data, these were resolved by hand before proceeding with the analysis. A summary map of the stores can be seen in Figure 2.5.

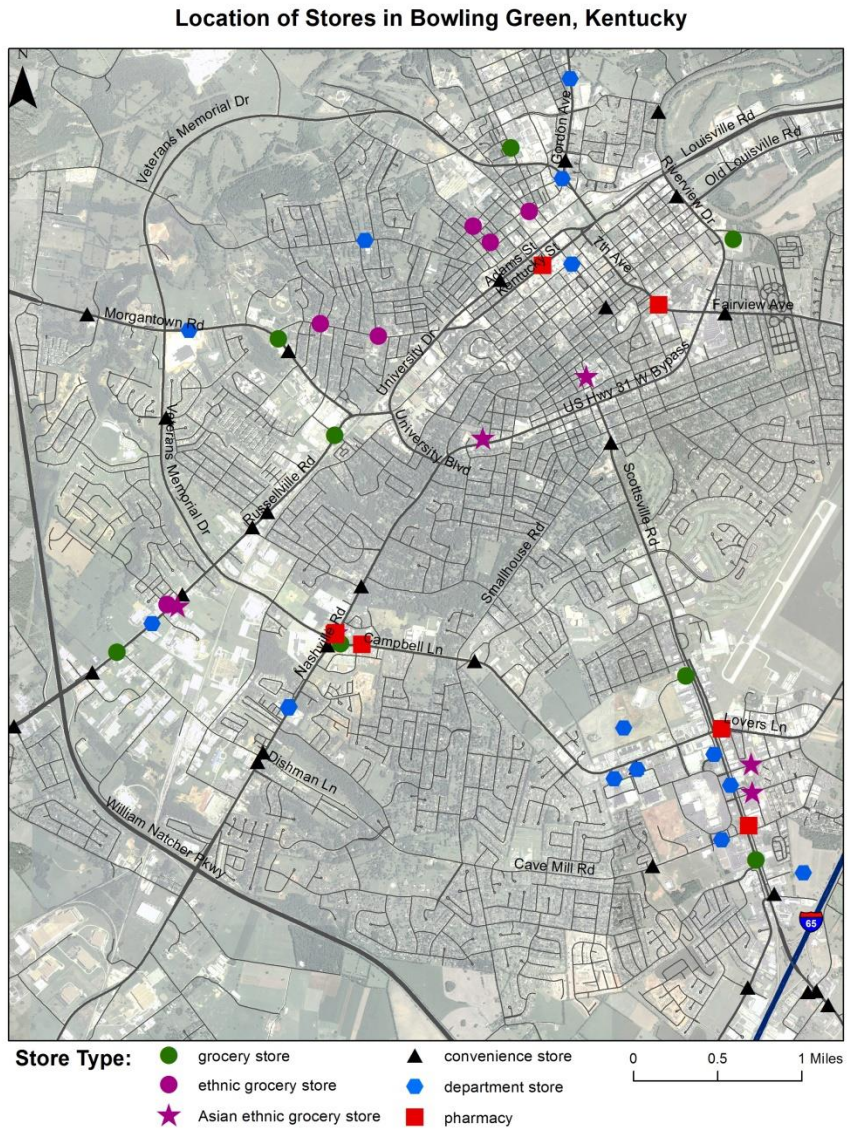


Figure 2.5: Location of Stores by Type.

The public transportation service that was considered is the GoBG bus system, which contains five routes that service the study area. A map of the routes was obtained from the GoBG website, and was digitized in order to be usable with GIS. This involved converting each route into a line feature, and each stop into a point feature. Ultimately, the bus routes played the role as a service as well as a transportation network. A map of the routes and stops can be seen in Figure 2.6.

GoBG Bus Routes and Stops

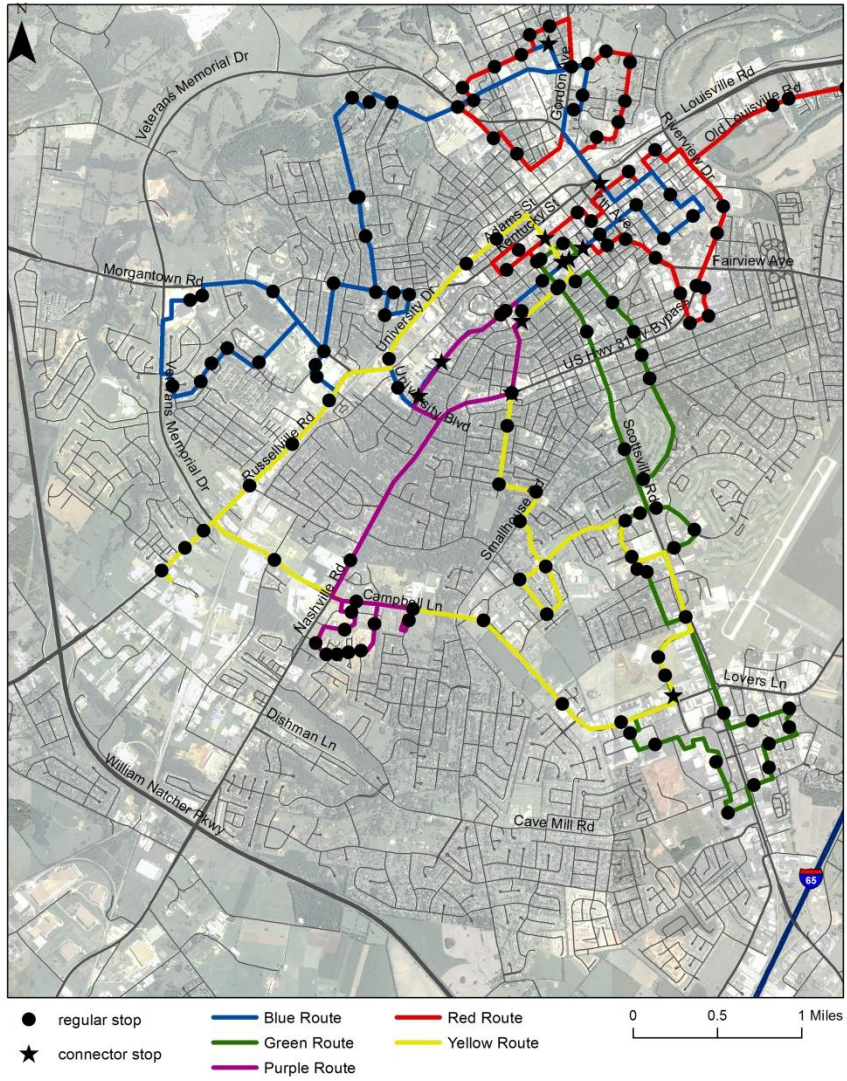


Figure 2.6: GoBG Bus Routes and Stops.

CHAPTER 3

NEIGHBORHOOD CHARACTERISTICS

When examining the maps that follow, it is important to remember that any neighborhood contains variability. In the case of the Burmese refugee neighborhoods, there are certainly other individuals who live in the same neighborhoods, and this will have an influence on the characteristics of those neighborhoods. Thus, this analysis is not studying the Burmese individuals directly, but is characterizing the neighborhoods in which they live, which is an important distinction to remember.

The analysis of the Burmese resettlement neighborhood characteristics begins with basic demographic characteristics. One simple measure to characterize the neighborhoods is simply with a raw population count, but it is more meaningful to depict this geographically using population density, calculated simply as the number of persons per area. This allows one to detect areas of high and low population concentration. The population density of the study area at the block group level using 2014 ACS data can be seen in Figure 3.1, and Figure 3.2 depicts the full 2010 data at the block level.

Population Density (2010-2014 ACS 5-Year Estimates, Block Group)

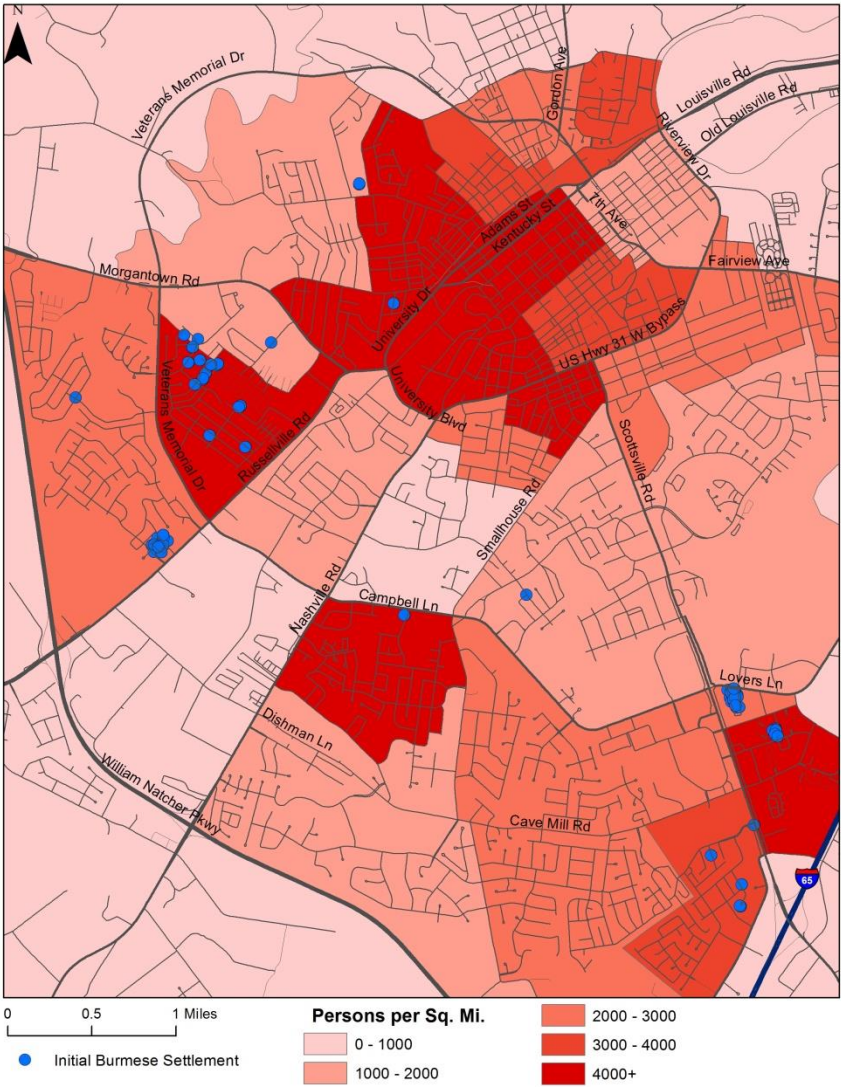


Figure 3.1: Population Density at the Block Group Level.

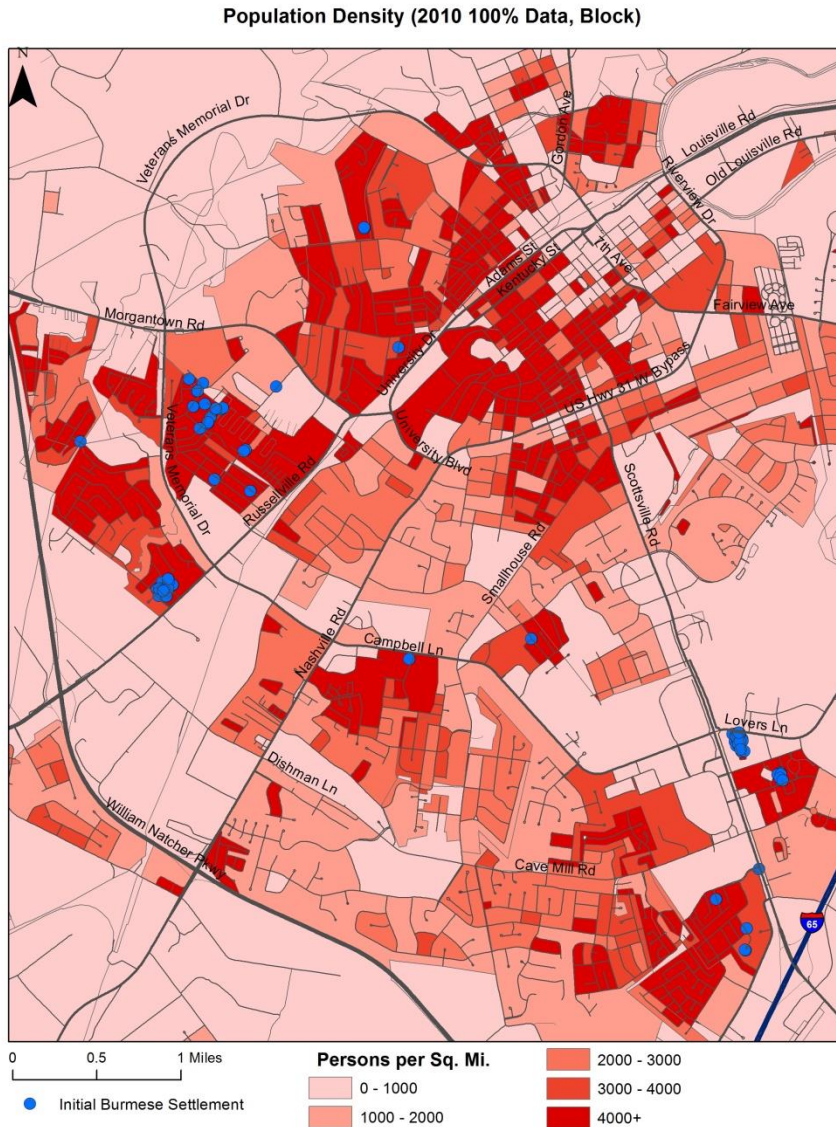


Figure 3.2: Population Density at the Block Level.

In general, the Burmese resettlement neighborhoods tend to have a higher population density than average. This is partly due to the presence of smaller, lower income housing units, which will be seen later, but this may also indicate a larger family

size. At any rate, there is a clear contrast with the lower density areas found in many residential subdivisions.

Another way to characterize the population of the neighborhoods is by age. This is an important consideration, because knowing the age breakdown of an area will allow city officials to know where to focus their efforts (for instance, a population with a higher area of children may indicate the future need for a school). The following four maps (Figures 3.3 through 3.6) depict the concentration of population under age 18 and the concentration of population aged 50 or older at both the block group and block level.

Percentage below 18 Years of Age (2010-2014 ACS 5-Year Estimates, Block Group)

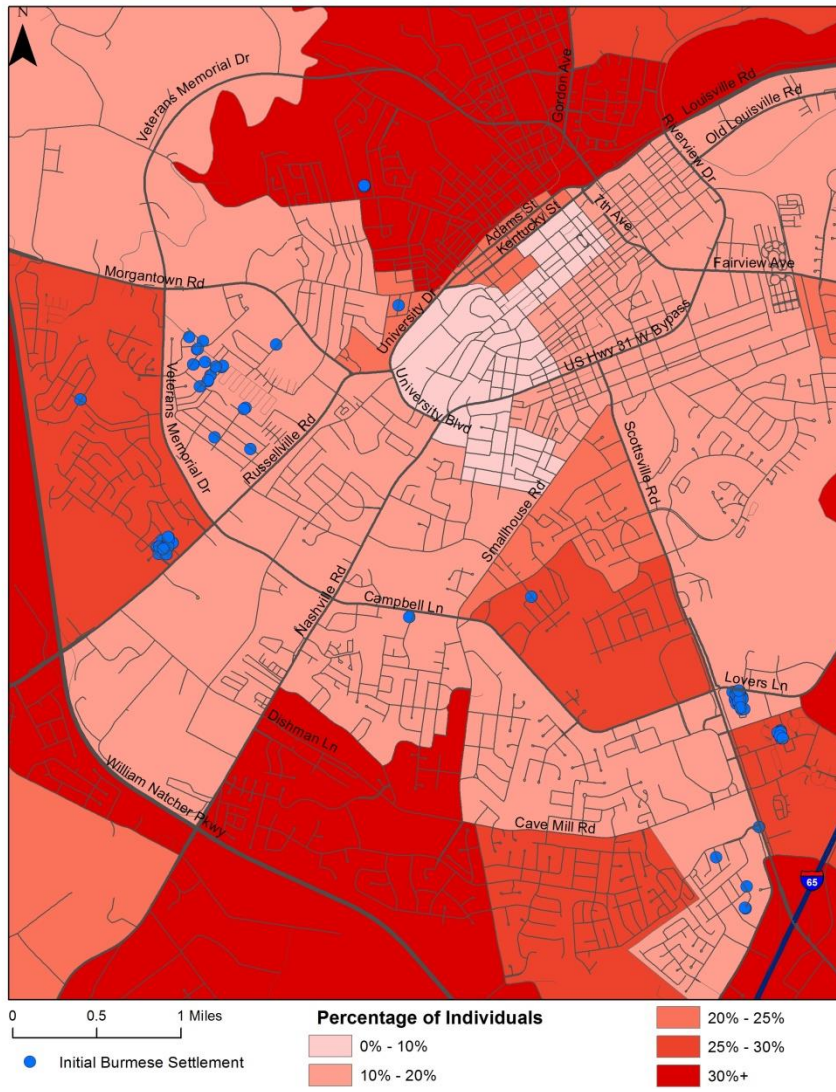


Figure 3.3: Concentration of Population Under Age 18 at the Block Group Level.

Percentage below 18 Years of Age (2010 100% Data, Block)

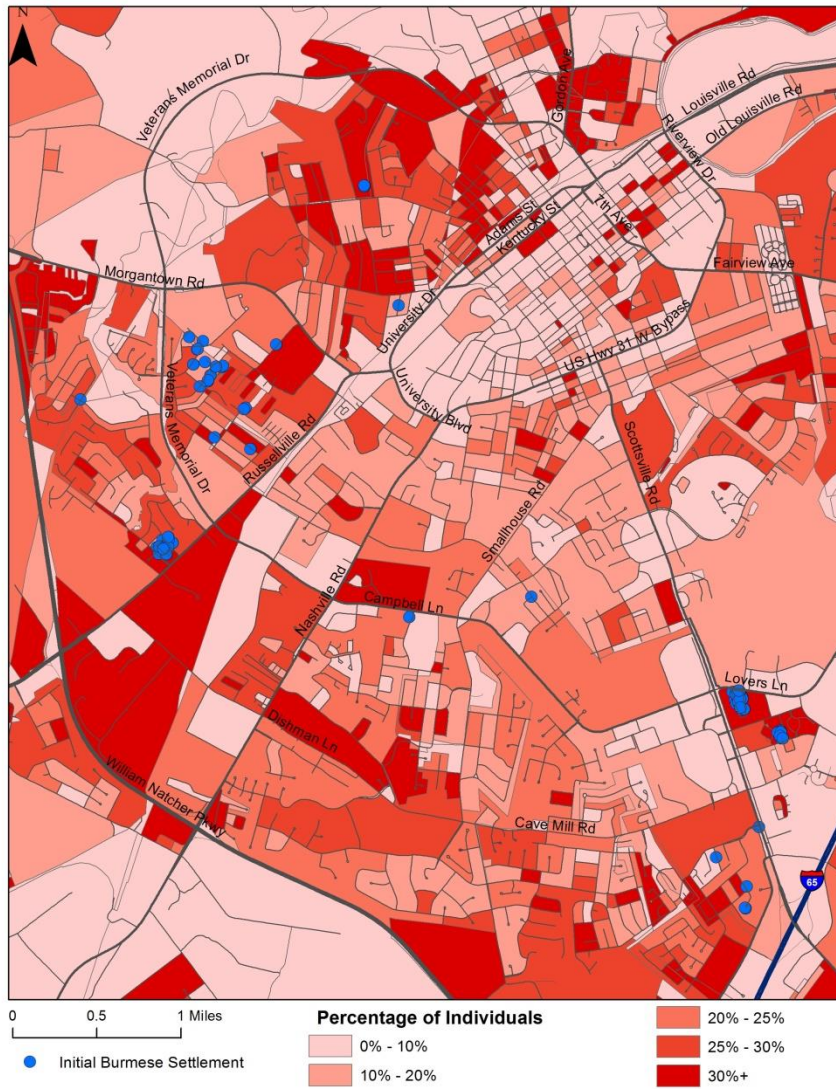


Figure 3.4: Concentration of Population Under Age 18 at the Block Level.

Percentage above 50 Years of Age (2010-2014 ACS 5-Year Estimates, Block Group)

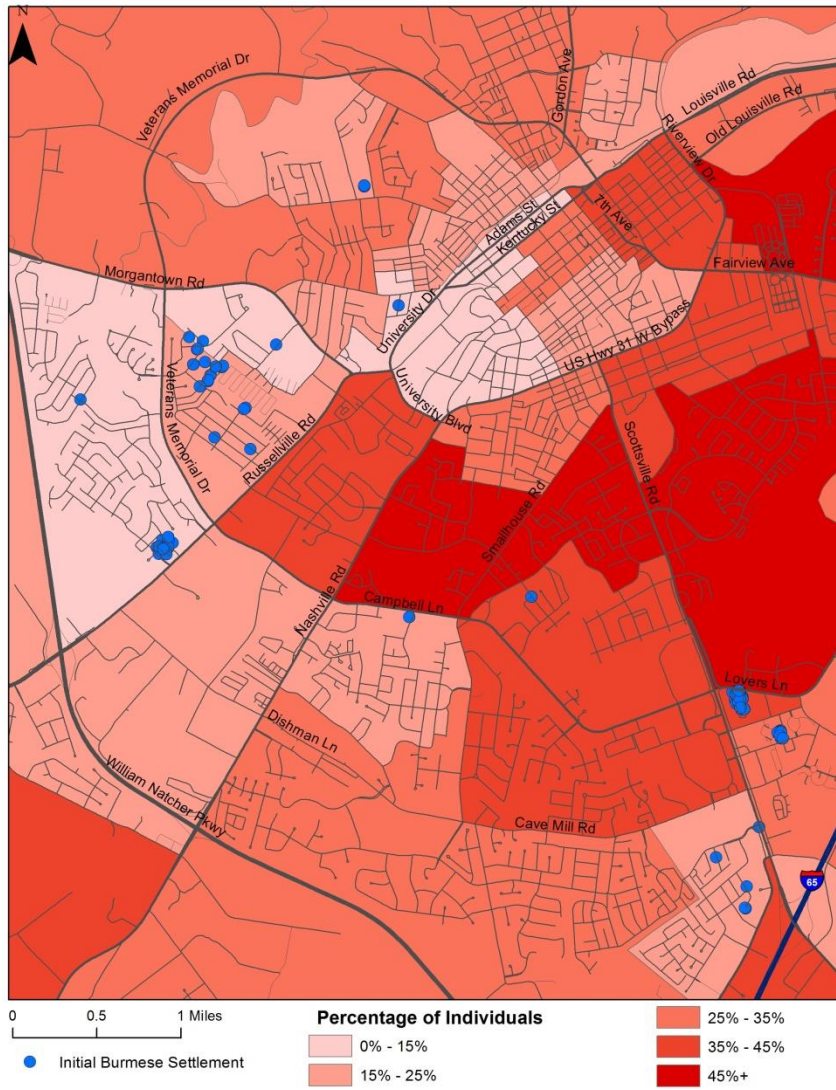


Figure 3.5: Concentration of Population Age 50 and Over at the Block Group Level.

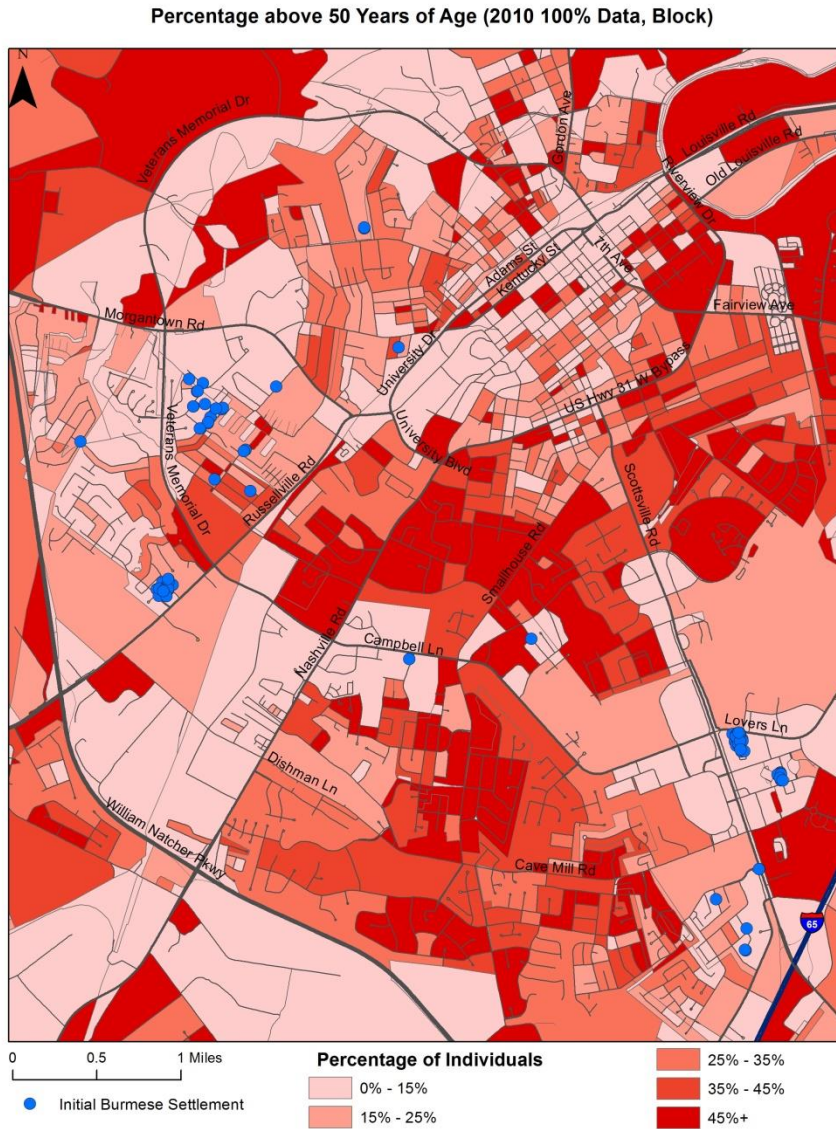


Figure 3.6: Concentration of Population Age 50 and Over at the Block Level.

From the maps at the block group level, there do not appear to be any particular extreme trends in the neighborhoods of Burmese resettlement. At the block level, however, more details are revealed, and the cluster near Lovers Lane in particular shows

a higher concentration of individuals below 18 years of age, and a lower concentration of individuals 50 years of age or above. The other clusters do not appear to deviate significantly from Bowling Green as a whole.

Another way to portray the age breakdown of a given population is by using a population pyramid. This shows the relative proportions of each cohort of a given age range and gender, which paints an overall picture of the population distribution. A “bottom heavy” pyramid reflects a younger population, while a “top heavy” pyramid reflects an older population. Population pyramids can be a useful tool to compare two populations, or a subset of a population to the whole. Figure 3.7 shows a population pyramid which considers the population of Warren County as a whole (i.e., all blocks), while Figure 3.8 shows a population pyramid which considers only blocks which contain Burmese resettlement.

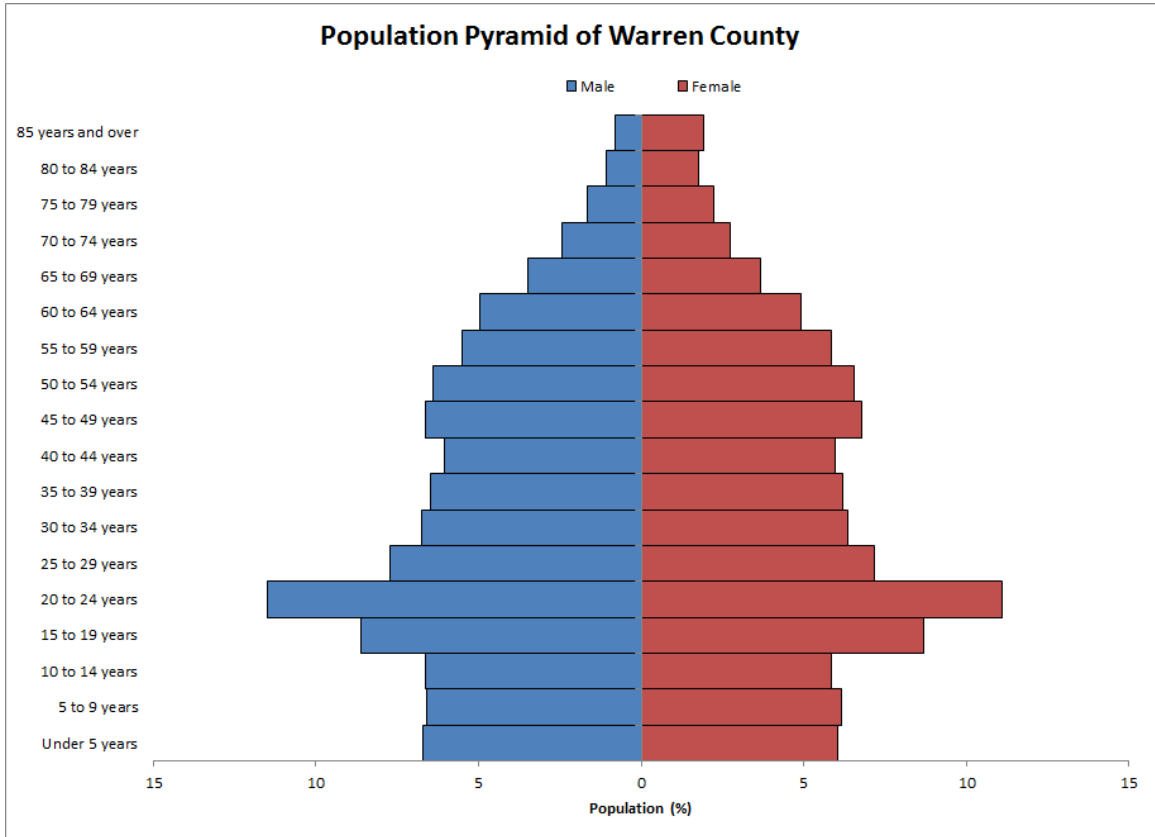


Figure 3.7: Population Pyramid of Warren County.

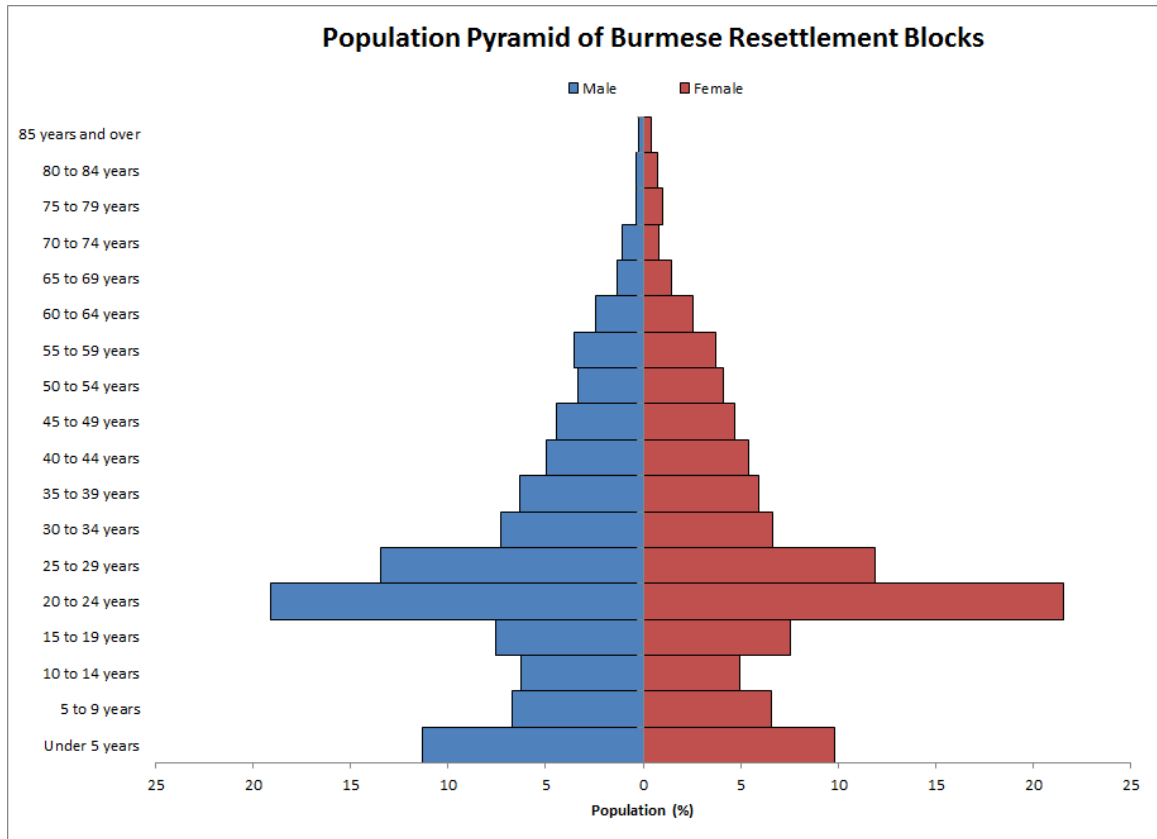


Figure 3.8: Population Pyramid of Blocks Containing Burmese Settlement.

As expected, there is a noticeable spike in the age 20-24 group in Warren County as a whole, reflecting Bowling Green’s status as a college town. This trend is magnified when considering only the blocks that contain Burmese settlement. However, this does not necessarily mean that the Burmese refugee population of Bowling Green contains an unusually high percentage of people in their early twenties; rather, it could reflect the fact that many students in that age group tend to live in those same neighborhoods.

Using GIS, it is also possible to quantitatively summarize any of the variables under consideration. This allows for the comparison of block groups that contain Burmese refugee resettlements with the entirety of Warren County. A summary of the demographic characteristics is shown in Table 3.9.

Variable	Burmese Block Groups	All Warren County Block Groups
Population Density	3030.6 people/sq. mi.	213.9975 people/sq. mi.
% under age 18	21.32%	22.59%
% age 50 or over	21.75%	28.88%

Table 3.9: Summary of Demographic Characteristics.

The block groups containing Burmese refugee resettlement neighborhoods tend to be much more densely populated than the Warren County average, though this is partially due to the presence of rural areas outside of Bowling Green. In terms of age, the Burmese population seems to not differ significantly from the population as a whole.

The next variables under consideration are the ethnicity characteristics. Examining these can determine whether the Burmese resettlement neighborhoods are integrated with the city of Bowling Green as a whole. Figure 3.10 shows the concentration of minority (non-white) population at the block group level, and Figure 3.11 shows the same at the block level.

Minority Population (2010-2014 ACS 5-Year Estimates, Block Group)

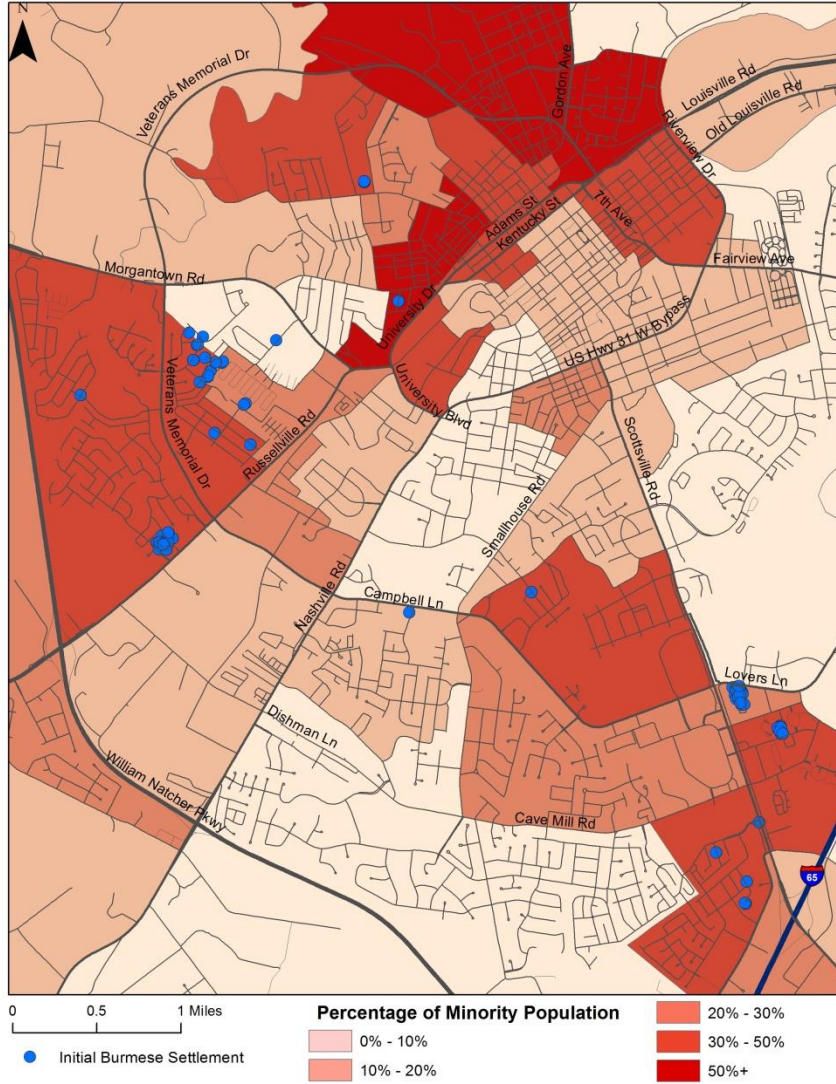


Figure 3.10: Minority Population at the Block Group Level.

Minority Population (2010 100% Data, Block)

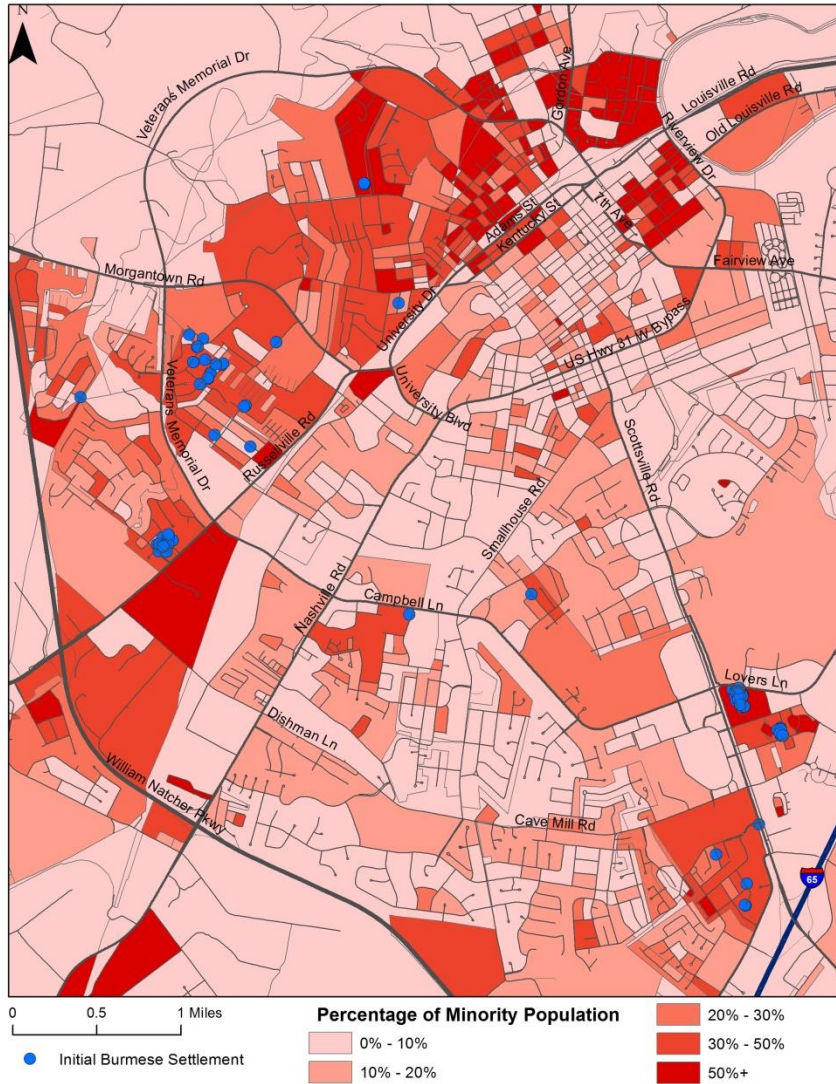


Figure 3.11: Minority Population at the Block Level.

More specifically, additional maps can be created that depict only minorities of Asian background. While this figure will contain groups in addition to the Burmese

refugees, examining the maps can still yield valuable information. Figures 3.12 and 3.13 show the concentration at the block group and block levels, respectively.

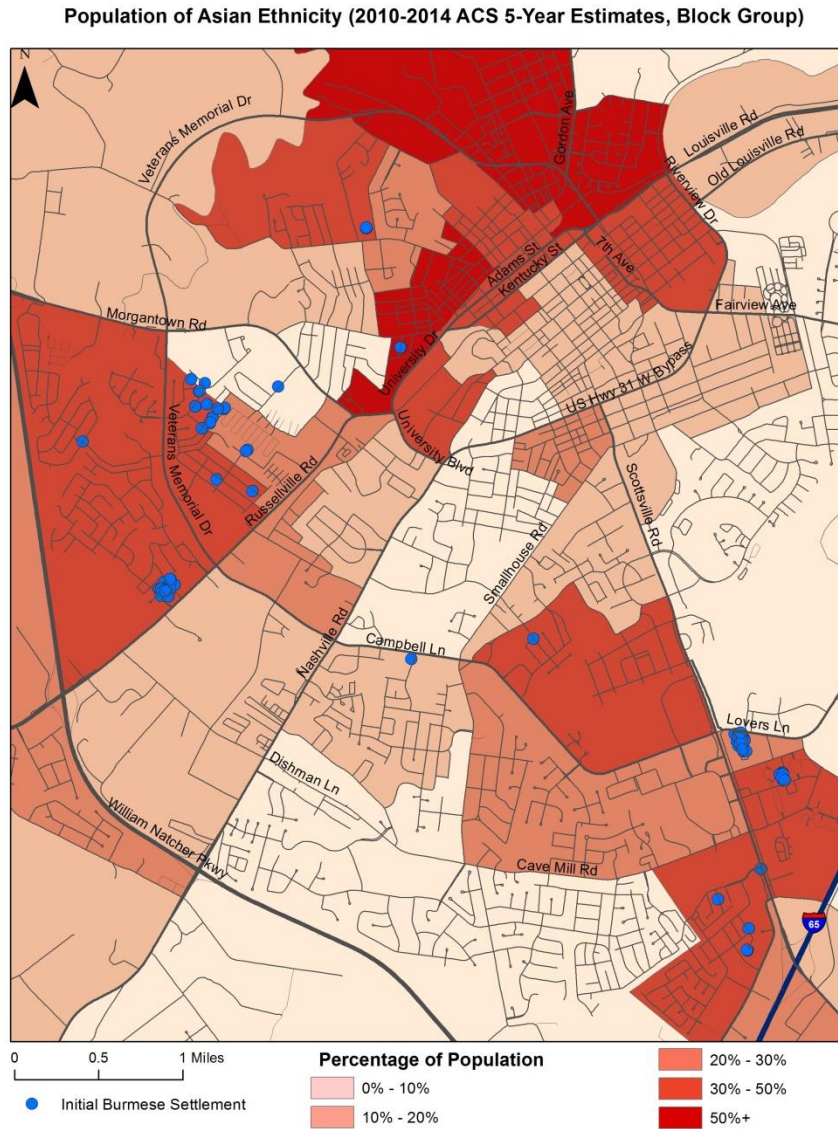


Figure 3.12: Asian Ethnicity Concentration at the Block Group Level.

Population of Asian Ethnicity (2010 100% Data, Block)

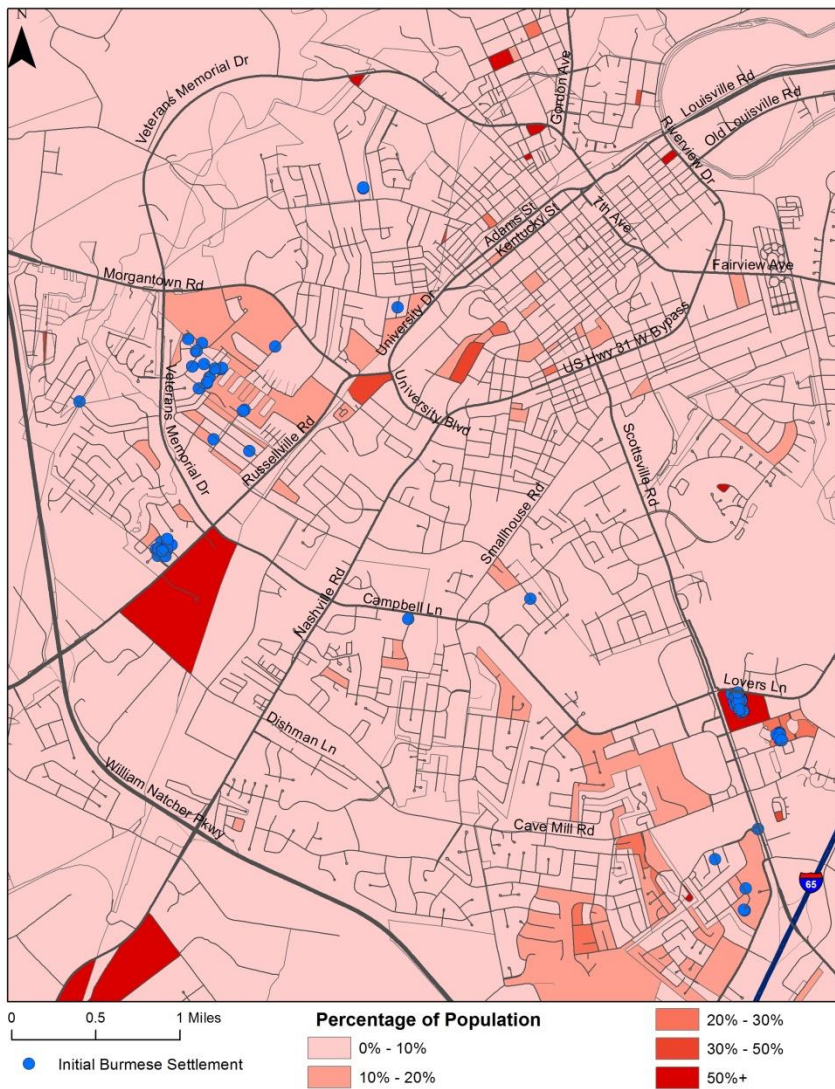


Figure 3.13: Asian Ethnicity Concentration at the Block Level.

The map for the block level is particularly telling in this case. It is clear from the previous maps that the Burmese resettlement neighborhoods tend to be located in areas with higher than average minority concentration, but there is a clear concentration of

Asian minorities in the areas with most of the Burmese refugee populations. This suggests two things: first, that initial resettlement tends to occur in similar, relatively homogeneous areas; and second, that the Burmese refugees tend to stay in similar neighborhoods after a move. This confirms the findings by Renaud, who showed that most of the moves by Burmese refugee families tend to be lateral in nature (2011).

A related way to characterize the population is by examining the concentration of non-English speakers. This can also give some idea of education, which is the next category under consideration. The data is only available at the block group level, and the results are shown in Figure 3.14.

Non-English Speaking Households (2010-2014 ACS 5-Year Estimates, Block Group)

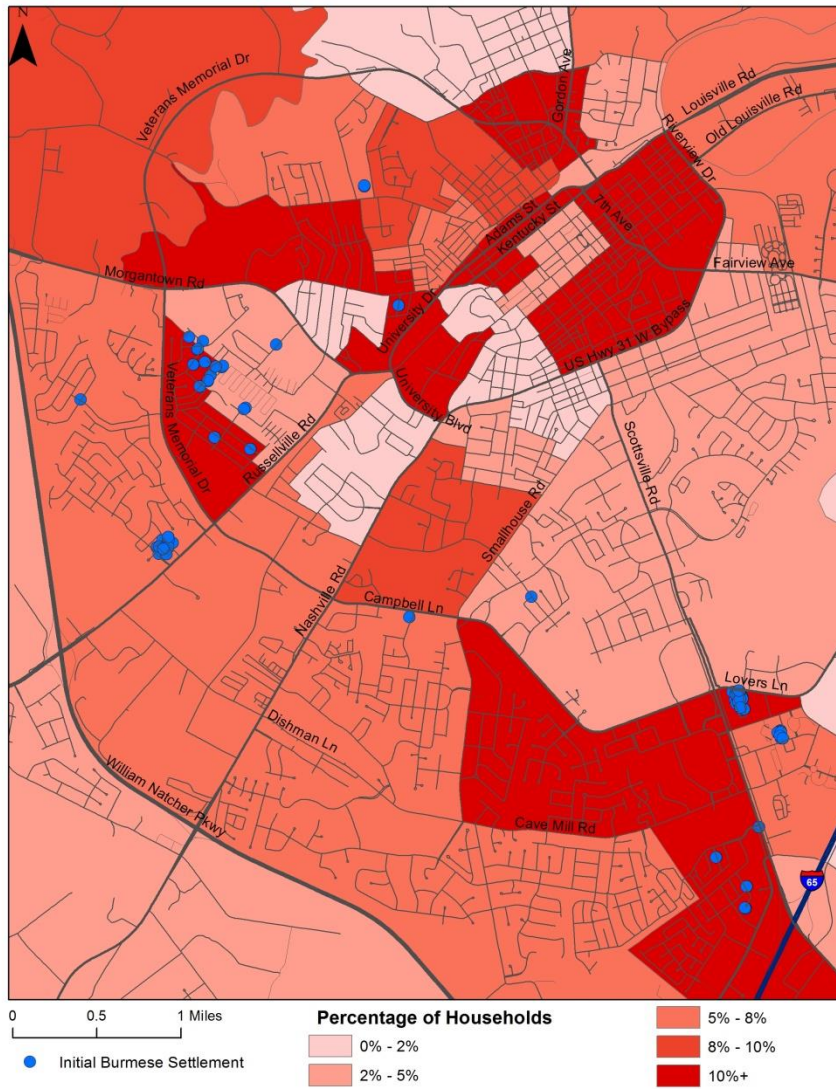


Figure 3.14: Non-English Speakers at the Block Group Level.

In general, the distribution of language spoken at home tends to mirror that of the ethnic minorities, with the Burmese resettlement neighborhoods tending to contain higher concentrations. A summary of the ethnicity characteristics is shown in Table 3.15.

Variable	Burmese Block Groups	All Warren County Block Groups
% Minority	32.67%	17.72%
% Asian ethnicity	7.02%	2.80%
% non-English speaking	17.20%	9.32%

Table 3.15: Summary of Ethnicity Characteristics.

In all variables, the Burmese block groups display higher concentrations of minority populations. This indicates that those neighborhoods may be significantly more diverse than Warren County as a whole.

The next characteristics under consideration are education variables. This is reflected by the percentage of the population age 25 or above with a specified level of education. For this analysis, the percentage of the adult population with a high school degree or GED is presented in Figure 3.16, and the percentage with any college degree is presented in Figure 3.17. These variables are only available at the block group level.

High School Diploma or GED (2010-2014 ACS 5-Year Estimates, Block Group)

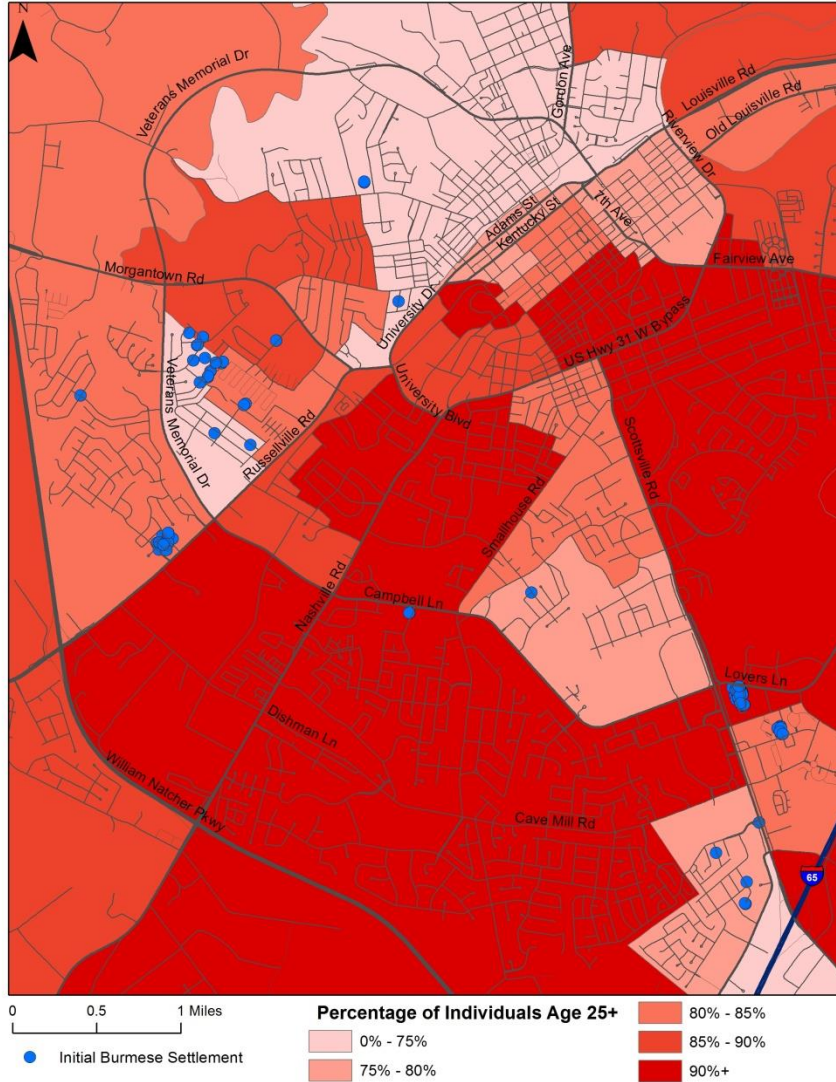


Figure 3.16: High School Diploma/GED Attainment at the Block Group Level.

Any College Degree (2010-2014 ACS 5-Year Estimates, Block Group)

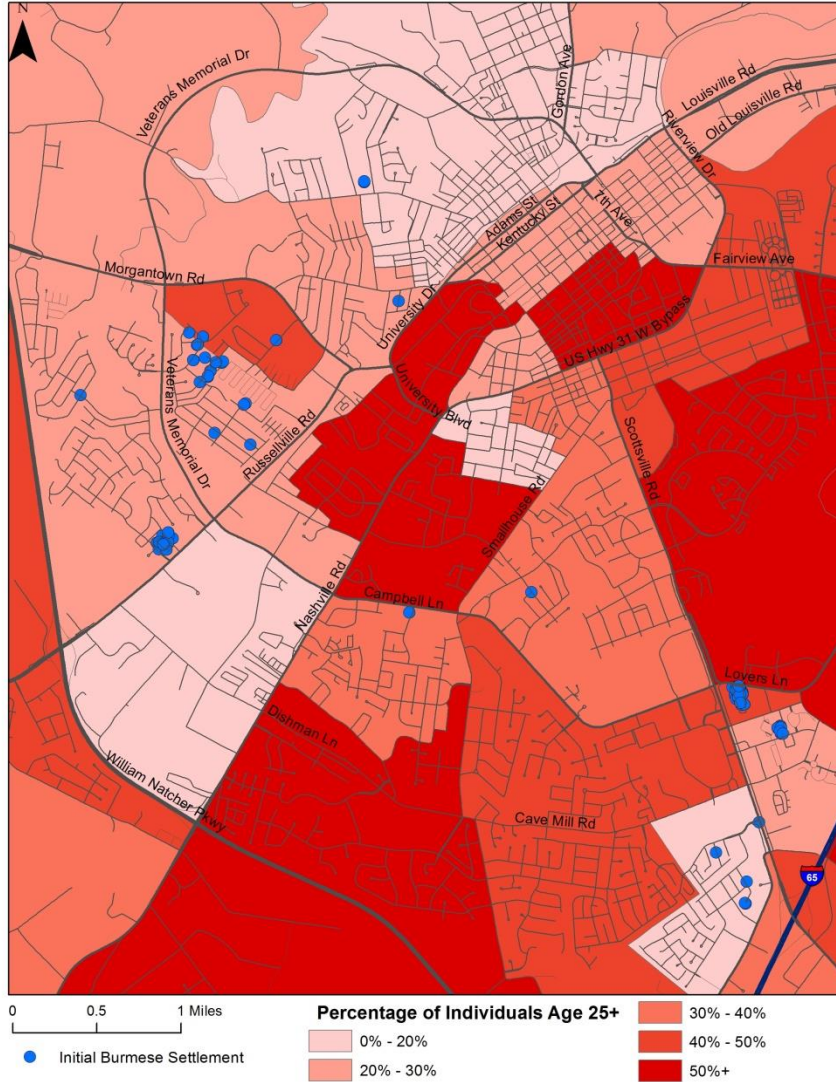


Figure 3.17: College Degree Attainment at the Block Group Level.

As can be seen, the education level for the neighborhoods of Burmese resettlement tends to be lower than that of the population as a whole. The cluster near Veterans Memorial Drive tends to have a lower concentration of individuals with a high

school diploma or GED, while the cluster to the west of Scottsville Road tends to have a lower than average percentage of individuals with a college degree. The results are summarized in Table 3.18.

Variable	Burmese Block Groups	All Warren County Block Groups
% with HS diploma/GED	83.28%	86.94%
% with college degree	29.13%	34.53%

Table 3.18: Summary of Education Characteristics.

In both cases, the block groups containing Burmese resettlement neighborhoods contain lower educational attainment. This is likely due to several factors, including the language barrier that the Burmese population would face in higher education.

The next set of variables to consider is the economic variables. The first of these, personal income, is only available at the block group level. It should be noted that the statistical “average” that is used is the median. This makes the statistic less susceptible to outliers, and presents a better overall view of the population as a whole. The concentration of individuals below the poverty line is presented as a percentage, as with many of the previous variables. Again, the data is only available at the block group level using ACS 5-year estimates. Figure 3.19 shows the median household income, and Figure 3.20 shows the concentration of individuals in poverty status.

Median Household Income (2010-2014 ACS 5-Year Estimates, Block Group)

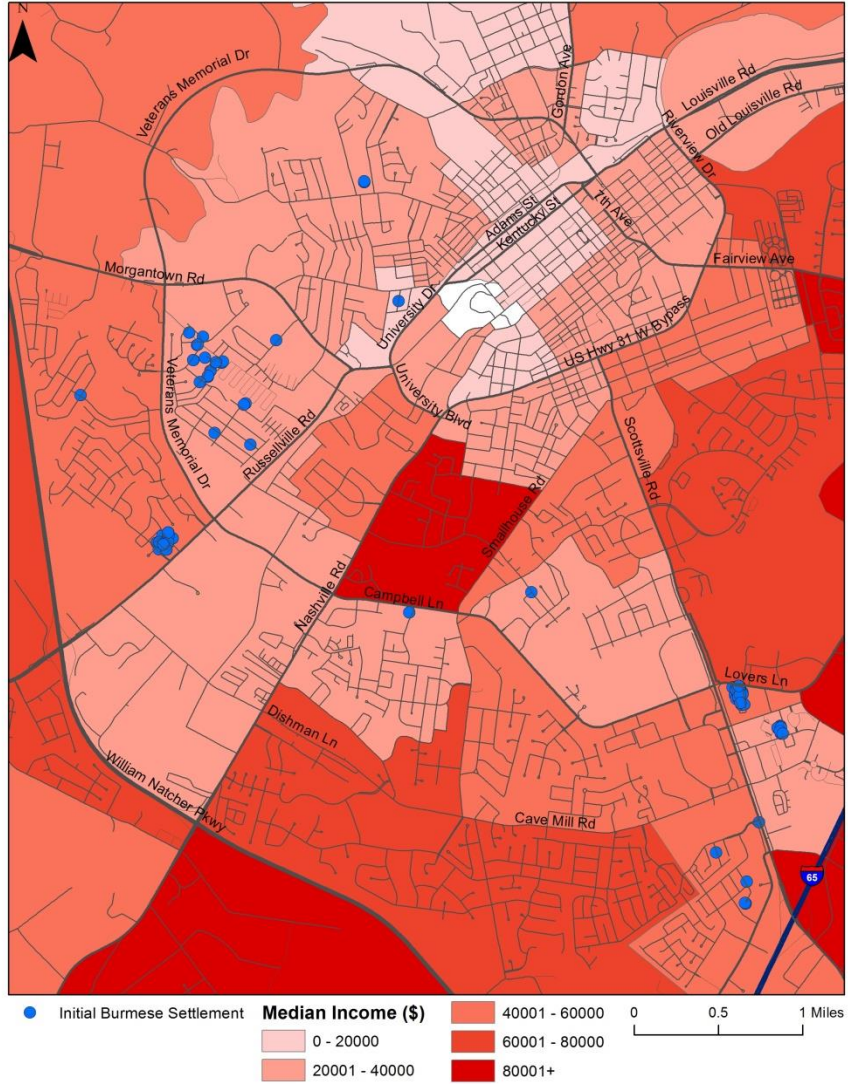


Figure 3.19: Median Household Income at the Block Group Level.

Persons below Poverty Line (2010-2014 ACS 5-Year Estimates, Block Group)

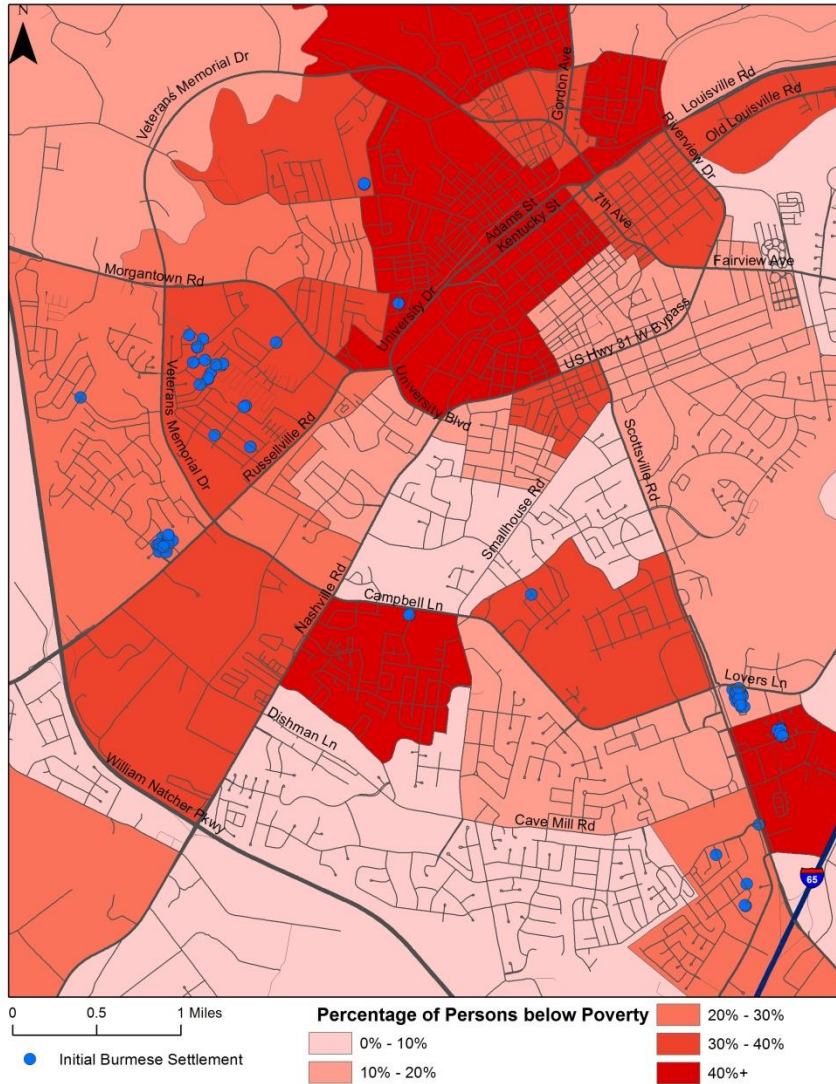


Figure 3.20: Individuals Below the Poverty Line at the Block Group Level.

While Figure 3.19 indicates that the neighborhoods of Burmese resettlement tend to have a lower than average median income, and Figure 3.20 indicates that most of the

Burmese neighborhoods tend to have higher than average poverty rates, both statistics for the neighborhoods are not the most extreme within the city of Bowling Green.

Because of the way the median is presented alone, and because individualized data is not available for income, it is not possible to summarize that data as with the other variables. However, Table 3.21 summarizes the poverty rates, which are significantly higher for the Burmese neighborhood block groups.

Variable	Burmese Block Groups	All Warren County Block Groups
% below poverty line	31.62%	19.06%

Table 3.21: Summary of Poverty Rates.

The next variables consider various statistics related to housing. This is, in a sense, also measuring economic traits of the neighborhoods, as the types of housing can indicate the levels of affluence within the neighborhood. The first maps simply measure the housing density, which is defined as the number of housing units per unit area. This metric gives an idea of the size and relative proximity of housing units, which can give a sense of the types of houses which might be present in the area. Figure 3.22 maps this value at the block group level, and Figure 3.23 maps it at the block level.

Housing Density (2010-2014 ACS 5-Year Estimates, Block Group)

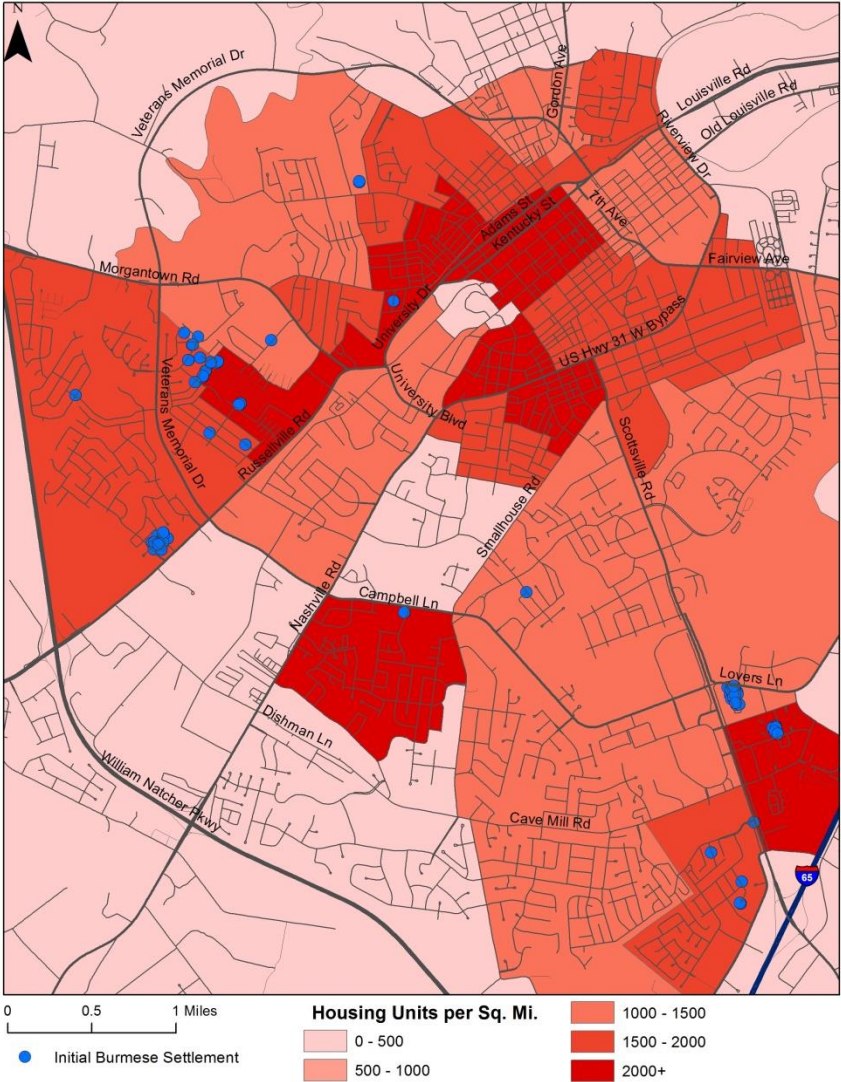


Figure 3.22: Housing Density at the Block Group Level.

Housing Density (2010 100% Data, Block)

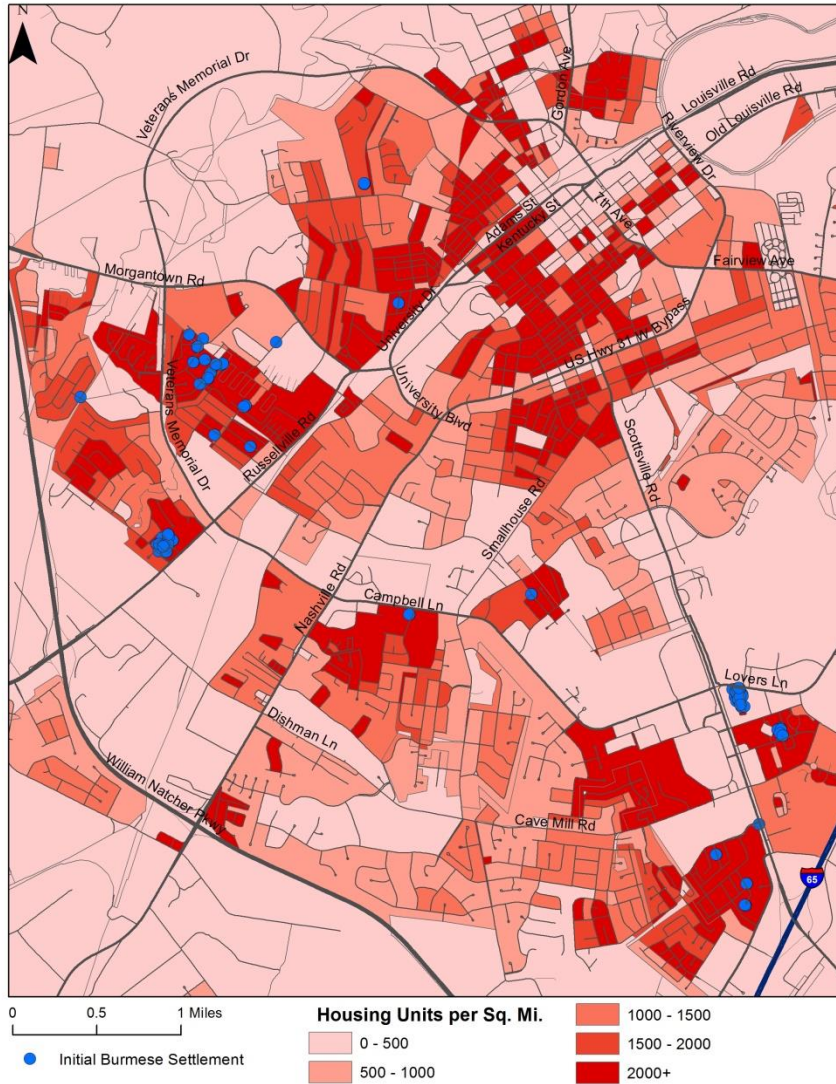


Figure 3.23: Housing Density at the Block Level.

As the maps indicate, the Burmese resettlement neighborhoods tend to have higher than average housing density, which indicates smaller housing units that are likely clustered close together.

The next variable under consideration is persons per household. This metric is often used as a proxy for family size, and describes whether people in the area tend to live alone or in larger groups. Figure 3.24 shows this variable at the block group level.

Persons per Household (2010-2014 ACS 5-Year Estimates, Block Group)

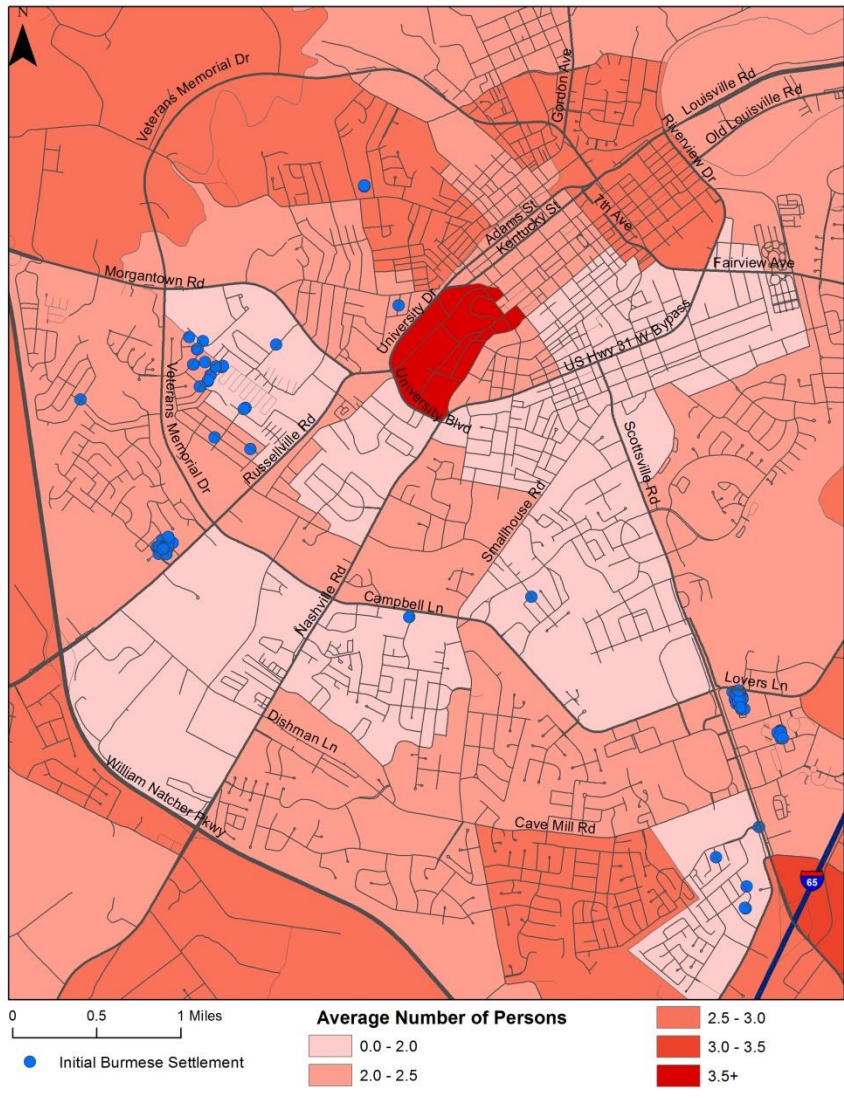


Figure 3.24: Persons per Household at the Block Group Level.

The neighborhoods with high Burmese concentration, as expected, tend to have a higher than average persons per household, particularly in the Lovers Lane cluster. This indicates families or groups of families are living together in the same household, which

makes sense given the refugee status of the Burmese population. Note that the values for the block groups containing Western Kentucky University are extreme outliers, and this is due to the presence of students living in dormitories, which are considered housing units by the Census Bureau data.

The next variables describe the status of the housing units in the neighborhoods. Figures 3.25 and 3.26 depict the percentage of housing units that are vacant at the block group and block level, respectively, and Figures 3.27 and 3.28 show the percentage of occupied housing units that are rented rather than owned at the corresponding levels.

Housing Vacancies (2010-2014 ACS 5-Year Estimates, Block Group)

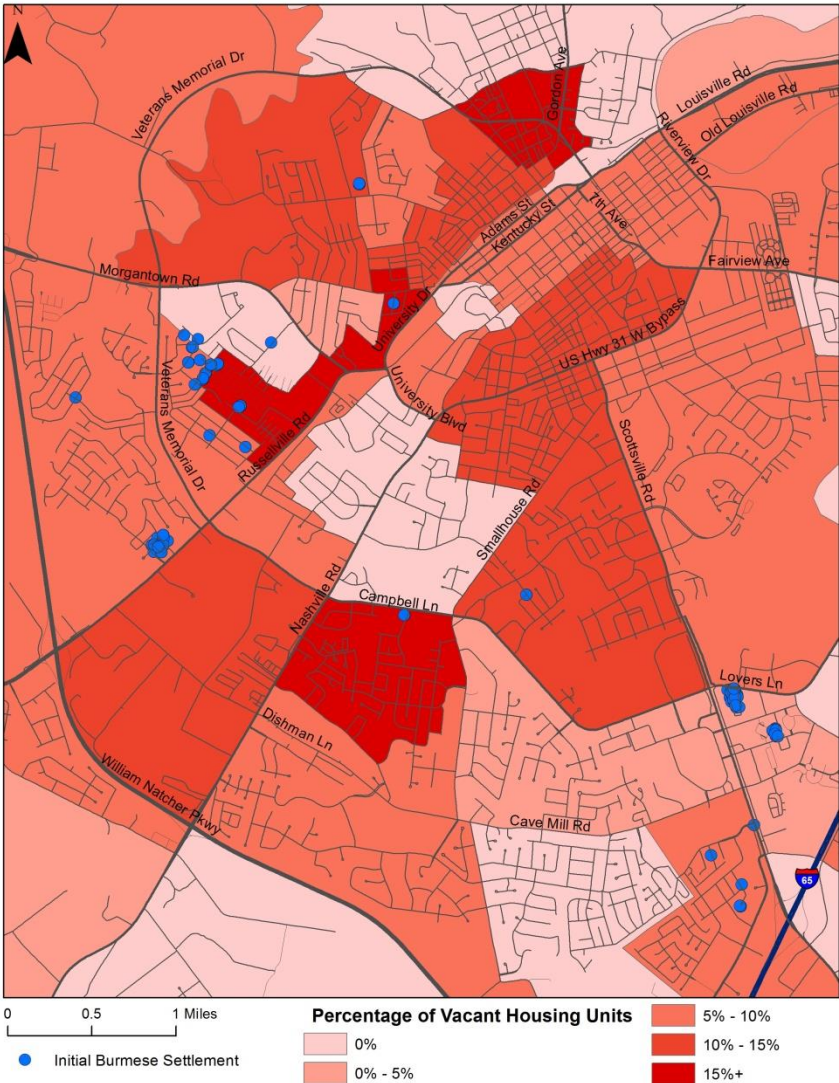


Figure 3.25: Concentration of Vacant Housing Units at the Block Group Level.

Housing Vacancies (2010 100% Data, Block)

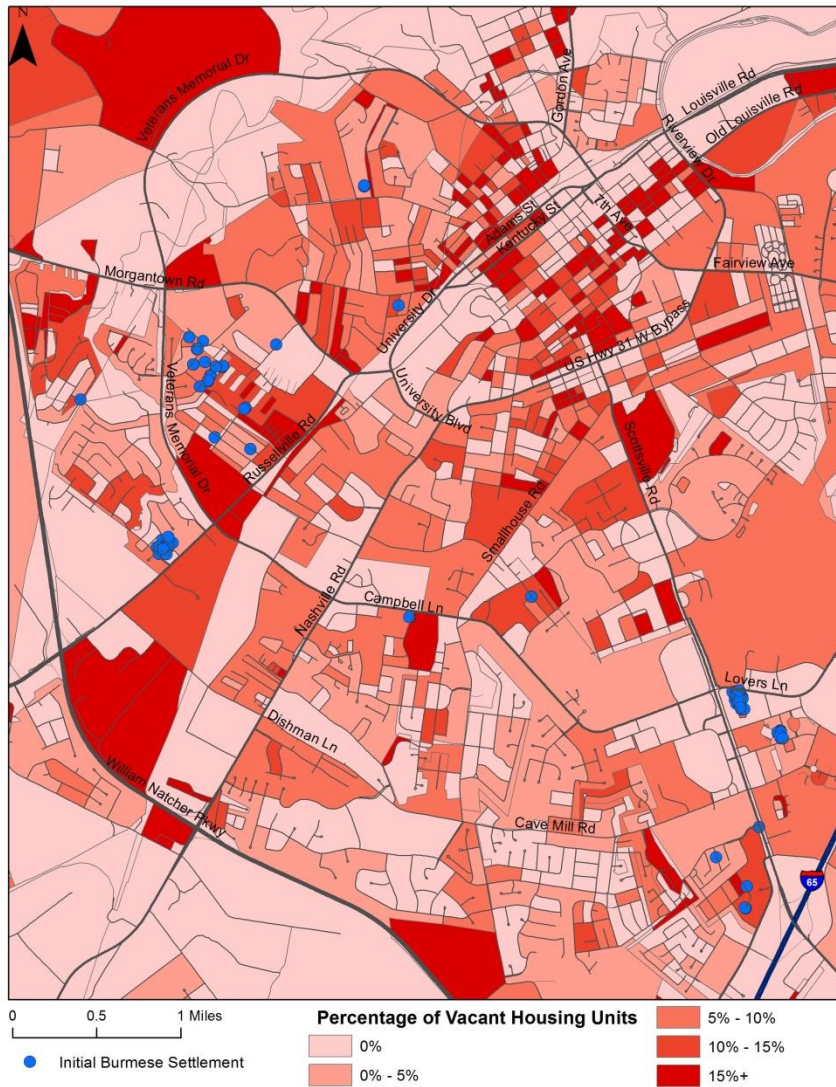


Figure 3.26: Concentration of Vacant Housing Units at the Block Level.

Rented Housing Units (2010-2014 ACS 5-Year Estimates, Block Group)

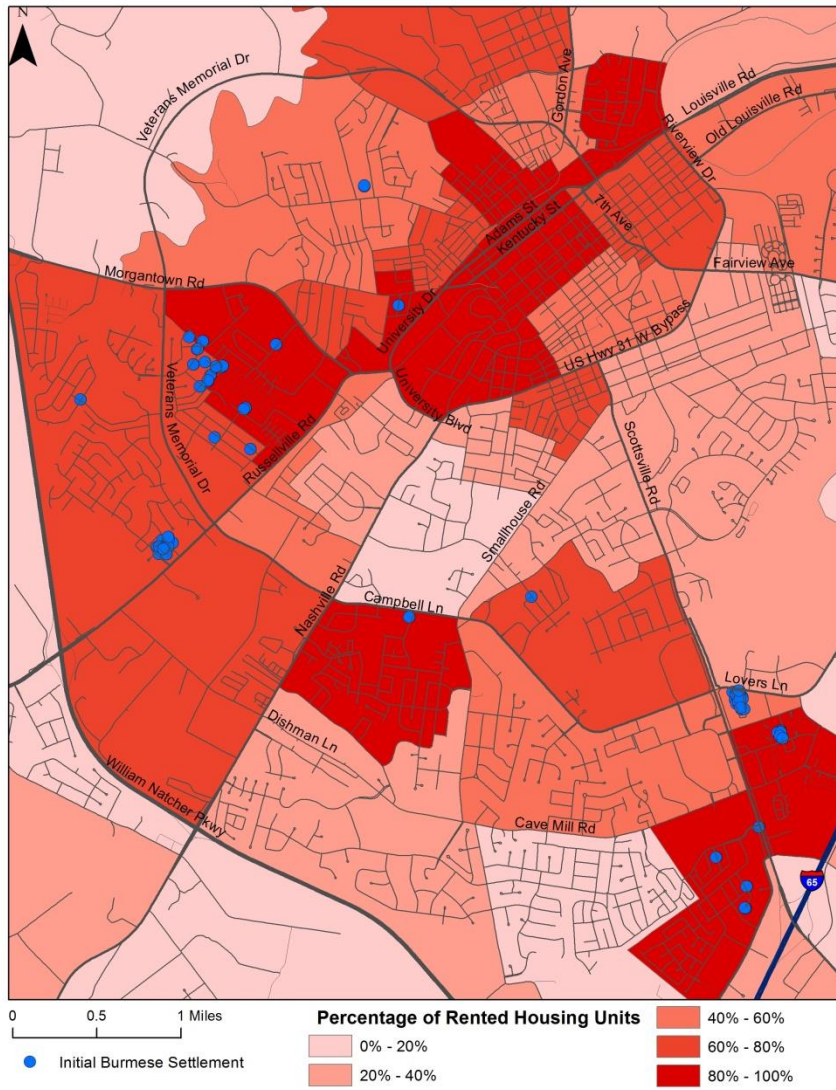


Figure 3.27: Concentration of Rented Housing Units at the Block Group Level.

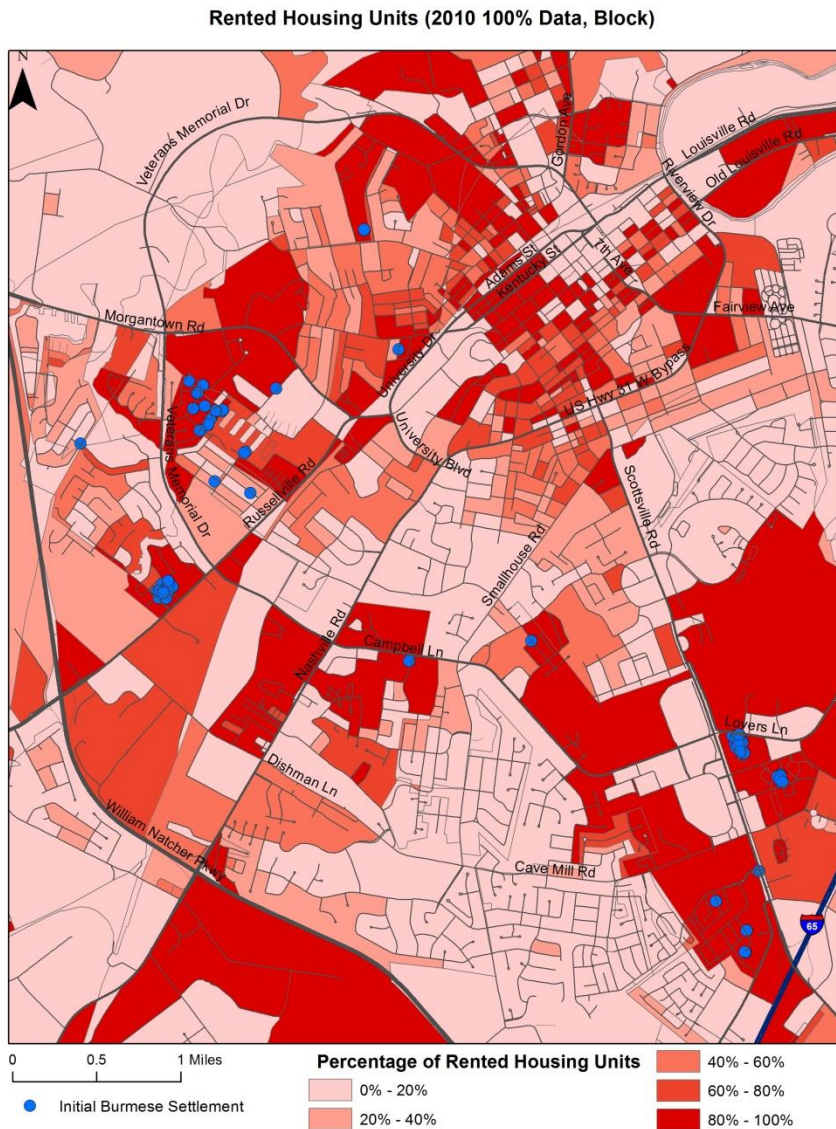


Figure 3.28: Concentration of Rented Housing Units at the Block Level.

The Burmese refugee cluster located near Veterans Memorial Drive tends to have a higher than average concentration of vacant housing units, and all Burmese resettlement neighborhoods tend to have a higher than average concentration of rented housing units, suggesting the presence of apartment complexes or smaller, single-family homes. It

should be noted that many of the other areas of high rental percentages are likely due to the presence of college students in the vicinity of Western Kentucky University.

Table 3.29 summarizes the housing characteristics for the entire population and the subset of interest. For the persons per household statistic, keep in mind that the value for the entirety of Warren County is heavily skewed by student housing.

Variable	Burmese Block Groups	All Warren County Block Groups
Housing Density	1470.159 units per sq. mi.	88.611 units per sq. mi.
Persons per household	2.061	2.415
% vacant housing units	9.96%	7.41%
% rented housing units	74.58%	41.61%

Table 3.29: Summary of Housing Characteristics.

While the Burmese block groups tend to be more heavily concentrated with vacant and rented housing units, the number of persons per household is somewhat lower than that of Warren County as a whole. However, it is clear that home ownership rates are much lower in these neighborhoods, suggesting the presence of apartment complexes and other rented homes.

The final characteristic that is considered is the mode of transportation used for commuting. Three modes were considered in the analysis: driving a personal automobile, walking, or taking public transportation, which for Bowling Green is most likely bus transit. The data is only available at the block group level, and Figures 3.30, 3.31, and 3.32 show each of the modes, respectively.

Commuters who use Automobile (2010-2014 ACS 5-Year Estimates, Block Group)

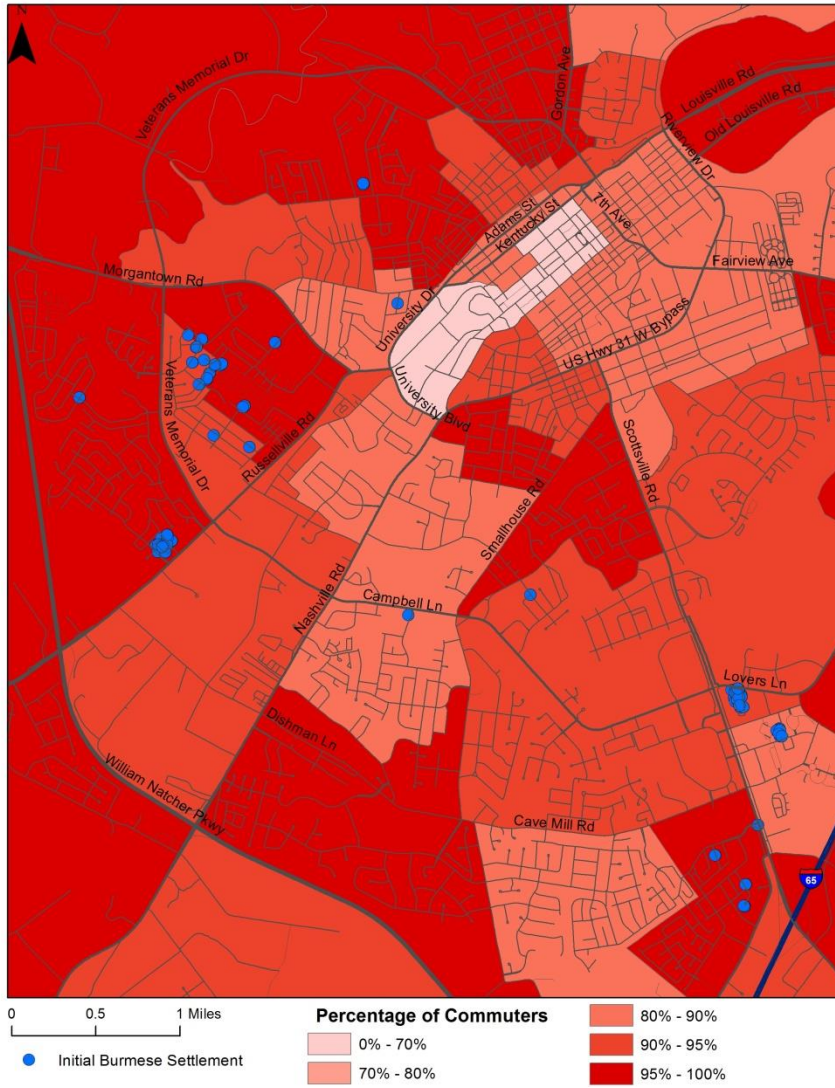


Figure 3.30: Individuals who Commute by Car at the Block Group Level.

Commuters who Walk (2010-2014 ACS 5-Year Estimates, Block Group)

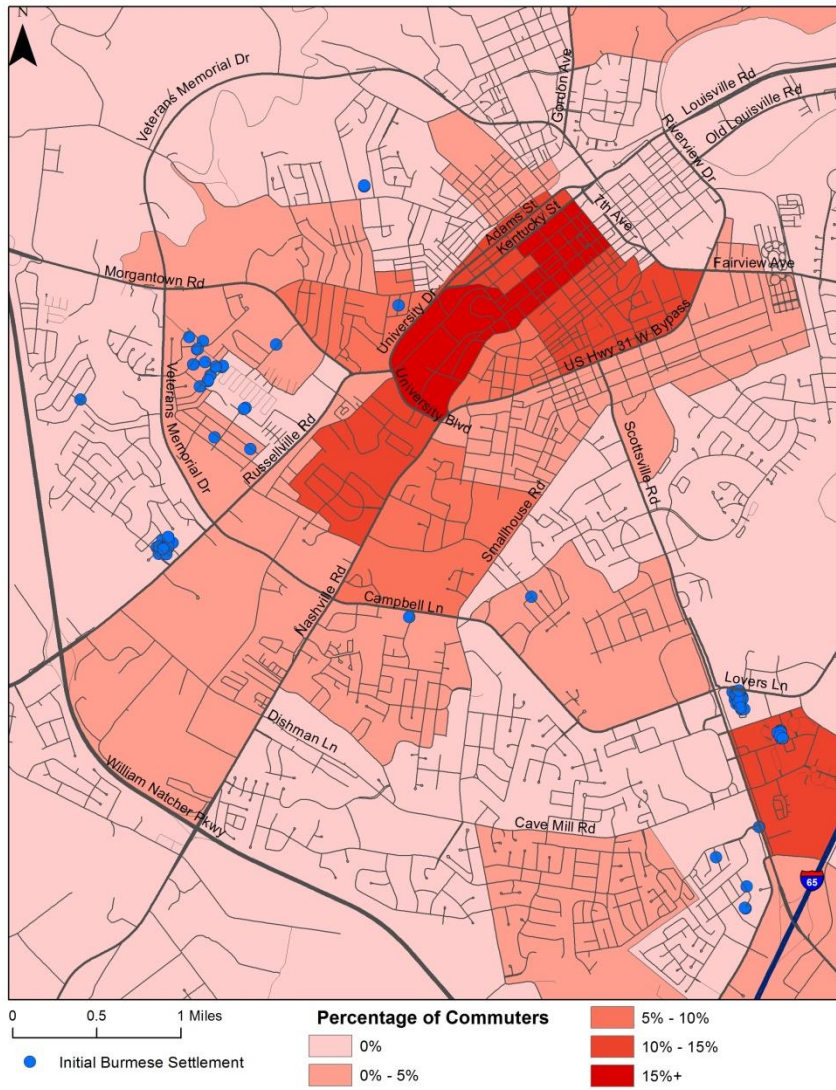


Figure 3.31: Individuals who Commute by Walking at the Block Group Level.

Commuters who use Public Transport (2010-2014 ACS 5-Year Estimates, Block Group)

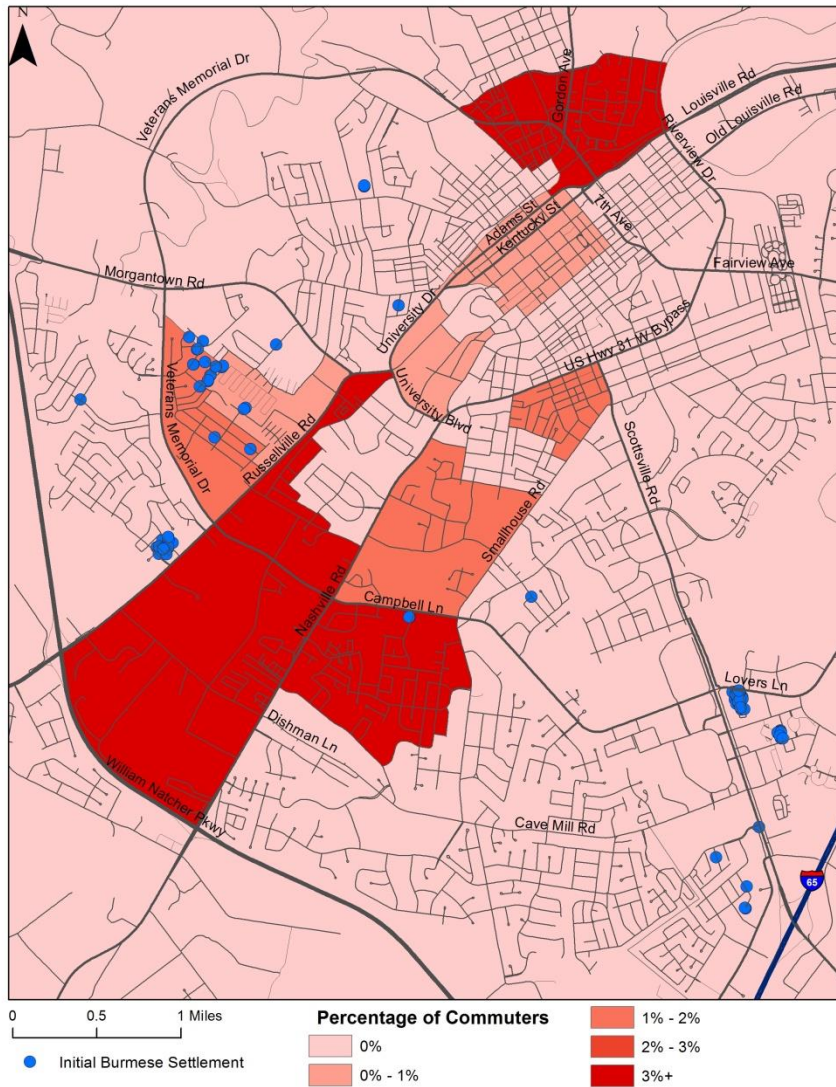


Figure 3.32: Individuals who Commute by Public Transit at the Block Group Level.

As expected, the vast majority of commuters in the Bowling Green area use their own car to commute to work, but the Burmese resettlement neighborhoods display different traits. The concentration of families near Lovers Lane tends to rely heavily on

walking, which makes sense given the relatively close opportunities along the Scottsville Road corridor. In contrast, the concentration near Veterans Memorial Drive tends to rely more on public transportation, which likely reflects the availability of the GoBG bus routes (as well as some likely influence from the WKU bus system for students who work part-time).

Table 3.33 summarizes the commuting characteristics.

Variable	Burmese Block Groups	All Warren County Block Groups
% commuting by car	93.91%	93.01%
% commuting by walking	2.36%	3.07%
% commuting by public transport	0.65%	0.38%

Table 3.33: Summary of Commuting Characteristics.

In this case, the summary provides somewhat surprising results, with a higher percentage commuting by car in the block groups containing Burmese resettlement neighborhoods despite the fact that most refugees do not own a personal vehicle. This is likely due to the influence of the modifiable areal unit problem, which will be discussed in further detail in Chapter 5.

CHAPTER 4

ACCESSIBILITY

Accessibility can be defined as “the degree of ease with which it is possible to reach a certain location from other locations” (de Blij & Muller, 2000). In a sense, accessibility can be thought of as potential access, but this potential can only be realized with mobility. In the case of the Burmese refugee population, many of them have reduced mobility due to the lack of access to an automobile. This should be taken into consideration when performing any analysis. It is assumed that members of the refugee population will likely walk or take public transportation in order to move about the city.

Using network analysis techniques in ArcGIS, it is possible to create service areas for certain basic services. These service areas show the regions which can be reached from a given location within a certain distance or time (Esri, 2016). Using the streets of Bowling Green, it is possible to create “walking” service areas for the stores dataset (as well as subsets of interest). This will further help to characterize the Burmese resettlement neighborhoods in terms of access to basic services. An average walking speed of 3 miles per hour is used as a simple assumption, so the times listed should be considered estimates. Figure 4.1 shows these service areas for all stores in the dataset.

Store (all) Service Areas, Walking

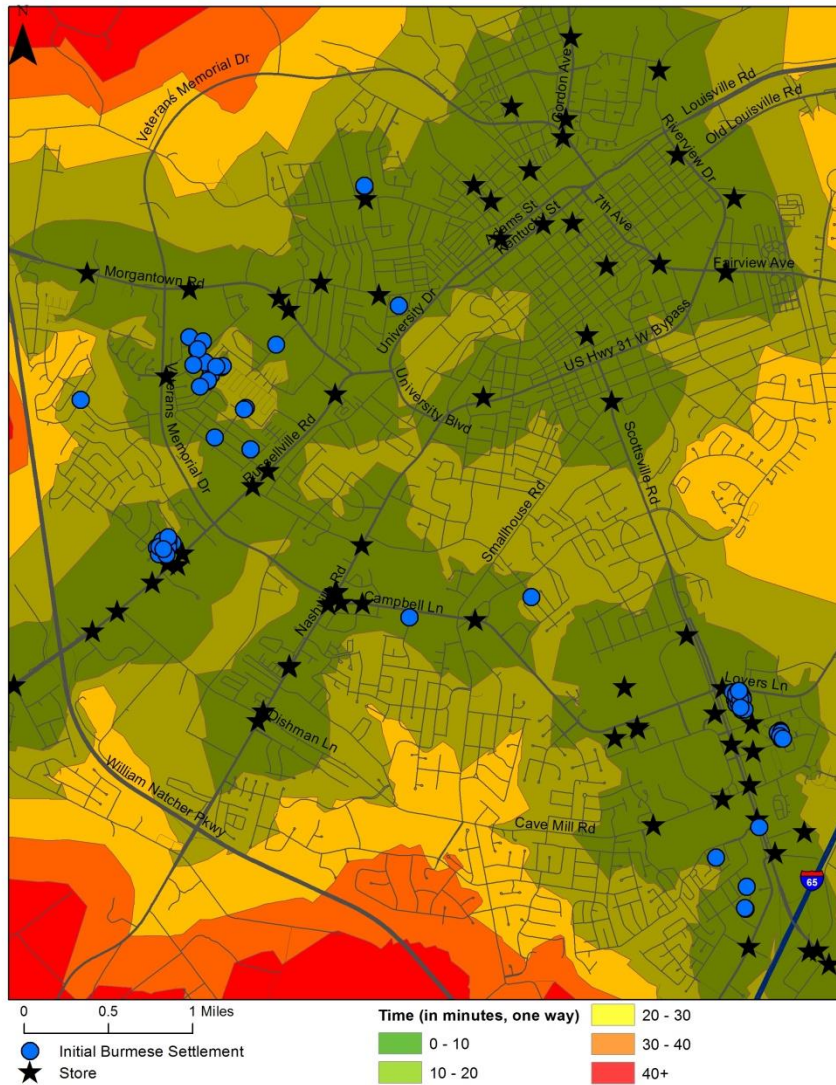


Figure 4.1: Walking Service Areas for All Stores.

For the previous map, regions with the darkest green indicate areas that are located within roughly a ten minute walk of the nearest store. It is important to note that this time reflects a one way trip, so a person walking from his or her home to the store

and back would take double the time (this will be true for all subsequent maps in this chapter).

Figure 4.1 provides limited information, as the type of store is not considered in the analysis, but it is possible to perform the same analysis on subsets of the stores.

Figure 4.2 repeats the analysis, considering only major chain grocery stores (Kroger (3), Meijer, Target, and Walmart (2)).

Major Grocery Store Service Areas, Walking

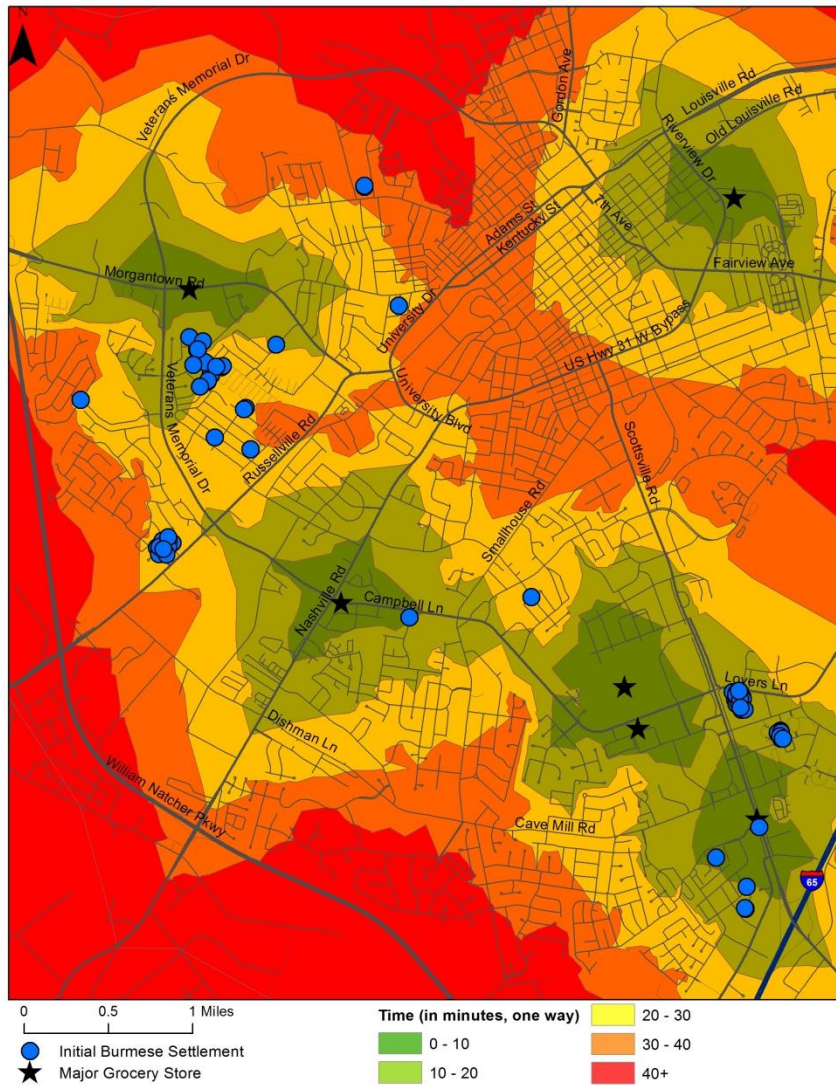


Figure 4.2: Walking Service Areas for Major Grocery Stores.

Of probable interest to the Burmese refugee population, another subset of the analysis considers only ethnic markets, in particular Asian markets (Asian Market,

Bangkok Grocery, Chin Asian Grocery, Himalayan Store, Nan Asian Grocery, and Oriental Grocery). Figure 4.3 depicts the walking service areas for those stores.

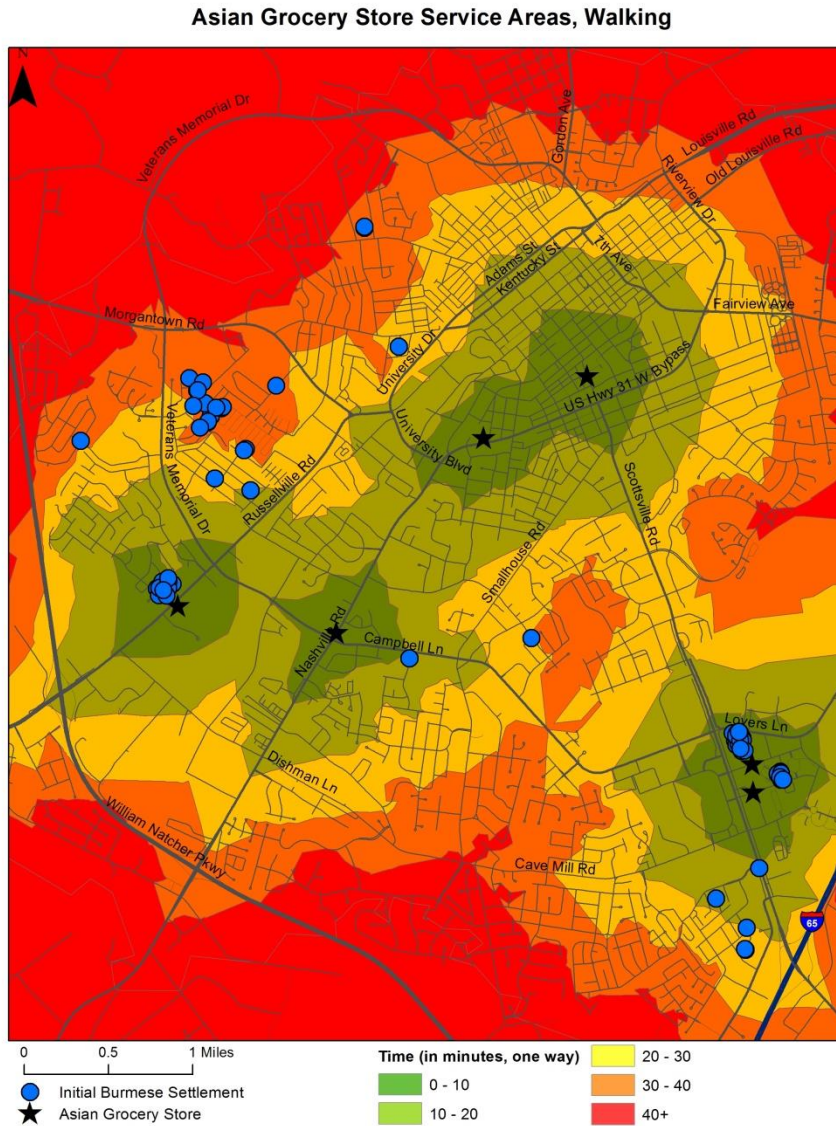


Figure 4.3: Walking Service Areas for Asian Grocery Stores.

Finally, Figure 4.4 considers devoted pharmacies (this includes all CVS, Rite-Aid, Sheldon's, and Walgreens locations, but does not include combined stores such as Walmart), which are important for providing medication and other health products to nearby neighborhoods.

Pharmacy Service Areas, Walking

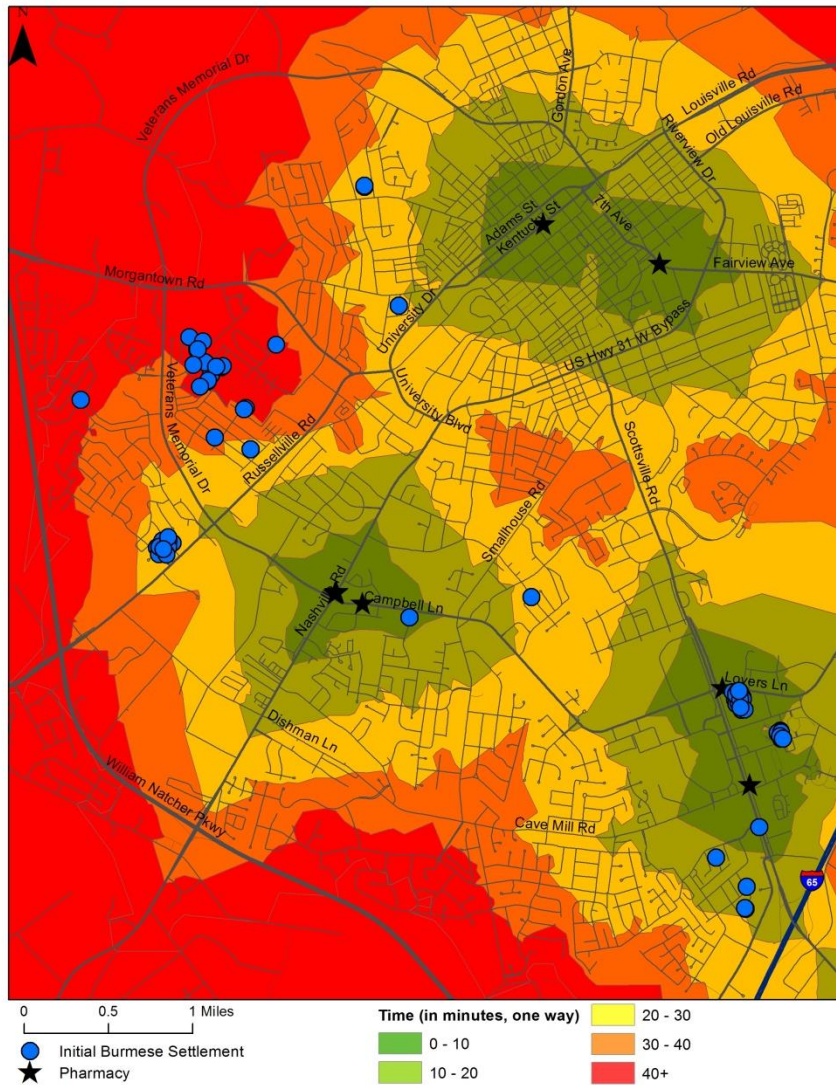


Figure 4.4: Walking Service Areas for Pharmacies.

As can be seen from the previous maps, the Burmese settlement neighborhood near Lovers Lane benefits from its relative vicinity to many stores along Scottsville Road, making it quite possible to access many locations via walking. The clusters near

Veterans Memorial Drive have more limited accessibility, but they are able to take advantage of the nearby Walmart on Morgantown Road.

It is possible to integrate the GoBG bus routes into the analysis, but there are several assumptions that must be made. First, Figure 4.5 shows walking service areas for the GoBG bus stops.

GoBG Bus Stop Service Areas, Walking

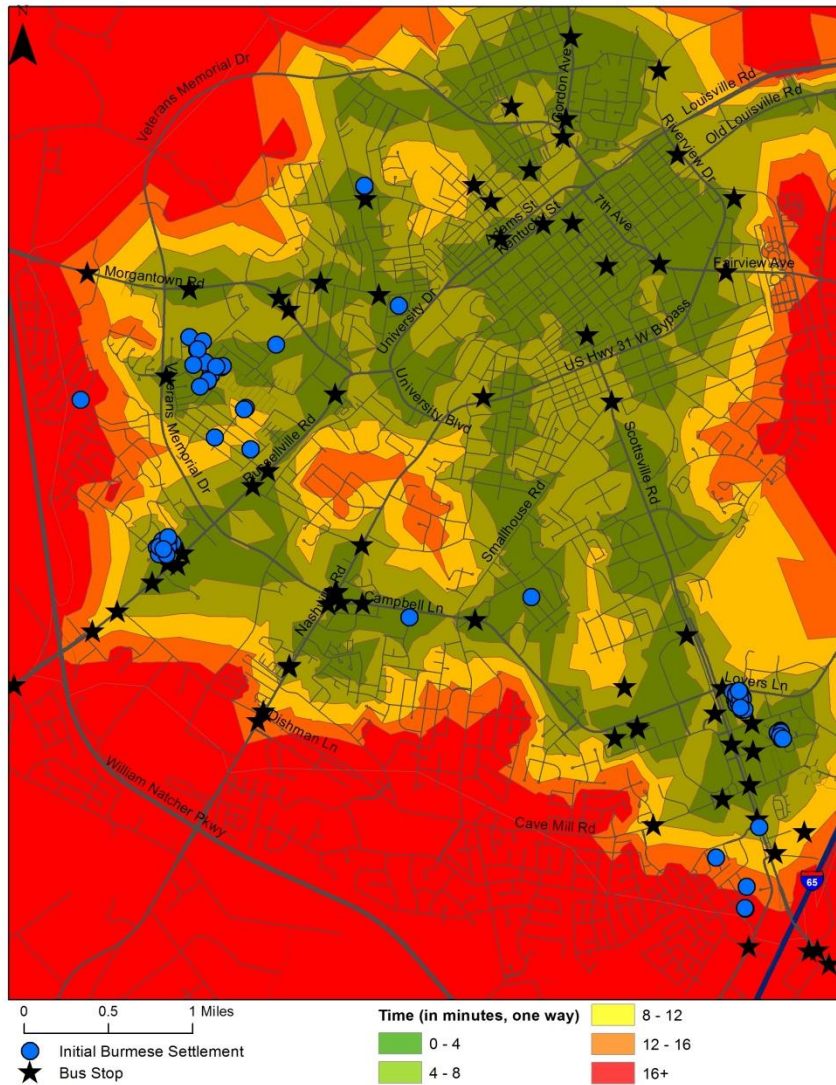


Figure 4.5: Walking Service Areas for Bus Stops.

Note that the intervals for the service areas have been decreased, to reflect the shorter time that people wish to walk to reach a nearby bus stop. The next step in integrating the GoBG bus routes into the analysis is to create a multimodal network. This

network includes both the walking network along the roads, but now adds the GoBG bus routes. People may walk along the roads as before, but may now walk to a bus stop and take a bus along its route. In reality, people must wait for a bus to arrive, but for simplicity's sake, the assumption was made that a bus would always be ready, and thus the waiting time at any stop is zero. (It can be assumed that travelers will readily learn the bus schedules.) Also, it was assumed that buses would travel at approximately five times the rate of a pedestrian, or about 15 miles per hour. This value was chosen to account for varied traffic patterns as well as the numerous stops along the route that each bus would make. With these simplifications in mind, it should be noted that the results of the analysis will again be estimates, but the important takeaway is the overarching trend depicted on the maps. Figures 4.6, 4.7, 4.8, and 4.9 repeat the analyses shown in Figures 4.1 through 4.4, this time using the multimodal walking and bus network.

Store (all) Service Areas, Walking with GoBG Routes

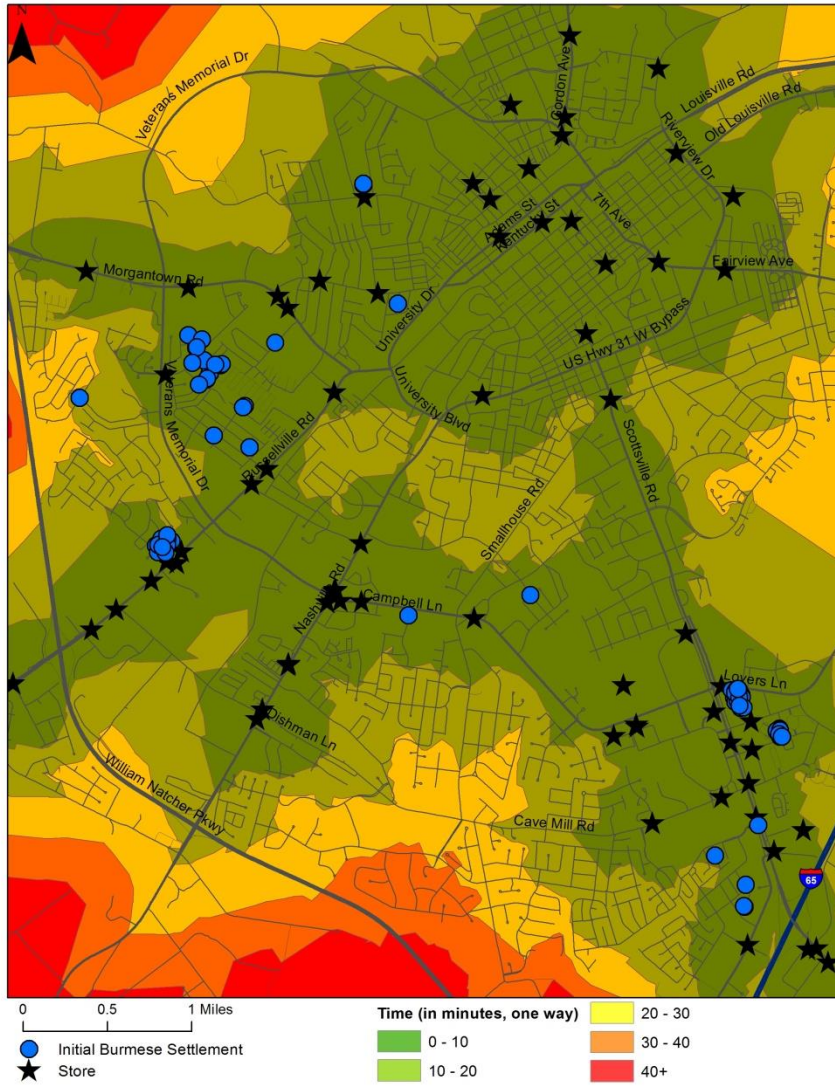


Figure 4.6: Multimodal Service Areas for All Stores.

Major Grocery Store Service Areas, Walking with GoBG Routes

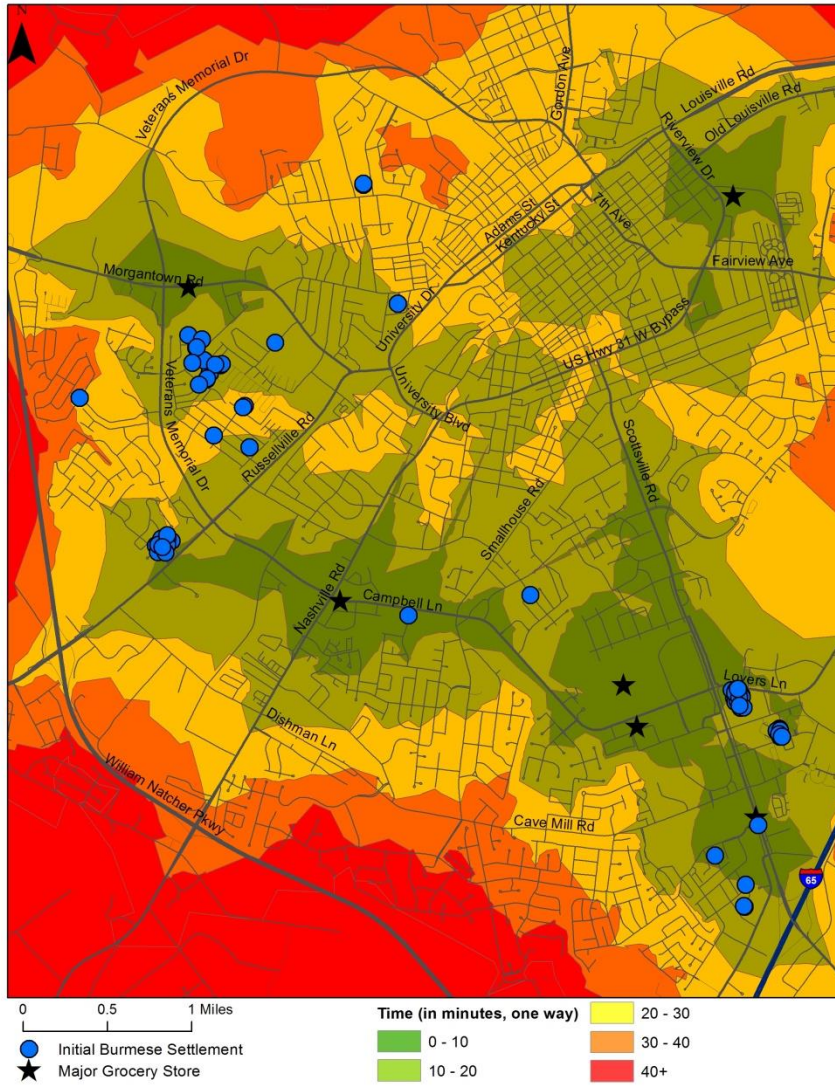


Figure 4.7: Multimodal Service Areas for Major Grocery Stores.

Asian Grocery Store Service Areas, Walking with GoBG Routes

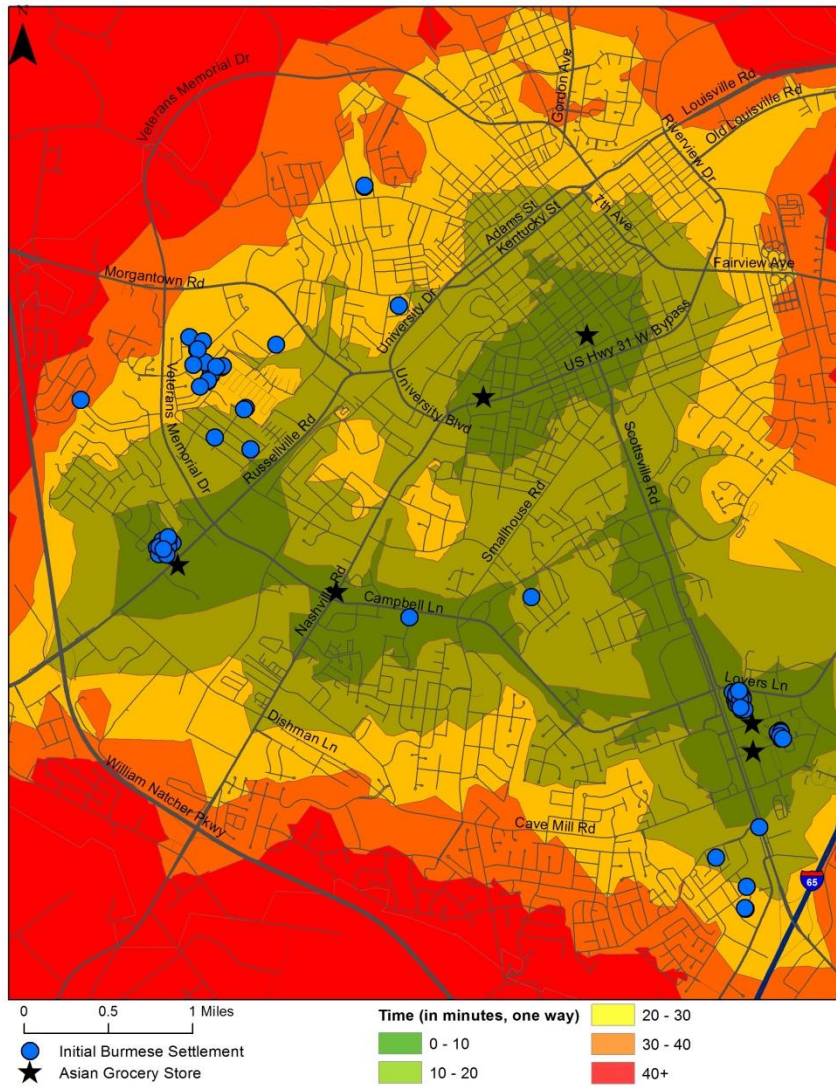


Figure 4.8: Multimodal Service Areas for Asian Grocery Stores.

Pharmacy Service Areas, Walking with GoBG Routes

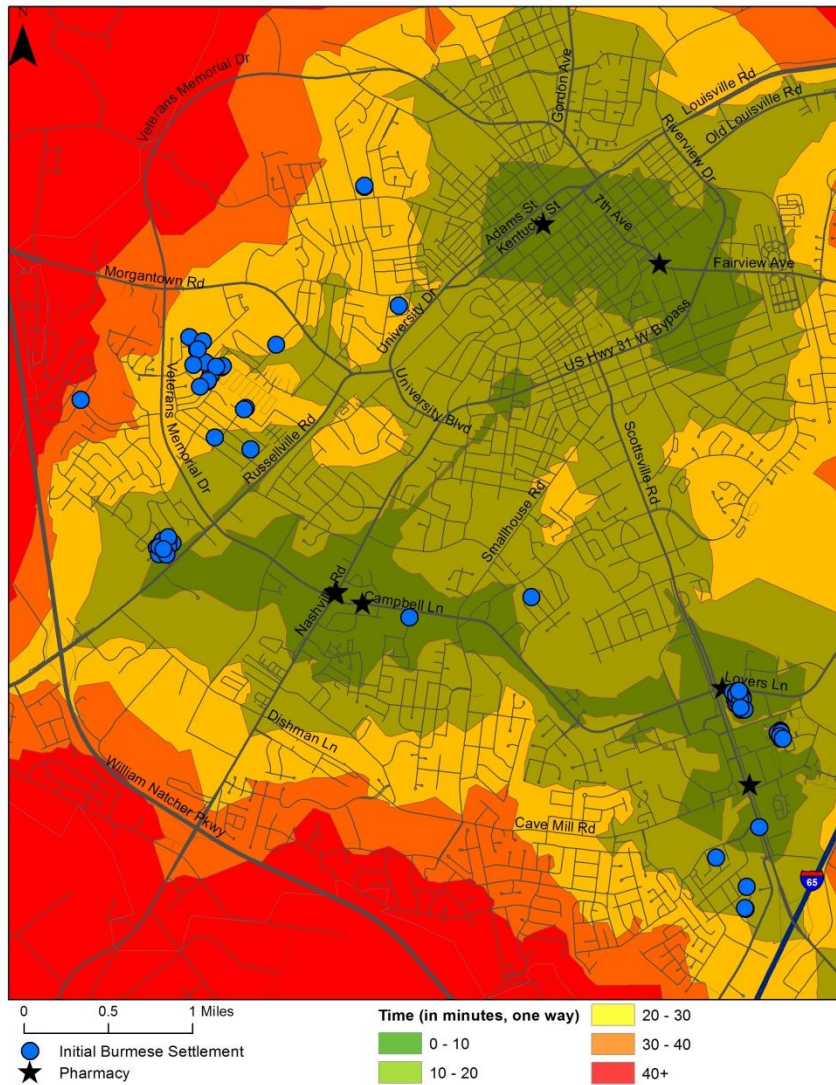


Figure 4.9: Multimodal Service Areas for Pharmacies.

In all cases, as expected, the service areas improved, allowing for greater accessibility throughout the city. In particular, the Burmese refugees who live in the cluster near Veterans Memorial Drive especially benefit from their proximity to the bus

lines (blue and yellow), which provide better access to stores on Campbell Lane and other areas.

CHAPTER 5

LIMITATIONS

Though the spatial analysis presented in the previous two chapters yielded a good deal of information about the Burmese resettlement neighborhoods, there are limitations that should not be ignored when considering the results. One limitation comes directly from the ACS sample data. Because the statistics are not a comprehensive census of the population, they should be considered as estimates with some margin of error.

When the comprehensive data from 2010 at the block level is available for a particular variable (for example, housing data), it can be useful to look for changing trends over time. While these trends may indeed manifest themselves, it can be dangerous to draw too strong of a conclusion for two reasons: first, the spatial unit (block group vs. block) is different, and second, the time difference is only a four year span. In order to look at chronological trends, more time and data is necessary, and it would be ideal to perform a more longitudinal sort of study.

A specific limitation in this case study involves the Modifiable Areal Unit Problem (MAUP). The MAUP can be defined as “a problem arising from the imposition of artificial units of spatial reporting on continuous geographical phenomena resulting in the generation of artificial spatial patterns” (Heywood, 1998). This problem can arise

either intentionally or by accident, but its consequences are significant in either case. The problem is best illustrated by an example from this study: the cluster of families settled in the vicinity of Lovers Lane.

Figure 5.1 shows two side-by-side maps previously presented in Chapter 3: those depicting the number of individuals below the poverty line and the percentage of individuals with a high school diploma or equivalent.

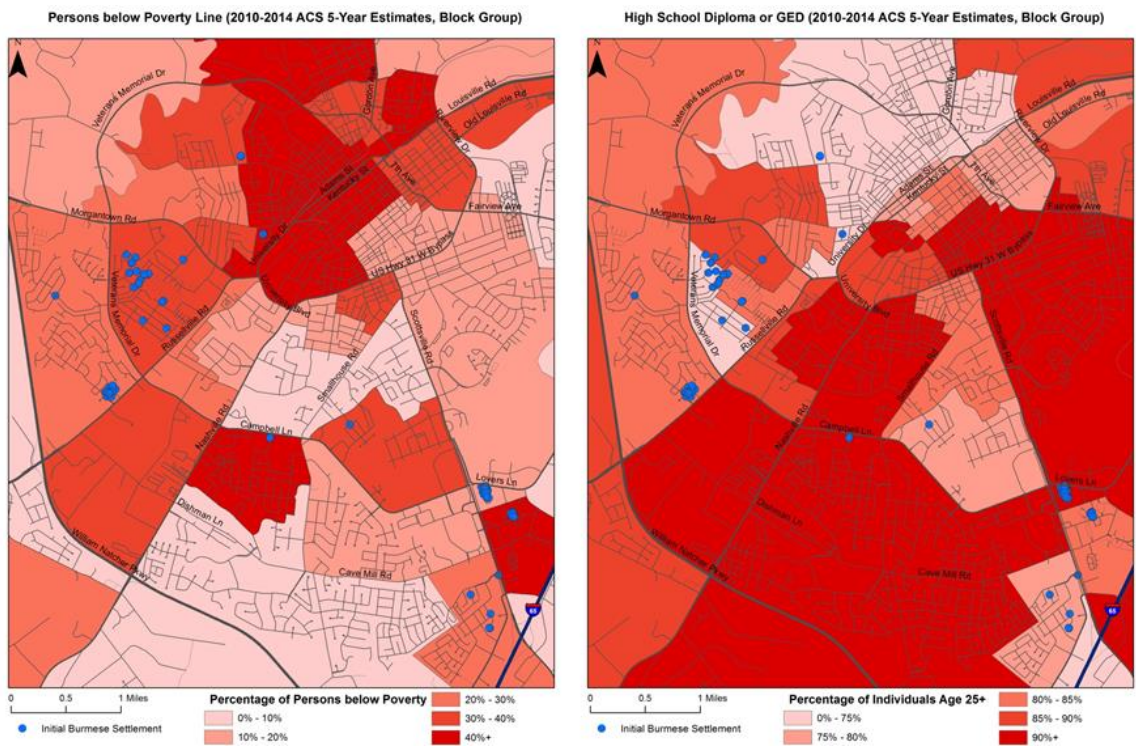


Figure 5.1: Comparison of Variables for the Lovers Lane Cluster.

Notice the values depicted on the maps for the clusters near Lovers Lane. The values for the cluster immediately south of Lovers Lane show marked contrast in comparison to the nearby clusters further south along Scottsville Road. Several other

variables in the study also display such a pattern. While it is possible that this contrast is indeed a true indicator of differences in the two neighborhoods, it is worth taking a closer look to see what is going on.

If the modifiable areal unit problem is to blame, then the boundaries of the block groups should be examined to see if they make sense. Figure 5.2 shows a closer look at the Lovers Lane clusters, highlighting the block group boundaries.

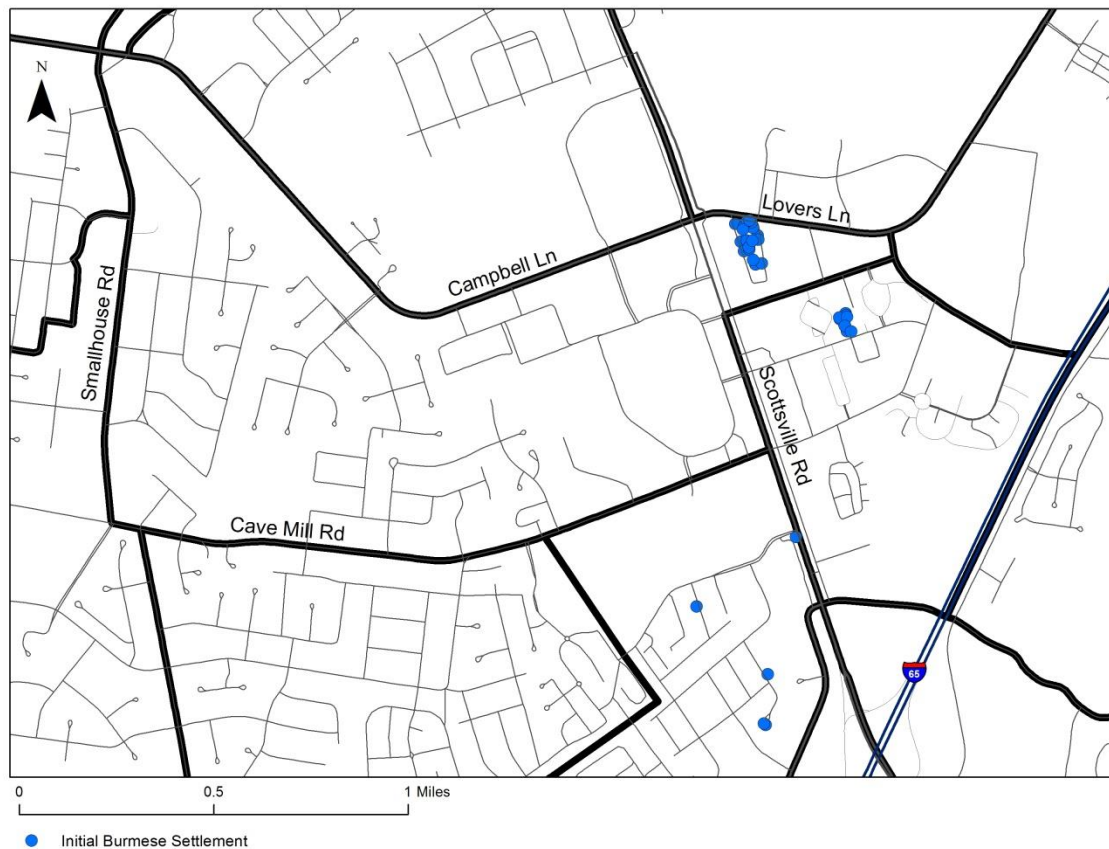


Figure 5.2: Block Group Boundaries for the Lovers Lane Cluster.

As can be seen, the boundaries for the block group are irregularly shaped. The northernmost cluster is grouped with many areas to the west of Scottsville Road, rather than being grouped with the nearby cluster immediately to its south. This suggests that the block group bounded by Campbell Lane, Smallhouse Road, and Cave Mill Road may contain more diverse neighborhood characteristics than the other block groups in the area. To test this, it may be helpful to look at the land use for the region. Such data is available from the Warren County City-County Planning Commission. The data contains dozens of individualized codes that each correspond to a highly specialized land use, but for the purposes of this analysis the zones were simplified. Figure 5.3 shows the land use for the block groups of interest.

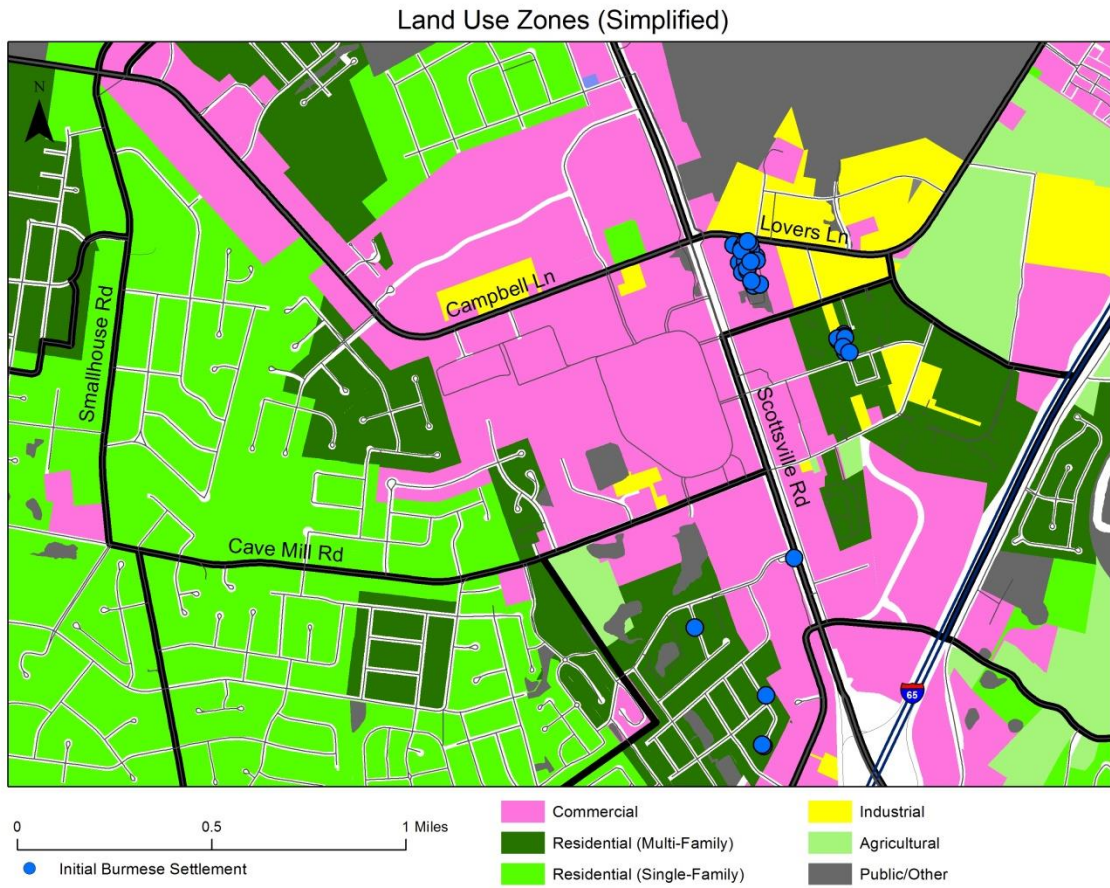


Figure 5.3: Land Use for the Lovers Lane Cluster.

As can be seen, the block group of interest contains a wide variety of land use types, ranging from residential (both single-family and multi-family) to commercial to industrial. Table 5.4 lists the overall percentages for the land use in the Campbell/Smallhouse/Cave Mill block group.

Land Use	Percentage
Residential (single family)	42.04%
Residential (multi-family)	10.34%
Commercial	43.03%
Industrial	3.18%
Public/Other	1.41%

Table 5.4: Land Use for the Campbell/Smallhouse/Cave Mill Block Group.

The block group of interest is divided significantly between commercial land use and residential, which is primarily single family use but also contains a significant portion of multi-family use. Because of this diversity, the data from the Census Bureau can be limited because it aggregates information from very diverse areas. Thus, due to the MAUP, it is likely that the true trends and outliers are masked by virtue of the unfortunately drawn arbitrary boundaries. Further illustrations of this diversity can be found with on-site photos (Figures 5.6 through 5.9), which are located according to the map in Figure 5.5.

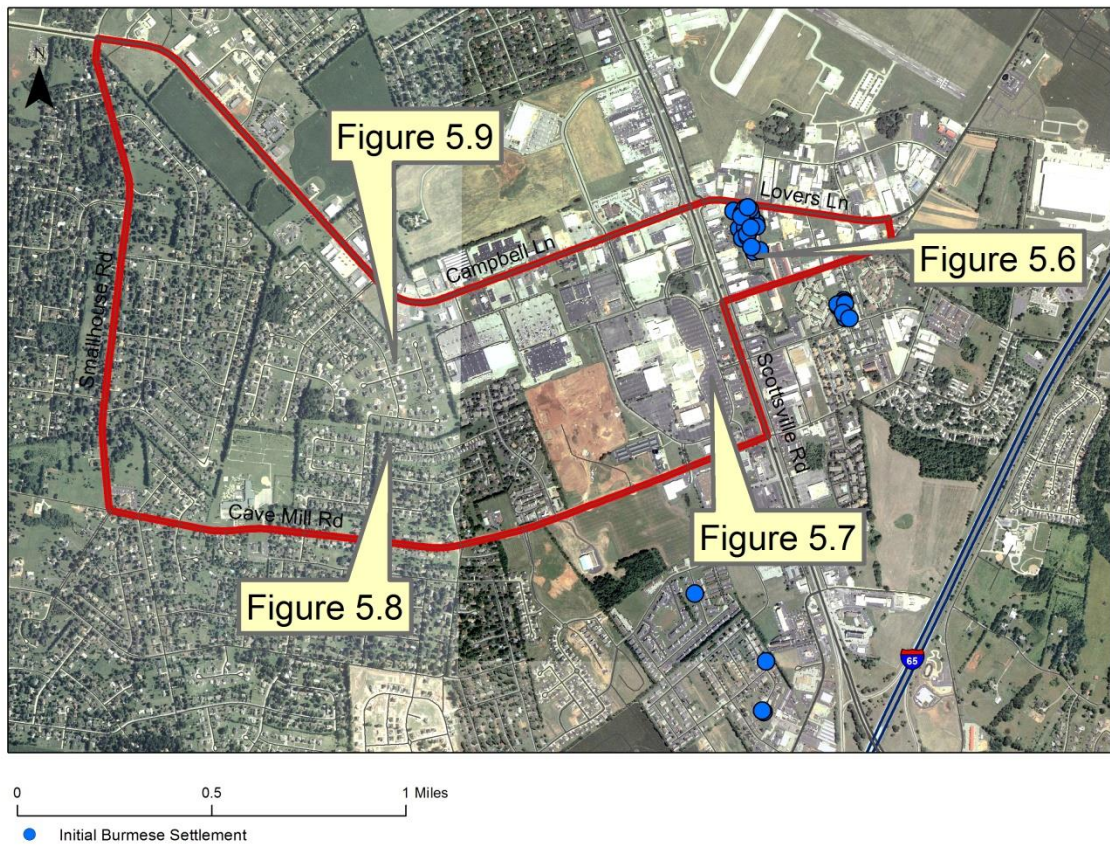


Figure 5.5: Location of On-Site Photos in the Lovers Lane Vicinity.



Figure 5.6: Lower Income Multi-Family Residential Unit.



Figure 5.7: Greenwood Mall (Scottsville Road Commercial District).



Figure 5.8: Middle-Income Single Family Residential Units.



Figure 5.9: High Income Single Family Residential Units.

On-site photographic evidence proves that the block group of interest is not very cohesive, making the MAUP a definite concern. However, it is still possible to glean useful information from the analysis with this limitation in mind, especially for the more specific block level maps.

Figure 5.10 examines the land use zones for the other major cluster of Burmese resettlement locations. They are located in a series of three block groups bounded by Russellville Road, Morgantown Road, and Veterans Memorial Drive.

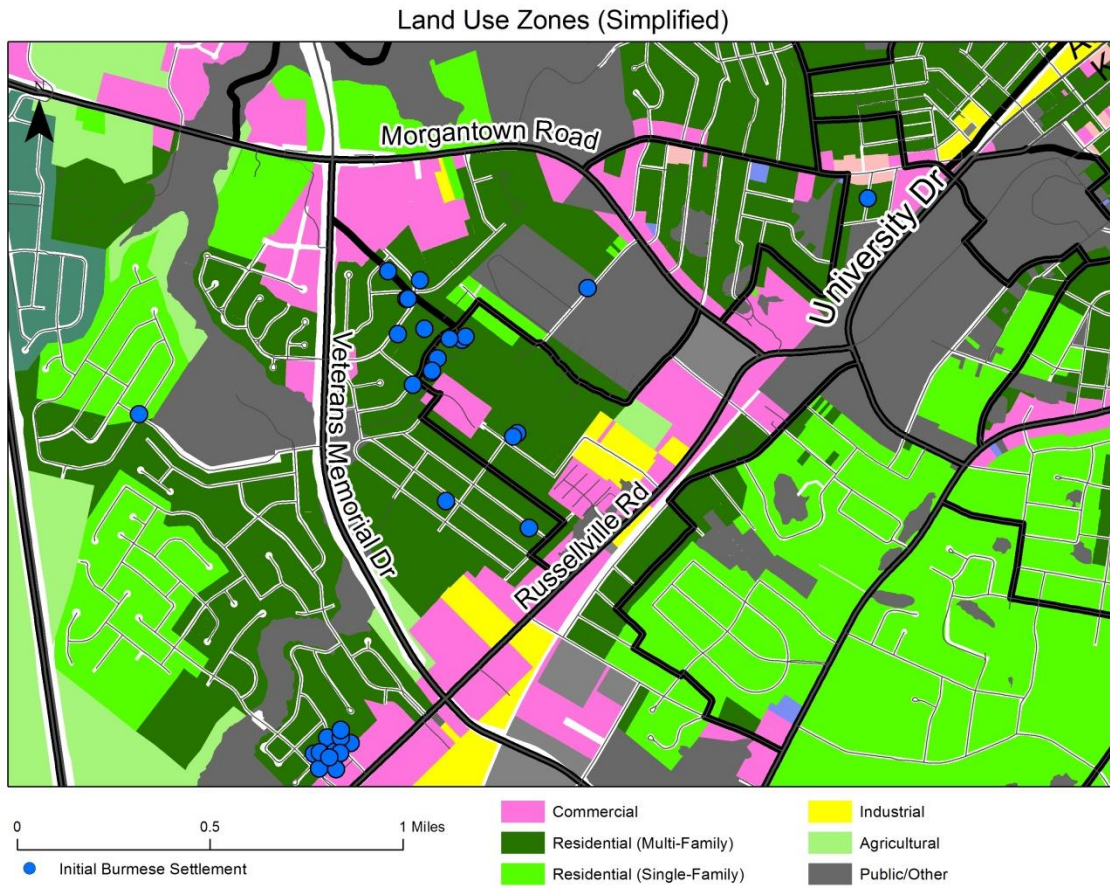


Figure 5.10: Land Use for the Veterans Memorial Drive Cluster.

In this instance, the zones are much more homogeneous, particularly in the types of residential zoning. Table 5.11 summarizes the land use zones for these three block groups.

Land Use	Percentage
Residential (single family)	2.22%
Residential (multi-family)	49.30%
Commercial	21.91%
Industrial	7.33%
Public/Other	19.25%

Table 5.11: Land Use for the Veterans Memorial Drive Cluster Block Groups.

While there is still a relatively significant amount of land zoned for non-residential activities in these block groups, the residential zones are primarily multi-family zones, so the MAUP is likely not affecting the results for this area.

In addition to the modifiable areal unit problem, another potential hazard comes with the ecological fallacy, which is, in a sense, the reverse situation. The ecological fallacy at its core involves taking data measured at a group level and attempting to apply it to individuals (Freedman, 2002). While this sometimes provides accurate results, it is not reliable to make that assumption, hence the fallacy. In the case of this analysis, it is important to remember that the findings apply to the resettlement neighborhoods, and not necessarily to the individual Burmese refugees.

CHAPTER 6

CONCLUSION

The preceding analysis offers much information about the neighborhoods in which Burmese refugees were initially settled between 2008 and 2010.

Demographically, these neighborhoods tend to be more densely populated, containing smaller, lower-income housing units often intended for multiple families. Ethnically, the neighborhoods have higher concentrations of minority groups, both Asian and non-Asian, indicating that the population of the neighborhoods may not be representative of Bowling Green as a whole. In addition, residents of the neighborhoods also tend to have lower education levels and lower household incomes, which are almost certainly related. This in particular is a common challenge with refugees such as the Burmese who must deal with a significant language barrier and a general unfamiliarity with American culture.

In terms of accessibility, the analysis indicates that the Burmese resettlement neighborhoods are reasonably located near stores, though the Veterans Memorial Drive cluster relies heavily on the GoBG bus system in that regard. Of course, the Burmese refugees are already at a significant disadvantage in terms of mobility, as they do not own a personal vehicle. Other modes of transportation may be limited in other ways that are not examined by this study (for instance, walking is limited by a person's stamina or

health, particularly on grocery trips where a person is carrying home several bags from the store).

Another potential way to expand the analysis in this project is by introducing statistical tests of significance, such as t-tests and difference of mean or difference of proportion tests. The main difficulty in this regard comes when using the sample data from the American Community Survey, which contains a margin of error for each statistic. This margin of error would need to be accounted for when performing such a statistical analysis, and the best approach would likely create a “best-case” and “worst-case” scenario by using each end of the margin of error interval. For this reason, the precision and confidence of such statistical tests would be limited, and thus they were omitted from this analysis.

Although the analysis presented in this project is certainly limited by the availability of data and the modifiable areal unit problem, the information contained in the maps still provides significant information. This information can be used by city officials and other individuals who work with the Burmese refugee families to help them assimilate into the city of Bowling Green. Of course, further research on the matter will benefit from the passage of time, which will allow for comparisons with the past data that can indicate chronological trends and provide evidence about how well the Burmese refugees are assimilating into society as a whole. In addition, more qualitative research that considers individual survey responses can also provide insights into the successful and less successful aspects of Burmese resettlement.

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