

Voter Participation and Demographics in Lowell, MA

A GIS Study

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Salem State College

GGR-904 - GIS for Research and Analysis

Acknowledgments

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Introduction

Objective

The non-profit organization ONE Lowell and the Salem State College spring semester Geographic Information Systems (GIS) for Research and Analysis class (GGR904) have collaborated on a project that seeks to find what, if any, connections there are between local demographics and voter participation in the city of Lowell. GGR904 has provided maps and analysis of the demographic variables of particular interest to ONE Lowell:

- Age
- Education
- Foreign-born Population
- Tenure in Residency
- Home Ownership
- Median Gross Rent
- Income
- Language Ability
- Race/Ethnicity

GIS is an extremely useful tool in the investigation of voter participation, because it allows users to map voter turnout and see where patterns are occurring. By looking at voter participation rates against specific demographics, we are able to provide ONE Lowell with a more comprehensive picture of what factors influence participation and what areas of the city the organization might target for outreach.

Background

Lowell has a large minority population, with twice the national average of foreign-born residents (Lotspeich, Fix, Perez-Lopez and Ost 2003). The received wisdom about voter participation is that the more educated, wealthy and older a population, the higher the voter turnout (American Political Science Association 2004; Burden 2009; Cho 1999), and indeed there is a robust correlation between these factors. However, this is not always the case in minority communities; minorities generally have a lower propensity to vote than whites, regardless of education, income or age (Cho 1999; Leighley and Vedlitz 1999).

Previous research indicates that minority communities with residents that participate in local events and groups (social capital) and that live within politically active neighborhoods are more likely to vote than are more socially-isolated minorities. (Bevelander and Pendakur 2009; Cho 1999, Gimpel, Dyck and Shaw 2006; Ramakrishnan and Espenshade 2001). Asians consistently have been found to have the lowest rates of voter turnout (Cho 1999; Lien 2004; Ramakrishnan et al 2001), a significant result, considering Lowell's relatively large Asian population.

Minority enclaves often have a higher than average number of linguistically isolated households (those in which no member speaks English). The number of limited English-language speakers in Lowell is more than twice the national average and there is not one census tract with fewer than 10% foreign-born residents (Lotspeich et al 2003). In minority communities lacking social capital (i.e., newspapers and outreach in the language of the community), linguistic isolation is also linked to low voter turnout (Cho 1999).

Lowell's naturalization rates are 10% lower than the national average despite, having a large number of eligible residents (Lotspeich et al 2003). Once naturalized, the voter participation of foreign-born minority residents increases like that of the native majority population—as education, wealth, and age increase (Bass and Casper 2001). In fact, once registered, naturalized citizens have been shown to have a higher rate of participation than native citizens of any race. The problem lies in getting them registered; foreign-born residents have a much lower registration rate than natives due to the twin hurdles of first becoming naturalized and then registering to vote, a process which is often unnecessary in the homelands of most naturalized citizens (Lien 2004). This reluctance to register may help explain why first generation naturalized minorities generally have lower voter turnout rates than native-born minorities (Ramakrishnan et al 2001).

The longer people live somewhere (whether minority or not) the more invested they become in their community and thus more likely to vote. Participation increases with residency tenure for those living in the same place for two years or longer (Squire, Wolfinger and Glass 1987). Research also indicates that owner-occupied housing tenure in particular has a positive impact on voter turnout (Pratt 1986).

Given the previous research in voter behavior, we would expect to find that the higher the income, education, rent and age and the longer the tenure (particularly owner-occupied tenure) the higher the voter turnout. Areas of Lowell with more minorities, foreign-born residents, and those that are linguistically isolated we anticipate will correlate with a lower voter turnout.

Methodology

We investigated the relationship between the variables and voter turnout at the census tract, census block group (where available), and voter precinct levels. Two voter turnout rates were calculated and are considered against each demographic variable—the average voter turnout rate for the local elections only, and the average voter turnout rate for all elections.

ONE Lowell provided the voting records for five local and eight state or federal elections over the past decade and registered voter lists. The census tract and block group demographic data come from the 2000 U.S. Census. Precinct demographic data were estimated using Geographic Information Systems (GIS) to create a weighted average from the block groups and census tracts. This process is described in Appendix B. GIS data were downloaded from MassGIS and the U.S. Census Bureau.

For each of the demographic variables discussed, we calculated R^2 values for local and all elections. The R^2 quantifies the strength of the association between the demographic variable and the

voter turnout rate. More specifically, the R^2 shows how much of the variation in the voter turnout rate can be explained by the variation in the demographic variable. For example, an R^2 of 0.70 means that the demographic variable explains about 70% of the variation in the voting rate. R^2 results are between 0 and 1. The closer the number is to 1, the higher the correlation between the two variables. We note that all R^2 s in this document account for only one demographic variable at a time. In addition, although we calculated R^2 s at the census tract and block group level when possible, we did not calculate R^2 s at the voting precinct level. This is because the demographic variables could only be estimated at the precinct level and any R^2 calculations based on these estimates would necessarily be unreliable.

Results

Overall Voter Turnout Rates

We analyzed Lowell's voter turnout rates across three geographic categories—26 census tracts, 33 voting precincts, and 86 census block groups. Examining voter turnout rates at each of these levels yields similar results, although the greater resolution of the block groups reveal pockets of higher and lower voter activity.

The coarsest level of analysis, the census tract level, shows that the areas with the highest average voter turnout rate are generally located away from the center of Lowell. Two adjacent tracts along the eastern edge of the city (tracts 3125.01 and 3125.02) have average voter turnout rates of 50% and 55%, respectively, for local elections, and 46% and 48%, respectively, for all elections. Three large adjacent tracts along the southern edge of Lowell, and two in the northwest corner, also have relatively high turnout rates. Areas in the center of Lowell have lower voter turnout rates, ranging from 14% to 30%.

Analysis at the voting precinct level offers the medium level of resolution, and yields essentially identical results as census tract-level analysis. The voting precincts with the highest voter turnout rates are Ward 1 Precinct 2 and Ward 1 Precinct 3, which correspond with the areas found to have the highest voter turnout rates at the census tract level. Along the southern edge of the city, Ward 8 Precinct 3 emerges as a relatively active precinct, with voter turnout rates of 43% for local elections, and 42% for all elections. Three precincts in the northwest corner are also relatively active, with voter turnout rates ranging from 28% to 35%. Once again, the center of Lowell is shown to have much lower voter turnout rates. In the analysis of voter turnout for all elections, a crescent-shaped area of low voter turnout emerges in the center of Lowell. This crescent of low turnout includes Ward 2 Precincts 1 and 2, Ward 3 Precinct 2, Ward 4 Precincts 2 and 3, Ward 7 Precincts 2 and 3, and Ward 10 Precinct 3.

The most granular level of analysis, using the 86 census block groups contained within Lowell, yields even finer distinctions in voter turnout rate. Block groups along the eastern edge of the city continue to show the highest voter turnout rates, along with several block groups along the southern edge and in the northeast corner. However, investigation by block group reveals several areas with lower voter turnouts that were obscured by the relatively coarse analysis at the tract and precinct level. For example, block groups 3114004, 3114003, and 3106011 along the western edge of Lowell show relatively low voter turnout at the block group level, while lower resolution analysis showed these areas as medium-level turnout regions. The pattern of lower voter turnout in the center of Lowell also changes with greater resolution. For local elections, the shape of the lower voter turnout areas is more horseshoe-shaped, with ends pointing north, and includes areas that are shown in coarser analysis as more moderate-turnout regions.

Age

Analysis of Lowell's population by age shows that younger people tend to be located near the center of the city, while older populations are more prominent on the eastern and western sides of the city. The relationship between age and voter turnout shows that the age ranges of 18 to 24 years old, 50 to 59 years old, and more than 60 years old are moderately predictive of voter turnout (R^2 s ranging from 0.20 to 0.45). The age ranges from 25 to 29 years old, 30 to 39 years old, and 40 to 49 years old have very little association with voter turnout.

Education

Education levels vary considerably in Lowell. For males, the percentage of the population that has finished high school ranges from 47% in tract 3120 to 88% in tract 3115. For females, high school graduates account for between 32% and 86% of the population.

Lowell data reveal a strong association between the percentage of the population with at least an associate's or bachelor's degree and voter turnout rate. The association is strongest for females with an associate degree or higher ($R^2 = 0.73$) and females with a Bachelor's degree or higher ($R^2 = 0.72$). The R^2 for males with least an Associate's degree is 0.65, and 0.64 for males with at least a Bachelor's degree.

These results indicate that the aggregate level of education in an area is a fairly strong predictor of voter turnout rate. That is, the more educated the population, the higher the voter turnout. In addition, although these data show that females, in general, have lower educational attainment than males, the positive relationship between education and voting is stronger for females than for males.

Foreign-born Population

Foreign-born persons make up about 22% of Lowell's population. The percentage of foreign-born persons ranges from 10% in tract 3102 to 41% in tract 3111. Analysis of voter turnout rates indicates that as the proportion of foreign-born residency increases, voter turnout rate decreases. The relationship to voter turnout rates is moderately strong, with R^2 s ranging from 0.35 to 0.42.

Tenure in Residency

The Census Bureau gathers data on the length of time people remain in the same residence, or residency tenure. These data are disaggregated into the categories *owner occupied*, *renter occupied*, and *combined* (owner and renter occupied). Previous research indicates that owner occupied housing tenure has a positive impact on voter turnout (Pratt 1986). Analysis of voter turnout and residency tenure data from Lowell confirms this result. That is, a greater proportion of longer-term residency is associated with greater voter turnout. However, the strongest relationship, as indicated by an R^2 of

0.59 for local elections at the block group level, is for the *combined* category rather than the *owner occupied* category. This implies that the length of time at the same residence is more important in predicting voter turnout than whether someone is an owner or a renter.

Home Ownership

According to the Census Bureau, there are approximately 16,300 owner occupied residences in Lowell, and about 21,600 renter-occupied residences. Owner-occupied residences account for less than 30% of all residences in the 8 census tracts located in the center of Lowell; owner occupied residences account for more than 60% of all residences in 4 tracts along the eastern and southern edges. The full range of owner-occupied residences extends from 2% in tract 3110 to 72% in tract 3125.01.

A comparison of the percentage of owner occupied residences with voter turnout rate yields a very strong association. For all elections, the R^2 for this relationship is 0.70; for local elections, it is even higher, 0.72.

Median Gross Rent

The median gross rent variable represents the median combined value of the monthly rent plus all utilities. In general, this variable exhibits a positive relationship with voter turnout, i.e., higher gross rent is associated with higher voter turnout. However, we note that due to the small number of data points and one significant outlier, the census tract data for this variable actually suggests a negative relationship between median gross rent and voter turnout. In either case, the association is not particularly strong.

Income

We used median household income of an area as a measure of aggregate income. This is the income level that would be in the middle if all incomes in the area were put into an ordered list. Median household income is a fairly strong indicator of voter turnout for both types of elections with fairly high positive relationships at both the census tract level and the block group level. The R^2 for median household income against voter turnout rate ranges from 0.52 for both types of elections at the block group level, to 0.64 for local elections at the tract level.

Language Ability

One measure of the aggregate language ability of the population in an area is captured by Census' accounting of "linguistically isolated households." According to the Census Bureau, a linguistically isolated household is one in which no member of the household speaks English. Data for linguistically isolated households are available at the census tract level. These data show that about 9,800 people in Lowell live in households in which no one speaks English, and that the center of the area of Lowell has the greatest concentration of these people. Specifically, about 22% and 21% of the population in tracts 3119 and 3120, respectively, live in linguistically isolated households. Areas with

high concentrations of non-English speakers are likely to have relatively lower voter turnout rates. This variable is a moderately strong (negative) predictor of voter turnout; the R^2 for linguistically isolated households is 0.39 for all elections, and 0.37 for local elections.

Ethnicity and Race

To examine the distribution of various ethnic groups, we used Census data about the language used most often at home. For example, we used the distribution of Vietnamese speakers as a proxy for the distribution of people of Vietnamese ethnicity.

Cambodians, Vietnamese, and Laotians are more concentrated in Lowell than at the county, state or national level. The Cambodian population, the largest of these groups, is concentrated along a north-south strip in the center of the city; Cambodians account for more than 20% of the population of three tracts in the city center. The Vietnamese population is about one-fifth as large, and is concentrated along a narrower strip of Lowell's center. Vietnamese make up more than 5% of the population of two census tracts. Laotians are distributed along a wide area extending from the center of the city to the south and west, but make up more than 5% of the population of only one tract.

Although prevalence of Laotians explains very little of voter turnout ($R^2 = 0.10$ for all elections and 0.06 for local elections), the relationship is stronger with Cambodians and Vietnamese (R^2 's ranging from 0.18 to 0.24). For all of these groups, and for the Asian minority variable (which includes persons of Asian descent from any Asian country), the relationship between ethnicity and voter turnout rate is stronger when compared to the voter turnout rate for all elections than when compared to the turnout rate for local elections only.

African language speakers, here used as a proxy for Blacks not native to the U.S., comprise fewer than 900 people in Lowell. The distribution of African language speakers has essentially no relationship with voter turnout, with an R^2 of 0.01 for both types of election. The presence of Portuguese speakers, here used as a proxy for Brazilian immigrants, also has little relationship with voter turnout rate. However, there is a moderately strong relationship between the distribution of Puerto Ricans and voter turnout.

Nearly 15,000 Lowell residents identify with the Census's racial category "Hispanic." This variable has a moderate association with voter turnout rate, with an R^2 of 0.35 for all elections and 0.39 for local elections. A similar level of association is found with Spanish-speaking households, an R^2 of 0.33 for all elections and 0.37 for local elections.

The R^2 for "all minority," a category which encompasses everyone categorized in Census data as not "White", is 0.57 for all elections, and 0.51 for local elections.

Overall, the results of examining Lowell's population according to racial and ethnic categories suggest that voter turnout rate is best explained at the census tract level by the prevalence of households without English-speakers, and the proportion of the population that is non-White. It is

notable that all of the ethnicity and race variables above point to a negative relationship with voter turnout.

Maps and Charts

Average Voter Turnout by Census Tract - All Elections – Map

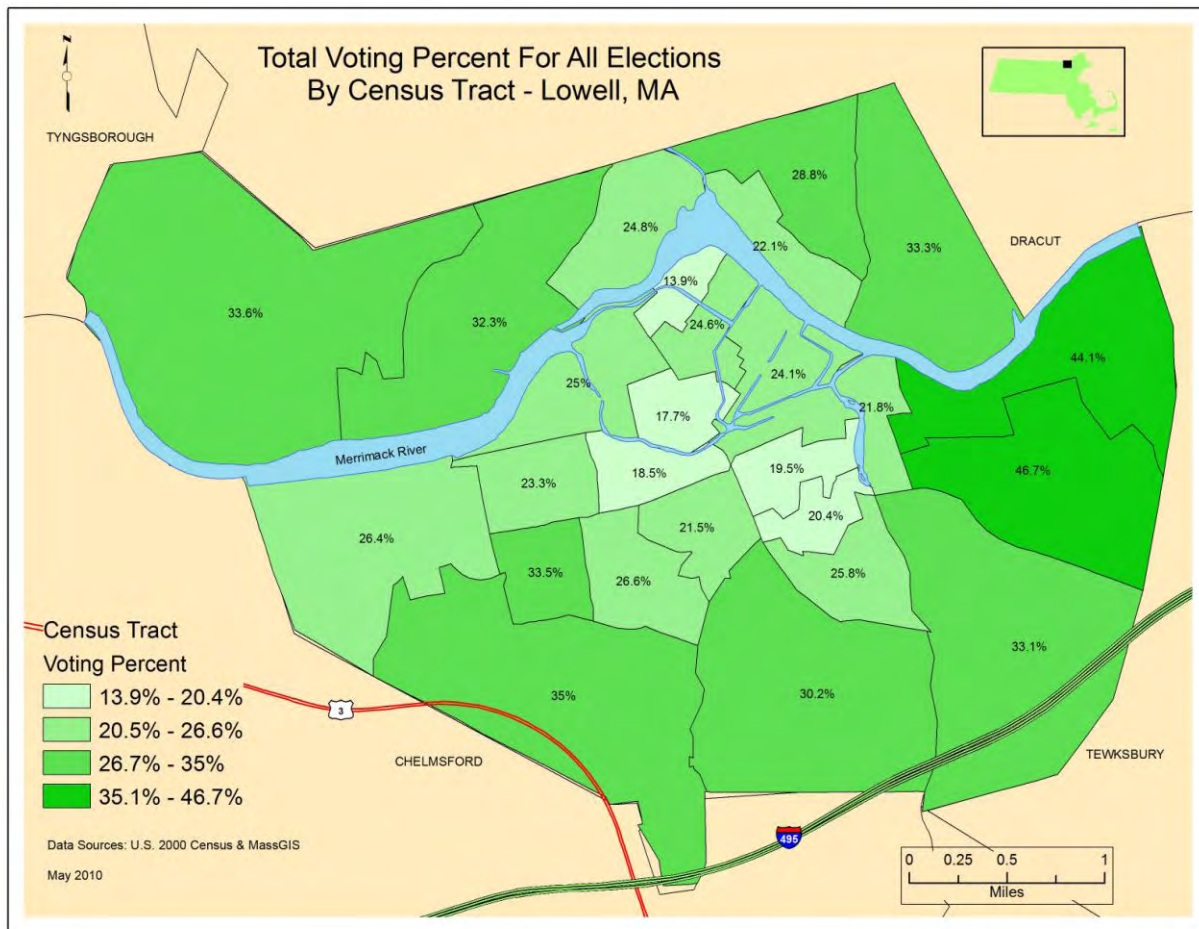


Exhibit 1

Average Voter Turnout by Census Tract - Municipal Elections – Map

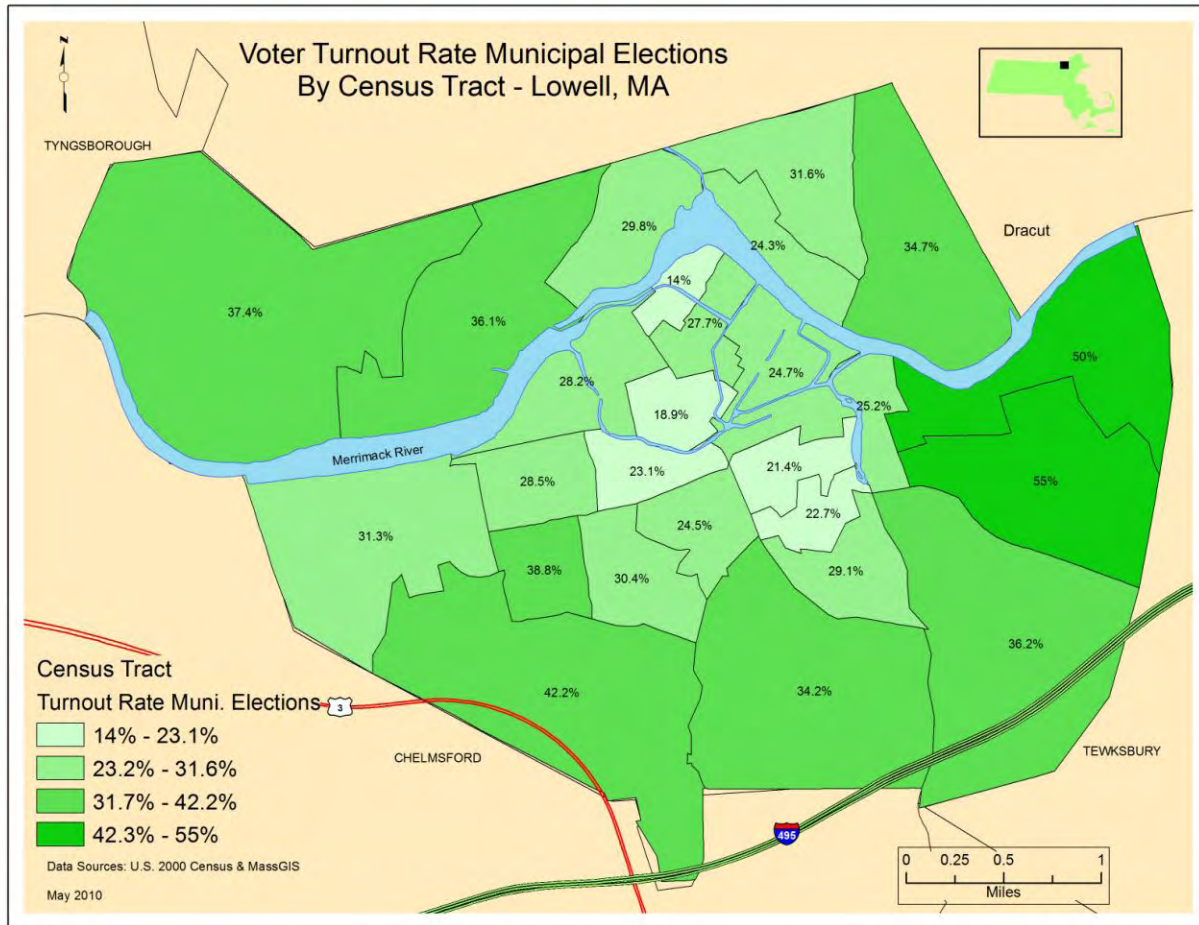
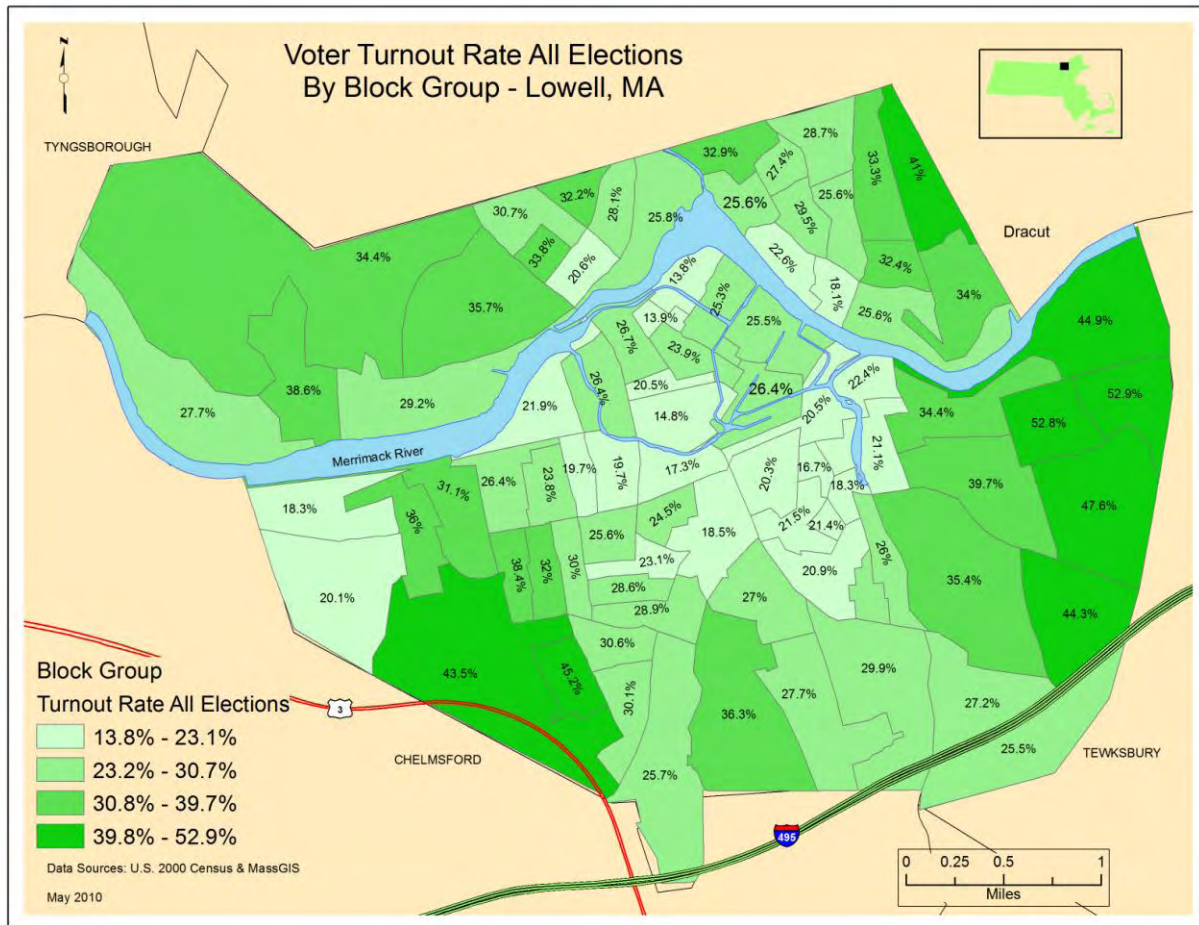
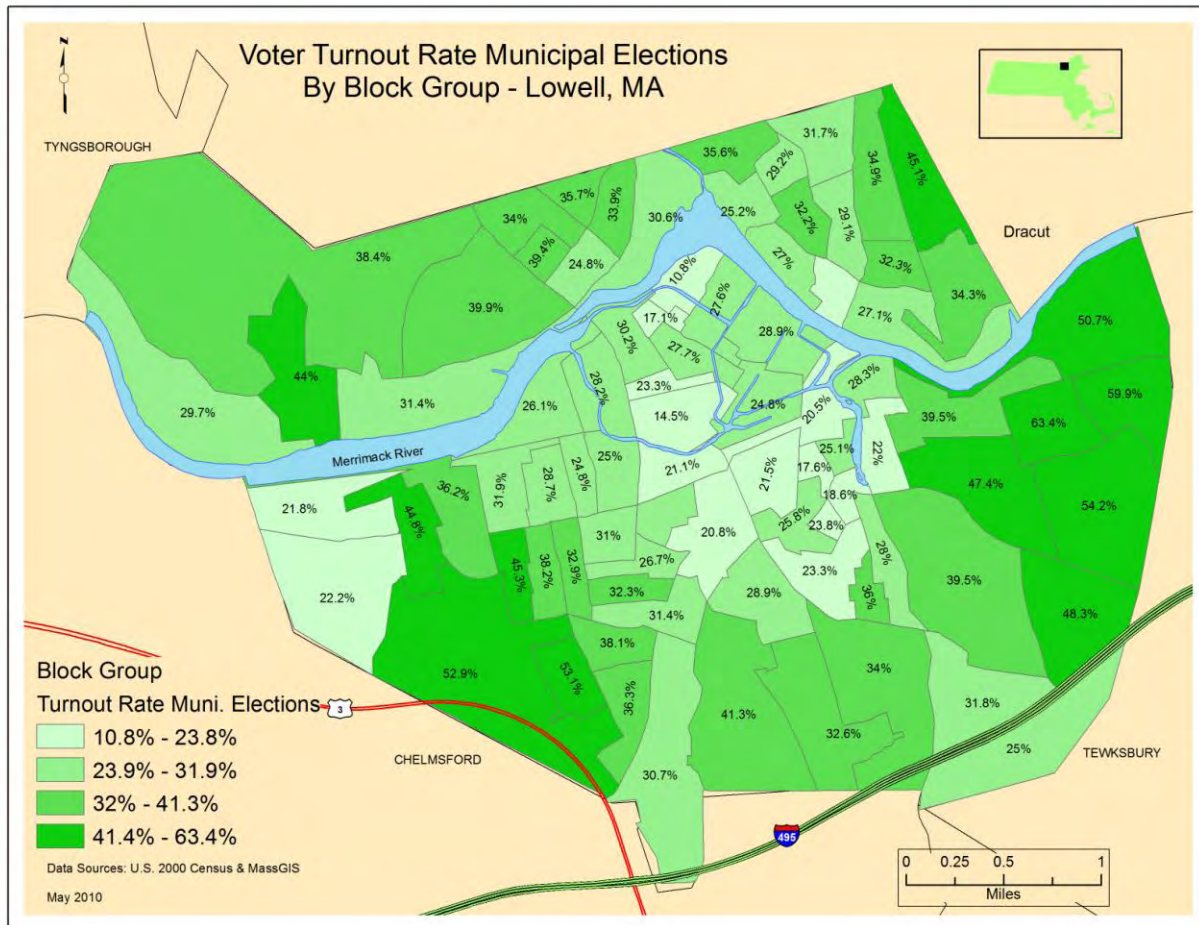


Exhibit 2

Average Voter Turnout by Block Group- All Elections – Map



Average Voter Turnout by Block Group- Municipal Elections – Map



Average Voter Turnout by Precinct - All Elections - Map

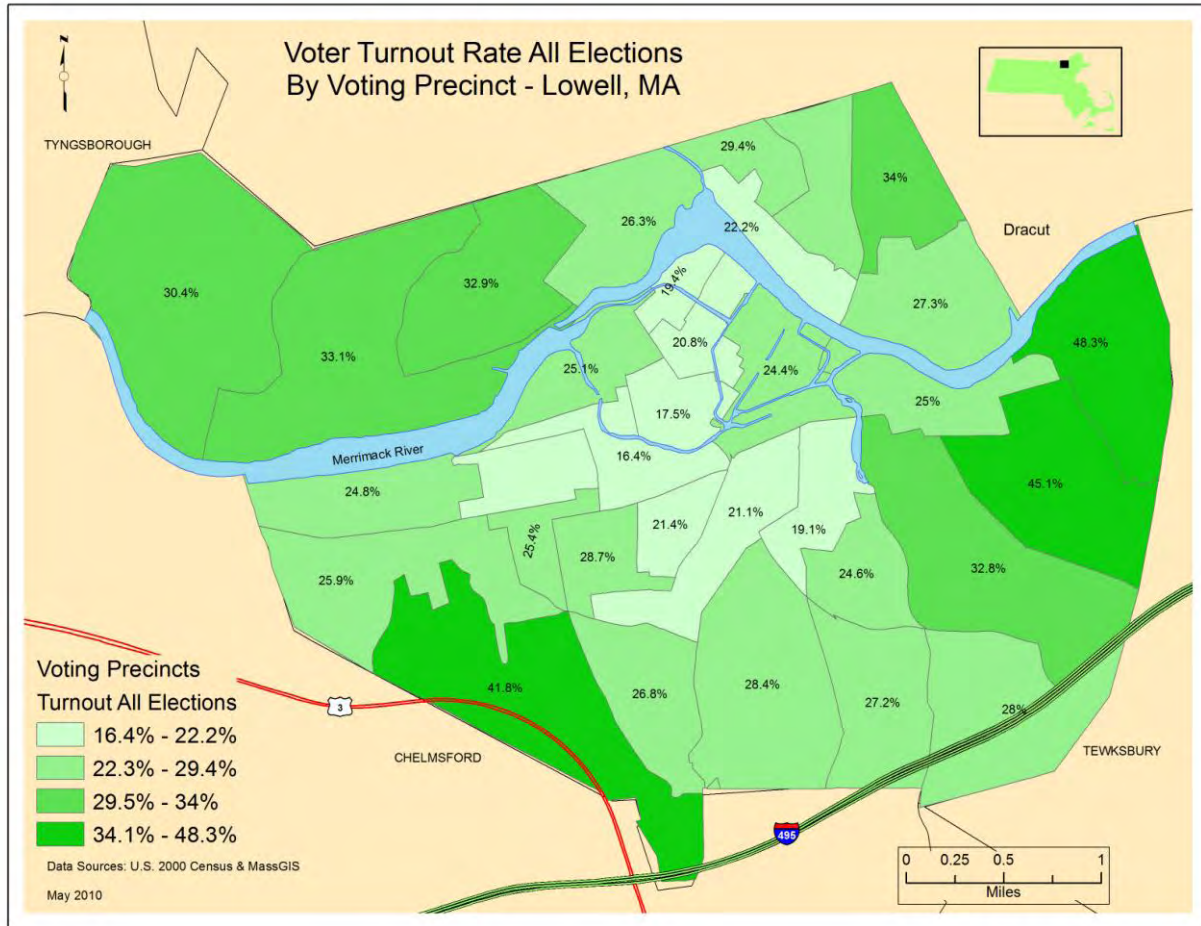
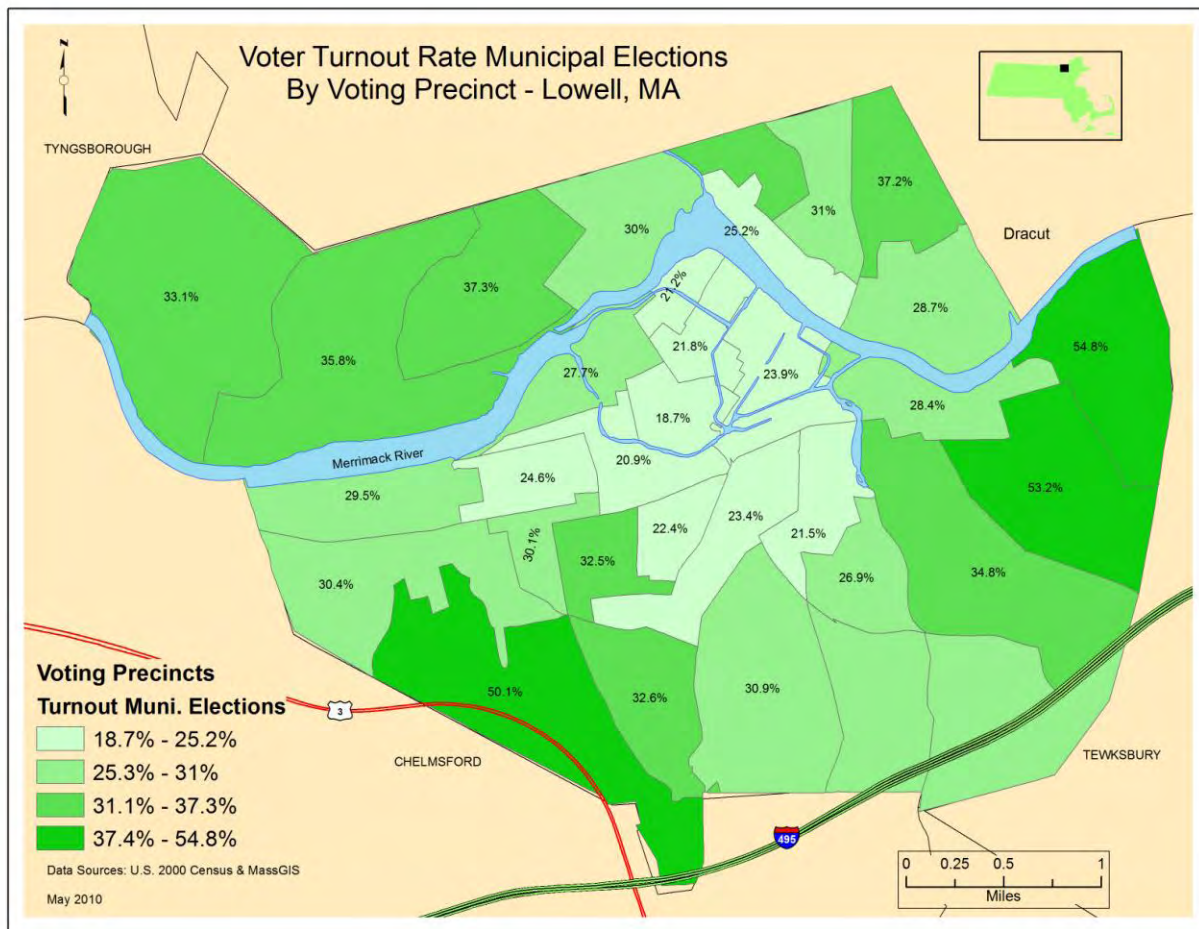


Exhibit 3

Average Voter Turnout by Precinct - Municipal Elections - Map



Percentage of Population Male Ages 18 to 24 – Maps

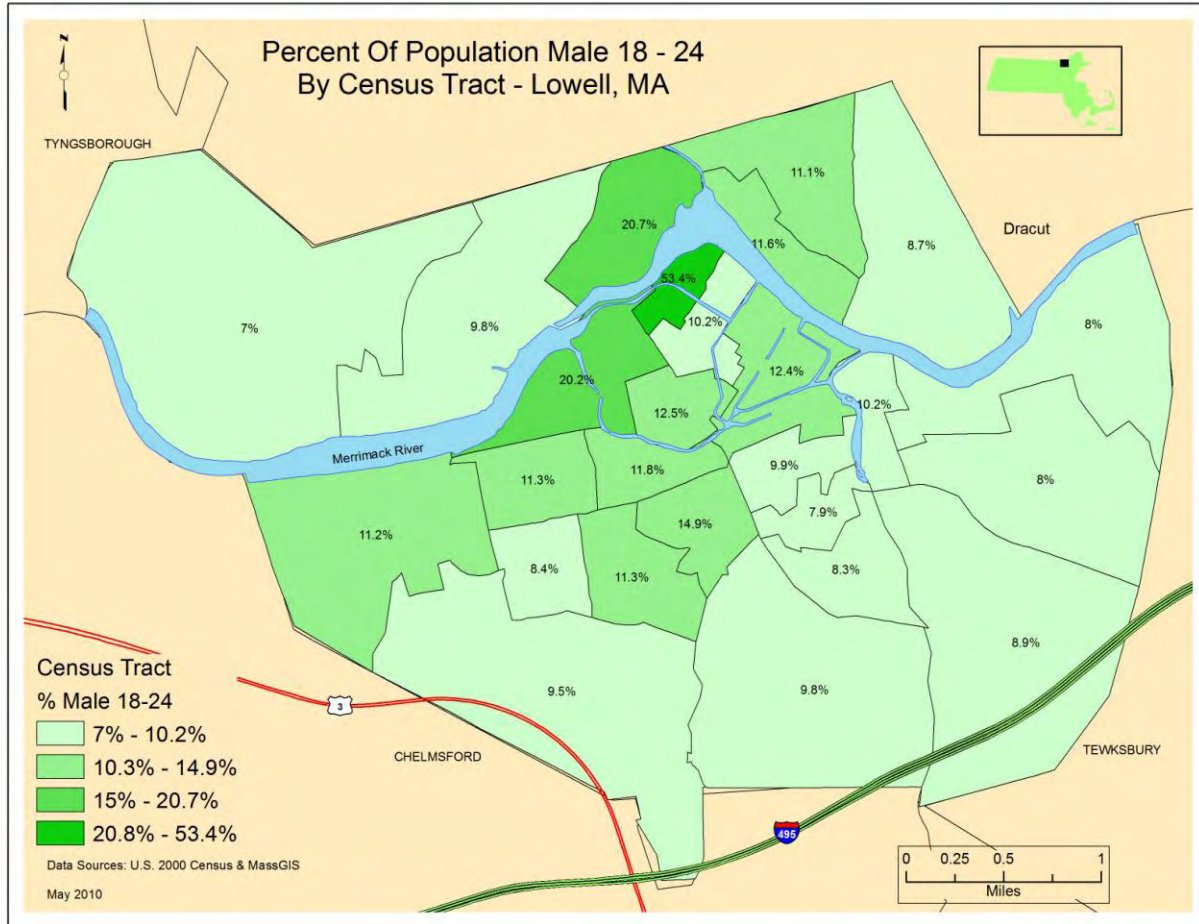


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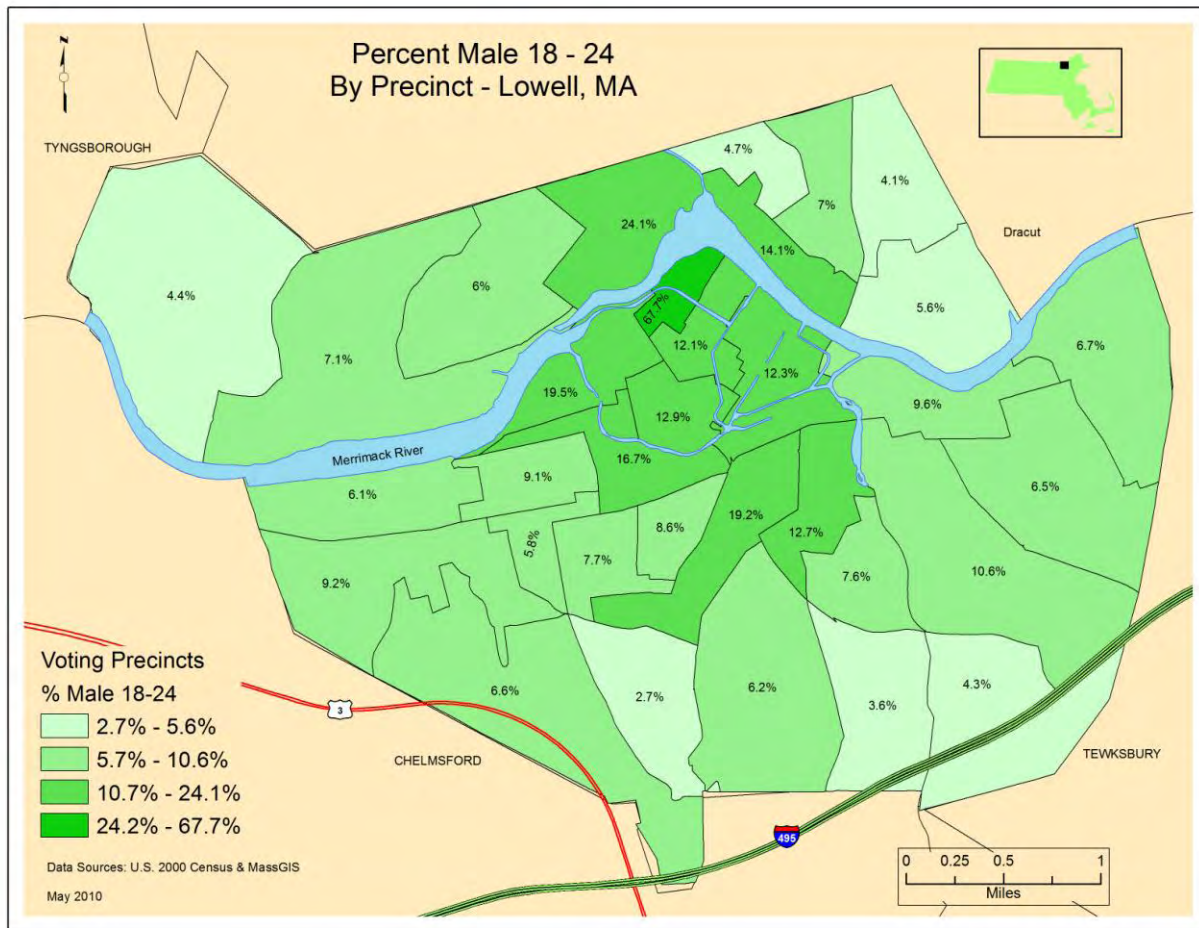


Exhibit 5

Percentage of Population Female Ages 18 to 24 – Maps

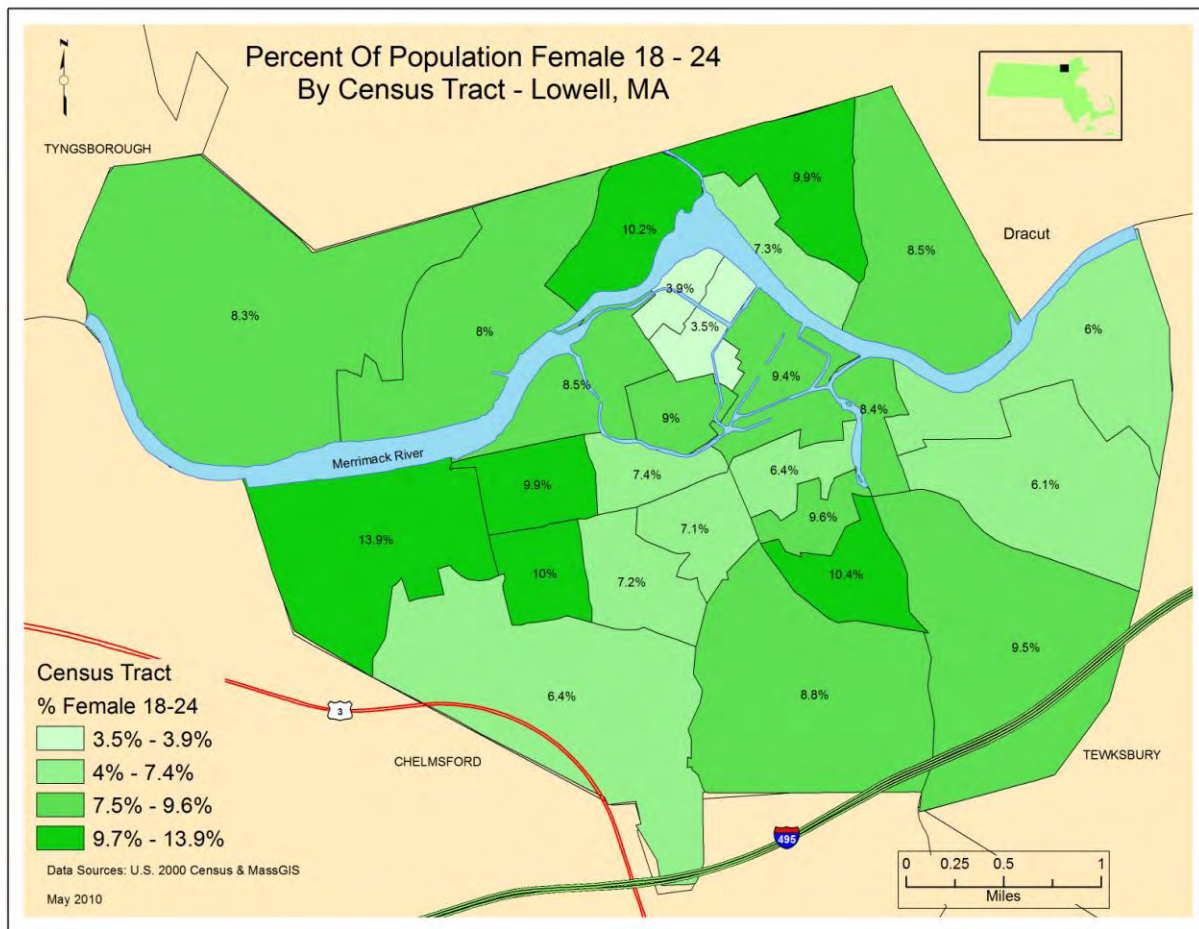


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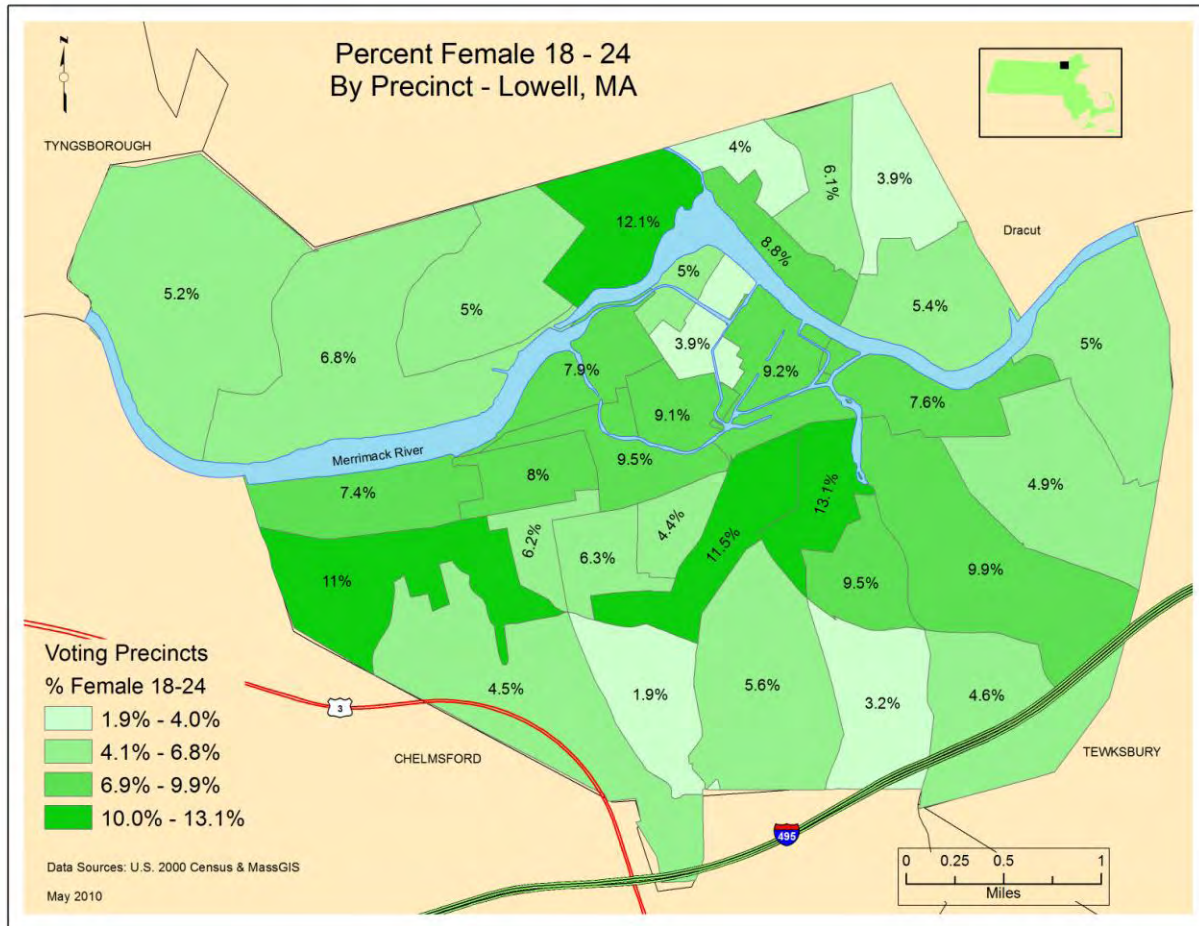


Exhibit 7

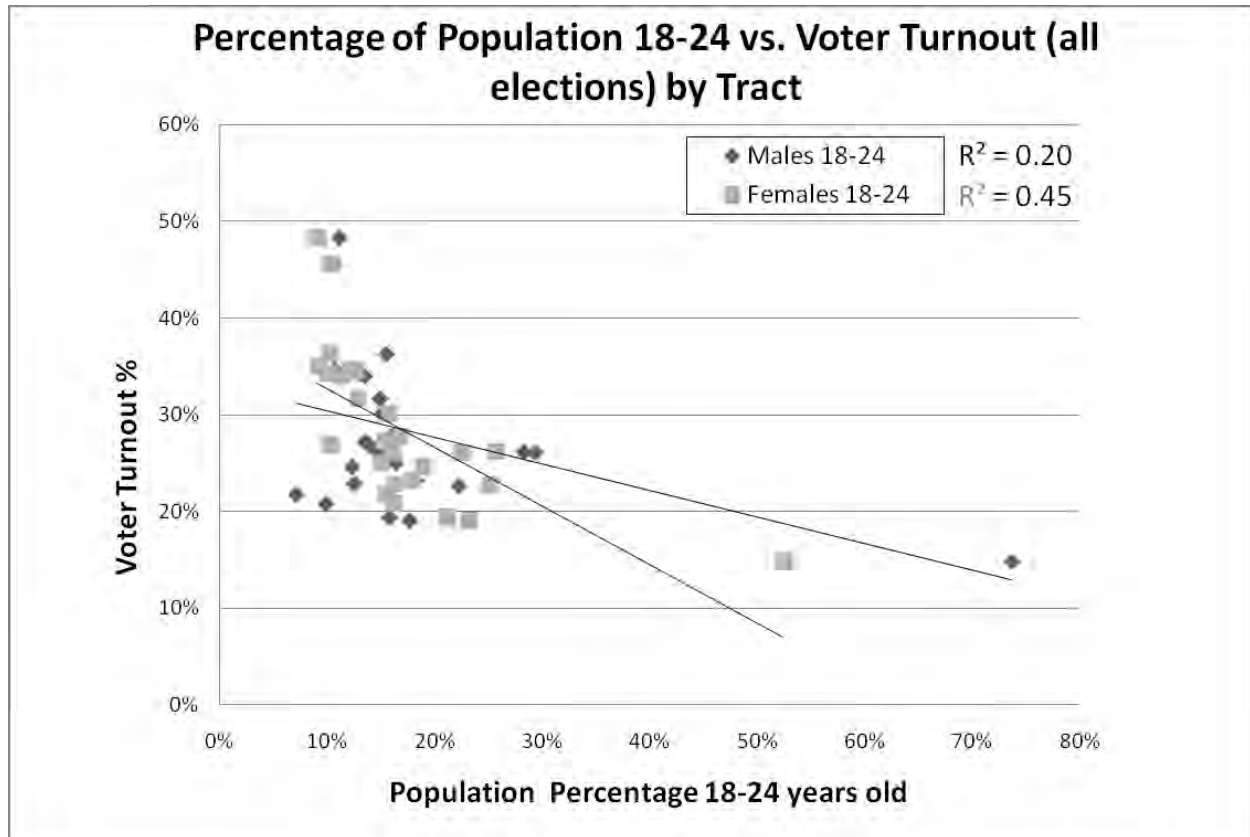
Percentage of Population Ages 18 to 24 and Voter Turnout - Charts

Exhibit 8

Percentage of population Male Ages 25 to 29 – Maps

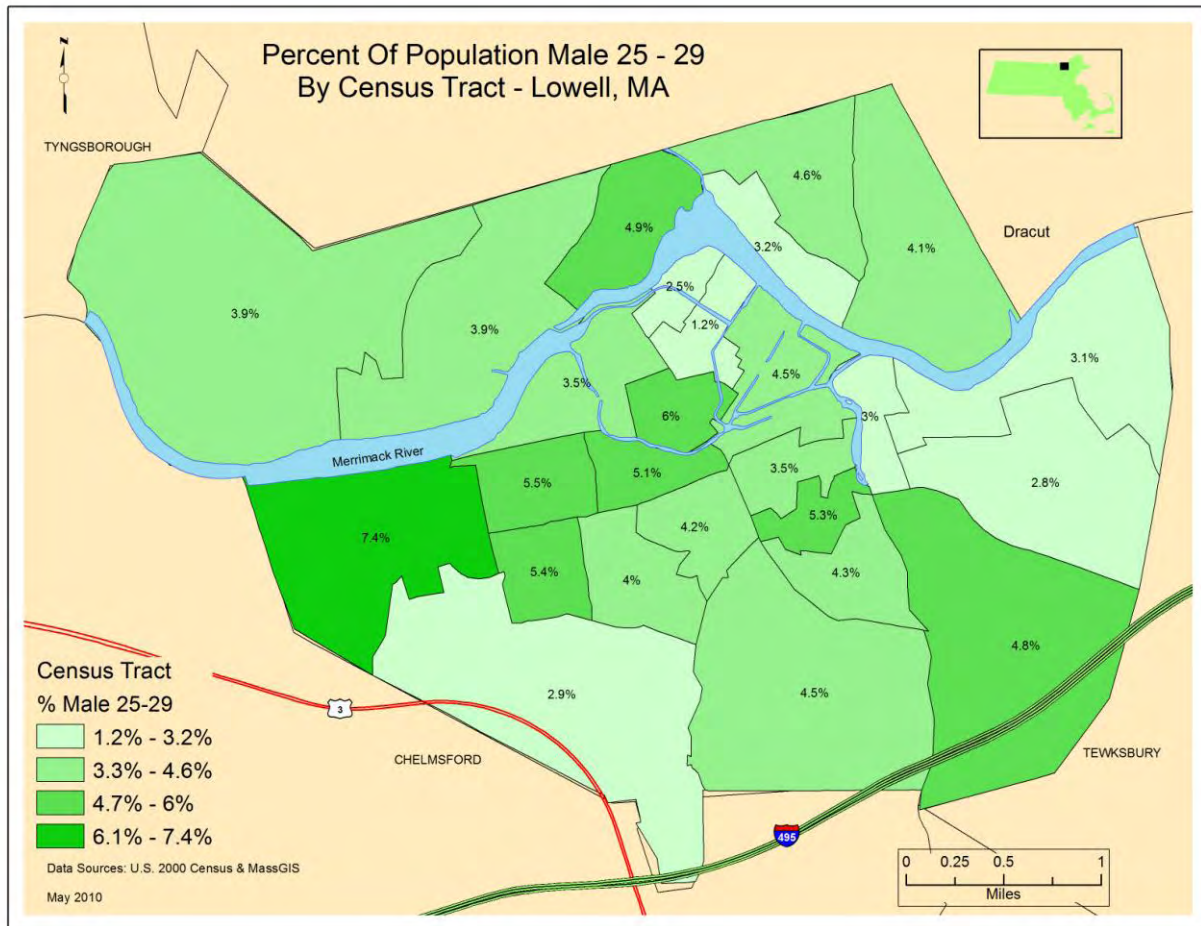


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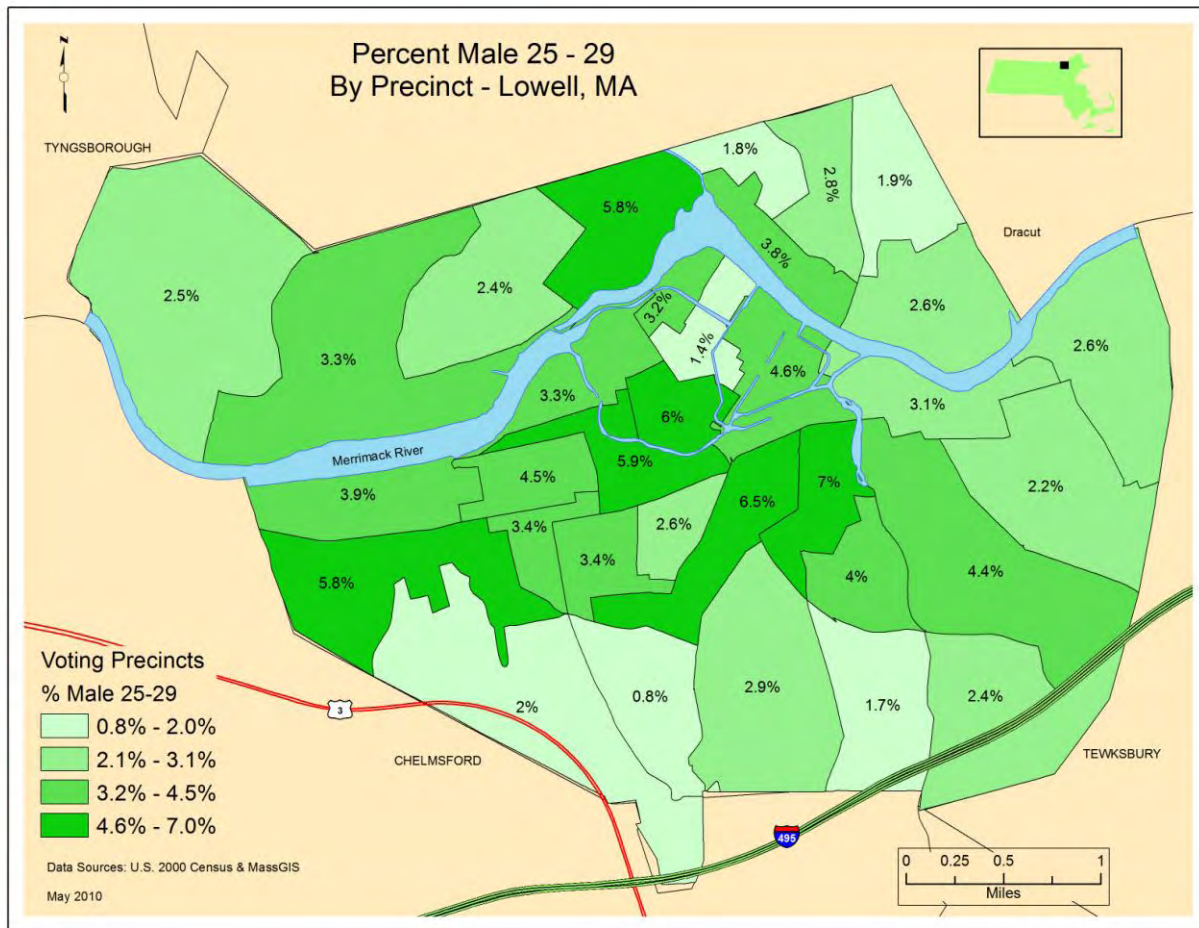


Exhibit 10

Percentage of Population Female Ages 25 to 29 – Maps

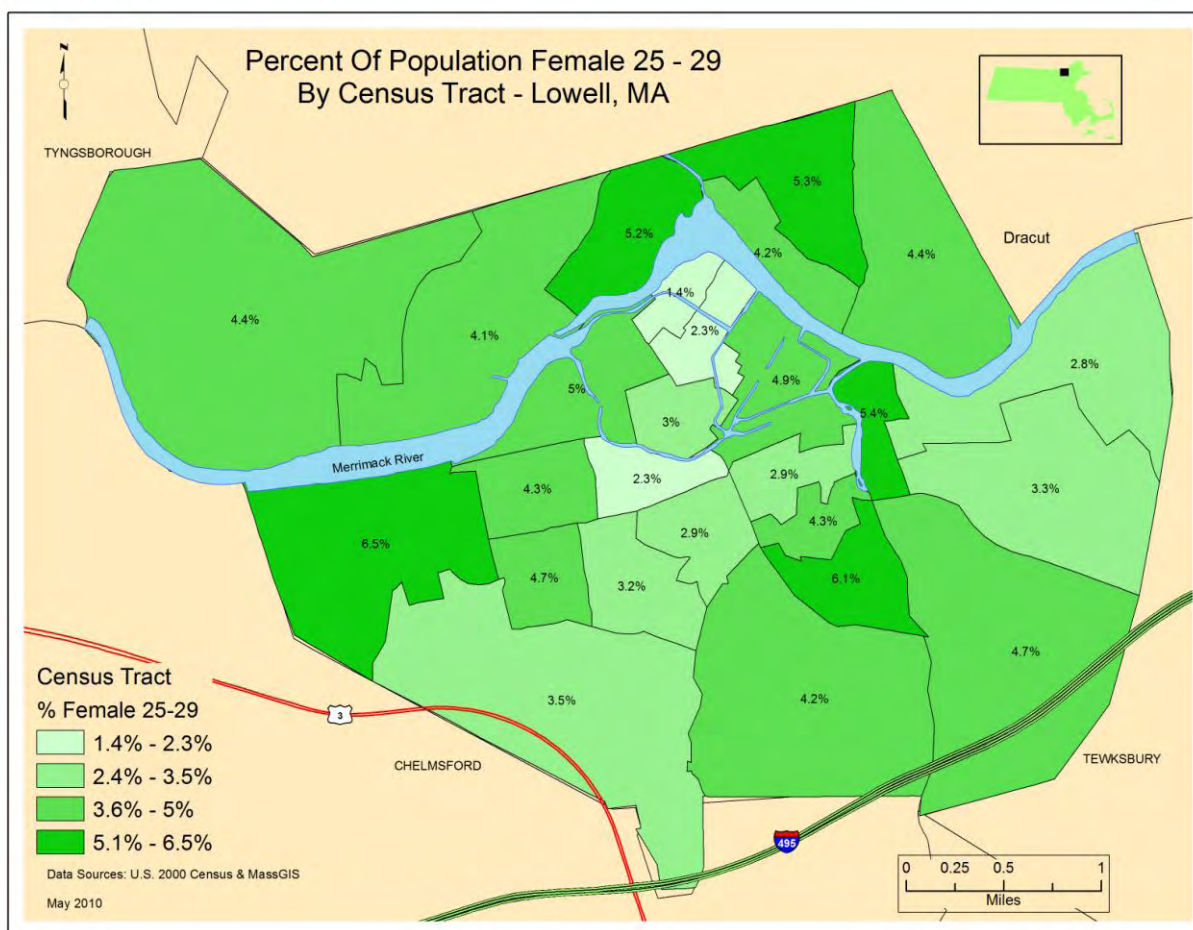


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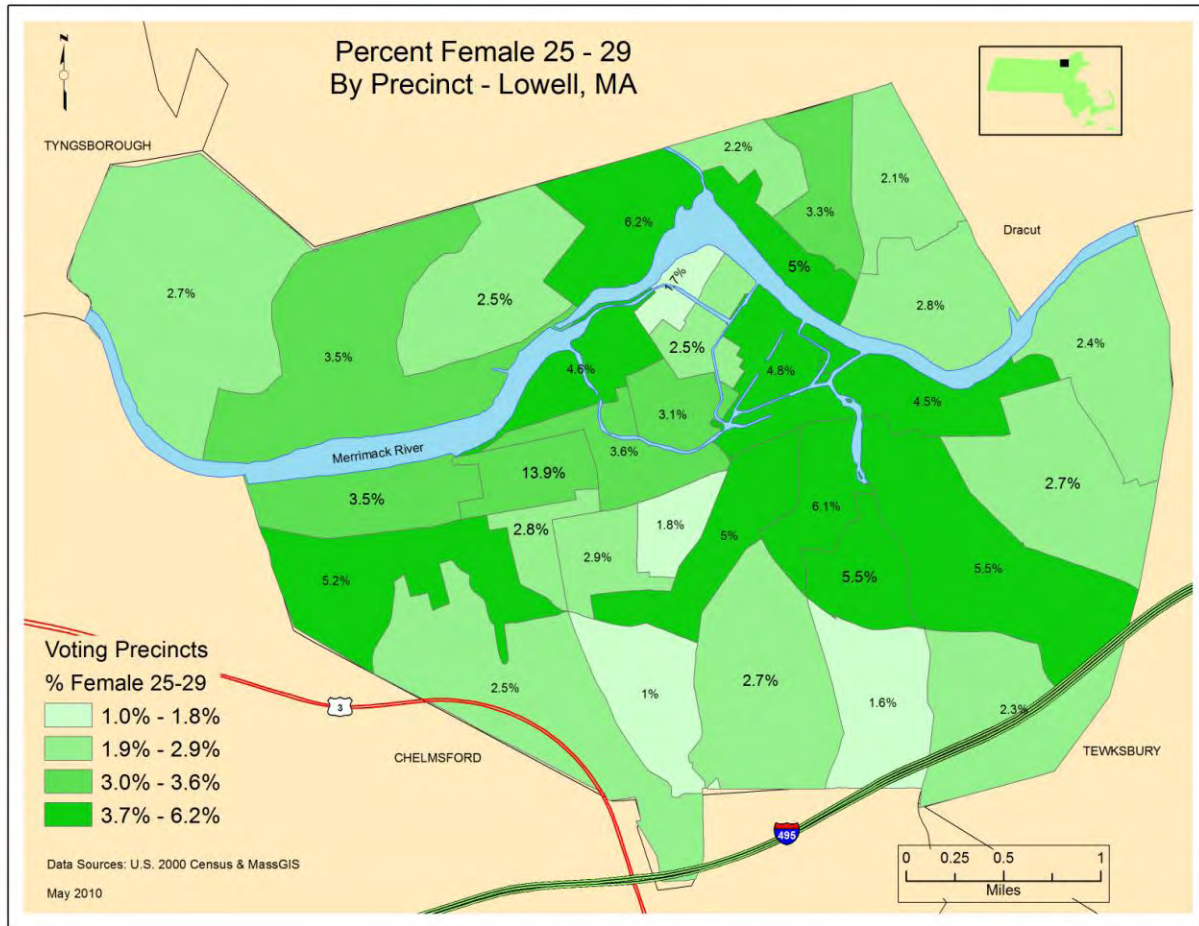


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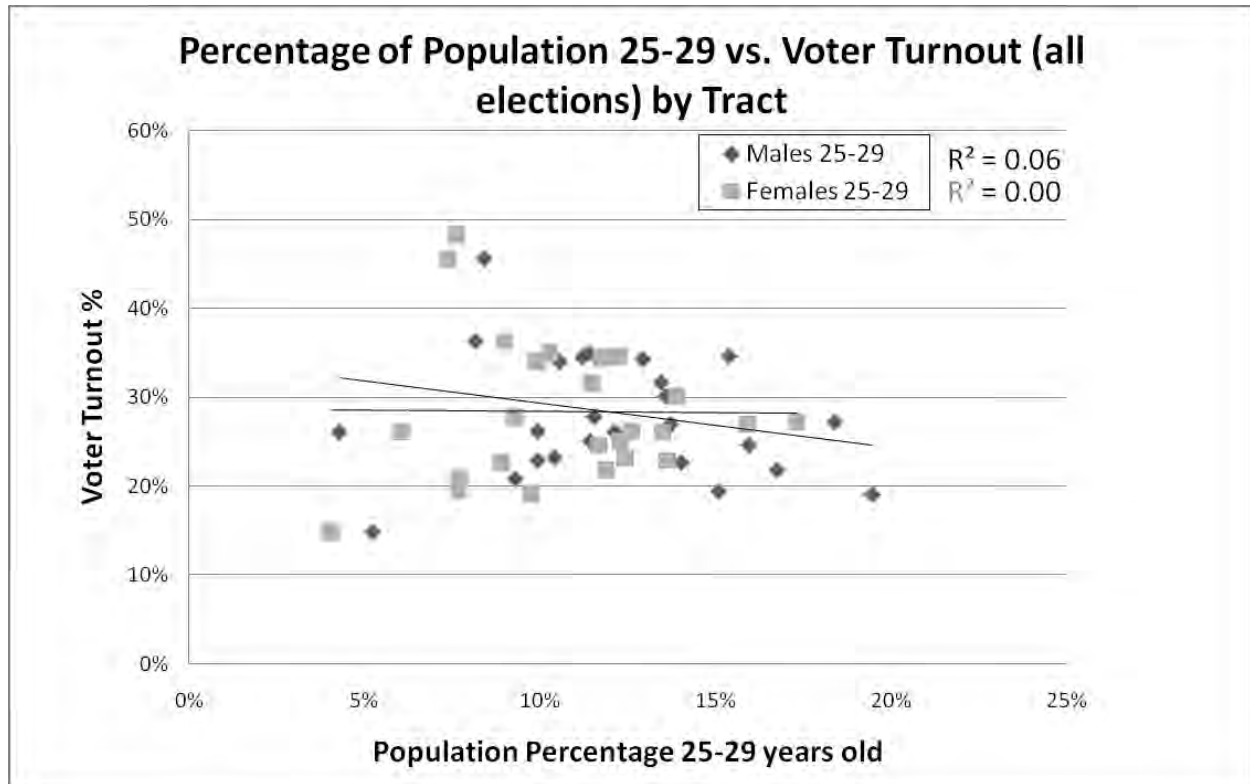
Percentage of Population Ages 25 to 29 and Voter Turnout – Chart

Exhibit 13

Percentage of Population Male Ages 30 to 39 – Maps

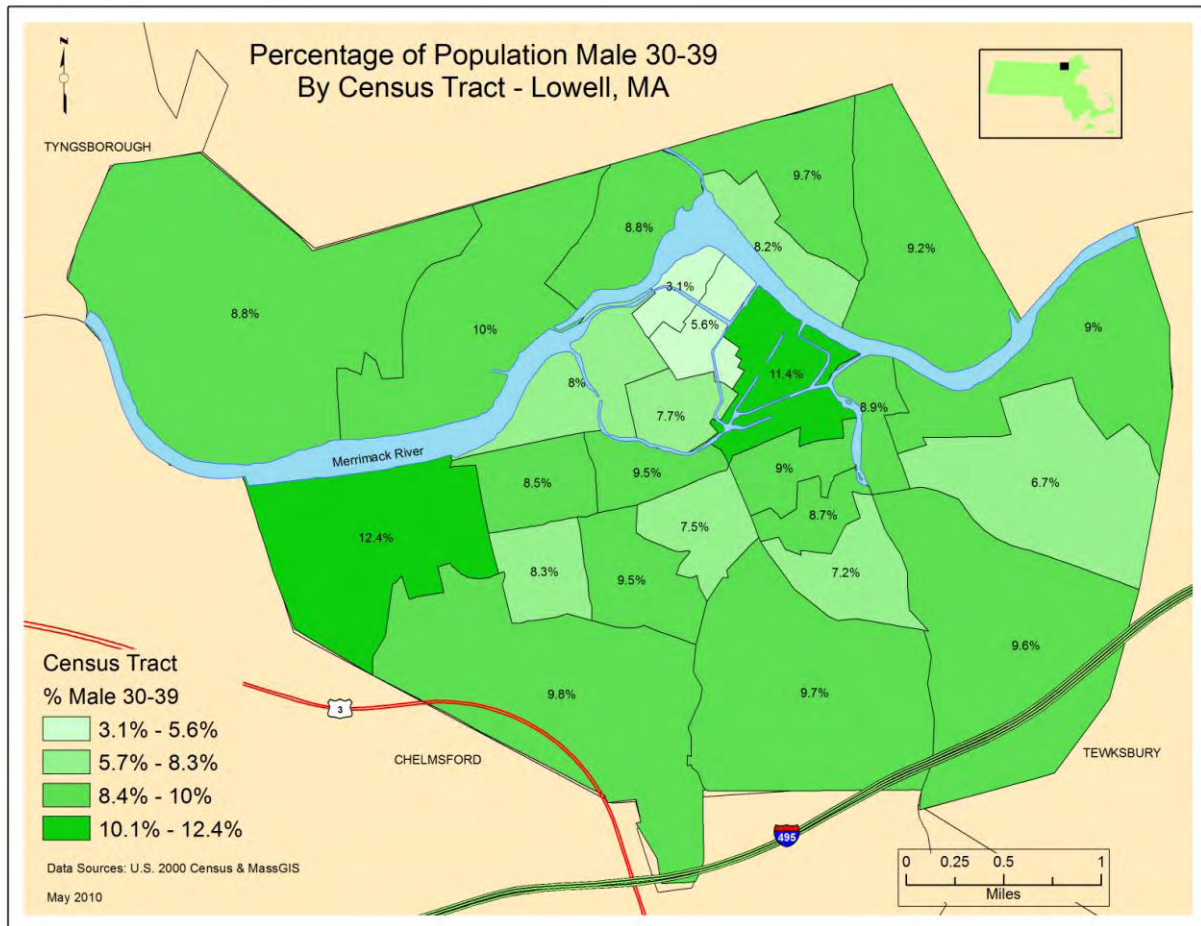


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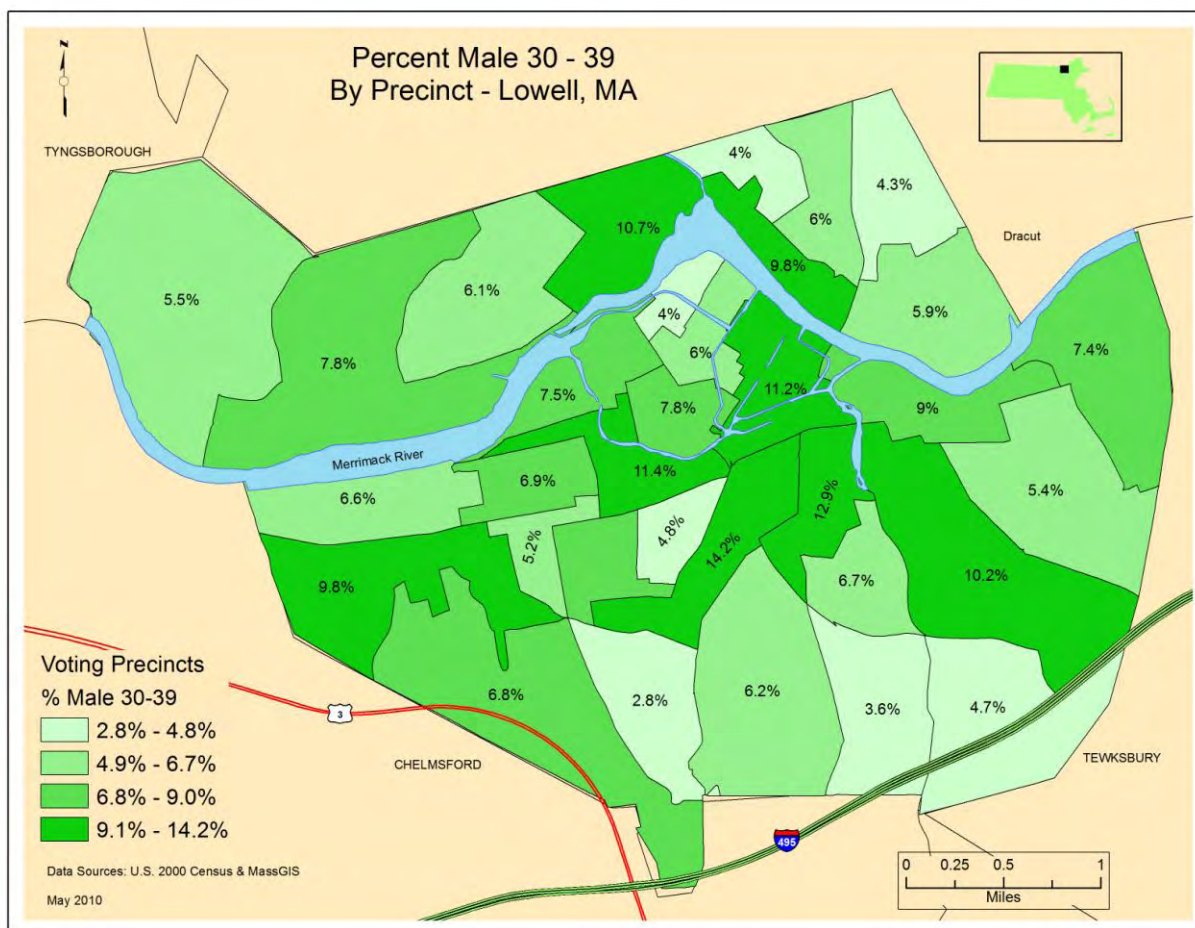


Exhibit 15

Percentage of Population Female Ages 30 to 39 – Maps

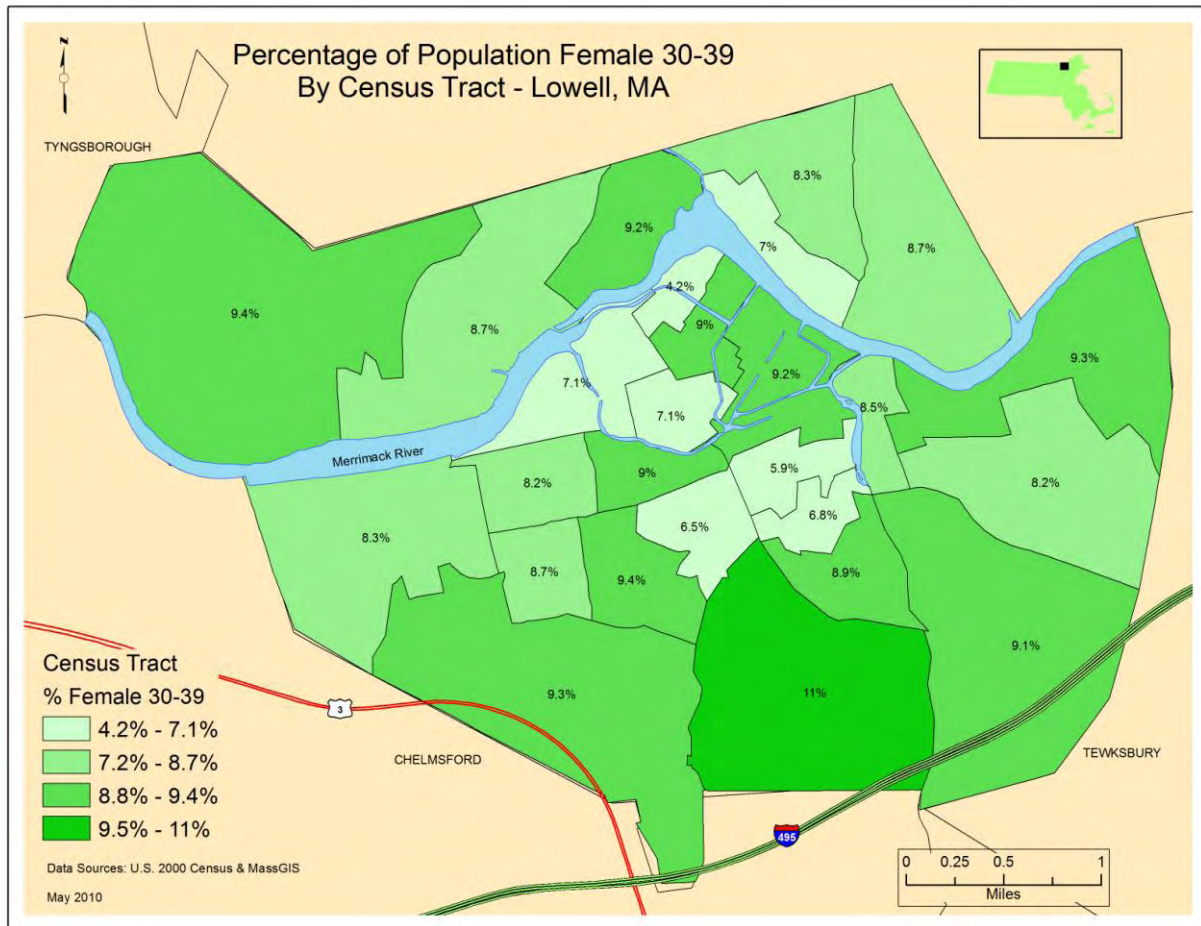


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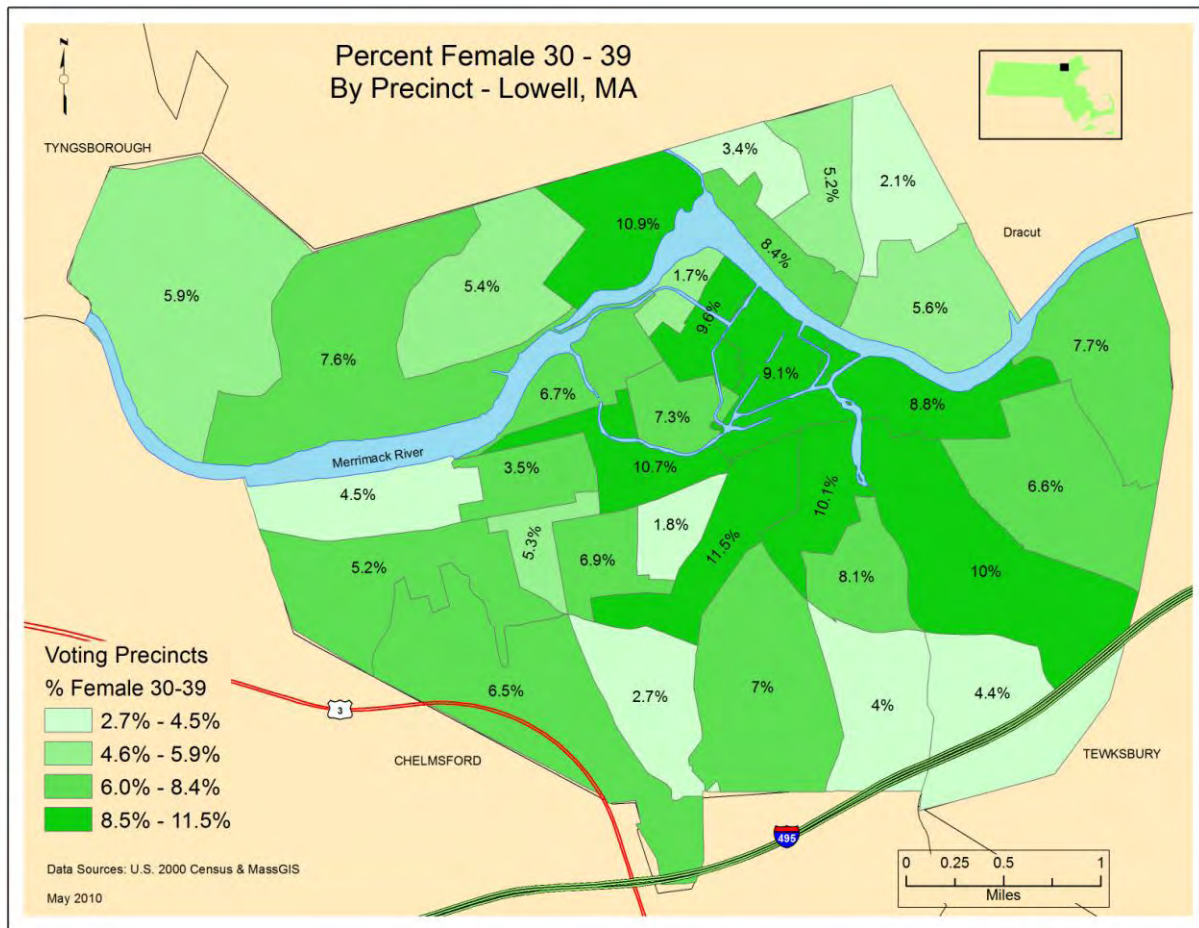


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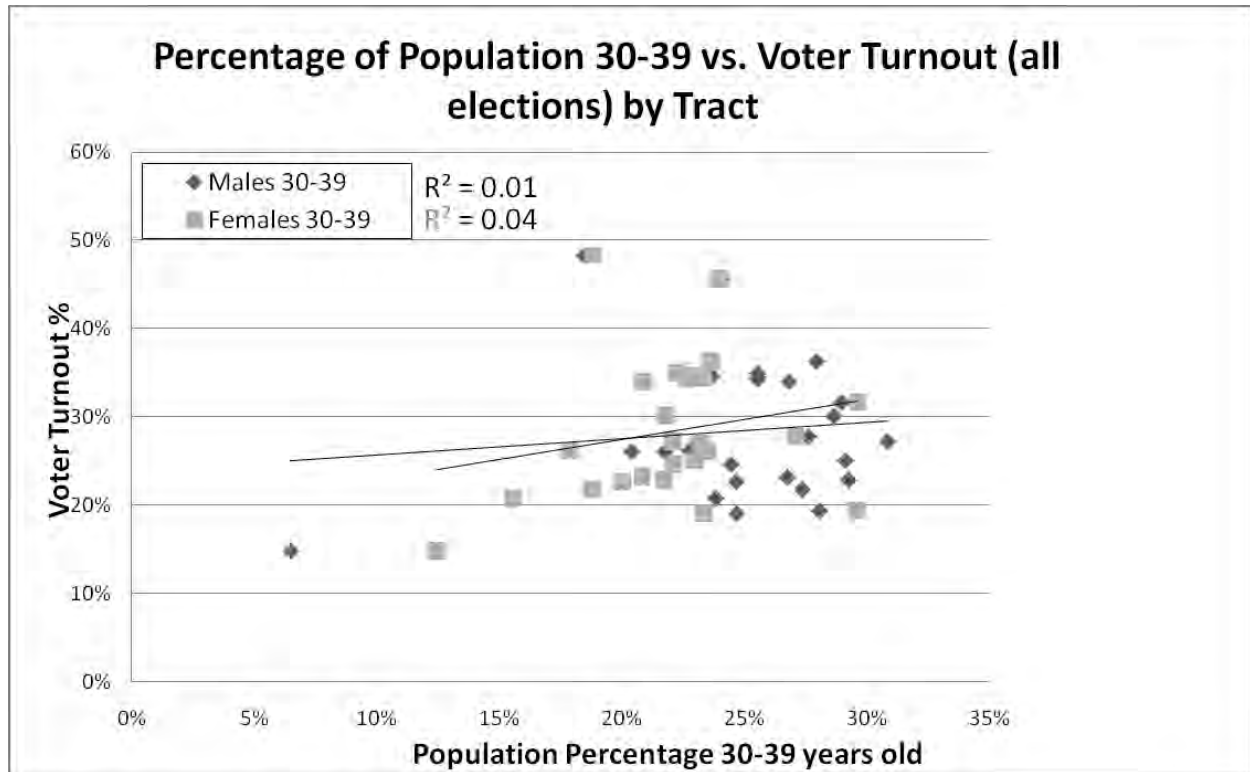
Percentage of Population Ages 30 to 39 and Voter Turnout - Chart

Exhibit 18

Percentage of Population Male Ages 40 to 49 – Maps

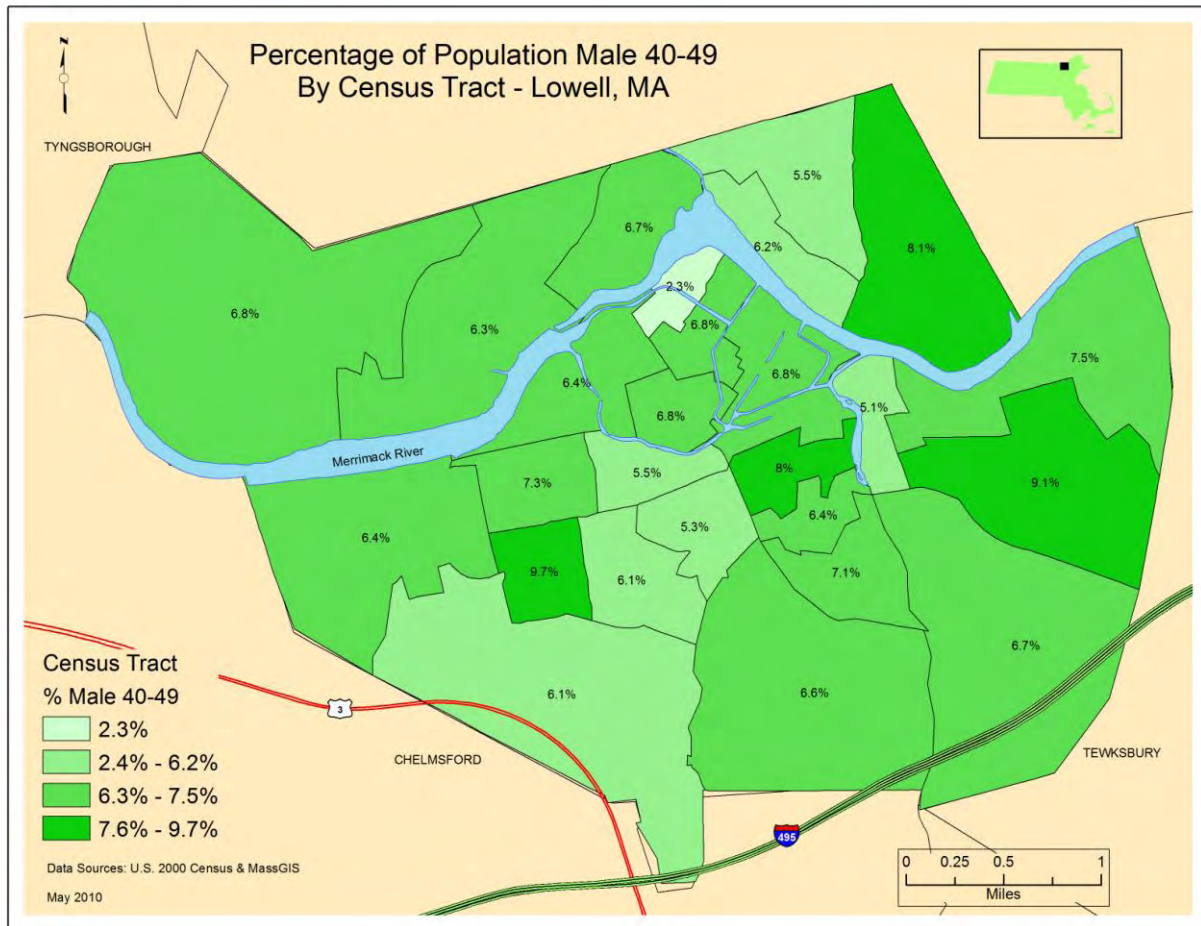


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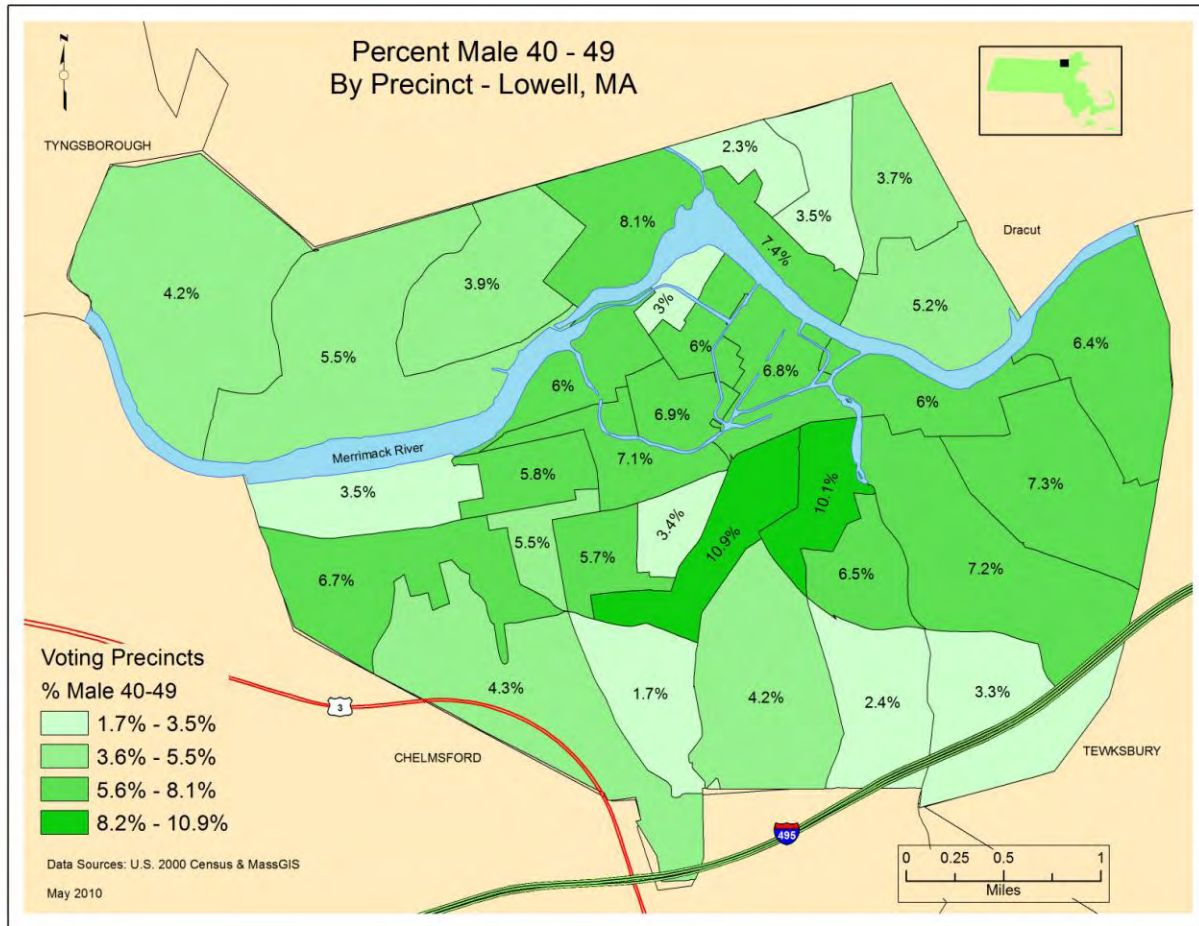


Exhibit 20

Percentage of Population Female Ages 40 to 49 – Maps

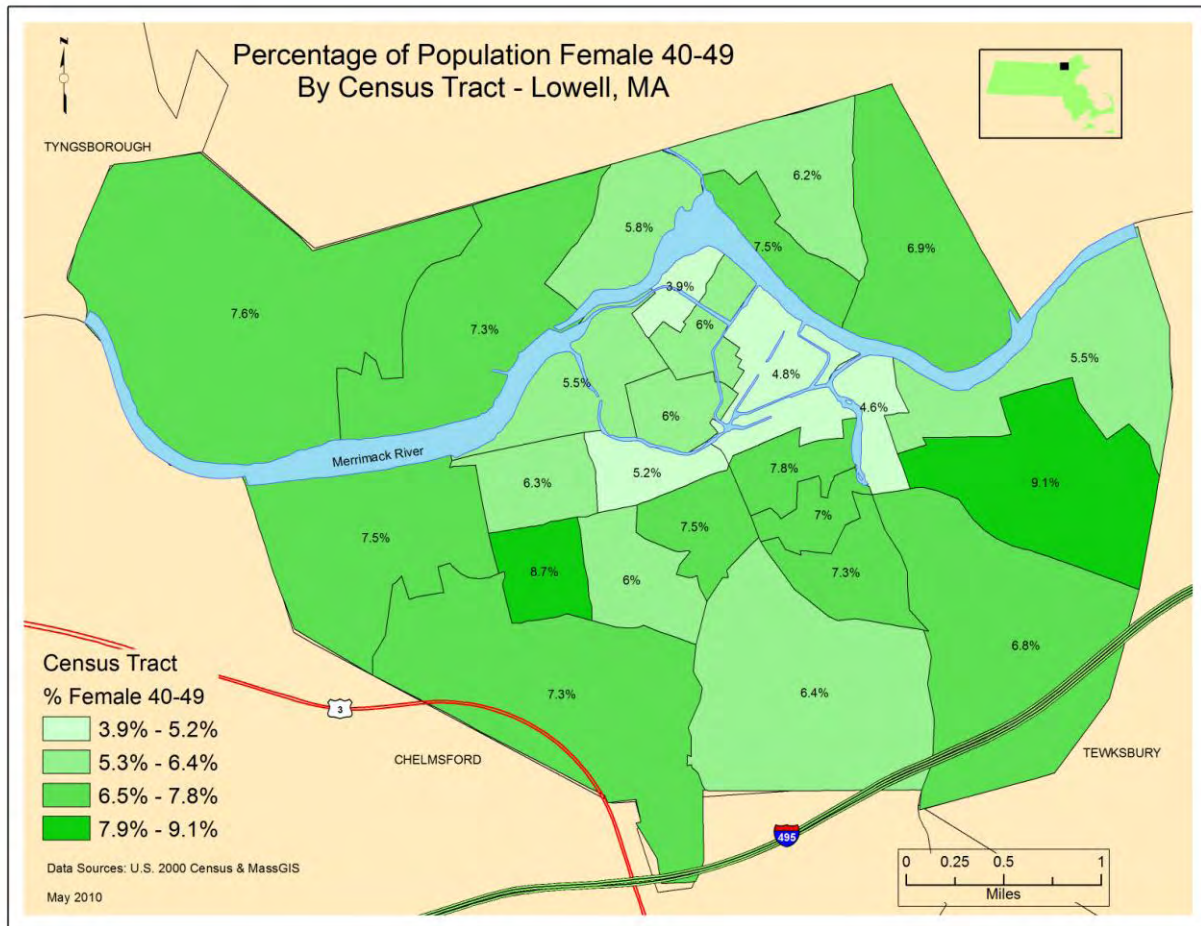


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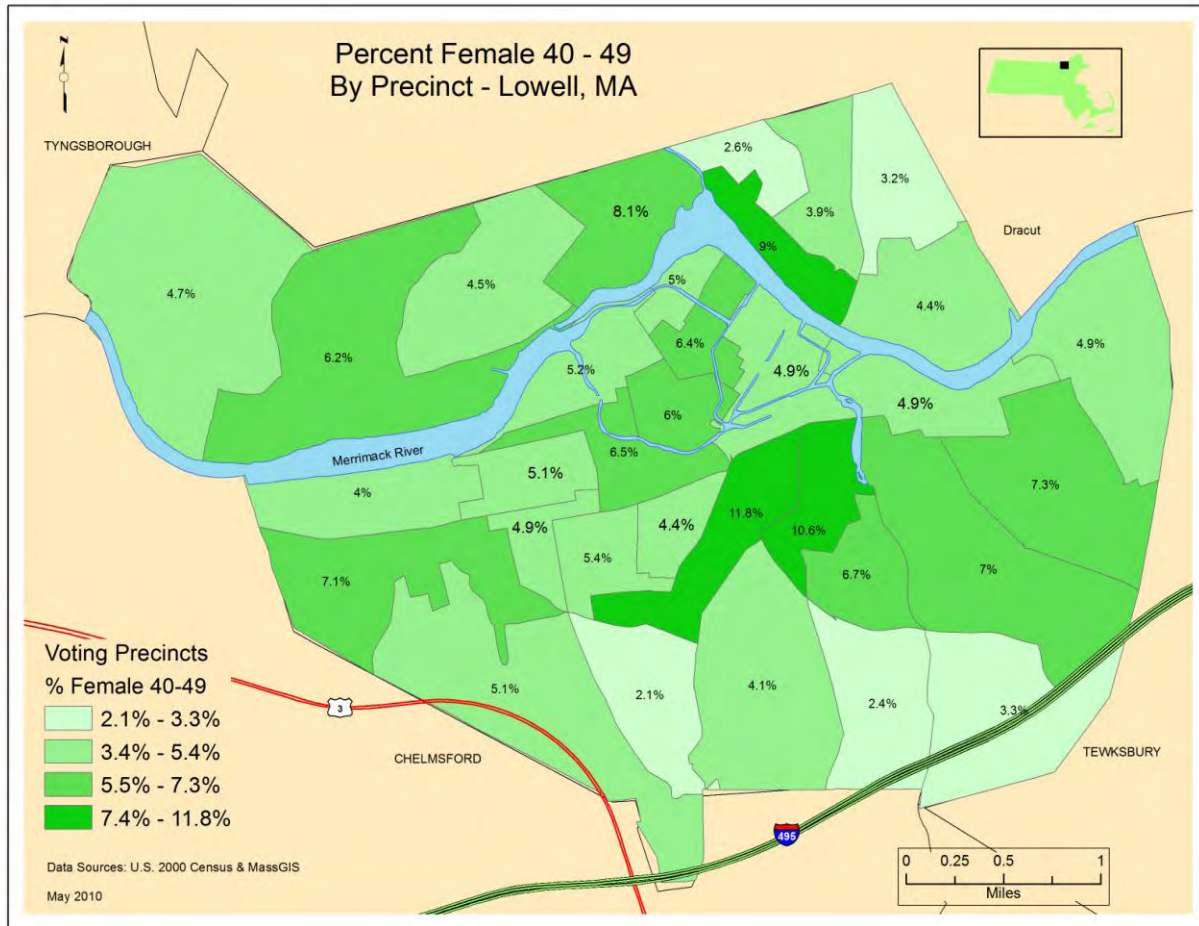


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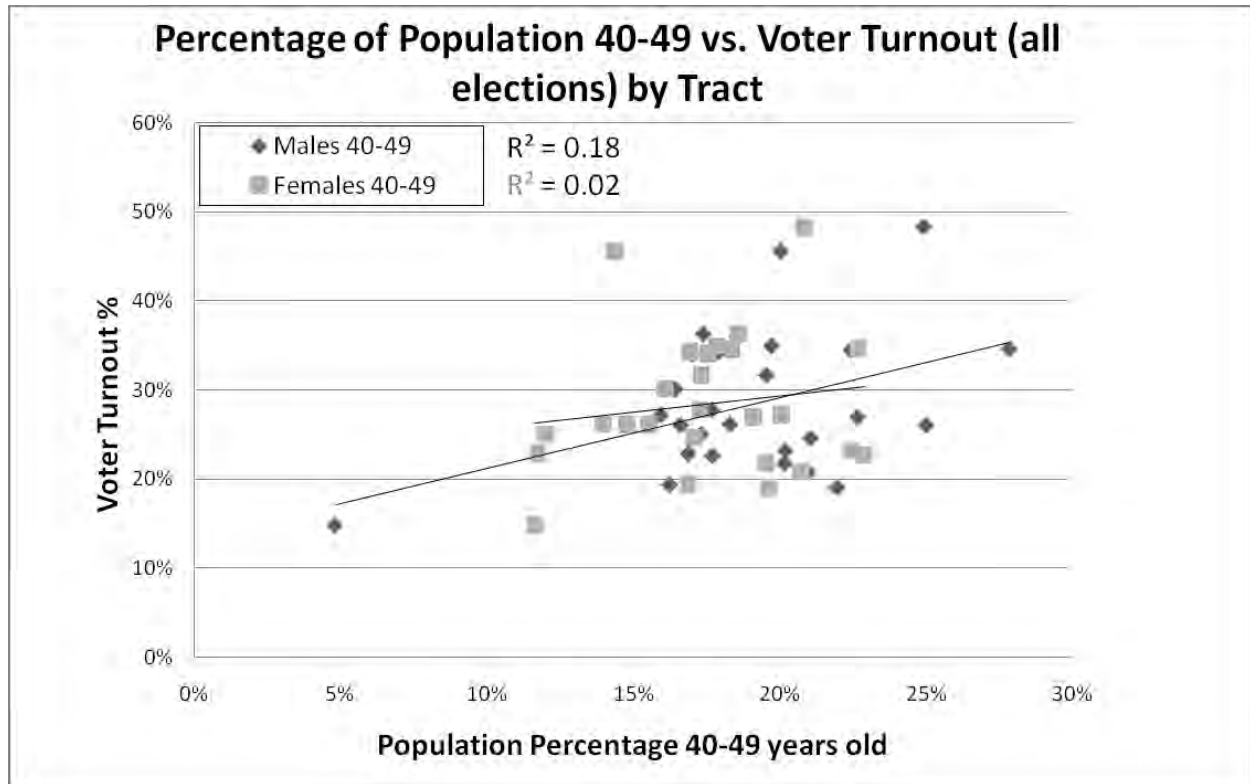
Percentage of Population Ages 40 to 49 and Voter Turnout – Chart

Exhibit 23

Percentage of Population Male, Ages 50 to 59 – Maps

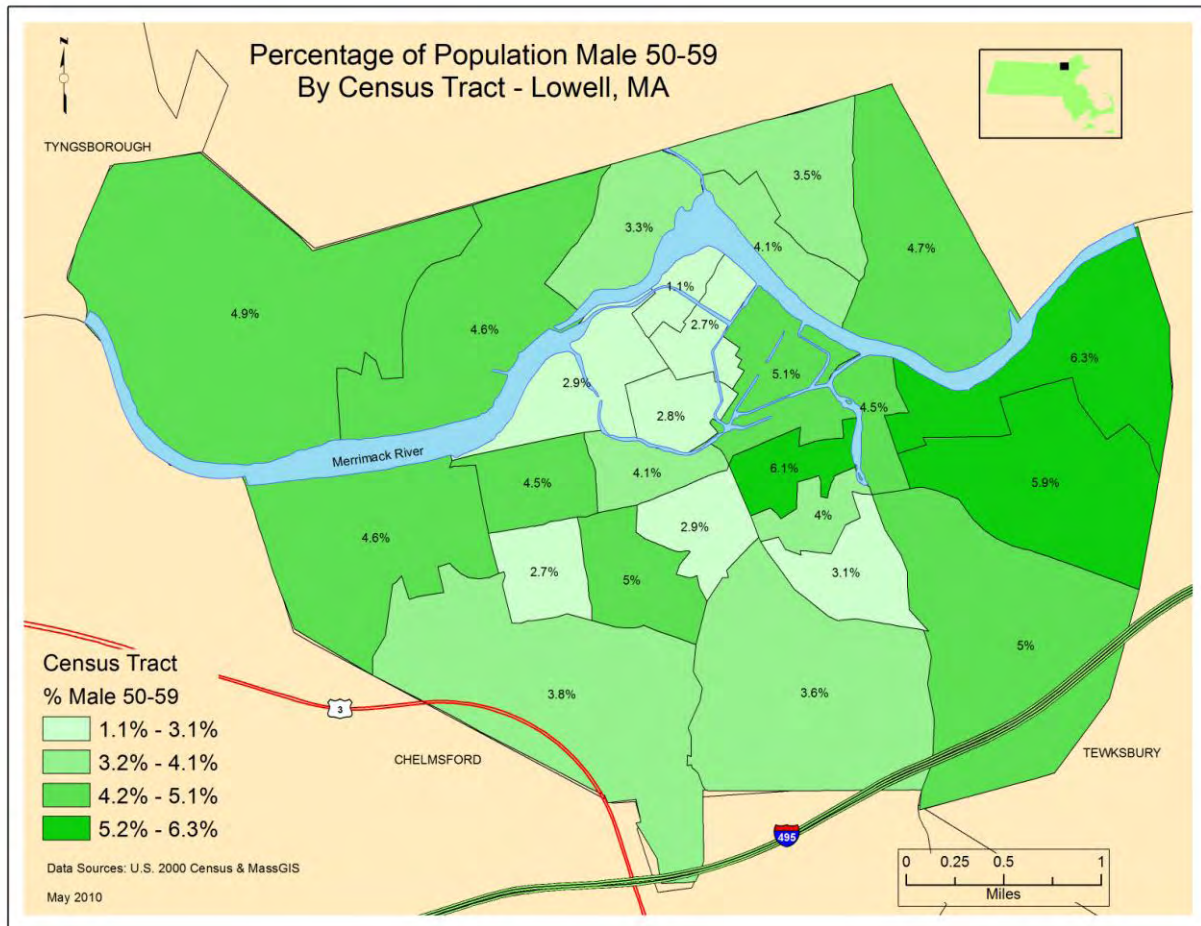


Exhibit 24

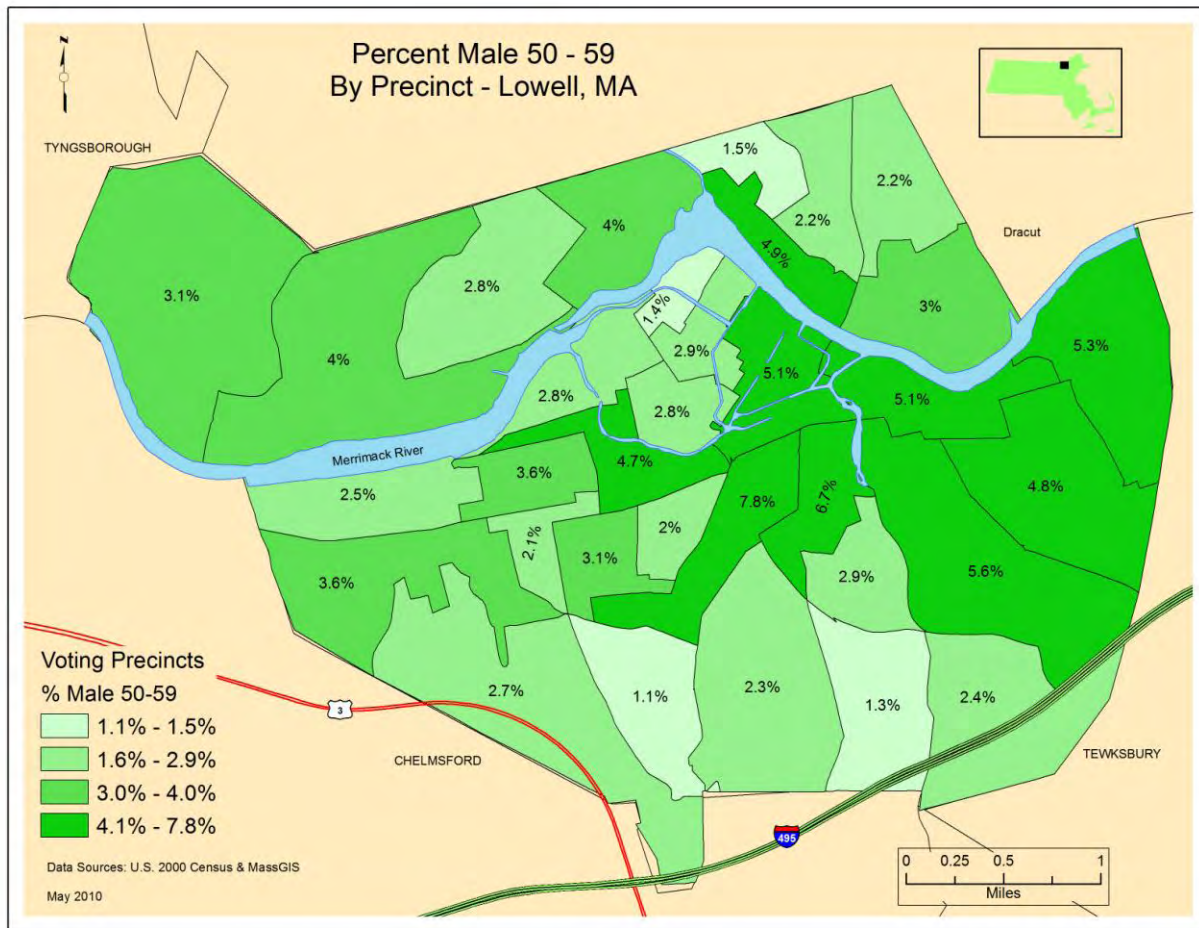


Exhibit 25

Percentage of Population Female, Ages 50 to 59 – Maps

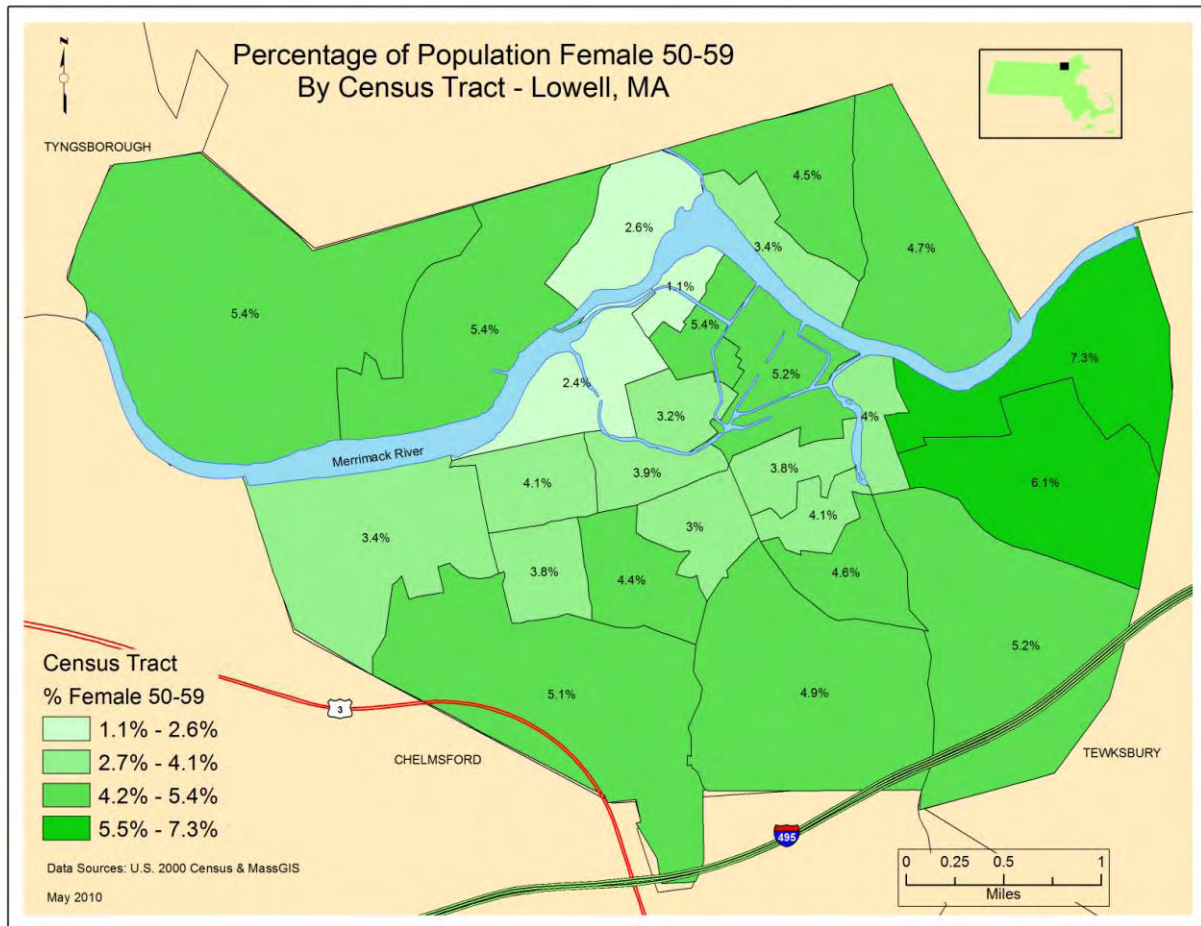


Exhibit 26

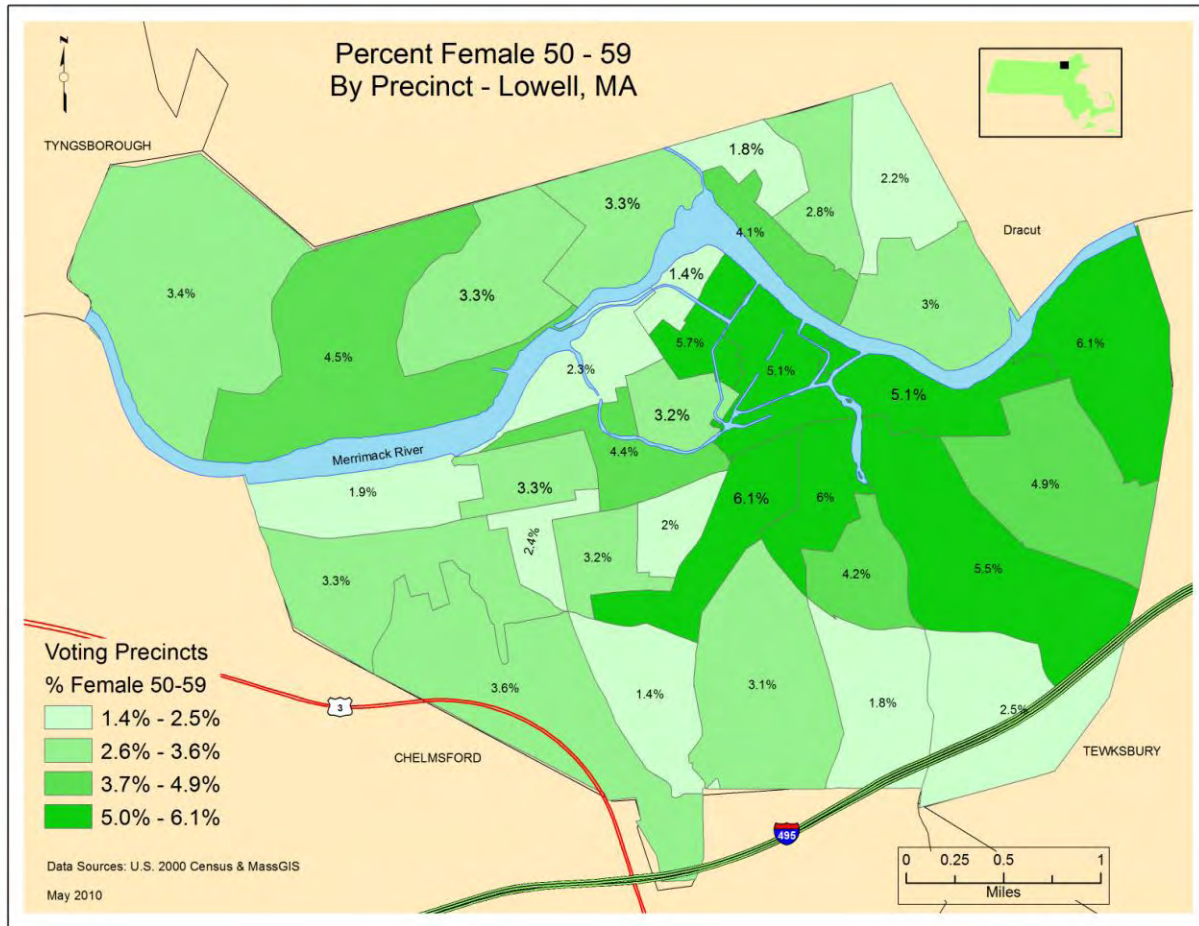


Exhibit 27

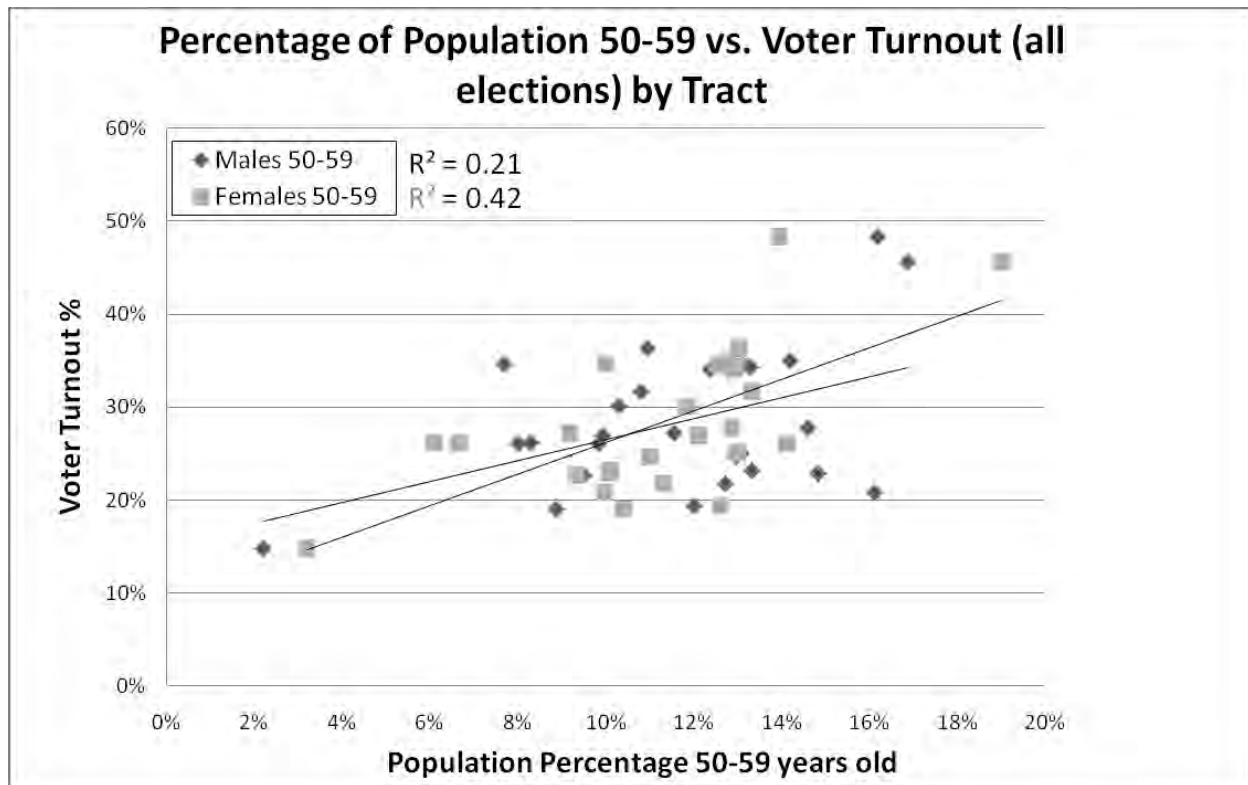
Percentage of Population Ages 50 to 59 and Voter Turnout – Chart

Exhibit 28

Percentage of Population Male Over 60 – Maps

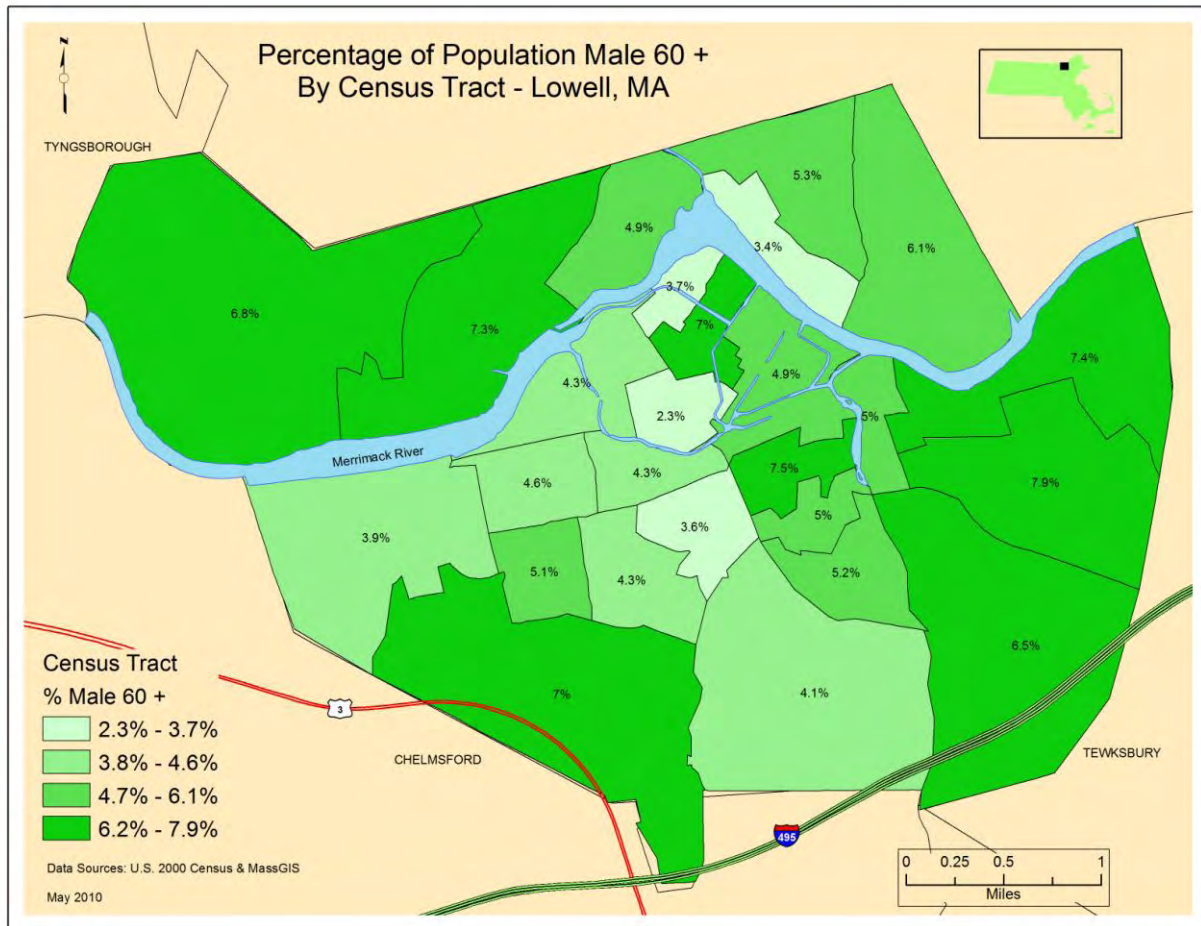


Exhibit 29

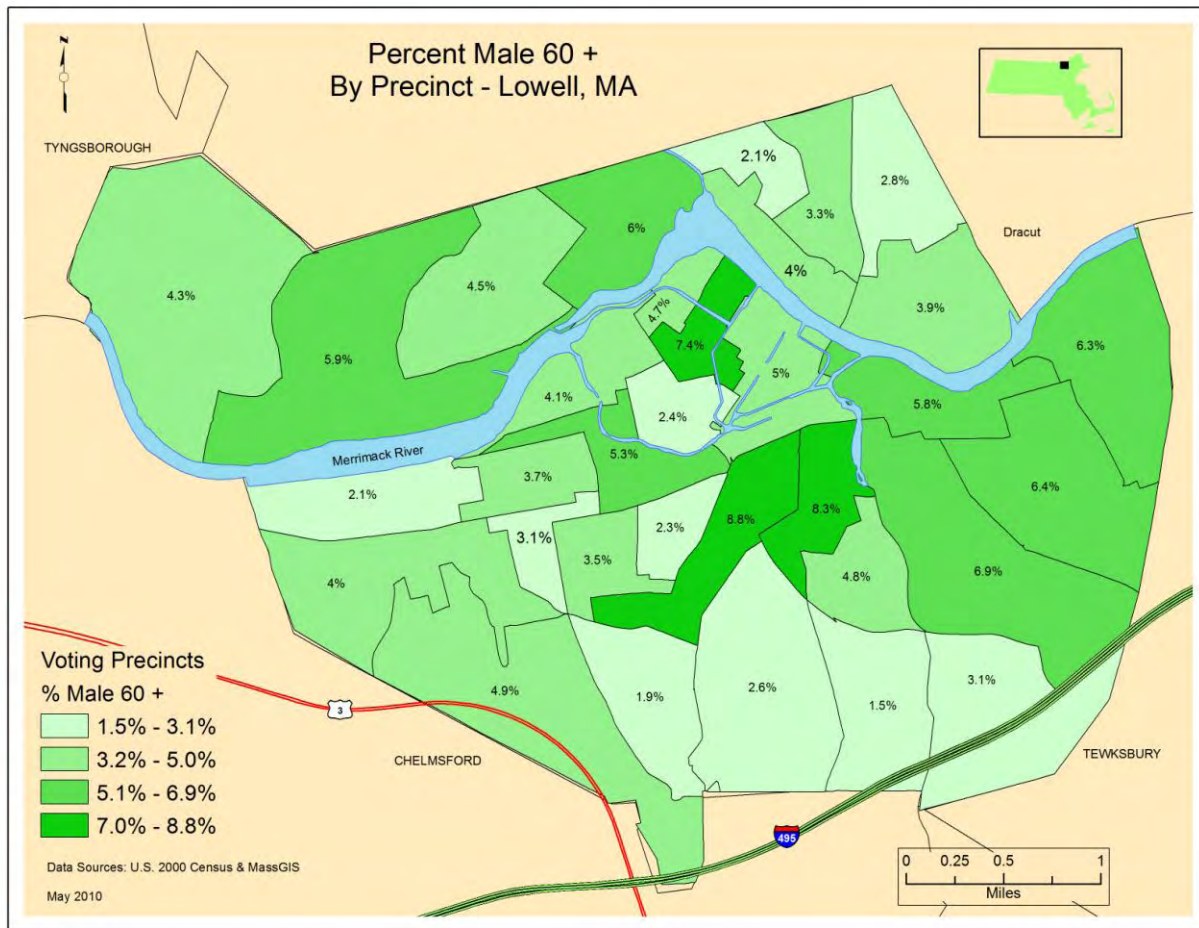
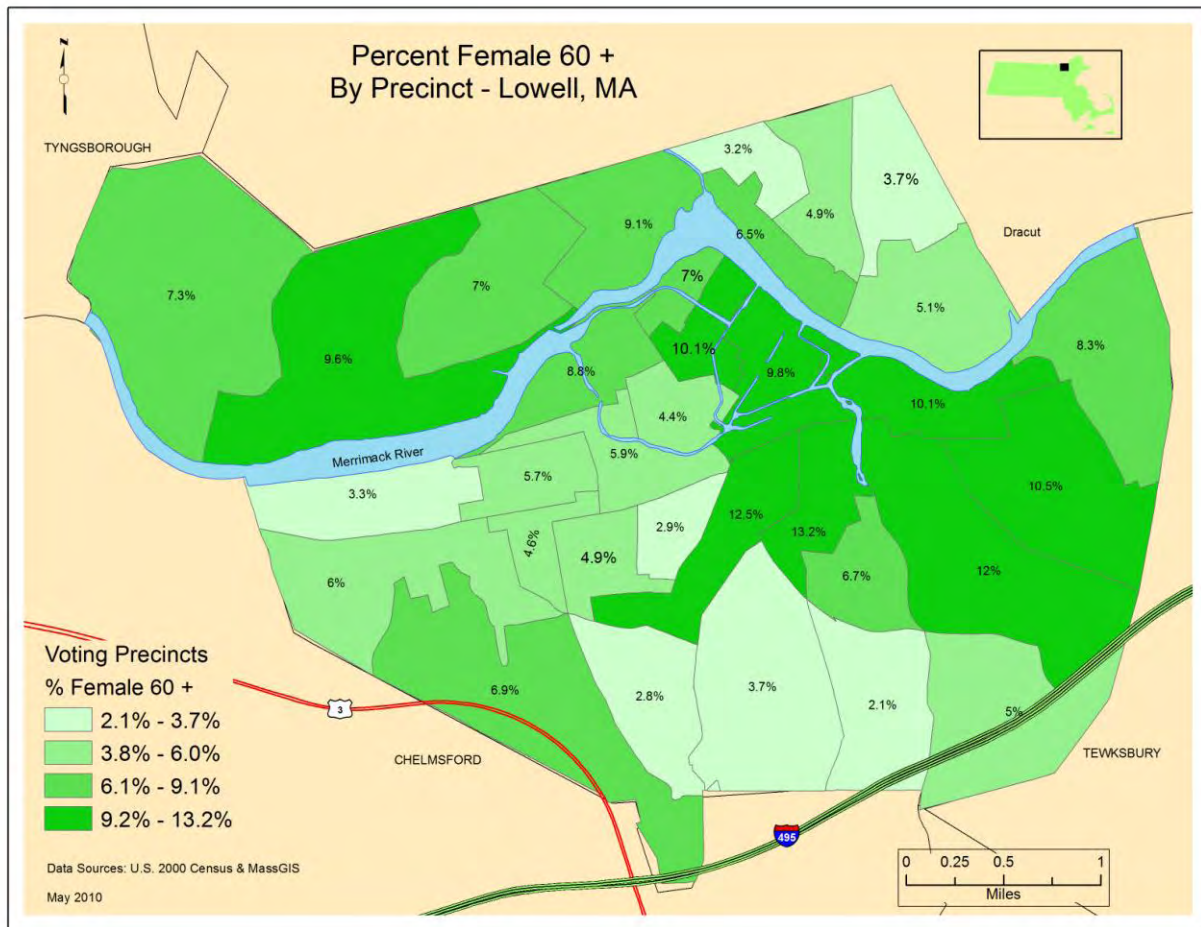


Exhibit 30

Percentage of Population Female Over 60 – Maps



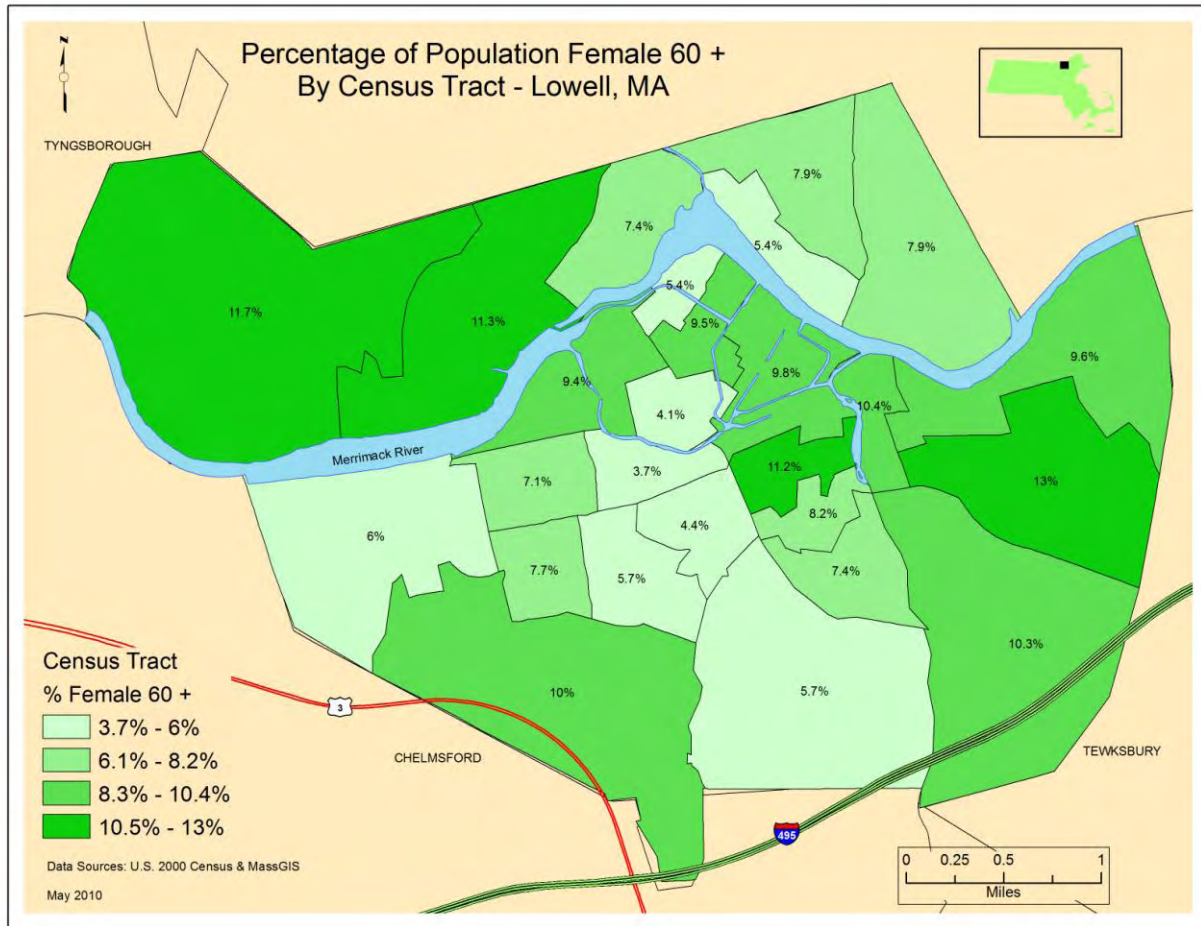


Exhibit 31

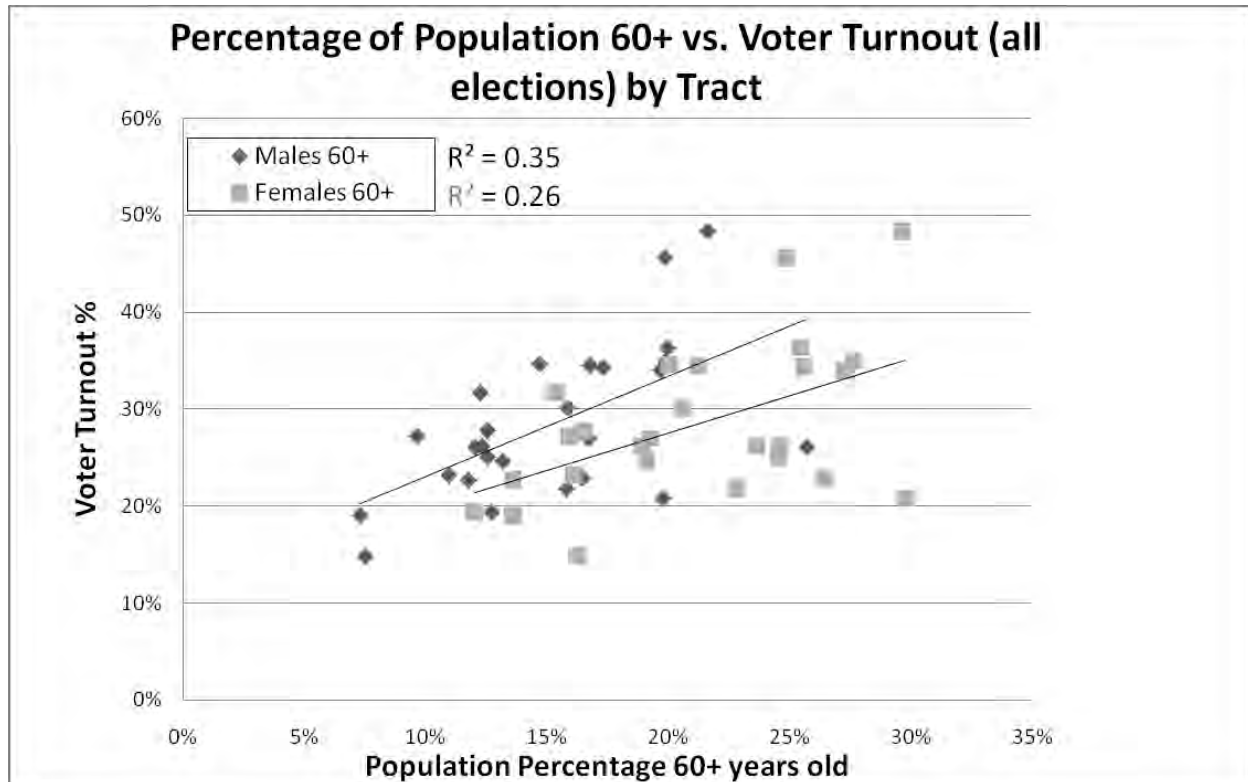
Percentage of Population Over the Age of 60 and Voter Turnout – Chart

Exhibit 32

Percentage of Male Population with High School Diploma – Maps

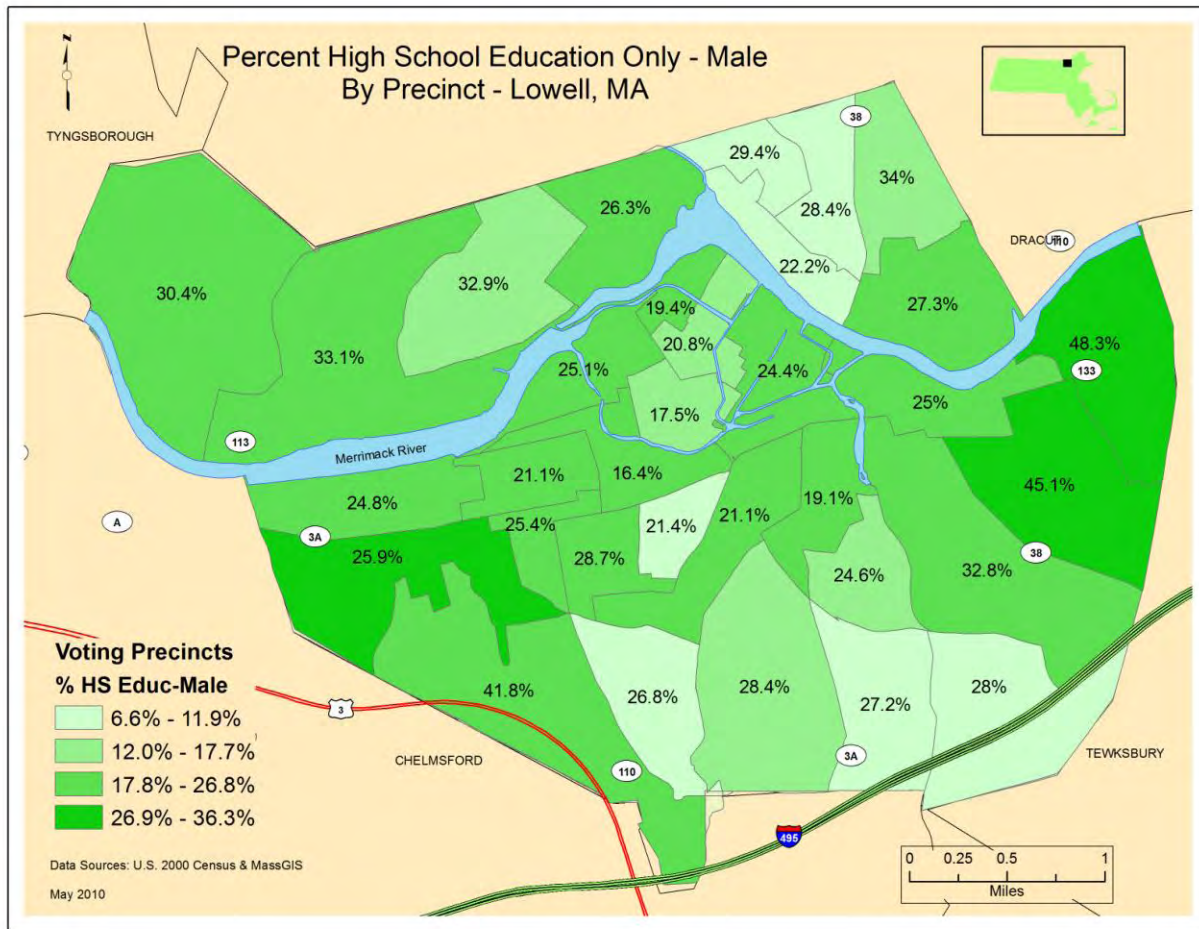


Exhibit 33

Percentage of Female Population with High School Diploma – Maps

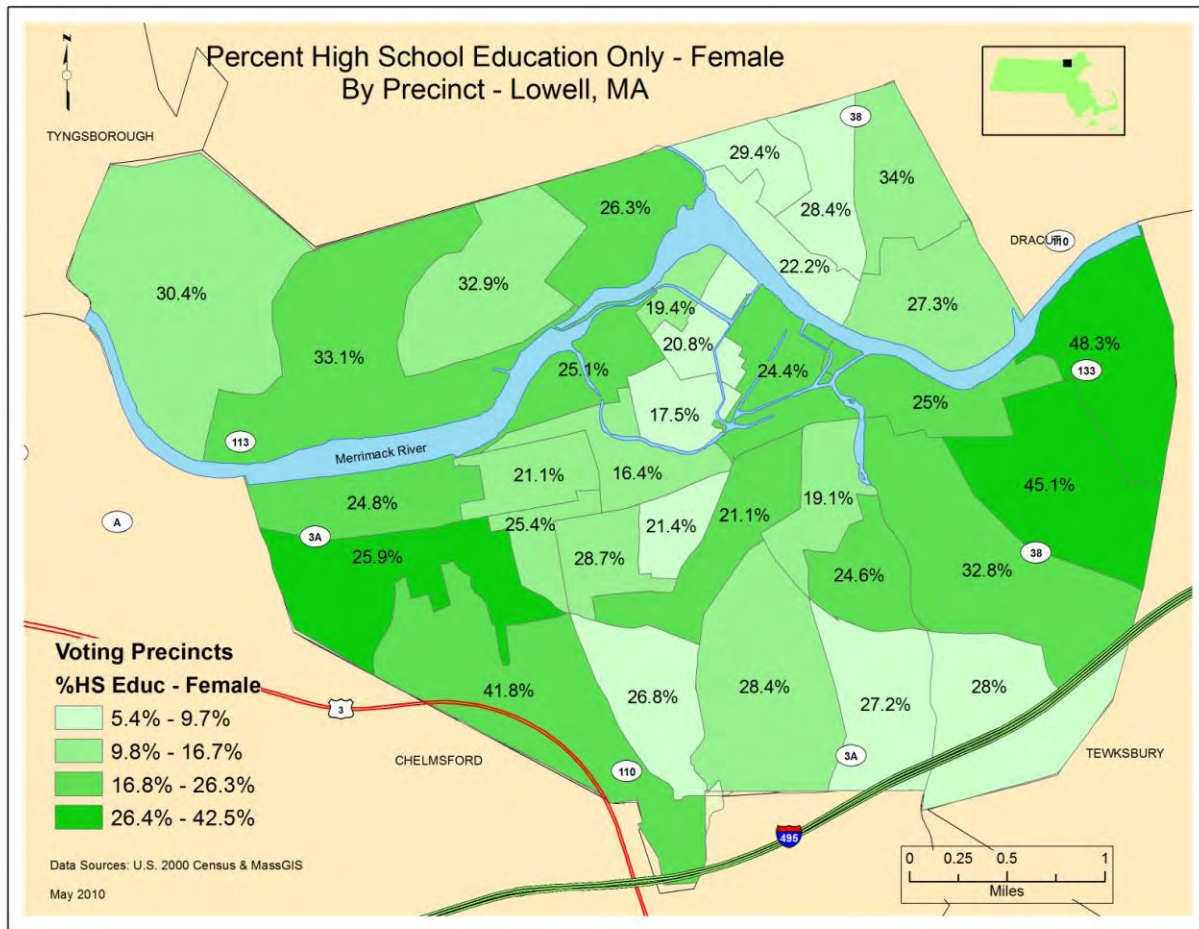


Exhibit 34

High School Diploma Attainment and Voter Turnout - Charts

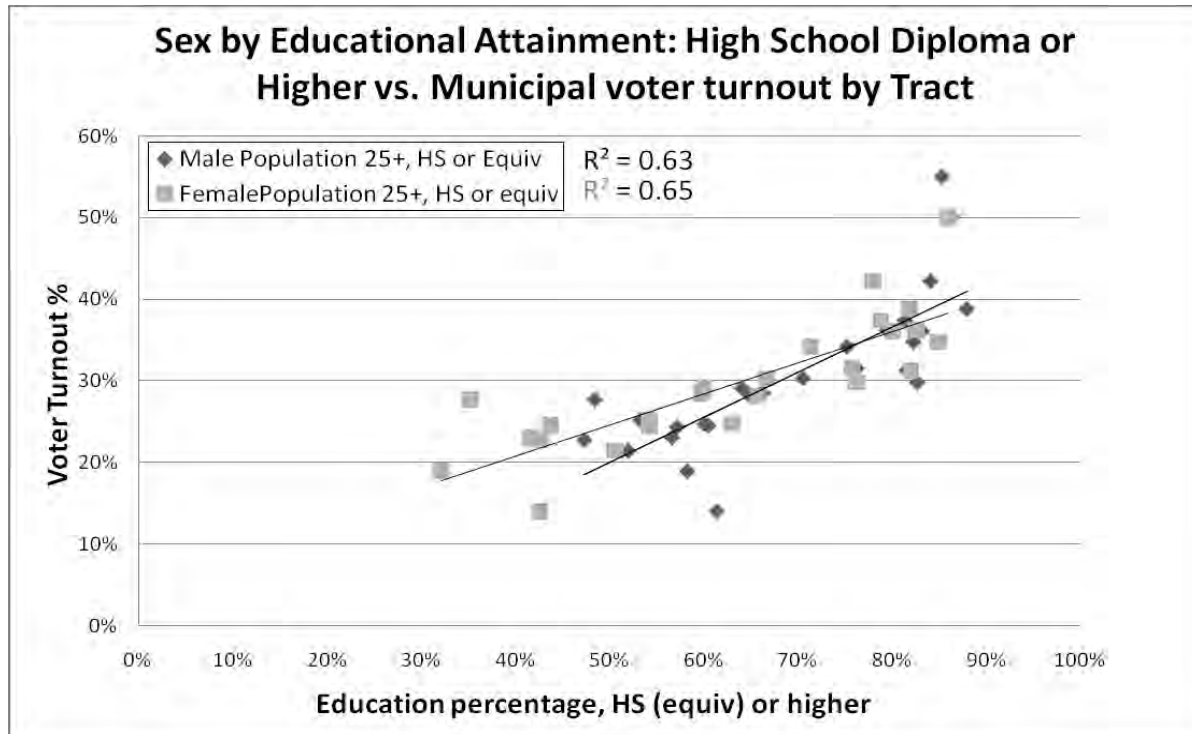


Exhibit 35

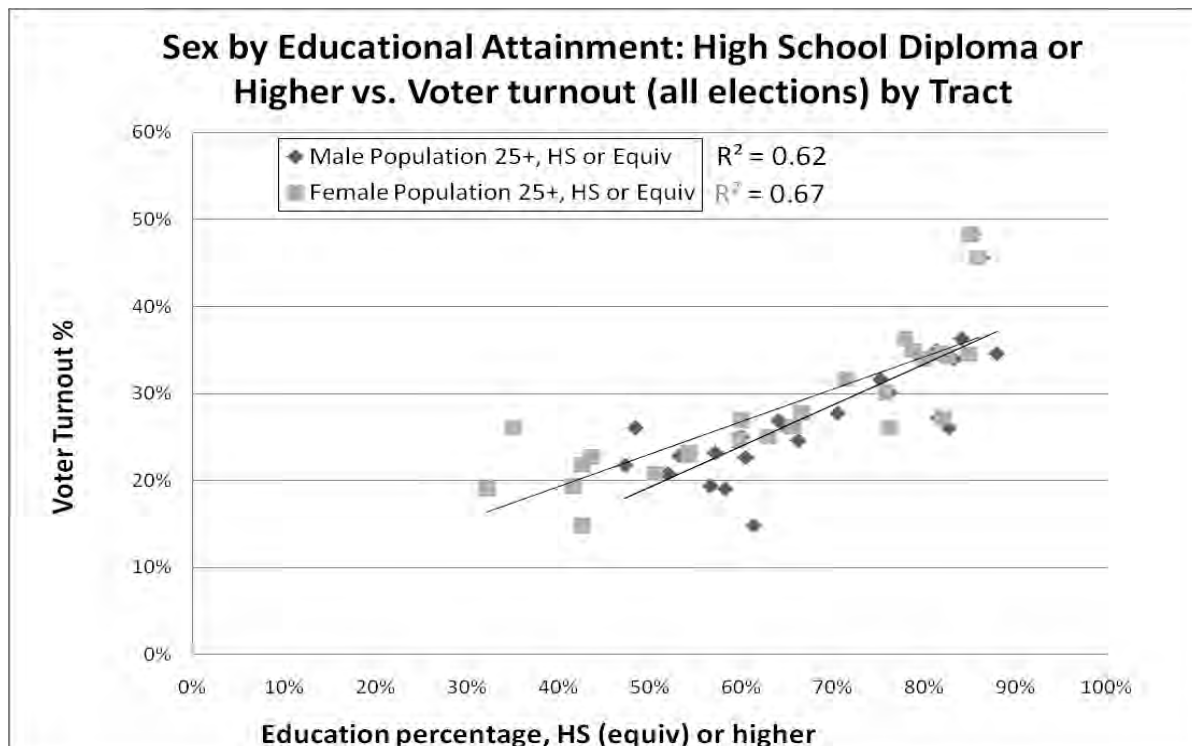


Exhibit 36

Percentage of Male Population with an Associate's Degree – Maps

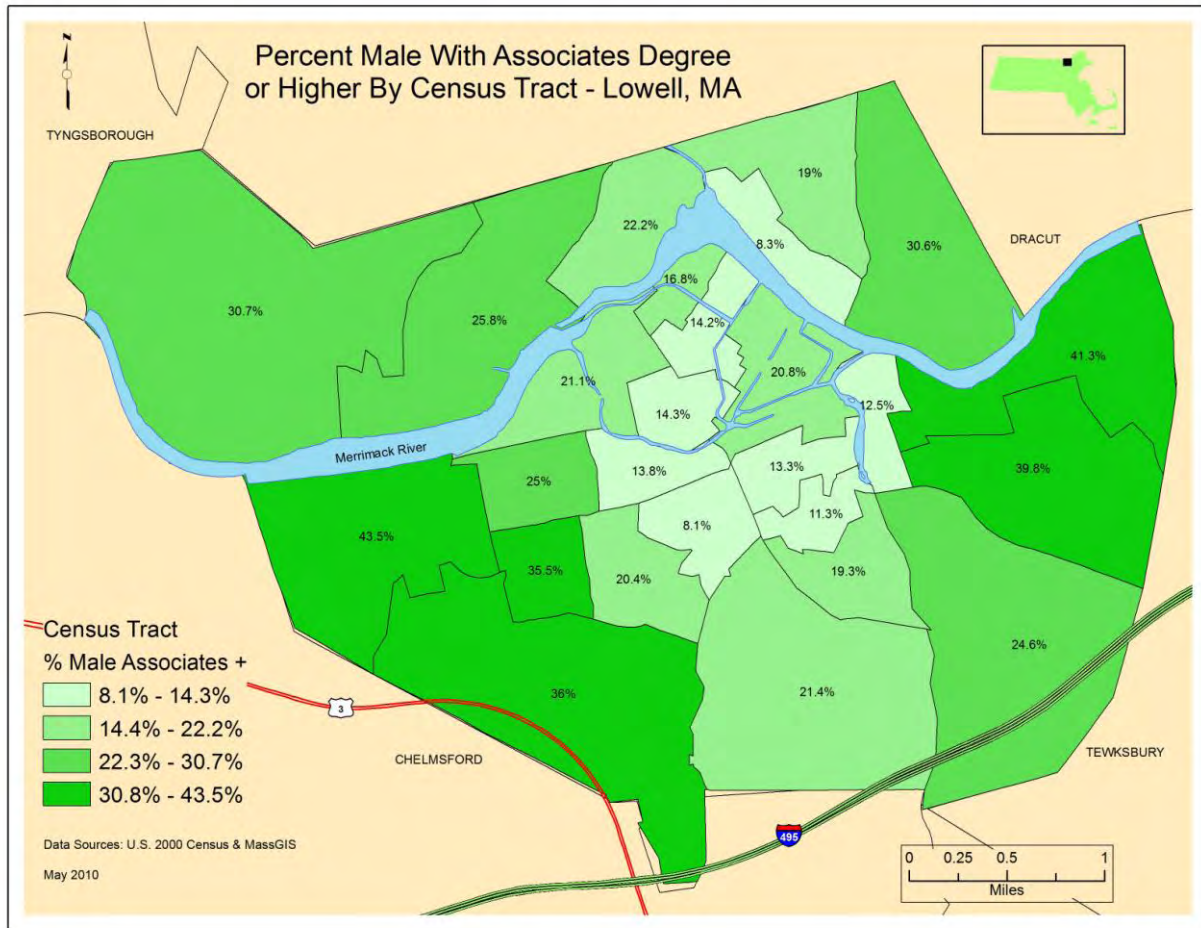


Exhibit 37

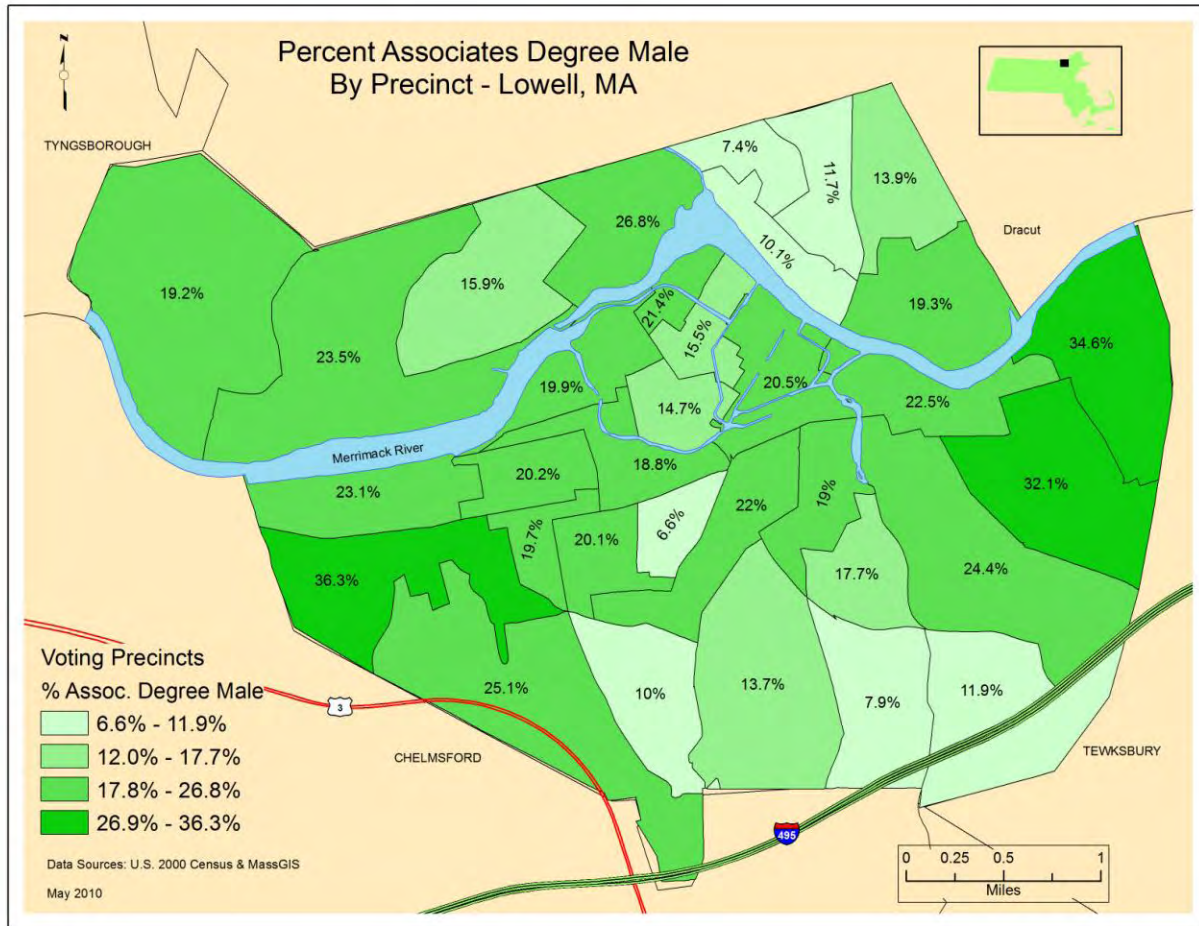


Exhibit 38

Percentage of Female Population with an Associate's Degree – Maps

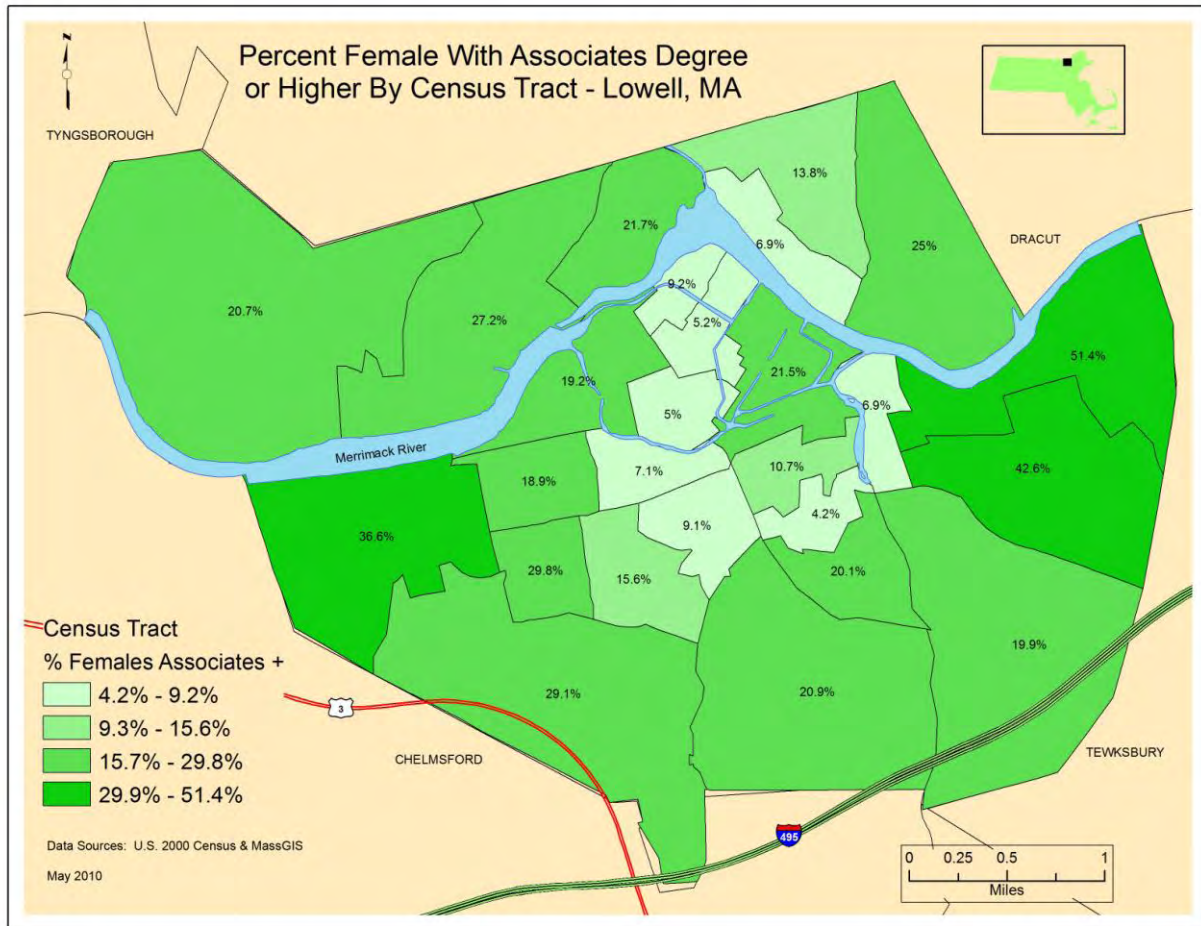


Exhibit 39

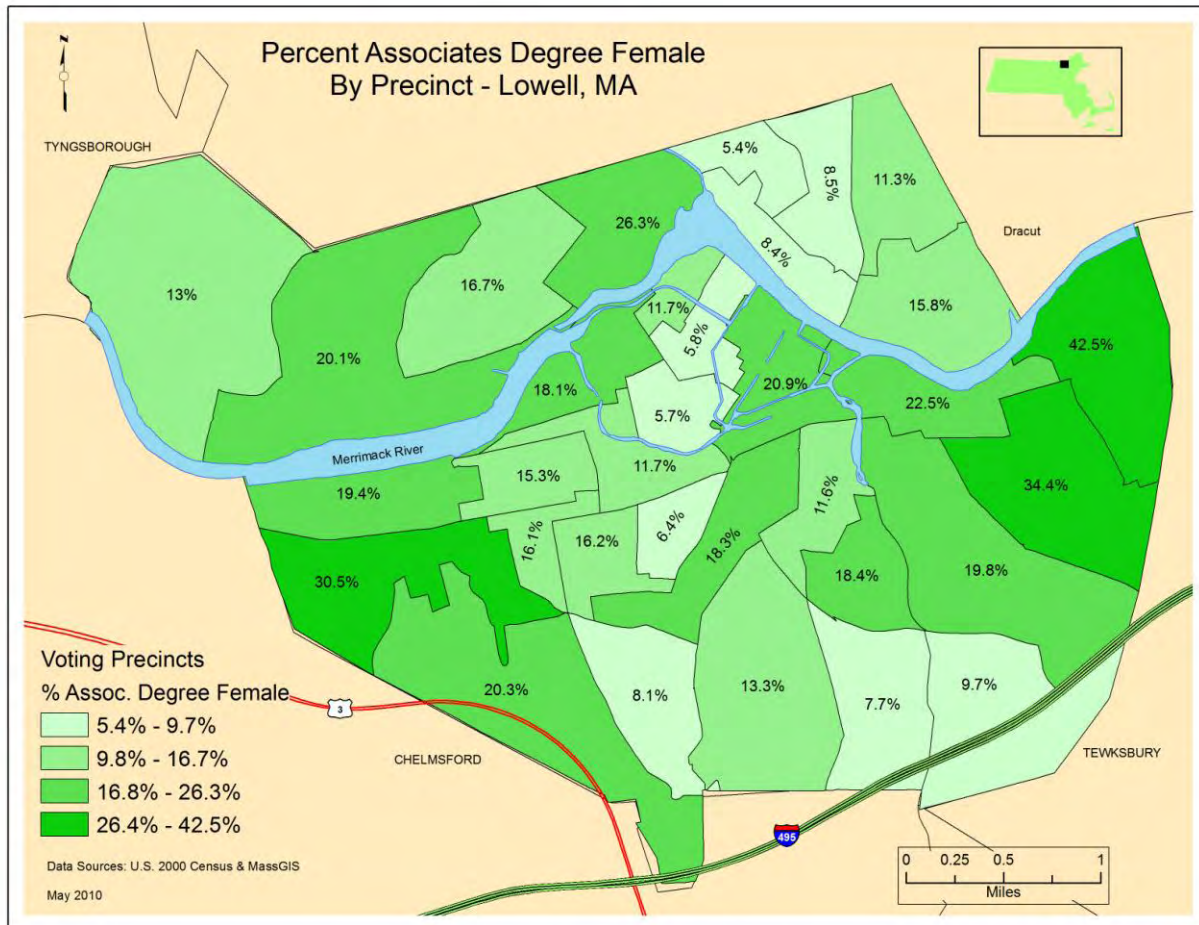


Exhibit 40

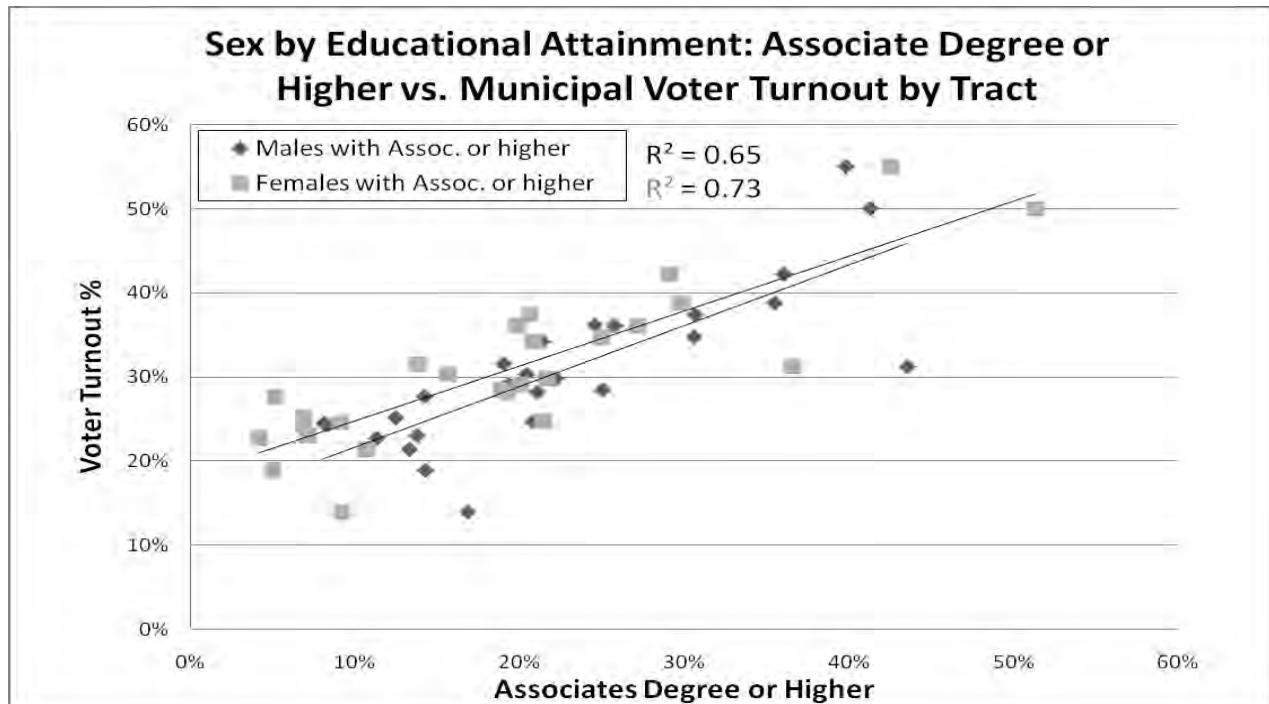
Associate Degree Attainment and Voter Turnout - Charts

Exhibit 41

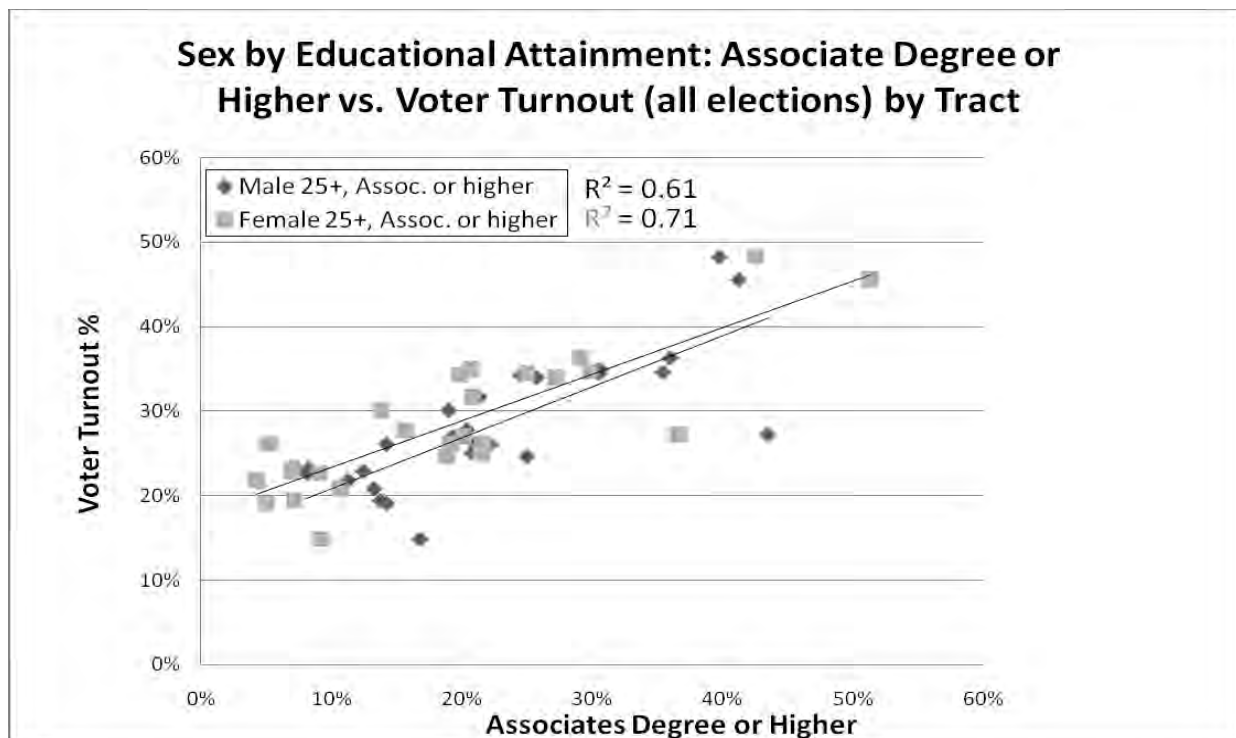


Exhibit 42

Percentage of Male Population with a Bachelor's Degree – Maps

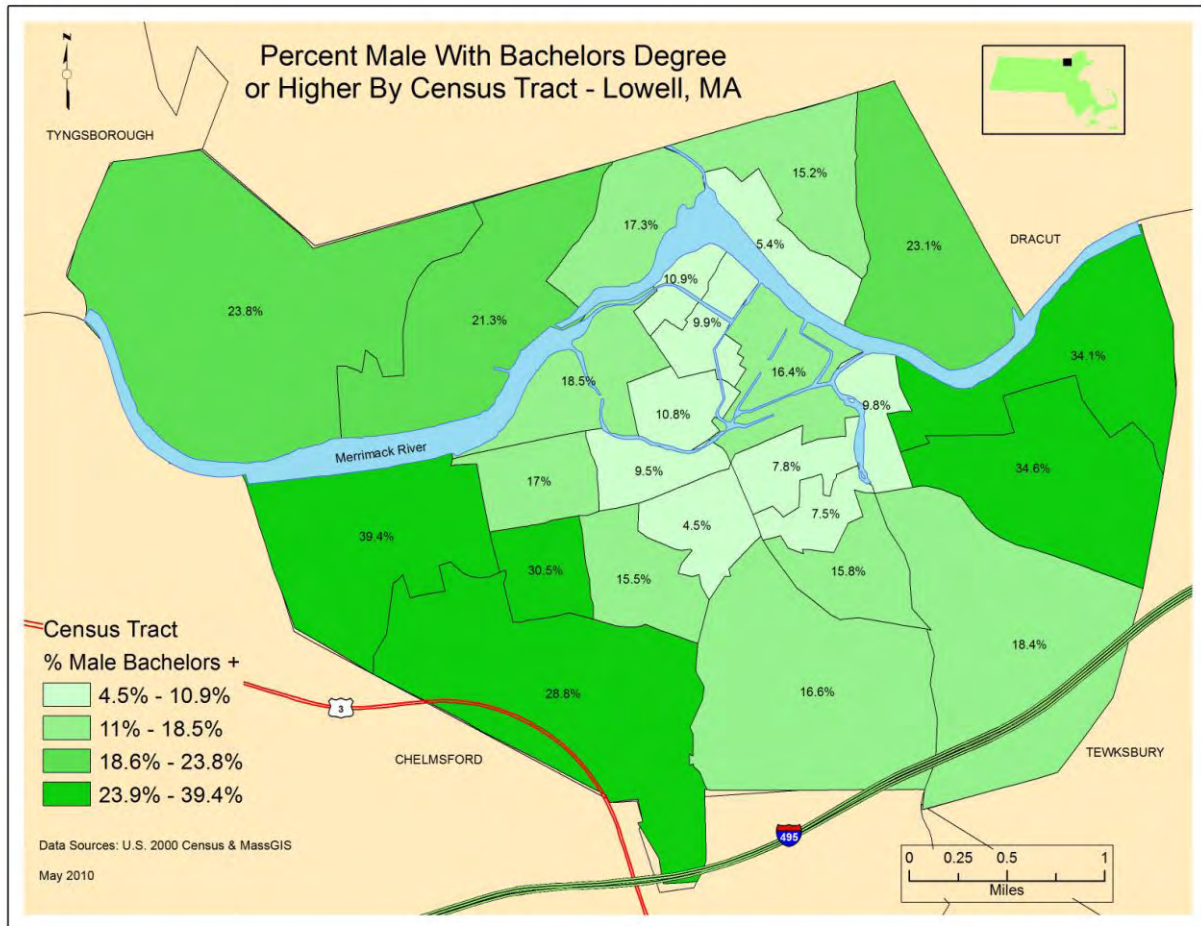


Exhibit 43

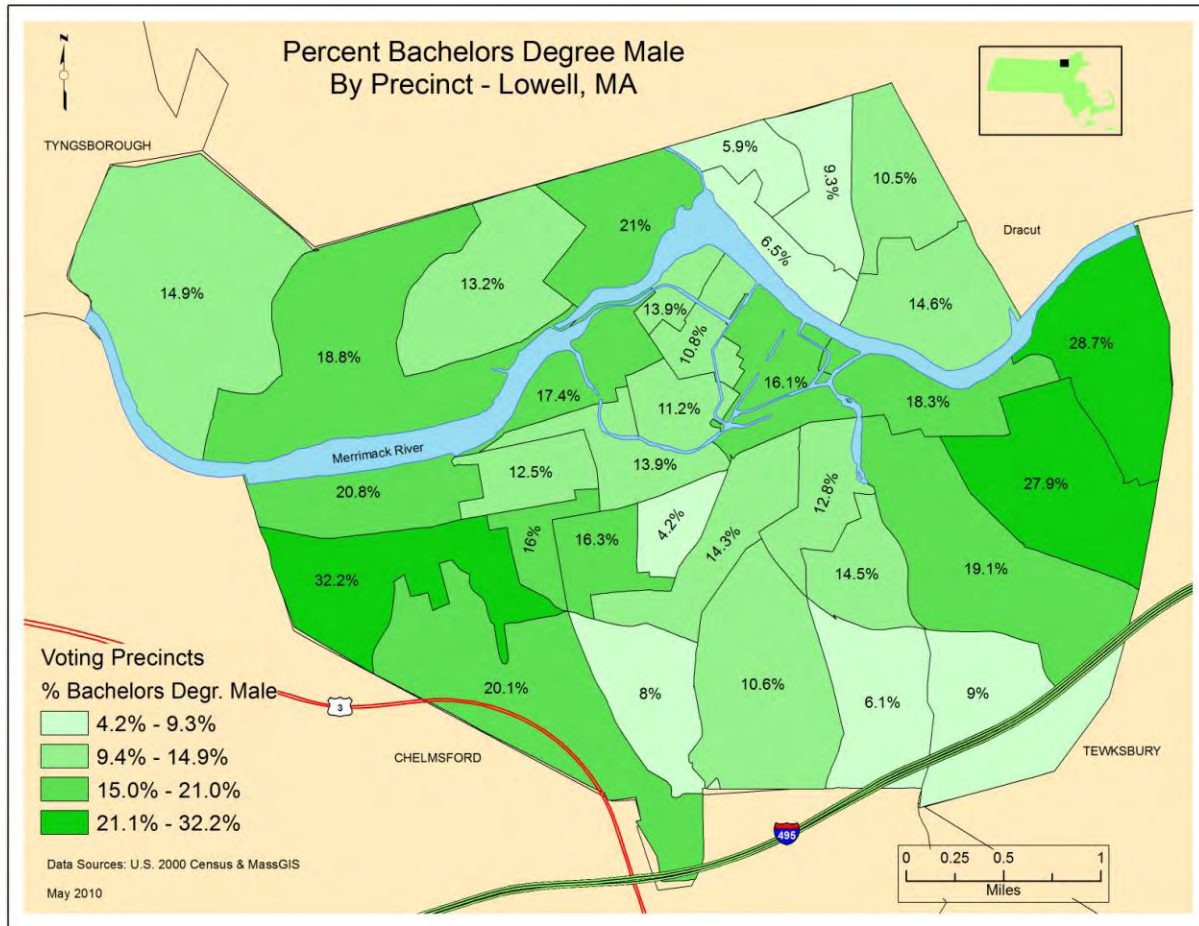


Exhibit 44

Percentage of Female Population with a Bachelor's Degree – Maps

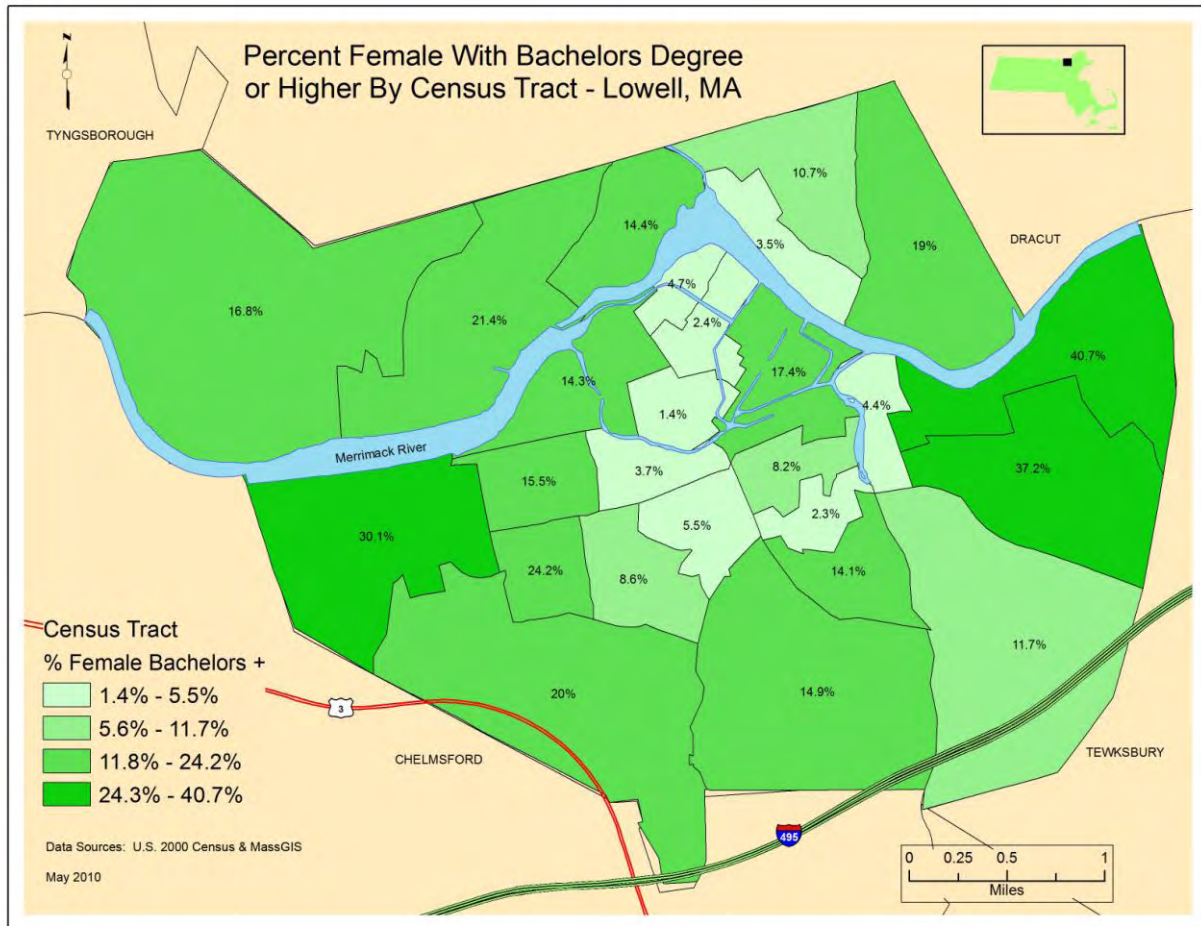


Exhibit 45

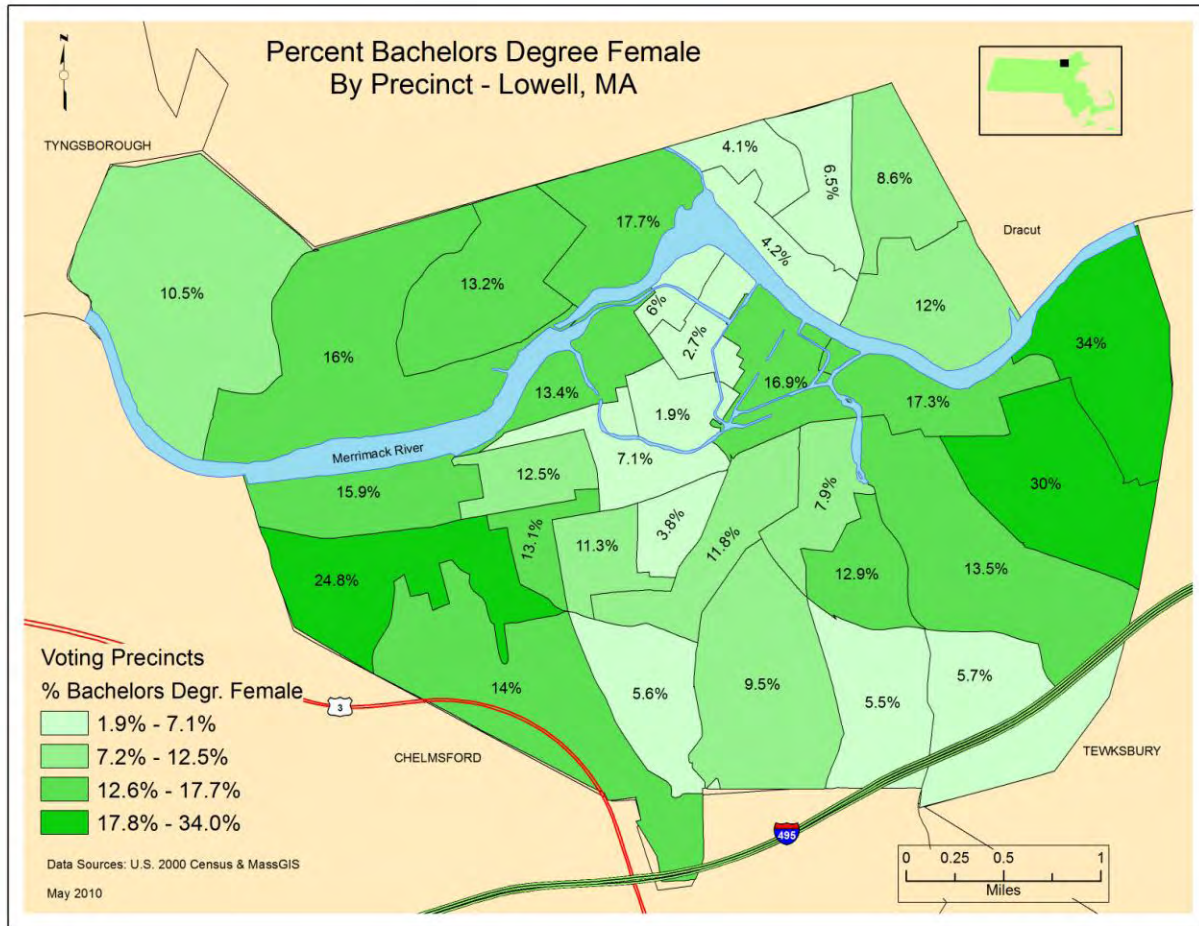


Exhibit 46

Bachelor Degree Attainment and Voter Turnout – Charts

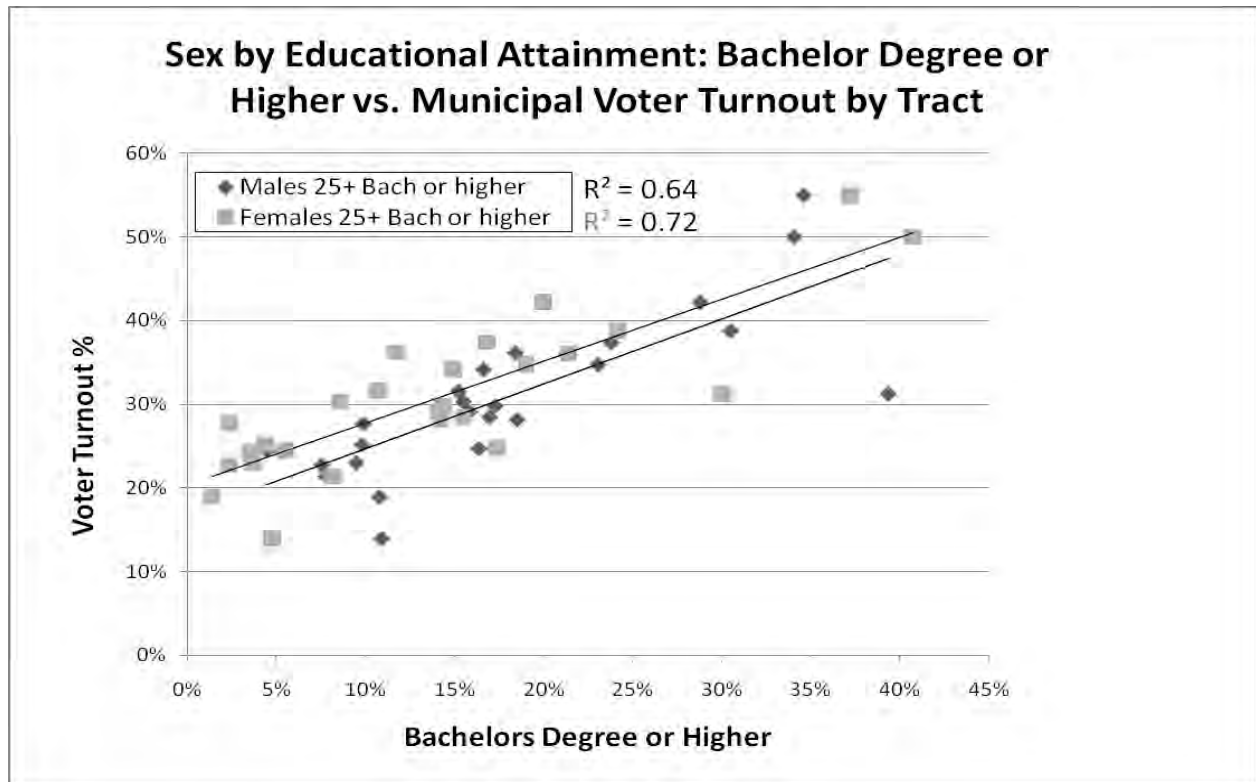


Exhibit 47

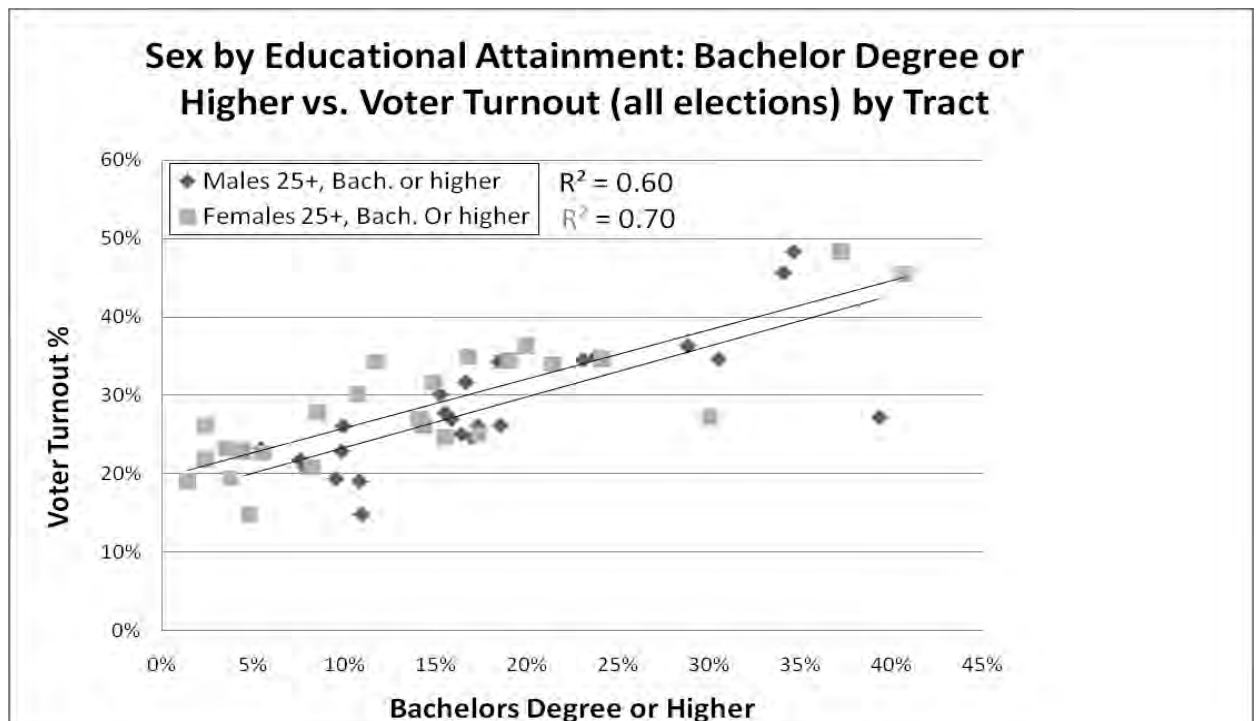


Exhibit 48

Percentage of Population Foreign Born – Maps

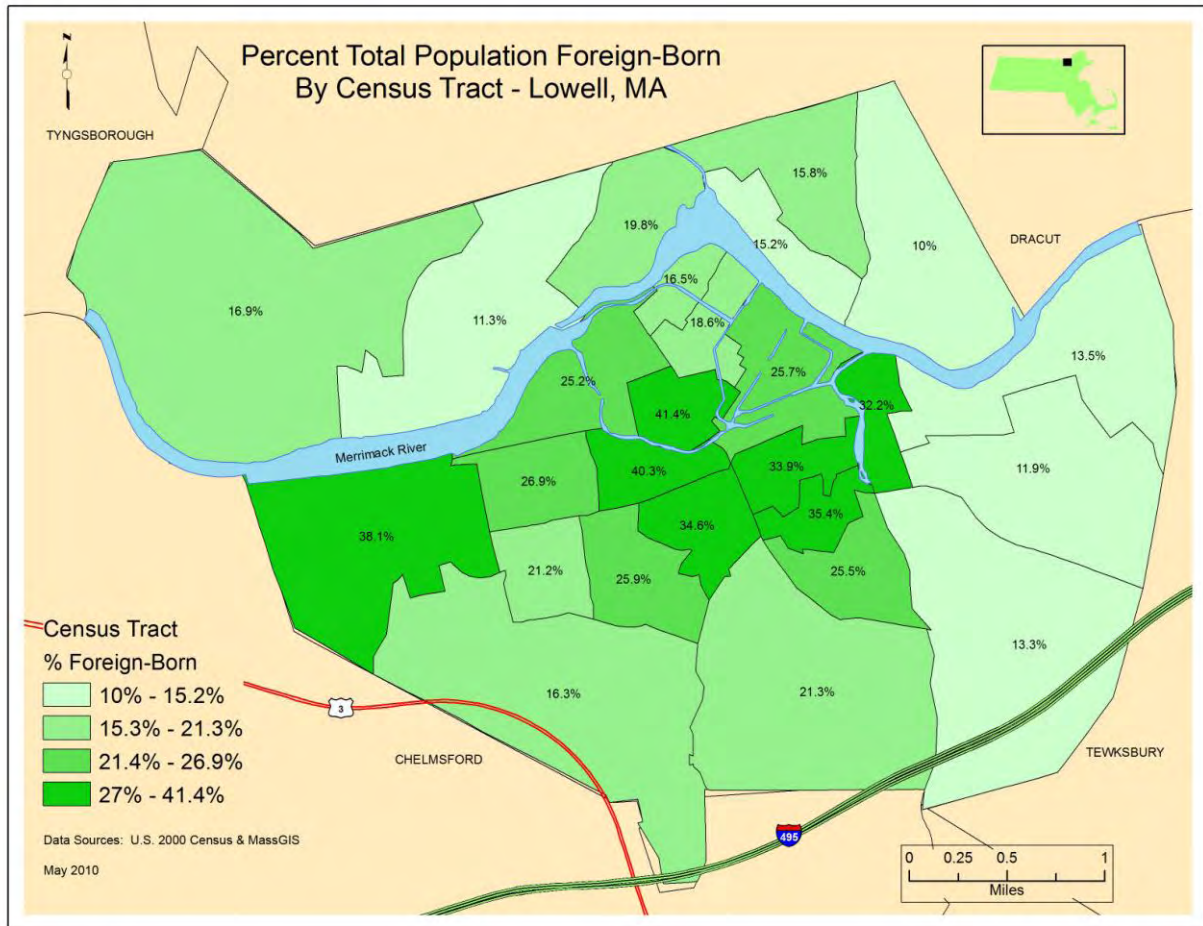


Exhibit 49

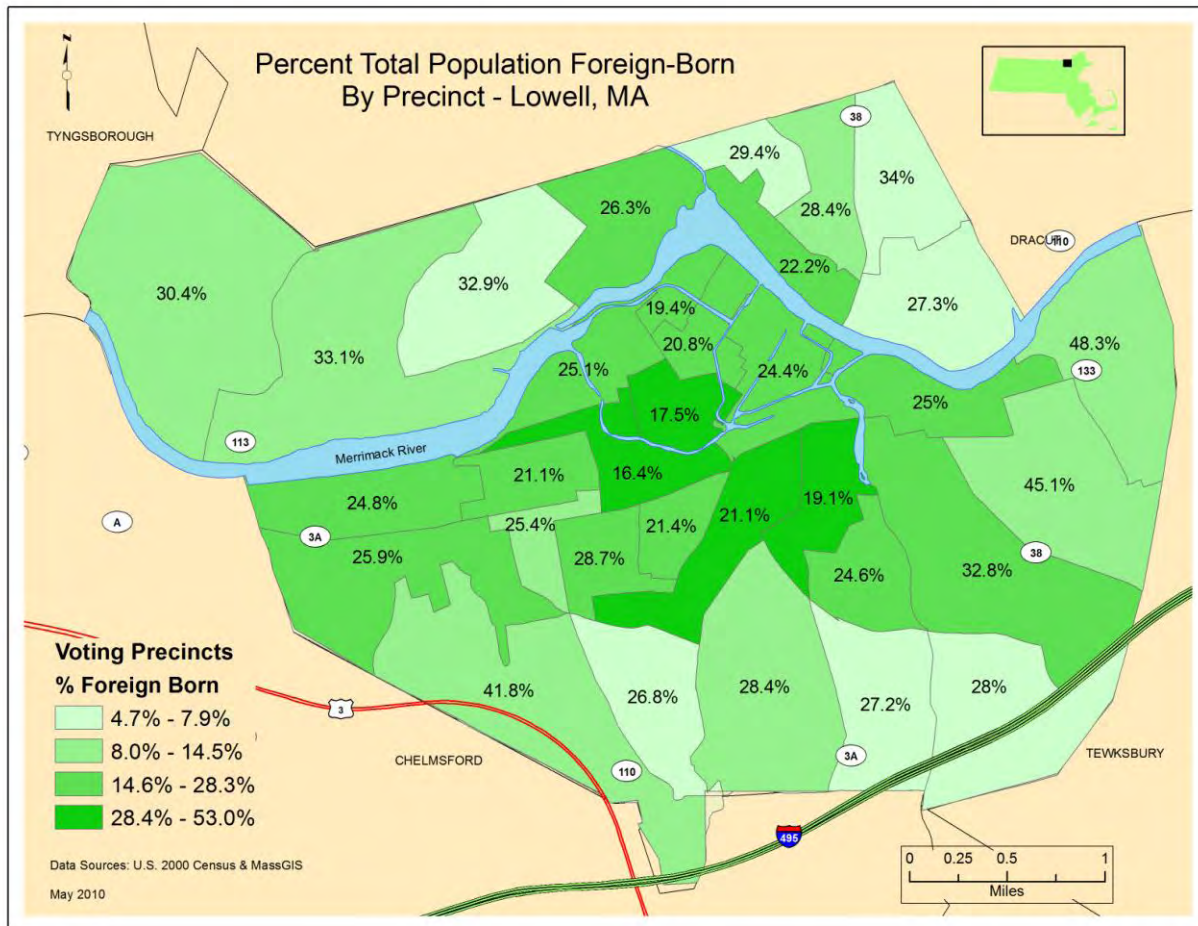


Exhibit 50

| Percent of Voter Turnout by Foreign Born at Tract Level | | |
|---|---------|--|
| Foreign Born | Turnout | |
| 10-15% | 39% | |
| 15-20% | 28% | |
| 20-25% | 31% | |
| 25-30% | 26% | |
| 30-35% | 22% | |
| 35-40% | 39% | |

Exhibit 51

Housing Tenure and Owner Occupancy – Maps

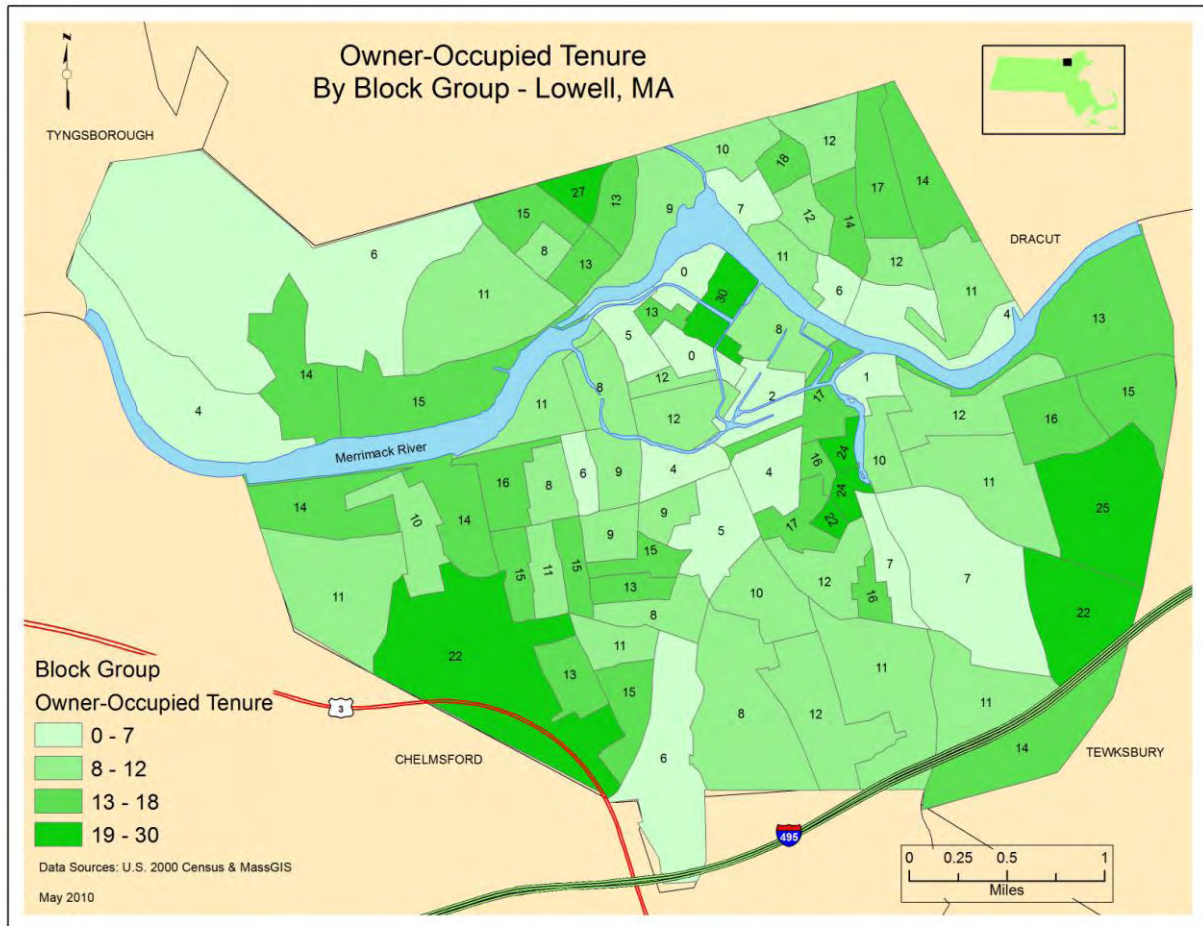


Exhibit 52

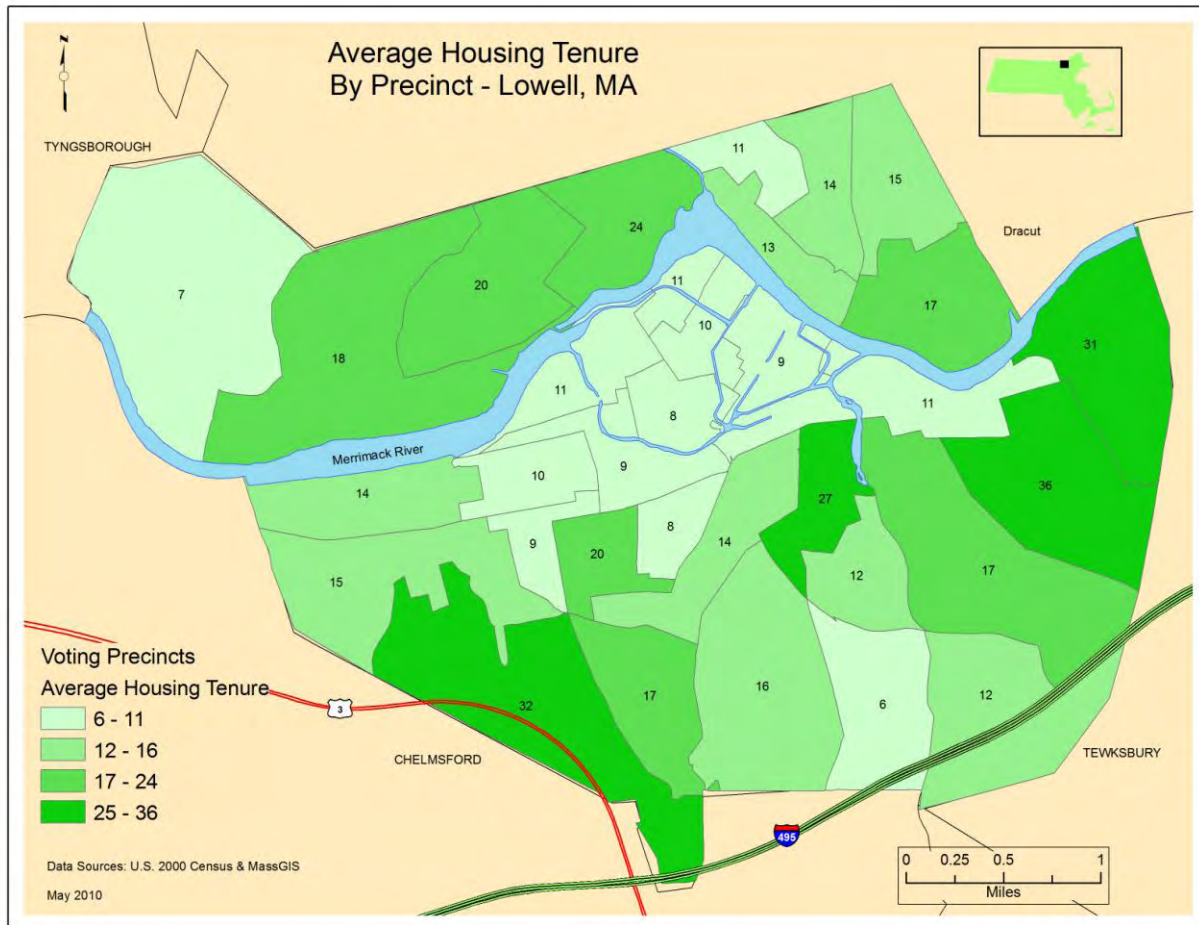


Exhibit 53

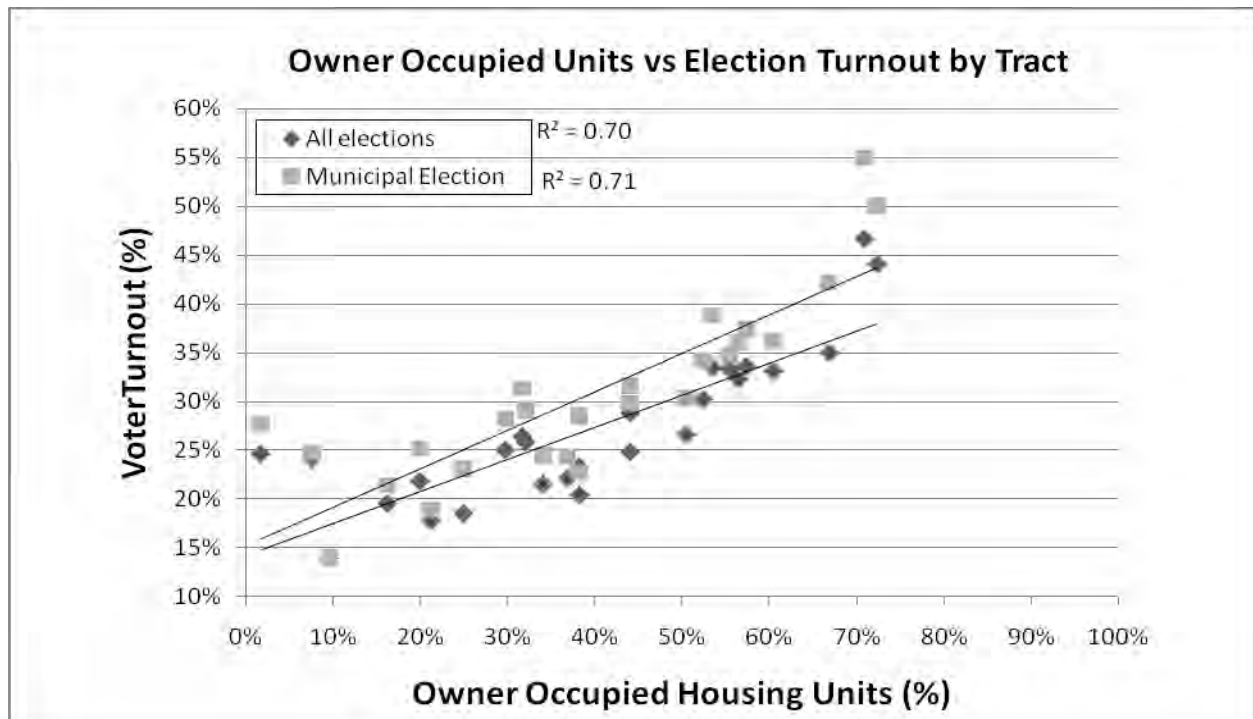
Housing Tenure, Owner Occupancy and Voter Turnout – Charts

Exhibit 54

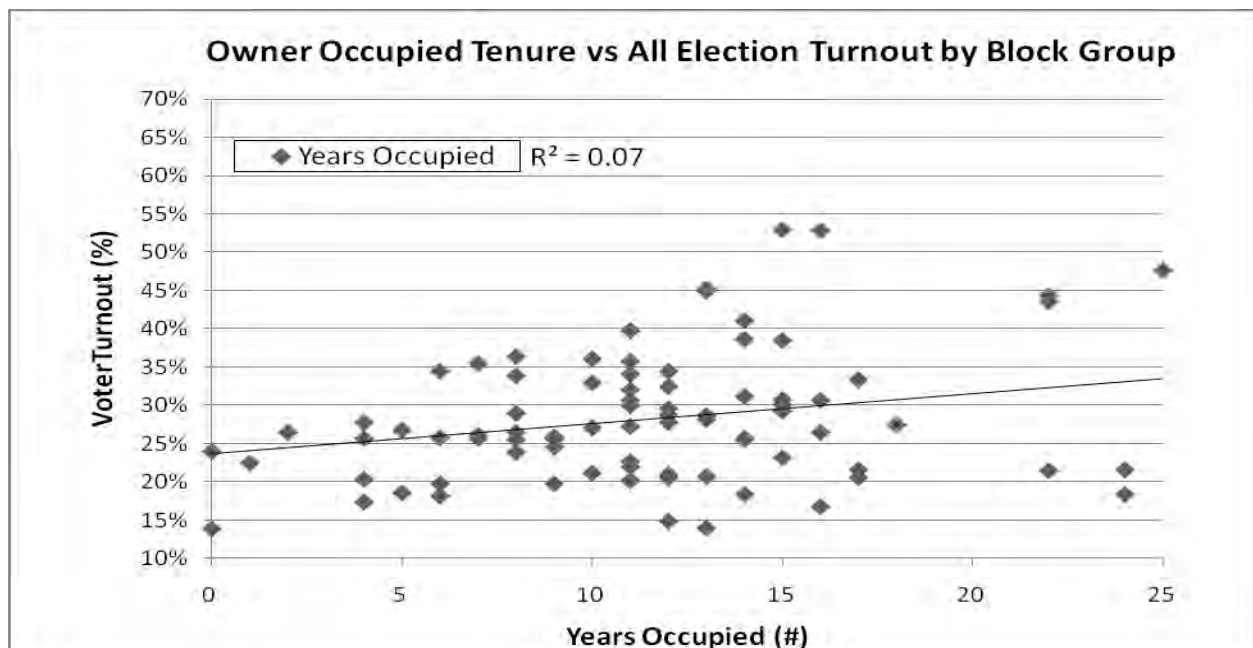


Exhibit 55

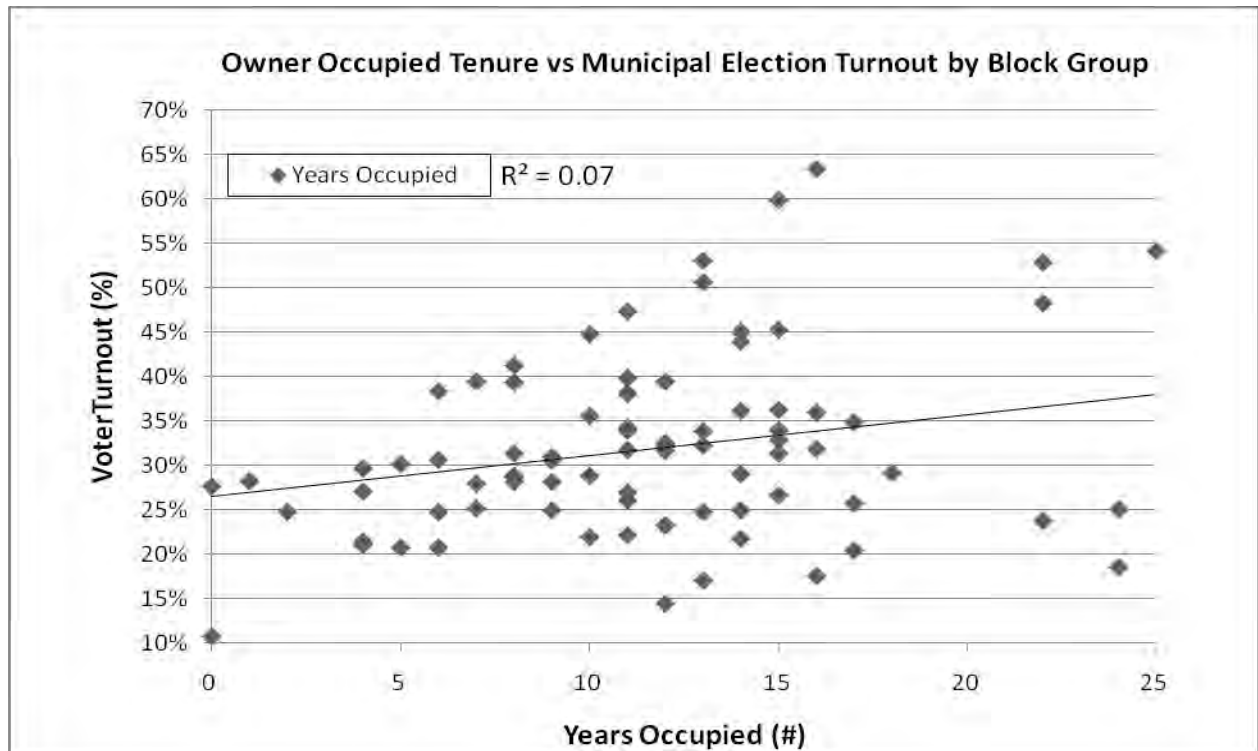


Exhibit 56

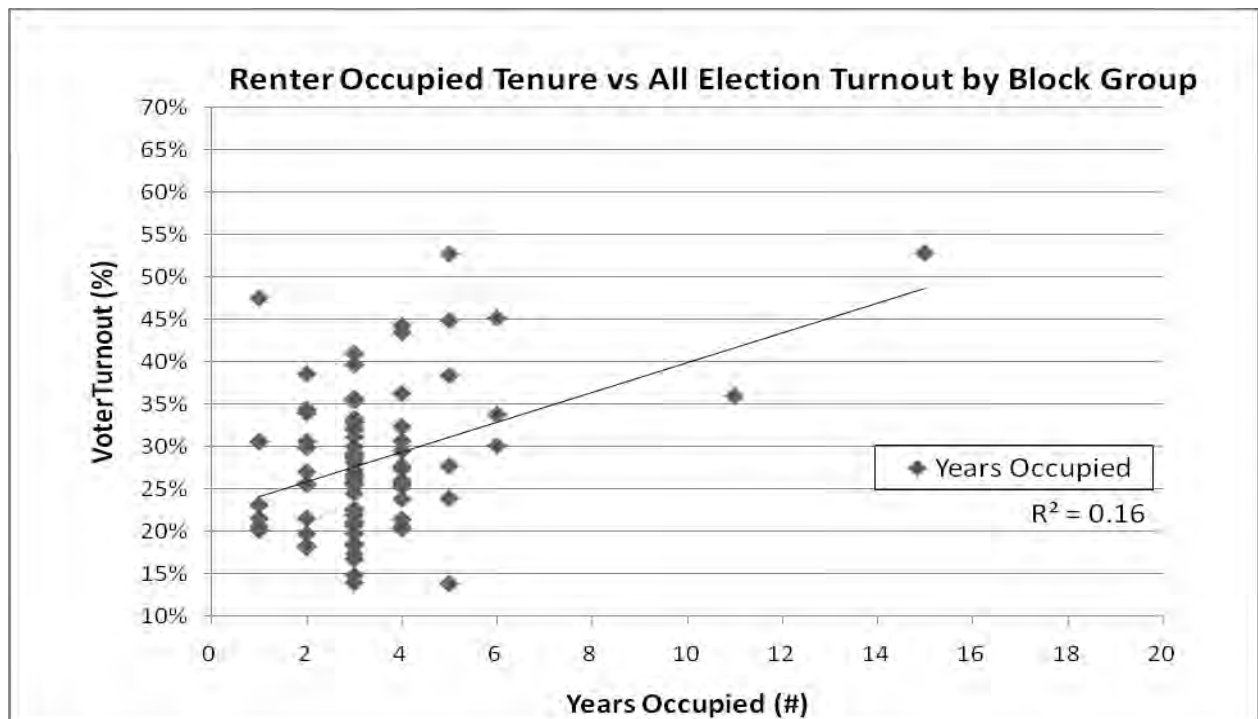


Exhibit 57

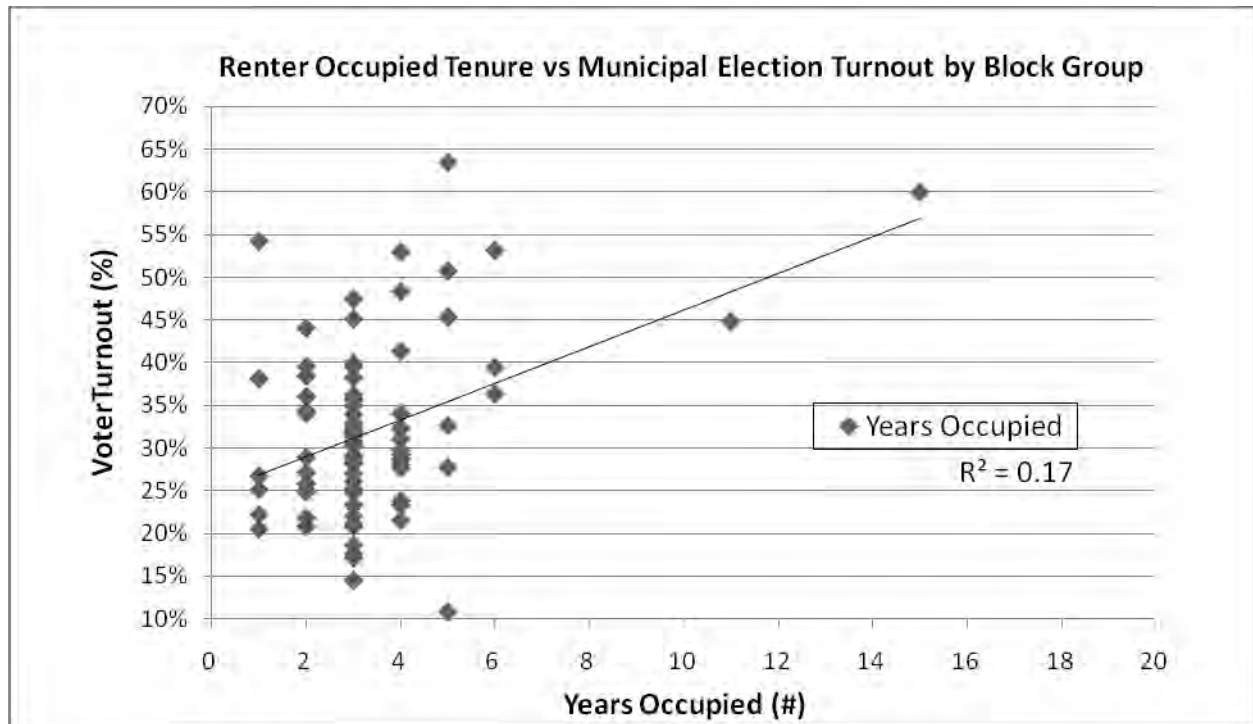


Exhibit 58

| Tenure | Average Voter Turnout | R ² |
|----------------|-----------------------|----------------|
| 1 to 3 Years | 23% | 0.01 |
| 3 to 6 Years | 27% | 0.58 |
| 6 to 9 Years | 25% | 0.19 |
| 9 to 12 Years | 23% | 0.18 |
| 12 to 15 Years | 27% | 0.26 |
| 15 to 18 Years | 39% | 0.34 |

Exhibit 59

Median Gross Rent – Maps

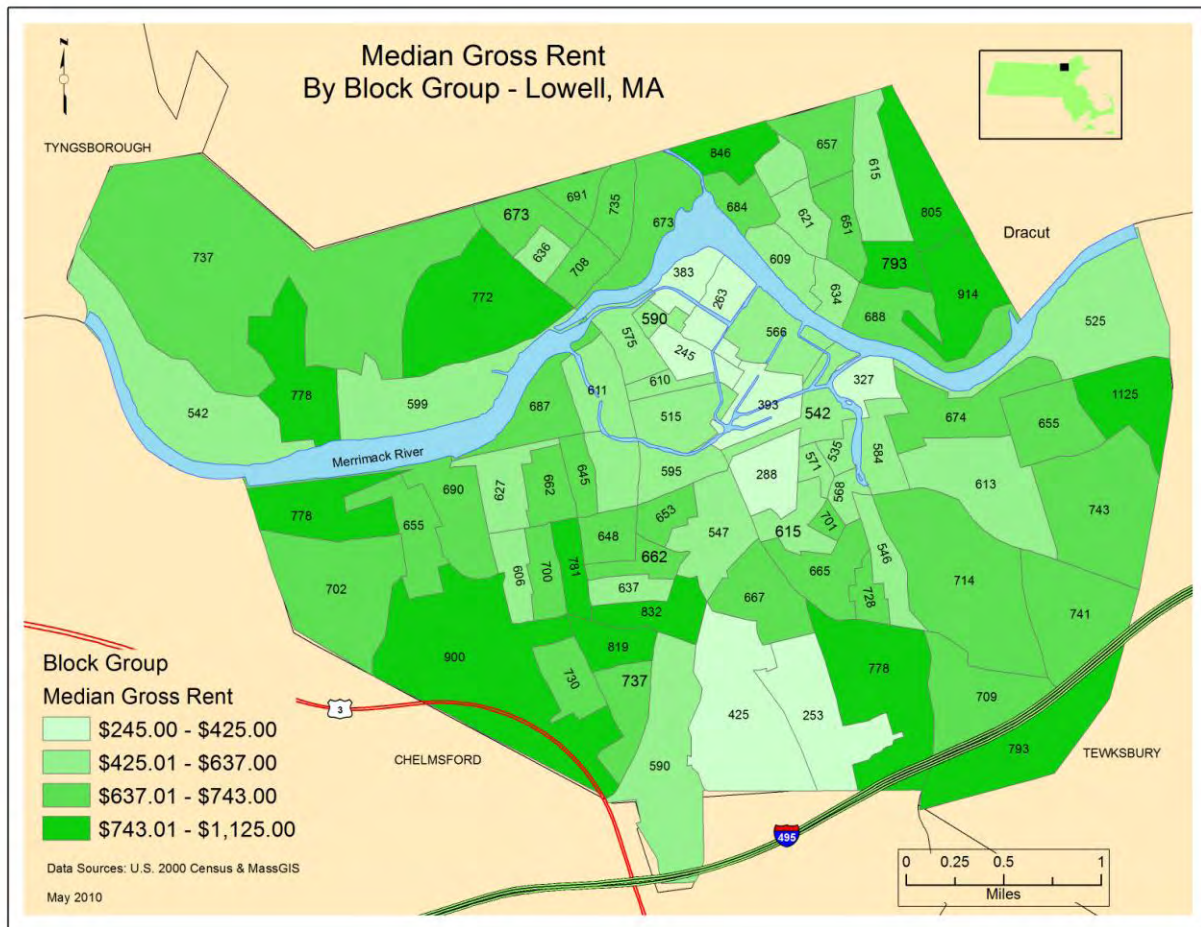


Exhibit 60

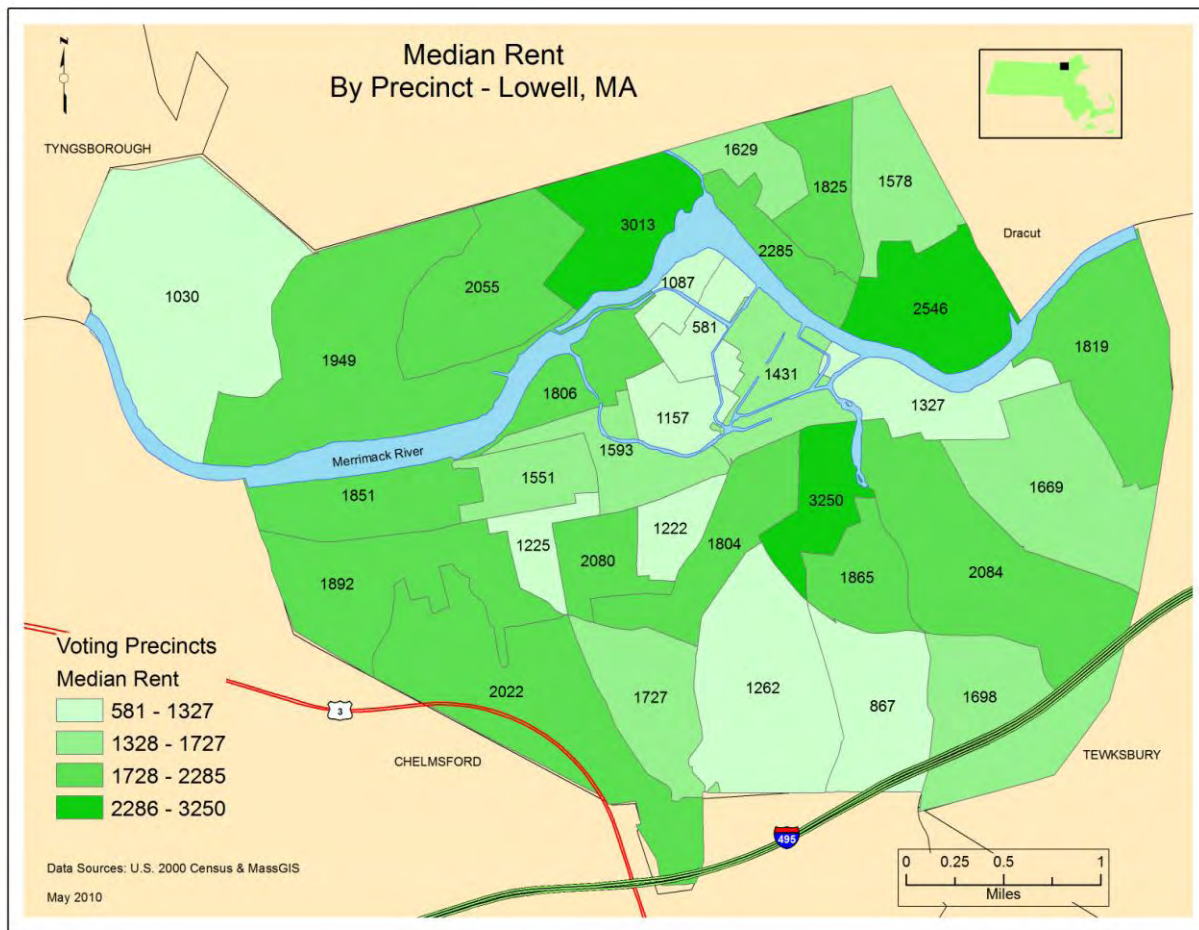


Exhibit 61

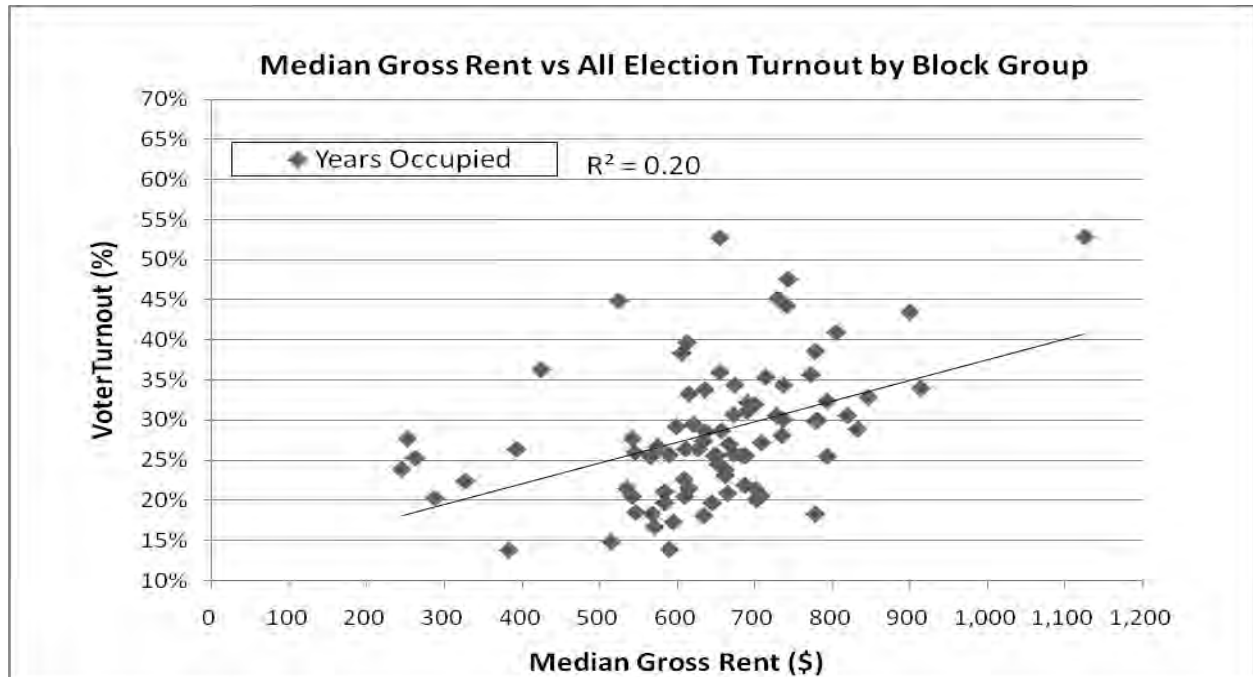
Median Gross Rent and Voter Turnout – Charts

Exhibit 62

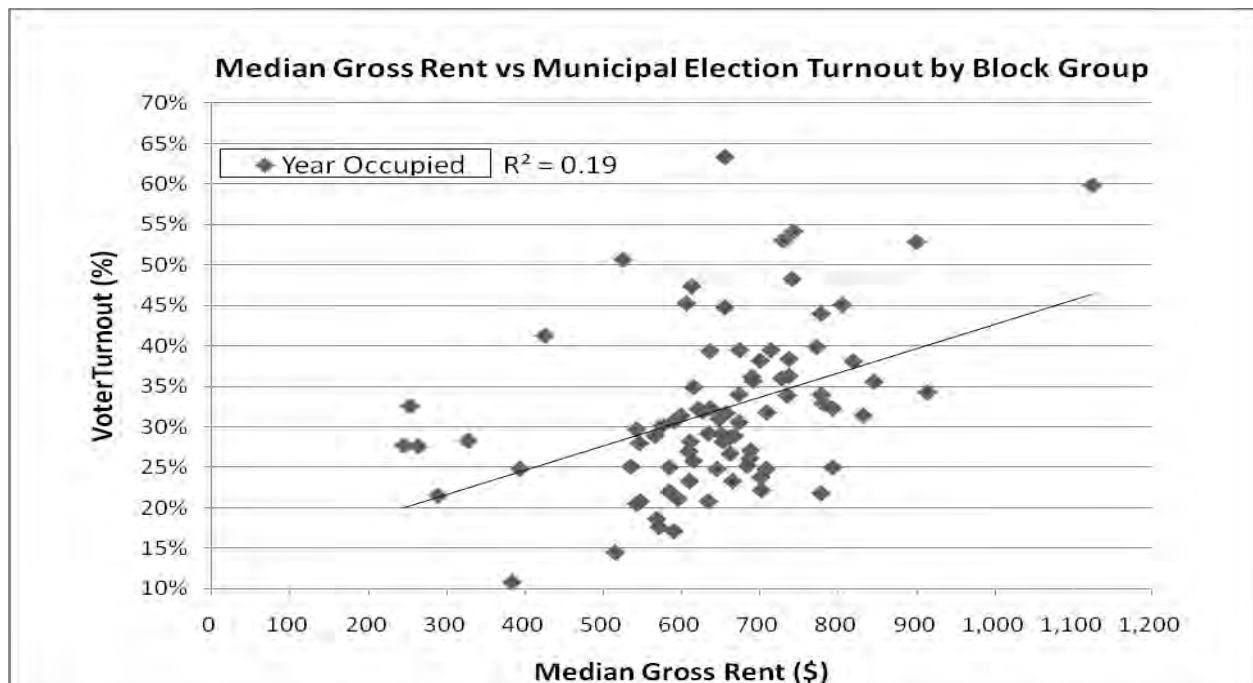


Exhibit 63

| Average Monthly Rent by Block ID Compared Voter Turnout | |
|--|----------------------|
| Rent | Voter Turnout |
| 200 - 400 | 22% |
| 400 - 600 | 26% |
| 600 - 800 | 34% |
| 800 - 1000 | 40% |
| 1000 - 1200 | 60% |

[Exhibit 64](#)

Median Household Income - Maps

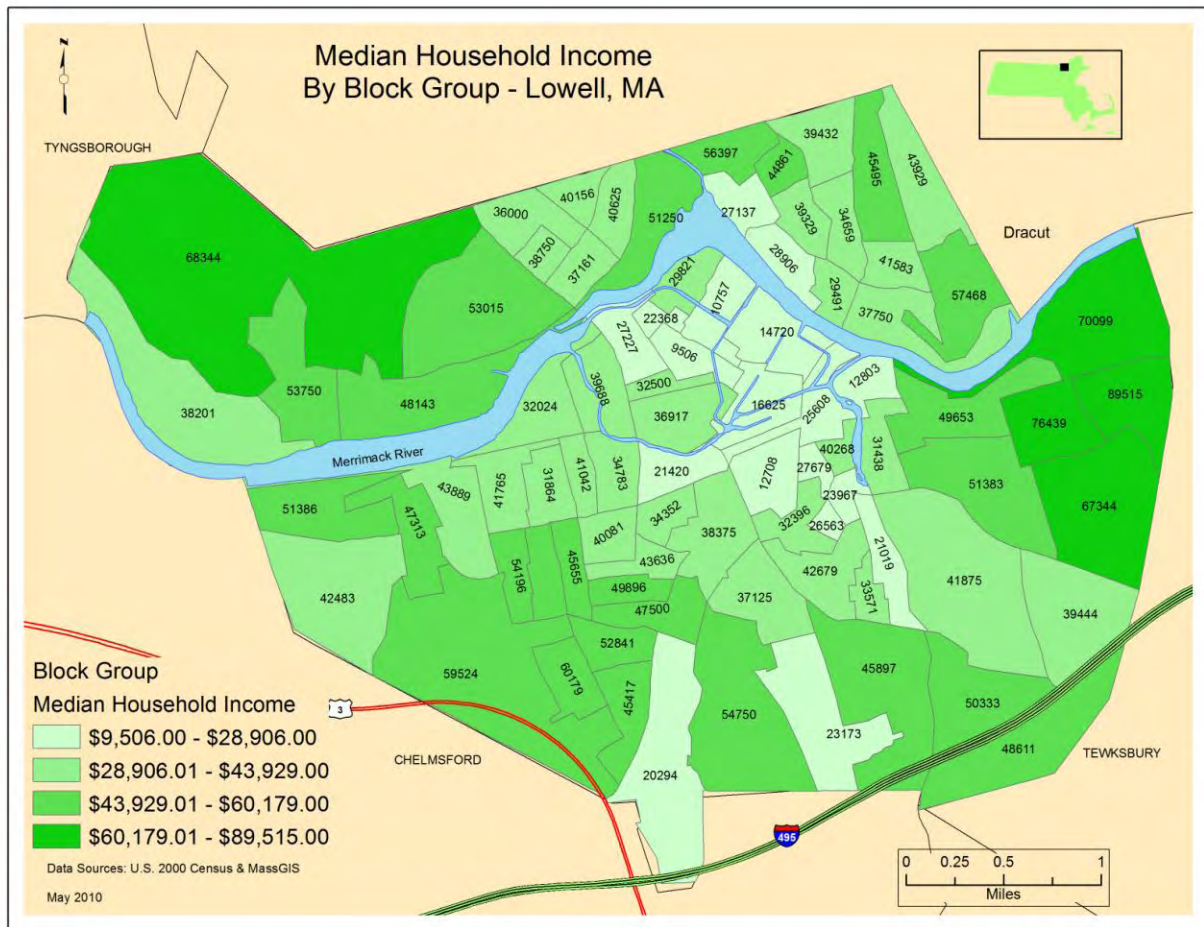


Exhibit 65

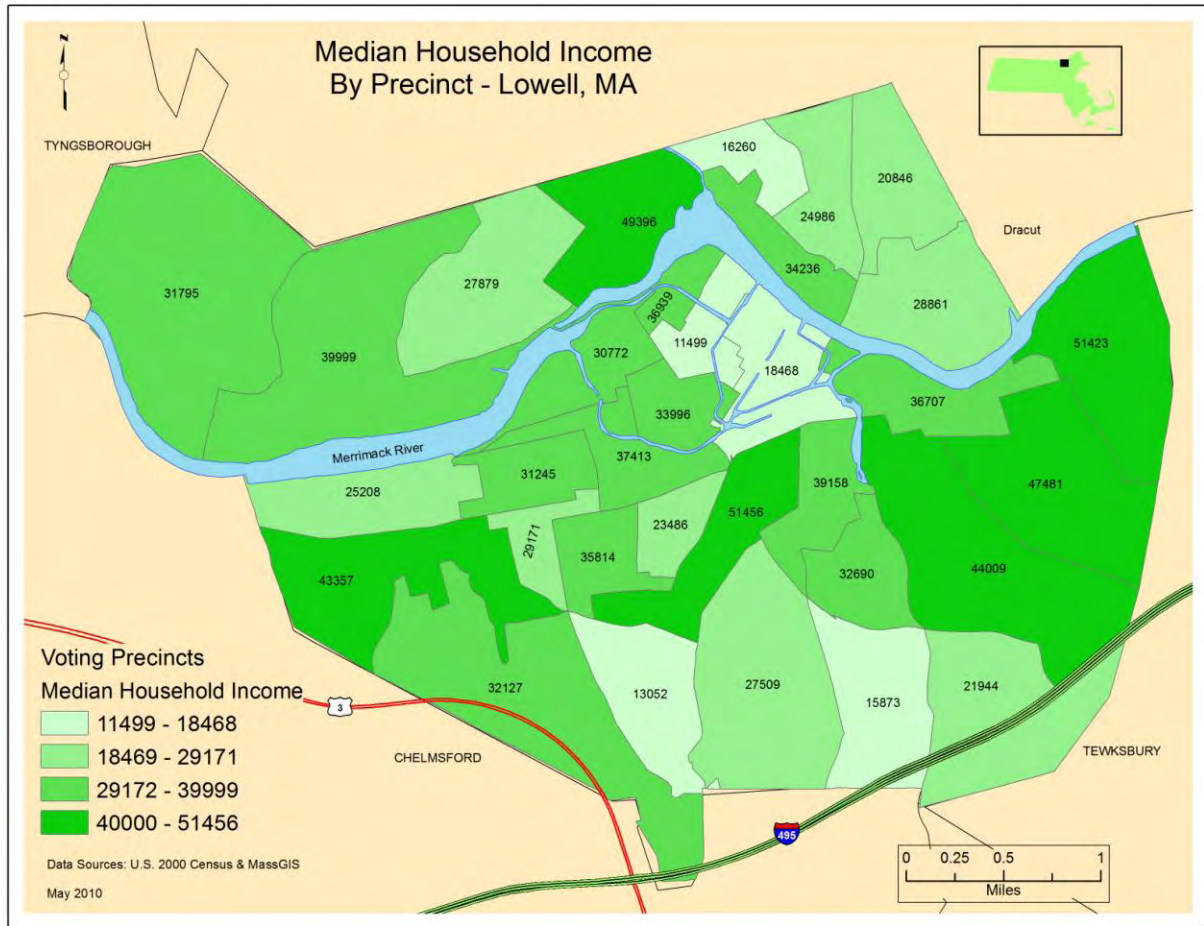


Exhibit 66

Median Household Income and Voter Turnout - Charts

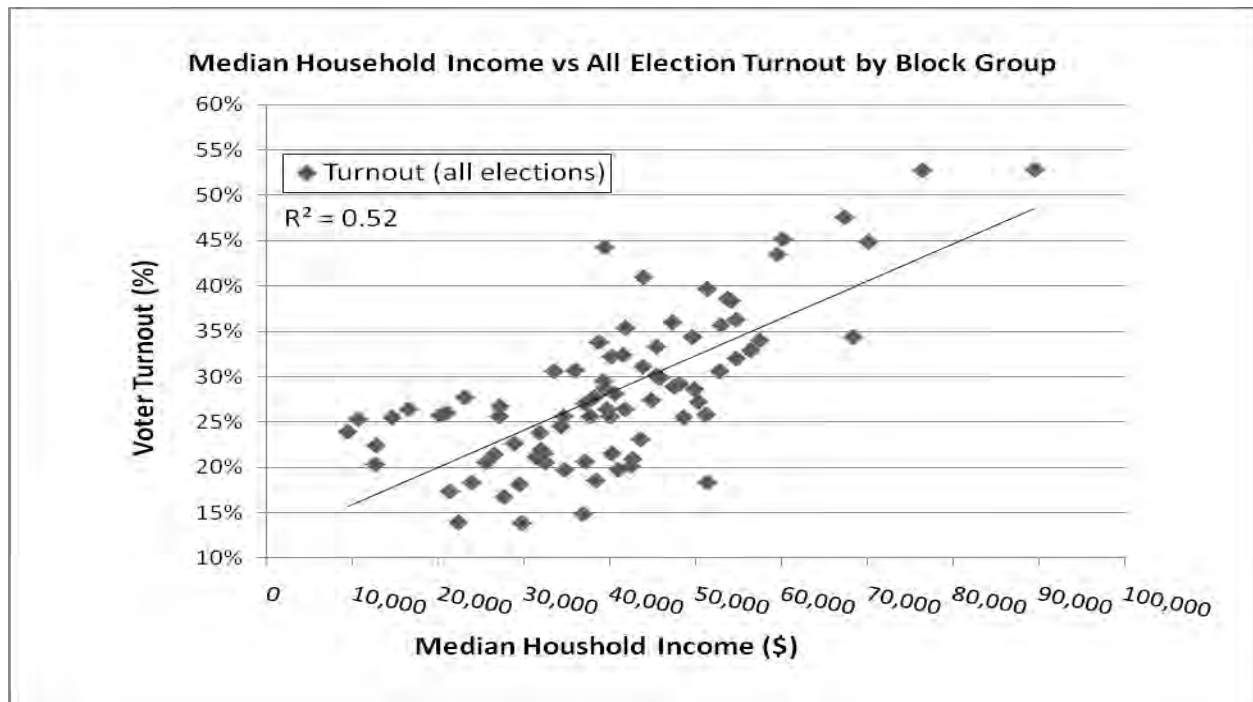


Exhibit 67

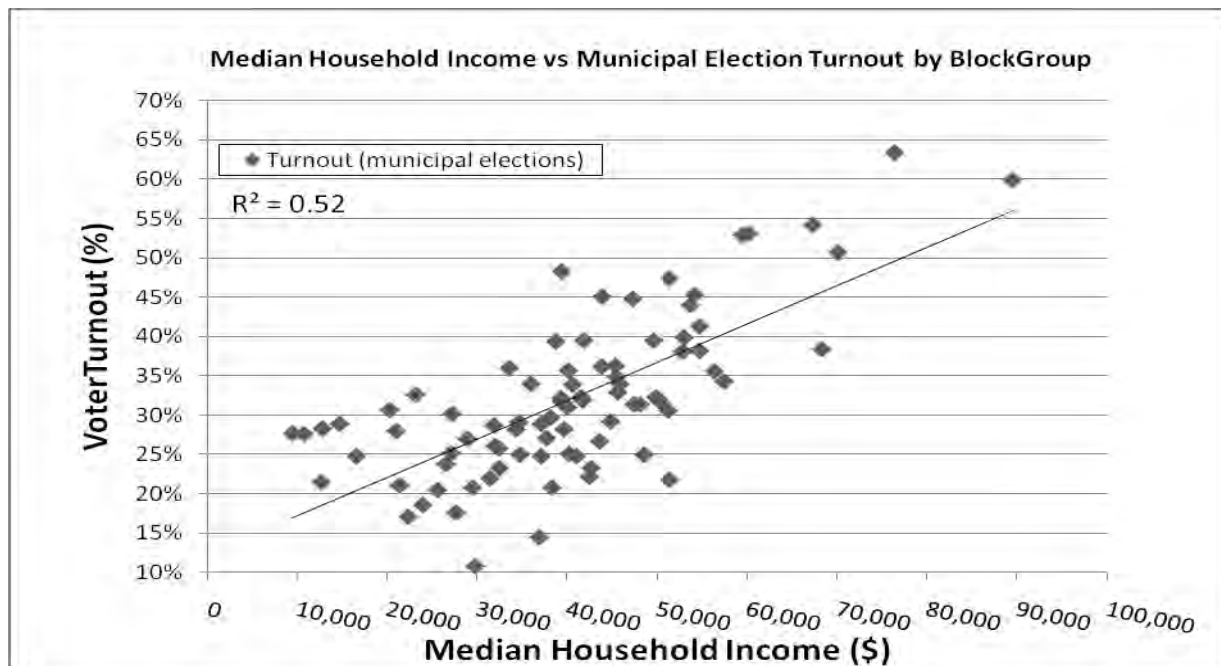


Exhibit 68

Percentage of Linguistically Isolated Households – Maps

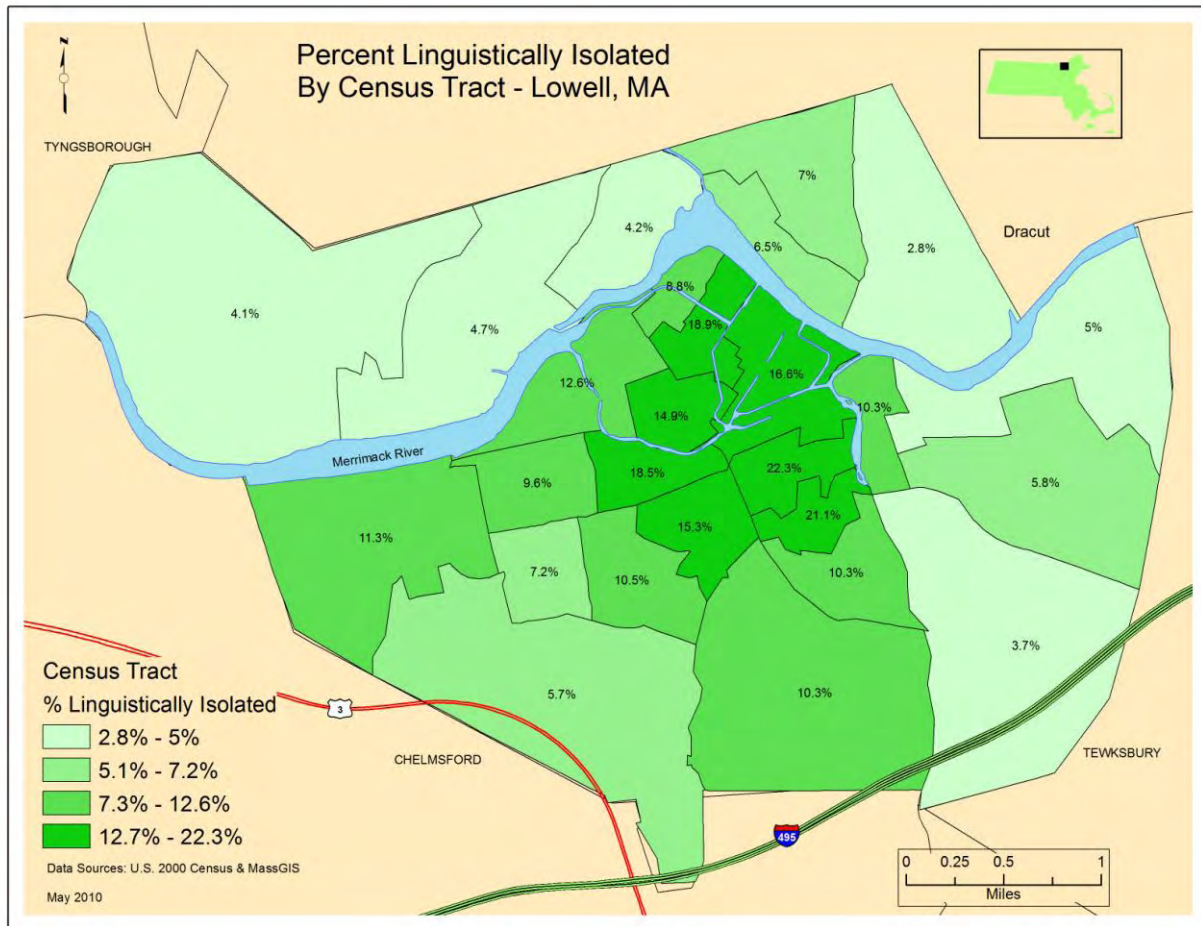


Exhibit 69

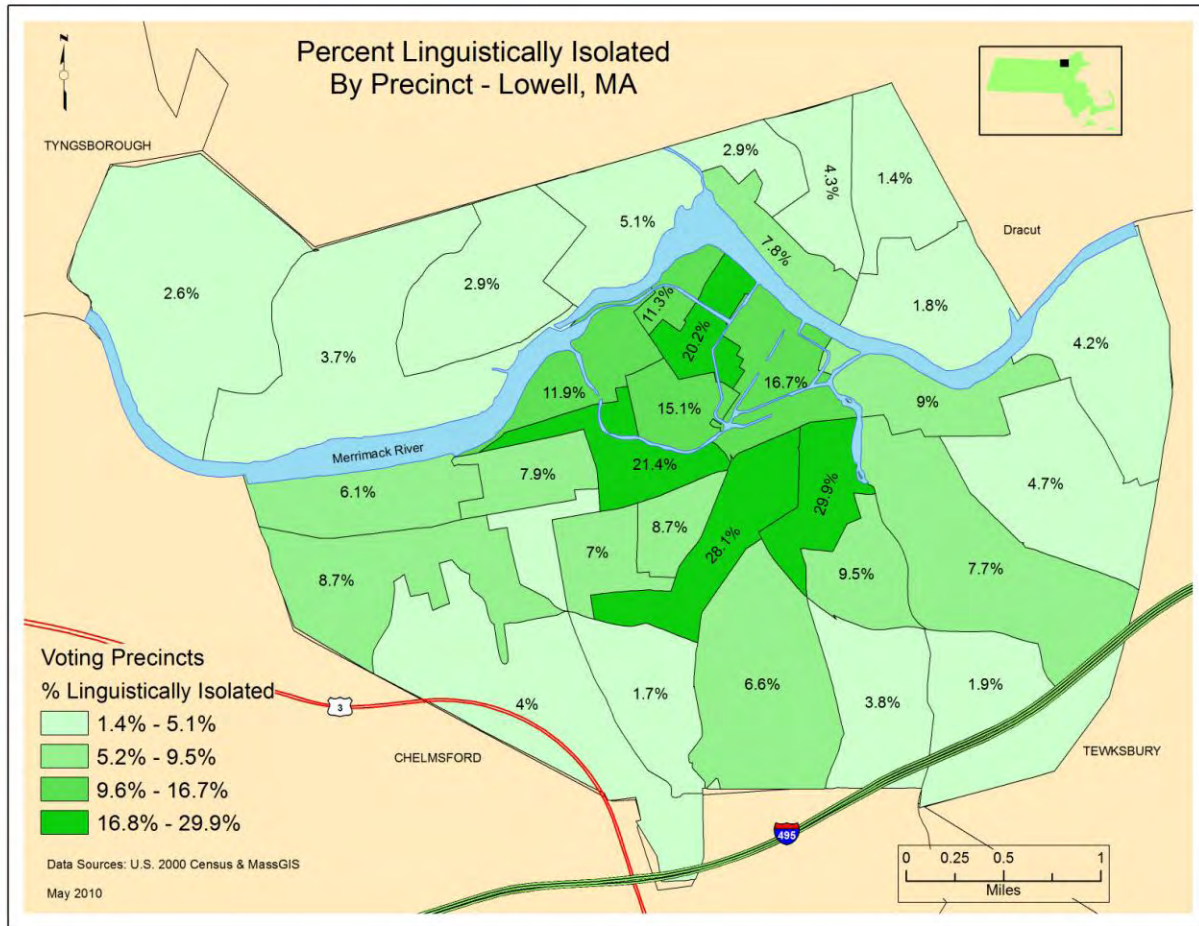


Exhibit 70

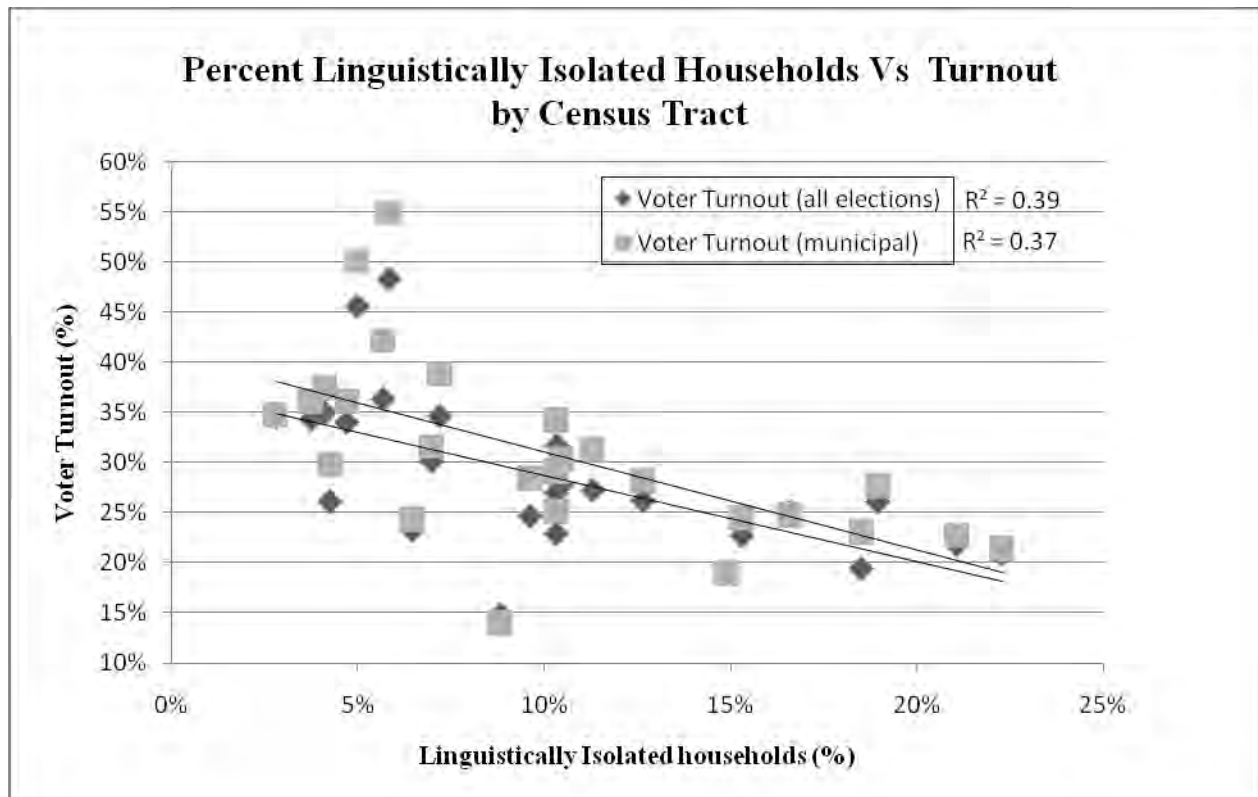
Percentage of Linguistically Isolated Households and Voter Turnout – Chart

Exhibit 71

Percentage of African Speaking Households – Maps

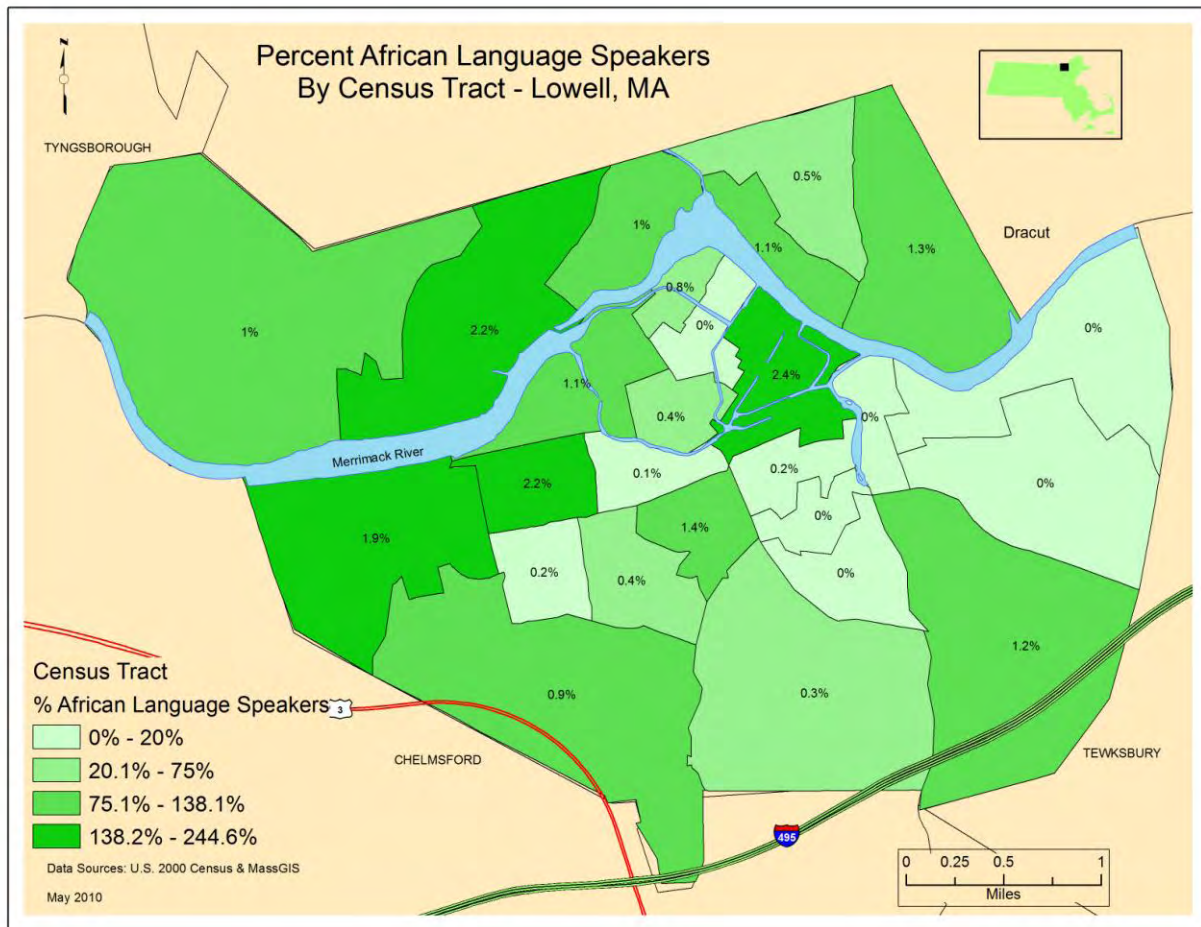
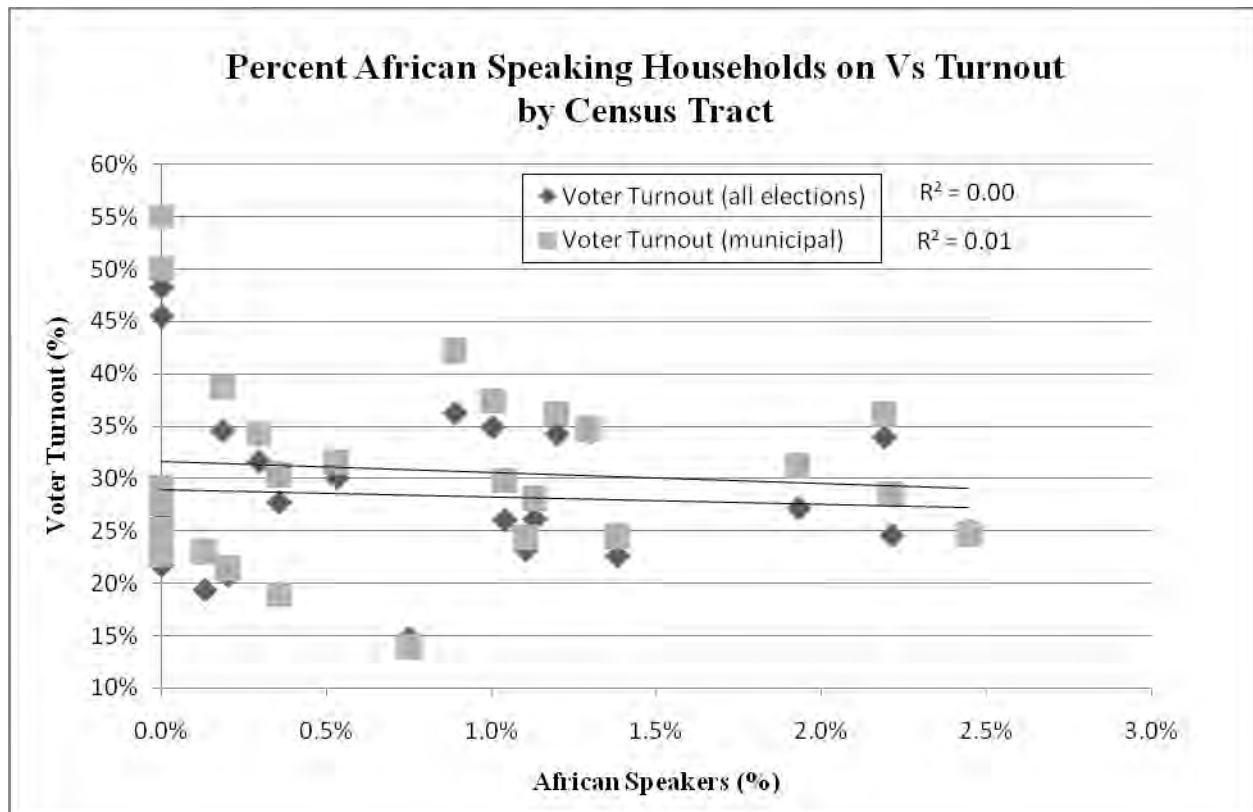


Exhibit 72

Percentage of African Speaking Households and Voter Turnout – Chart

Percentage of Khmer Speaking Households – Maps

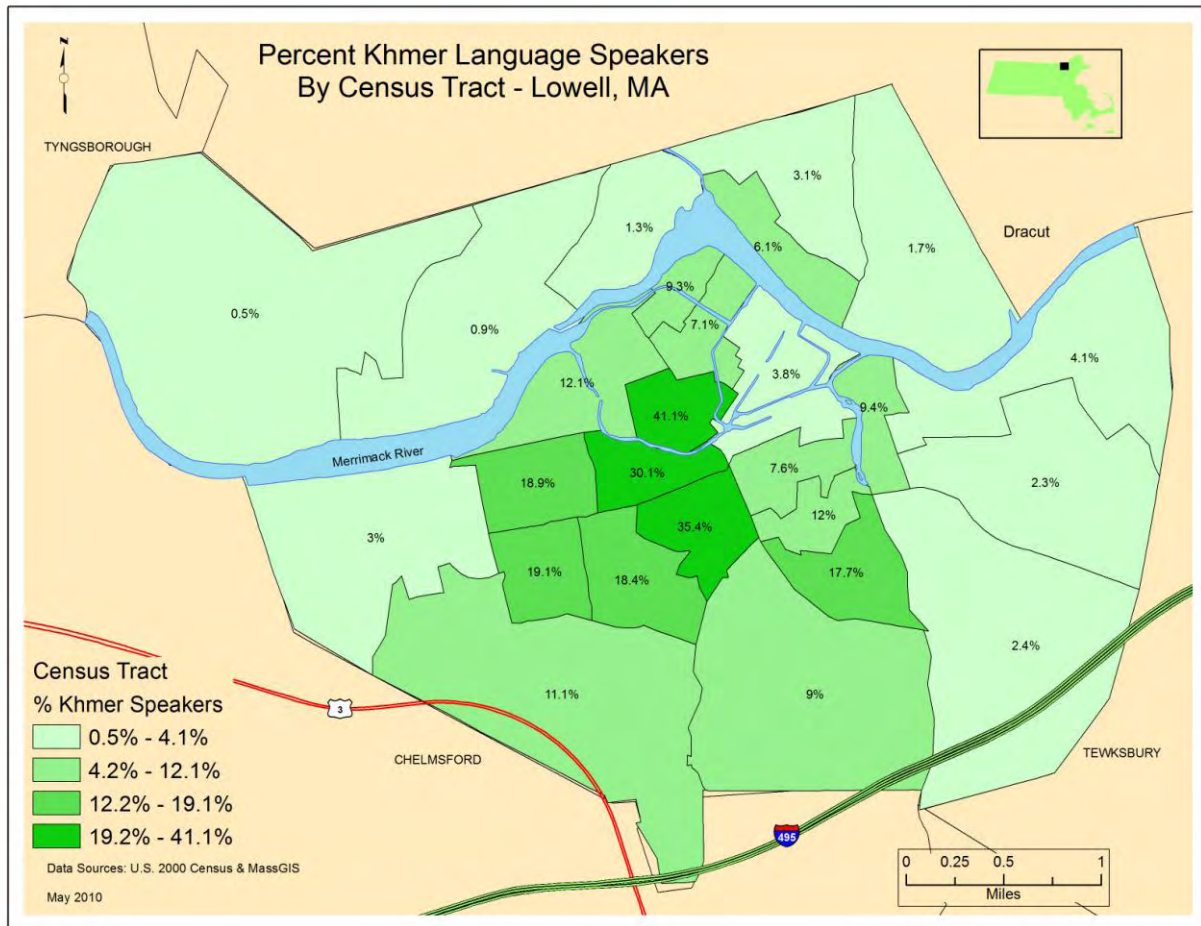


Exhibit 74

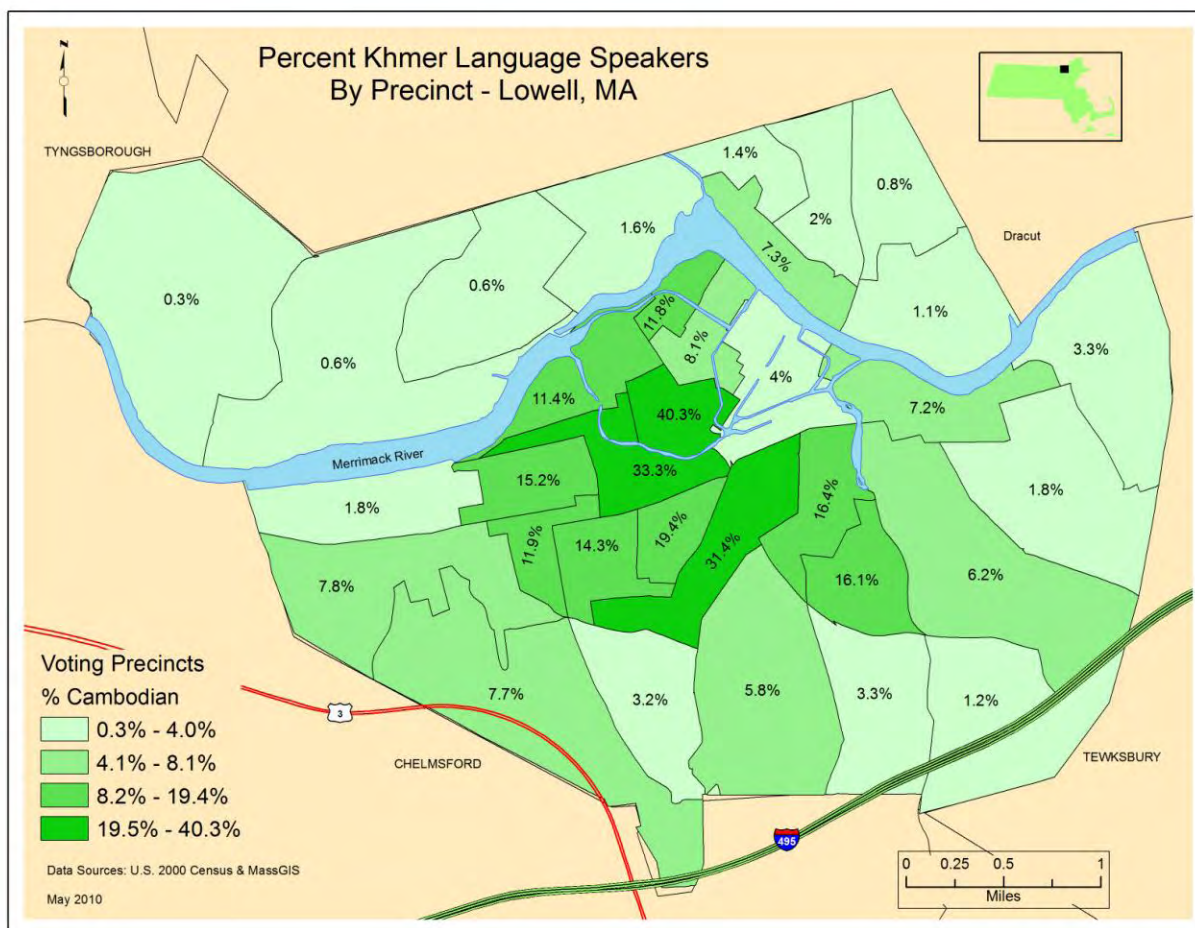


Exhibit 75

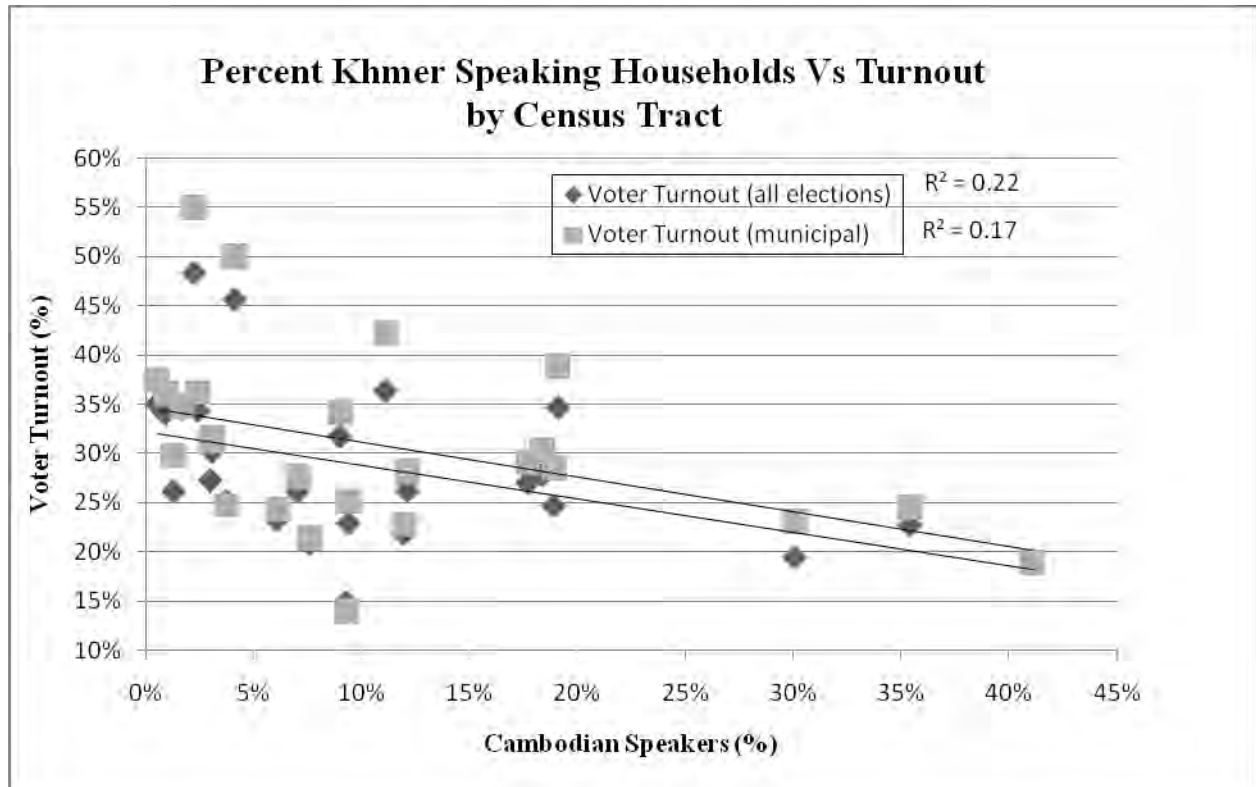
Percentage of Khmer Speaking Households and Voter Turnout – Chart

Exhibit 76

Percentage of Laotian Speaking Households – Maps

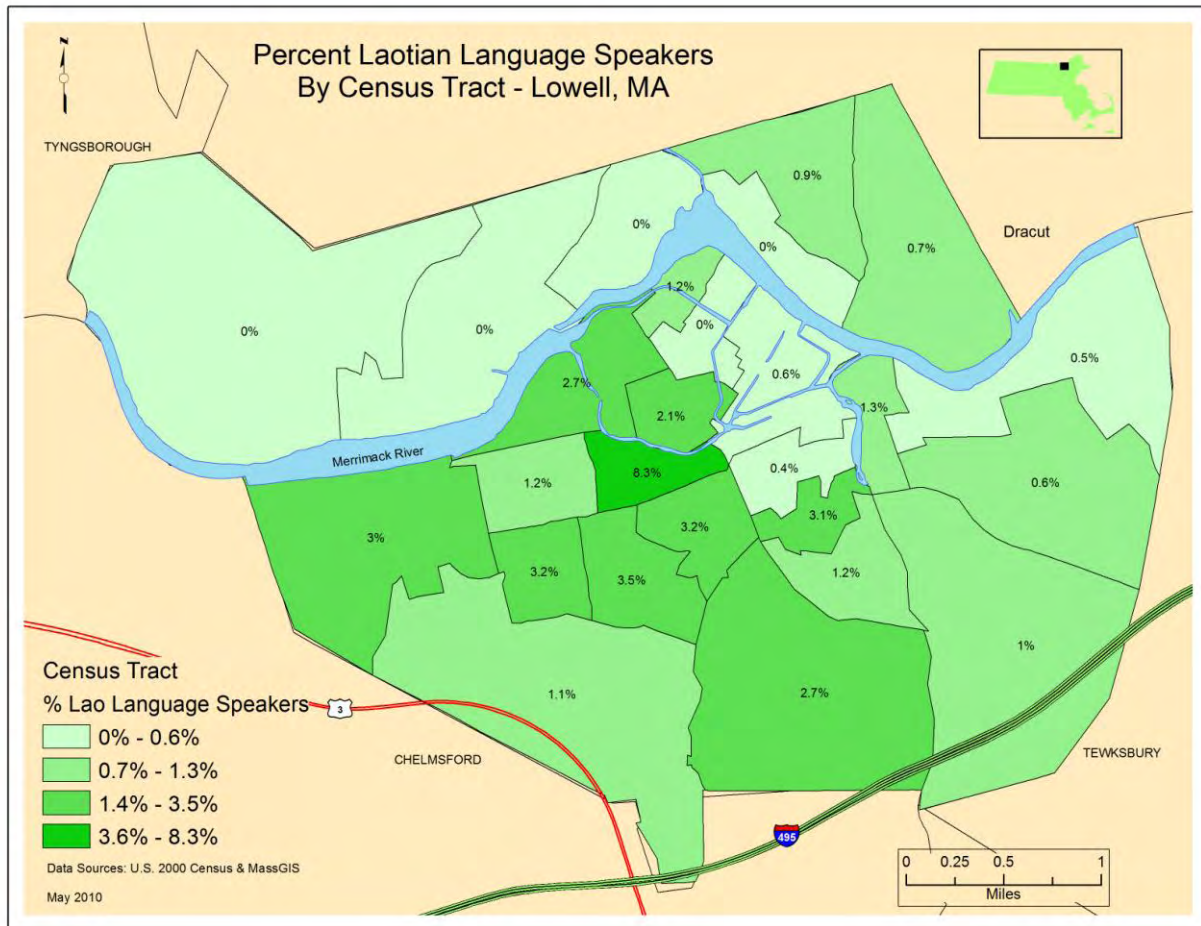


Exhibit 77

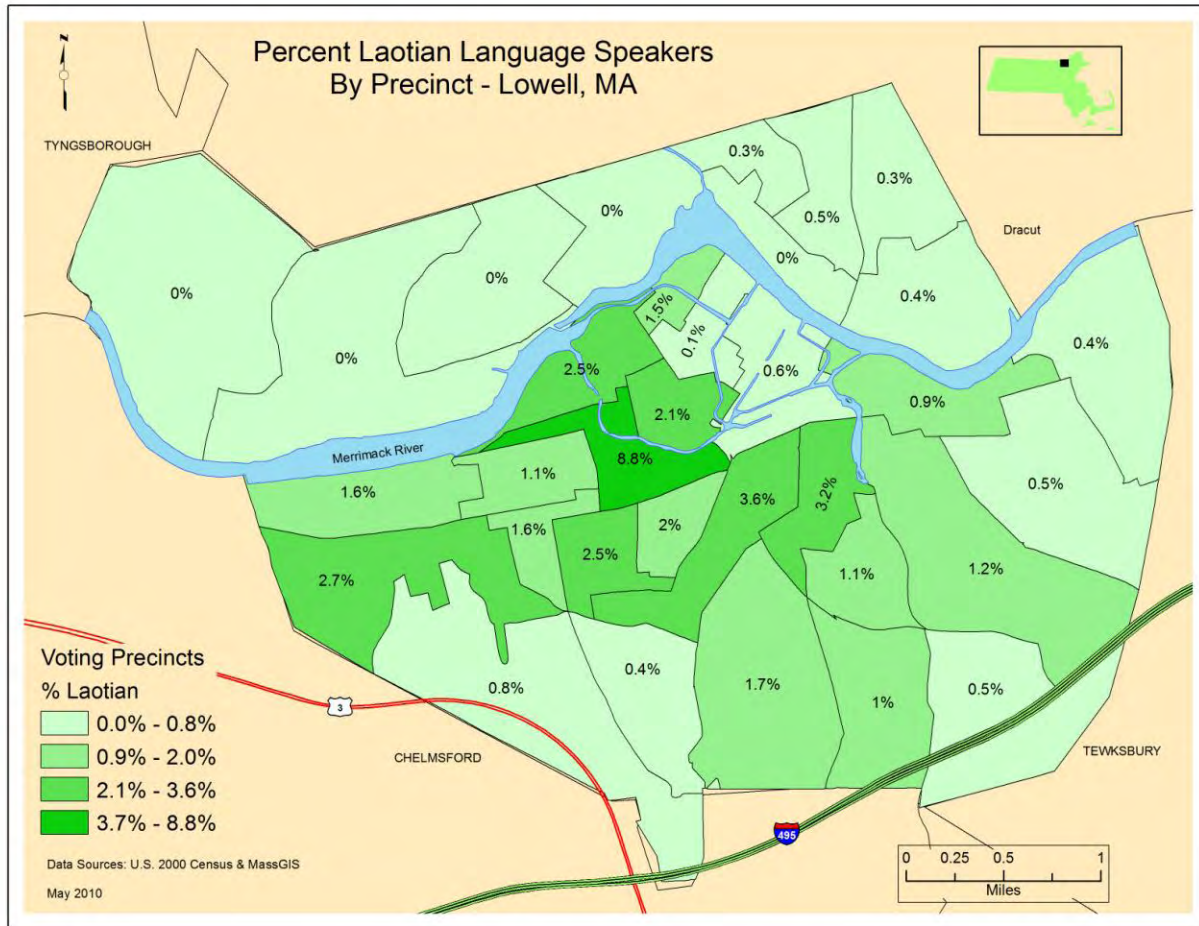


Exhibit 78

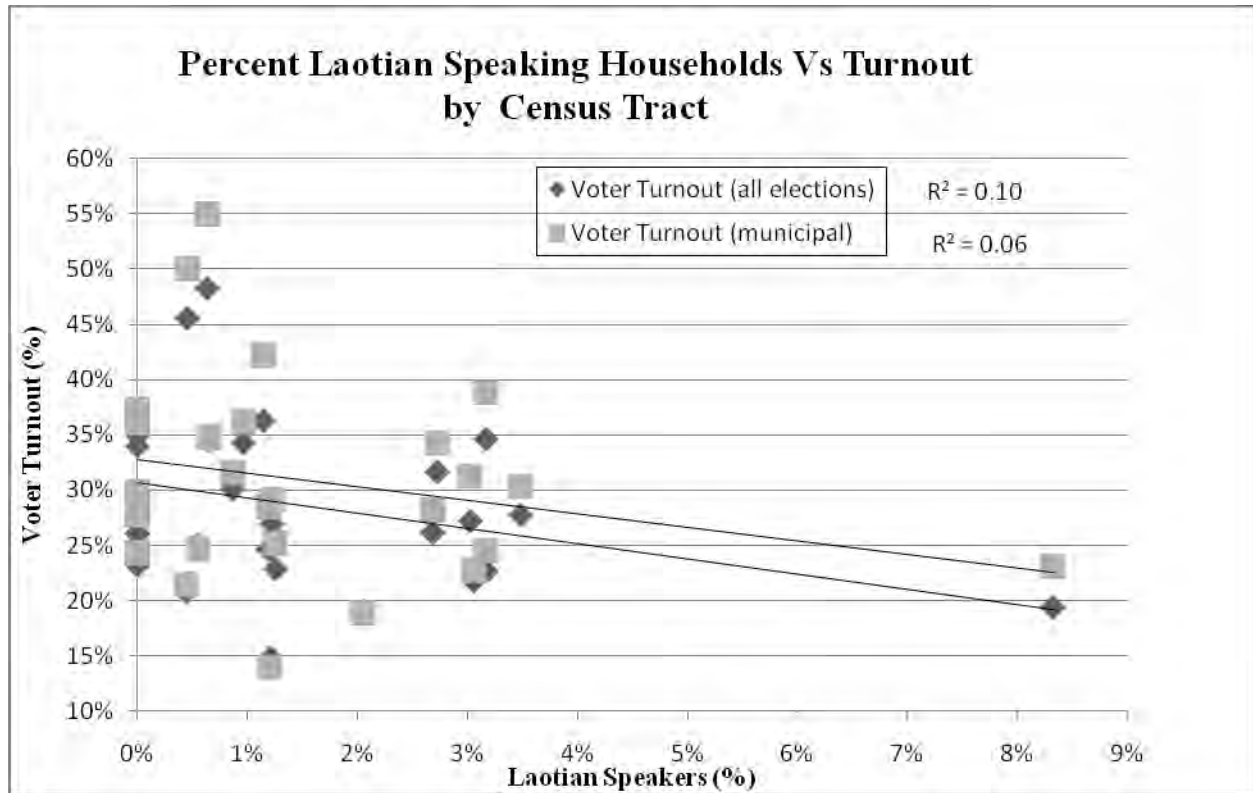
Percentage of Laotian Speaking Households and Voter Turnout – Chart

Exhibit 79

Percentage of Portuguese Speaking Households – Maps

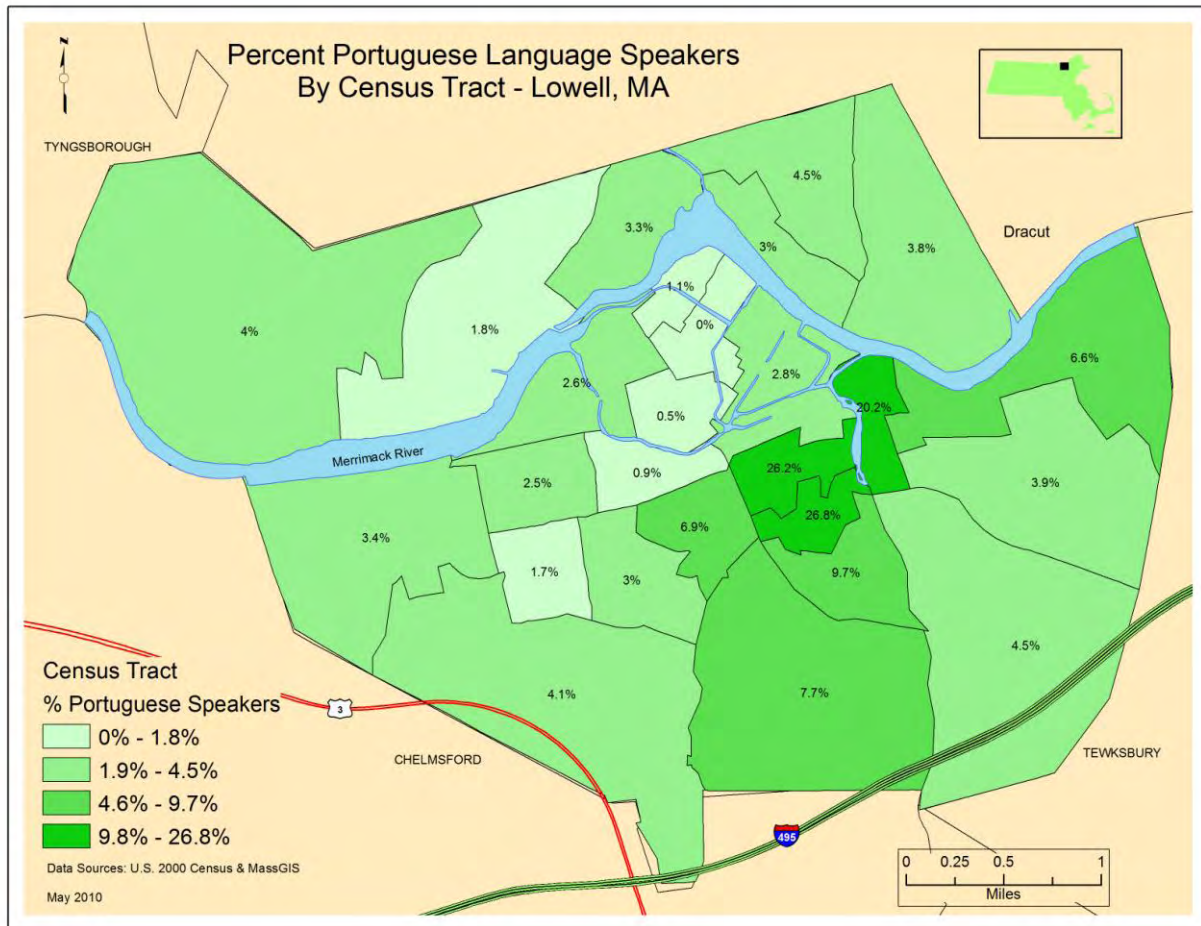


Exhibit 80

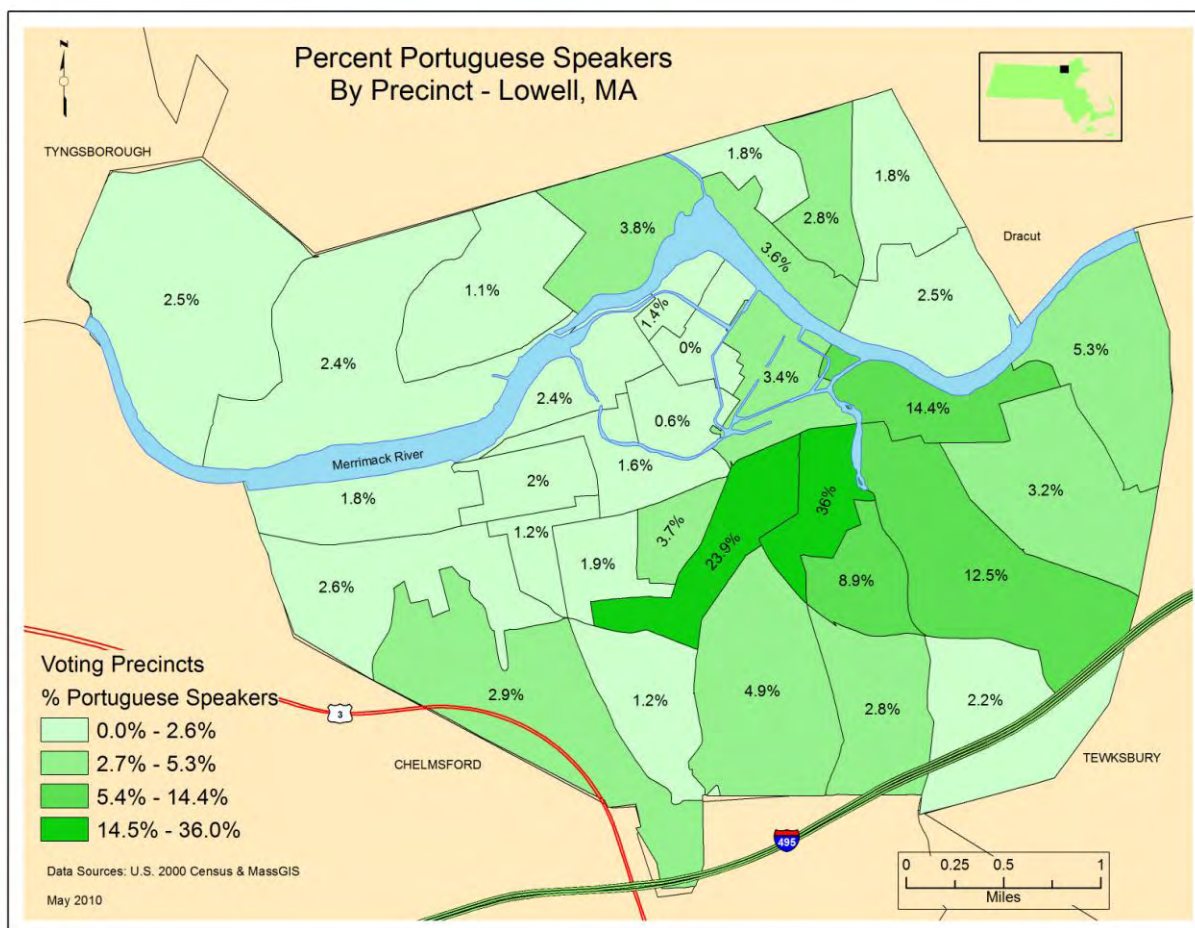


Exhibit 81

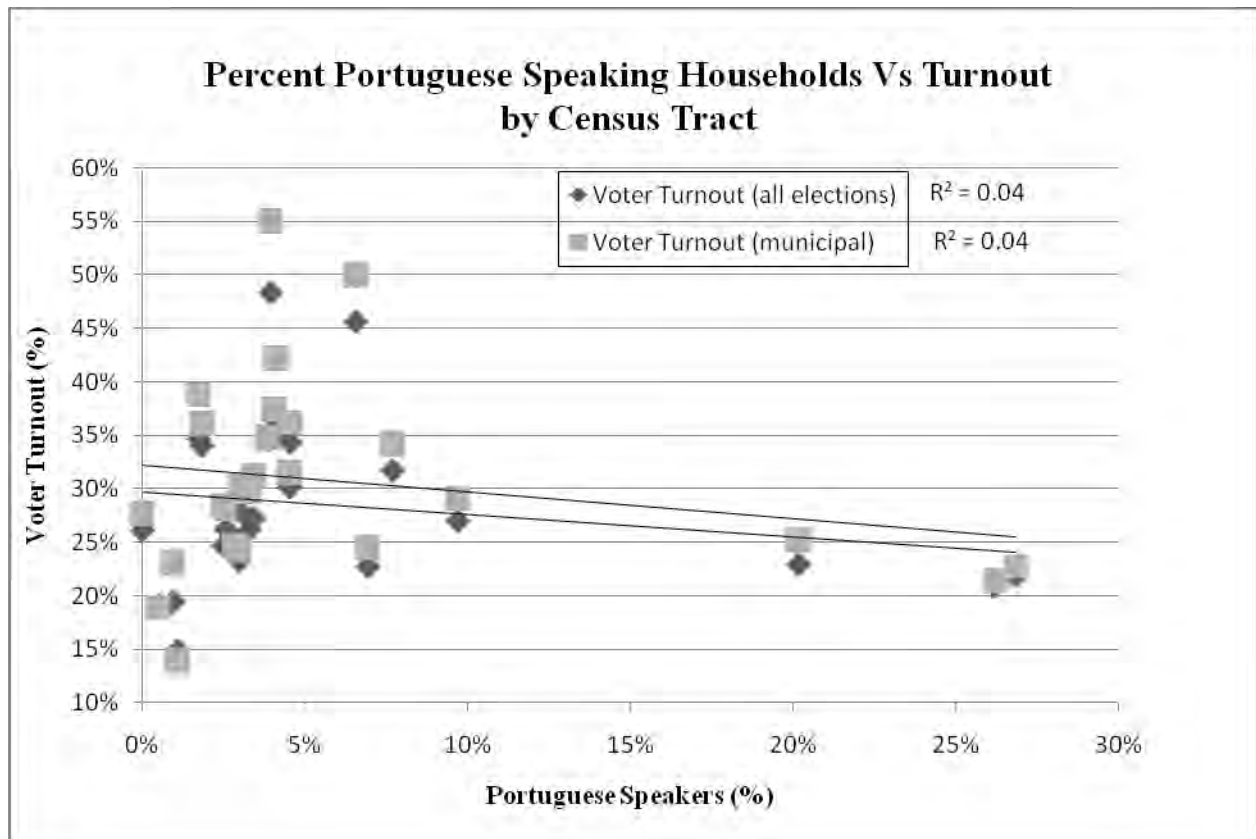
Percentage of Portuguese Speaking Households and Voter Turnout – Chart

Exhibit 82

Percentage of Vietnamese Speaking Households – Maps

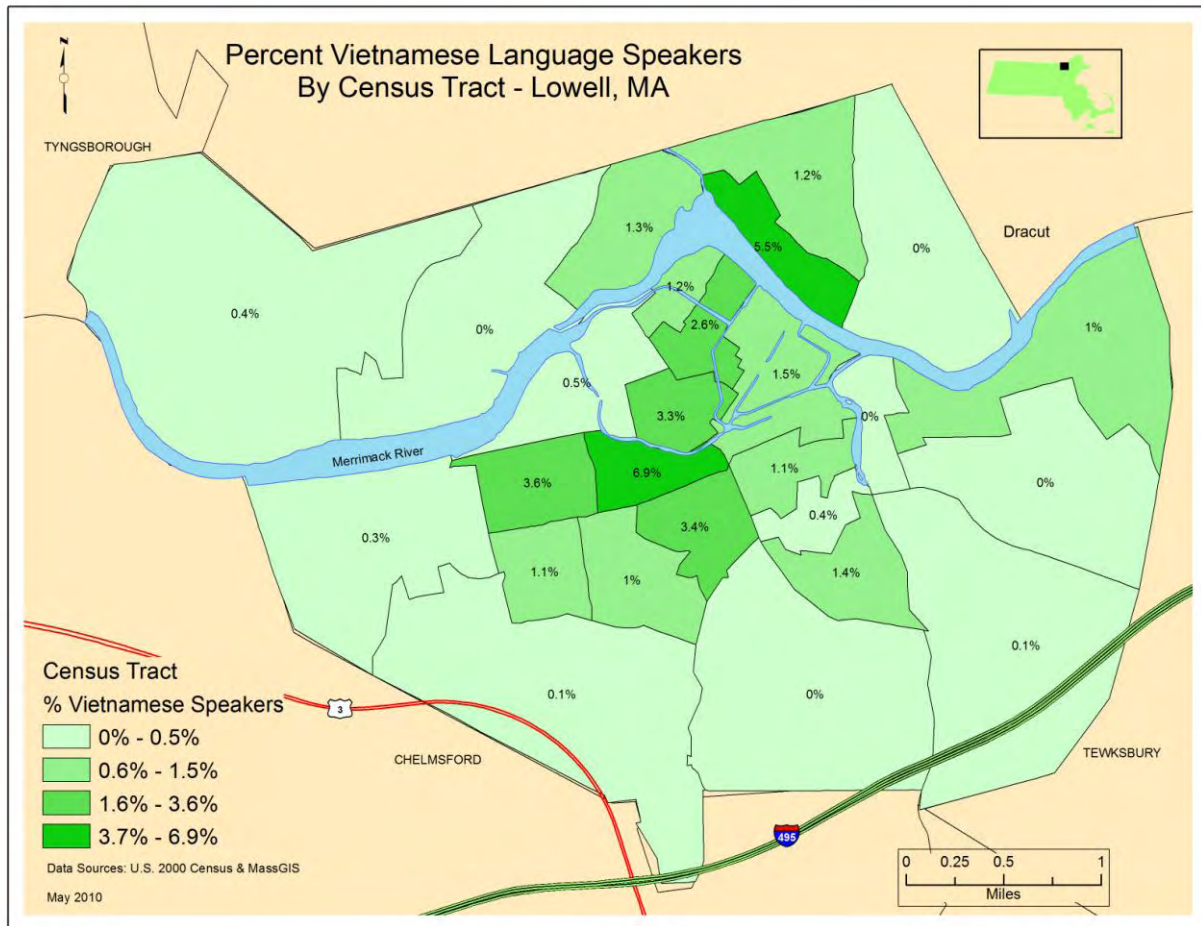


Exhibit 83

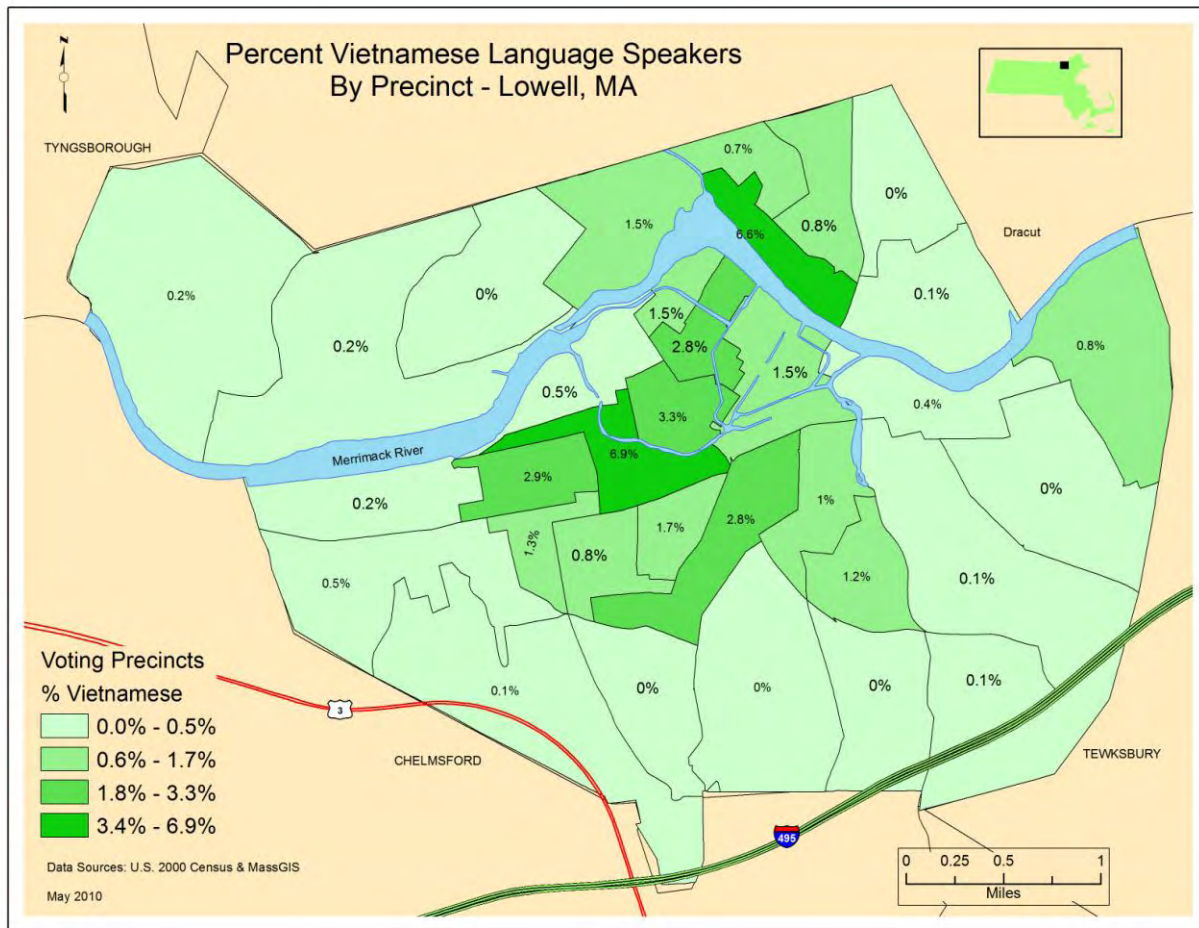


Exhibit 84

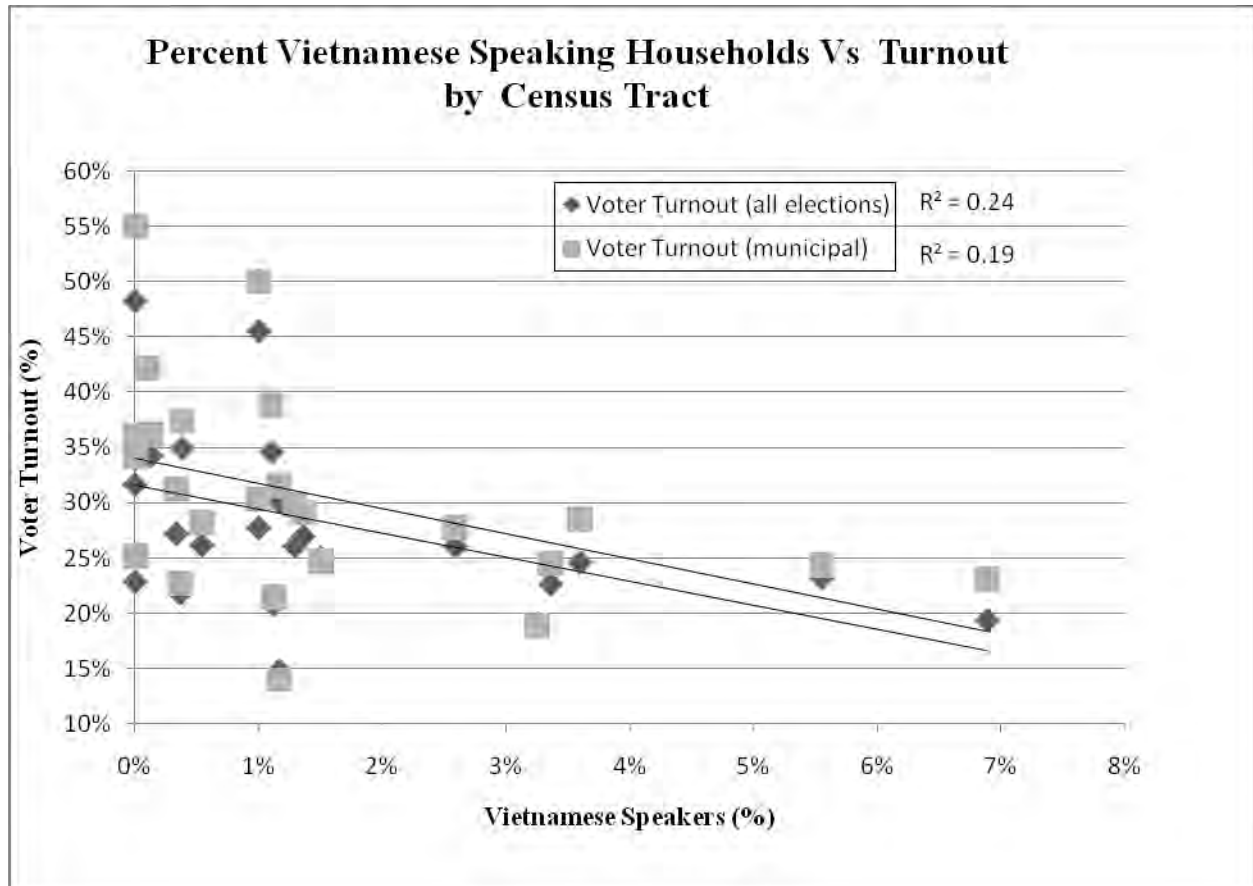
Percentage of Vietnamese Speaking Households and Voter Turnout – Chart

Exhibit 85

Percentage of Spanish Speaking Households - Maps

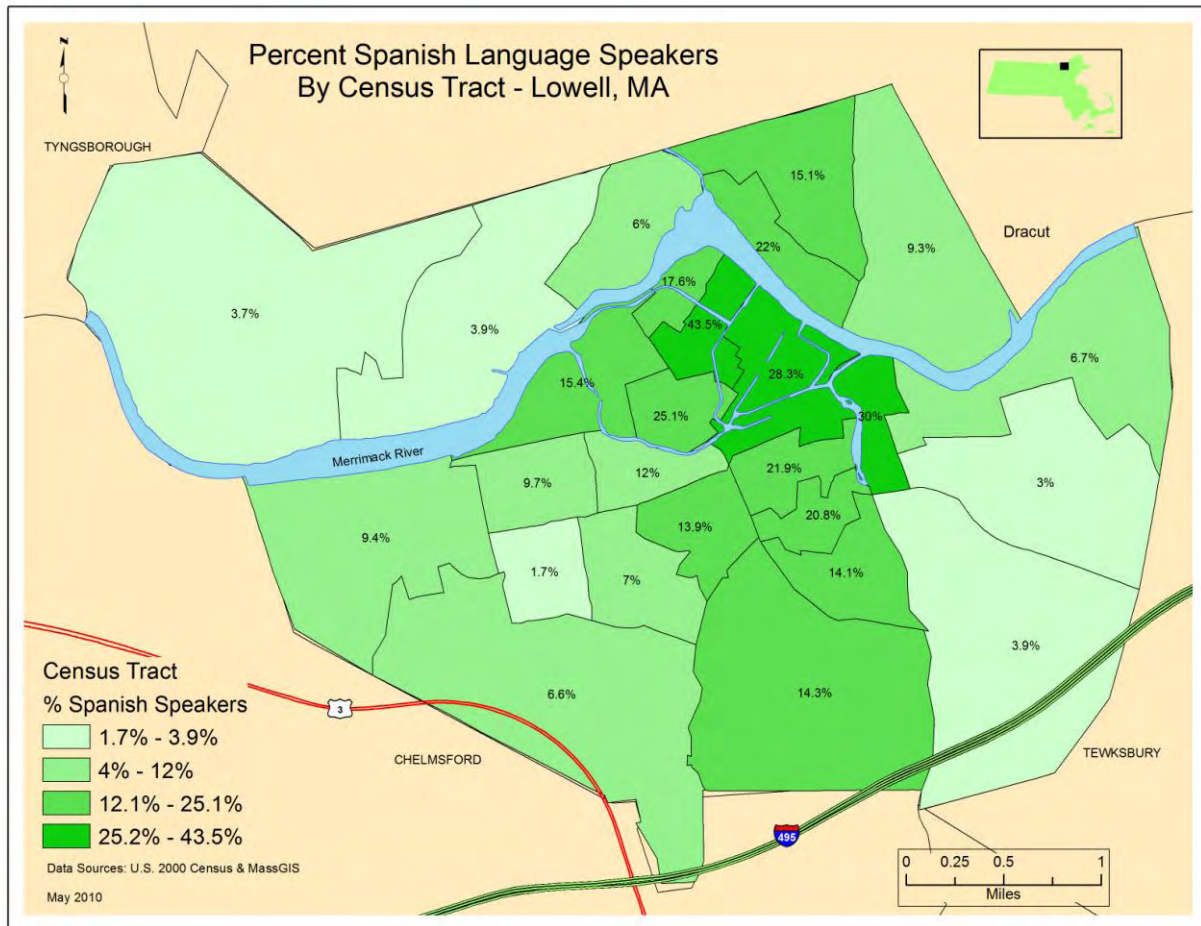


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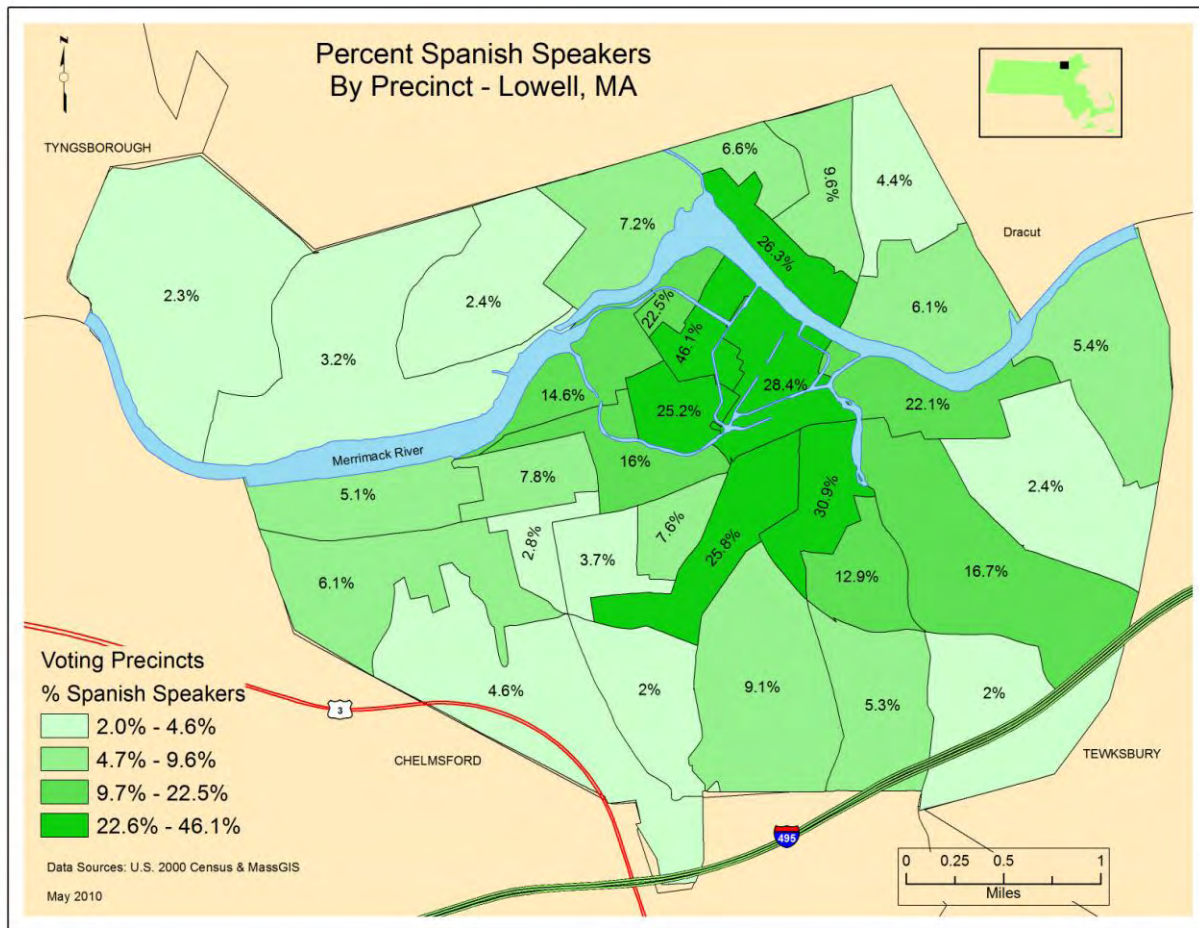


Exhibit 87

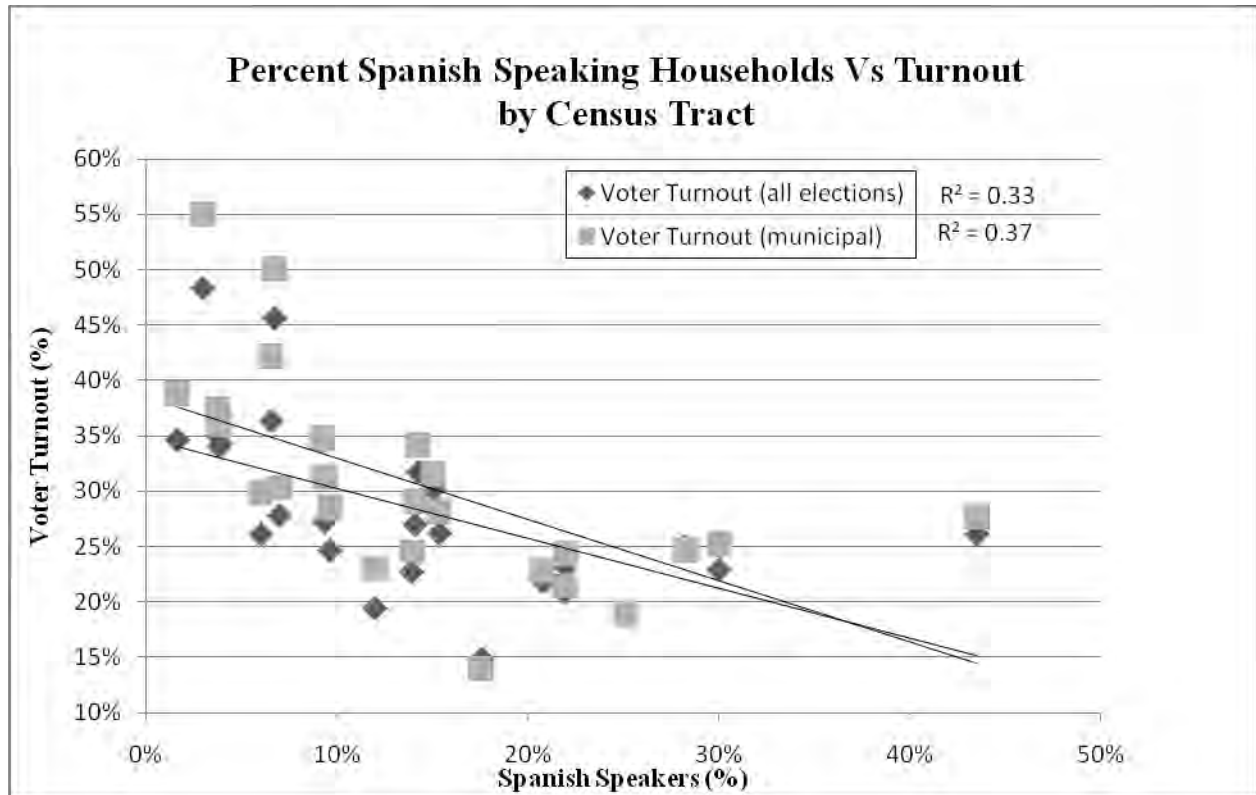
Percentage of Spanish Speaking Households and Voter Turnout – Chart

Exhibit 88

Percentage of Population White - Maps

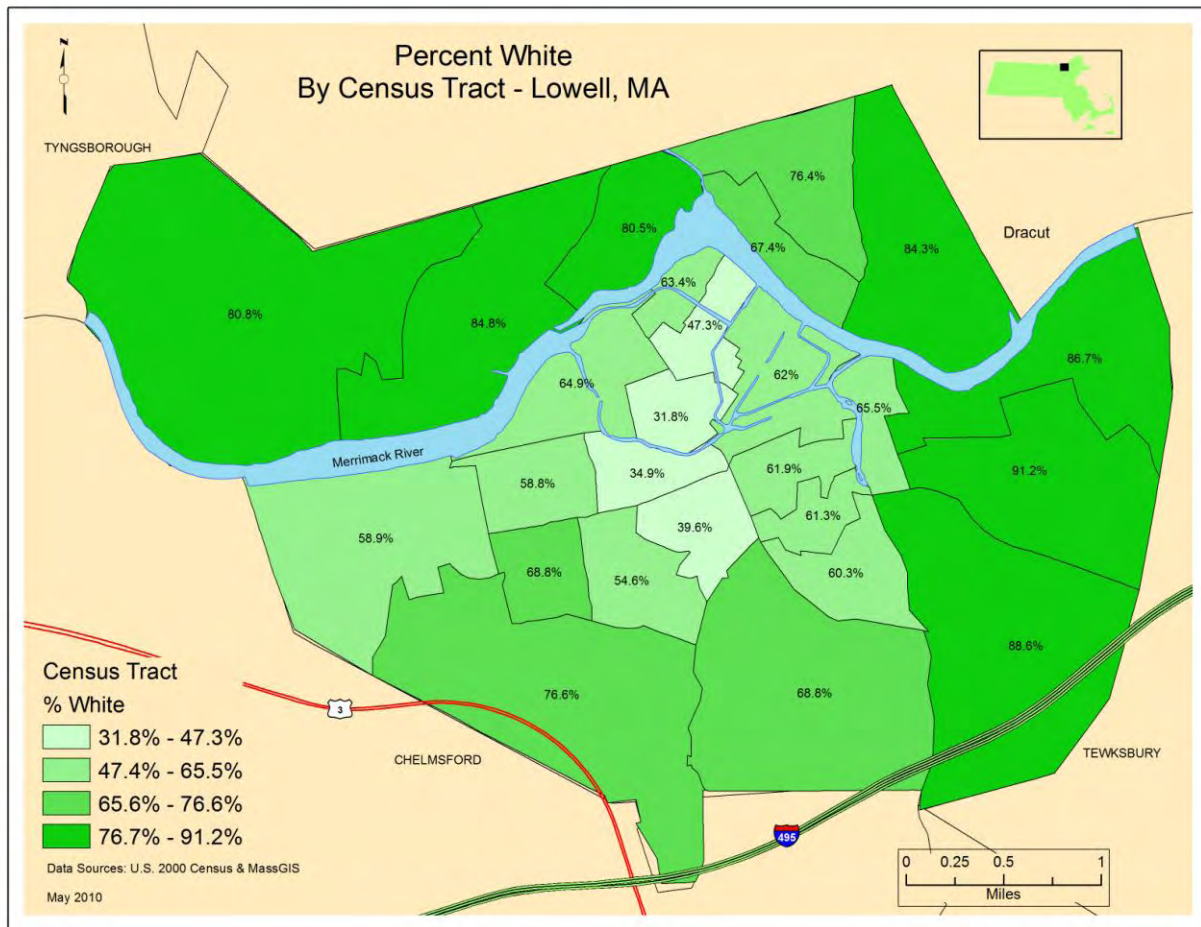


Exhibit 89

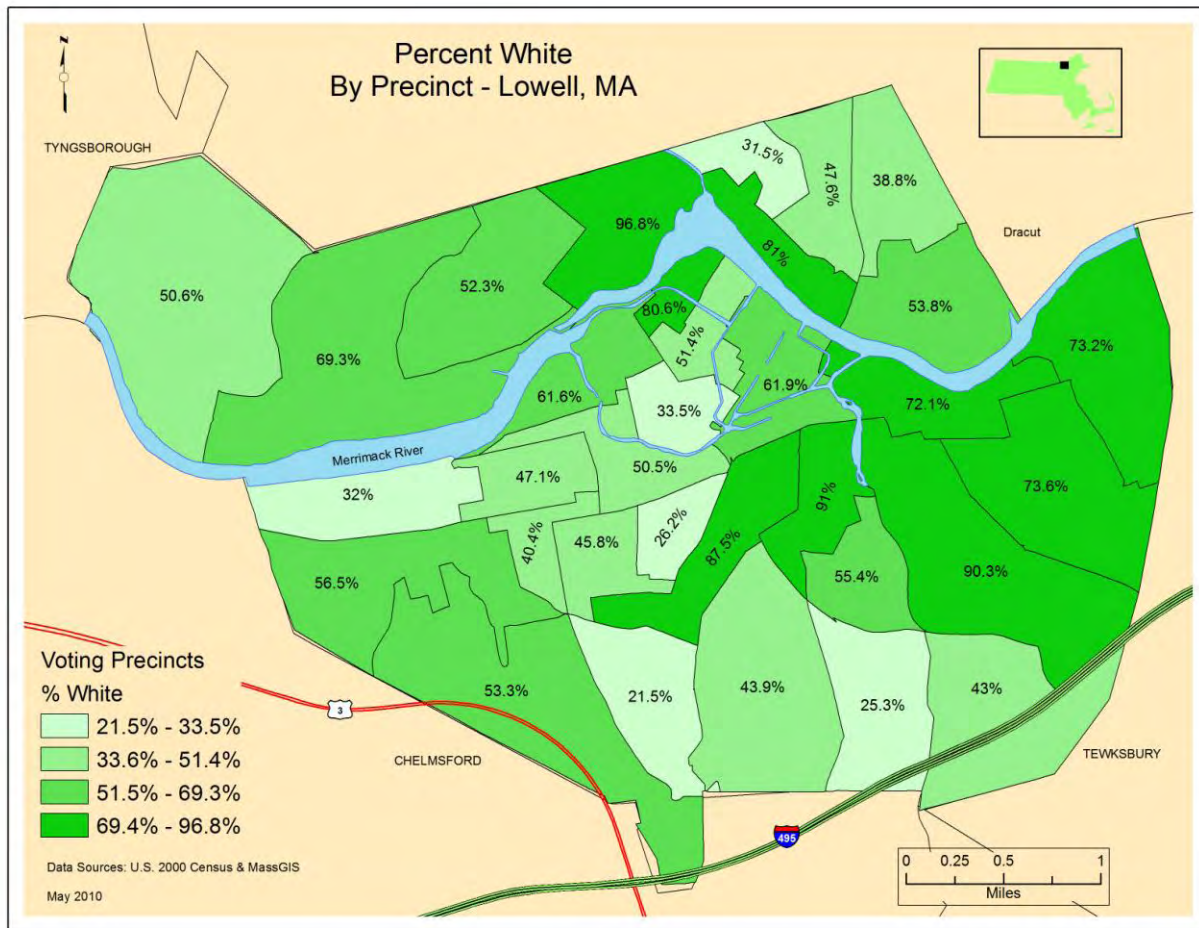


Exhibit 90

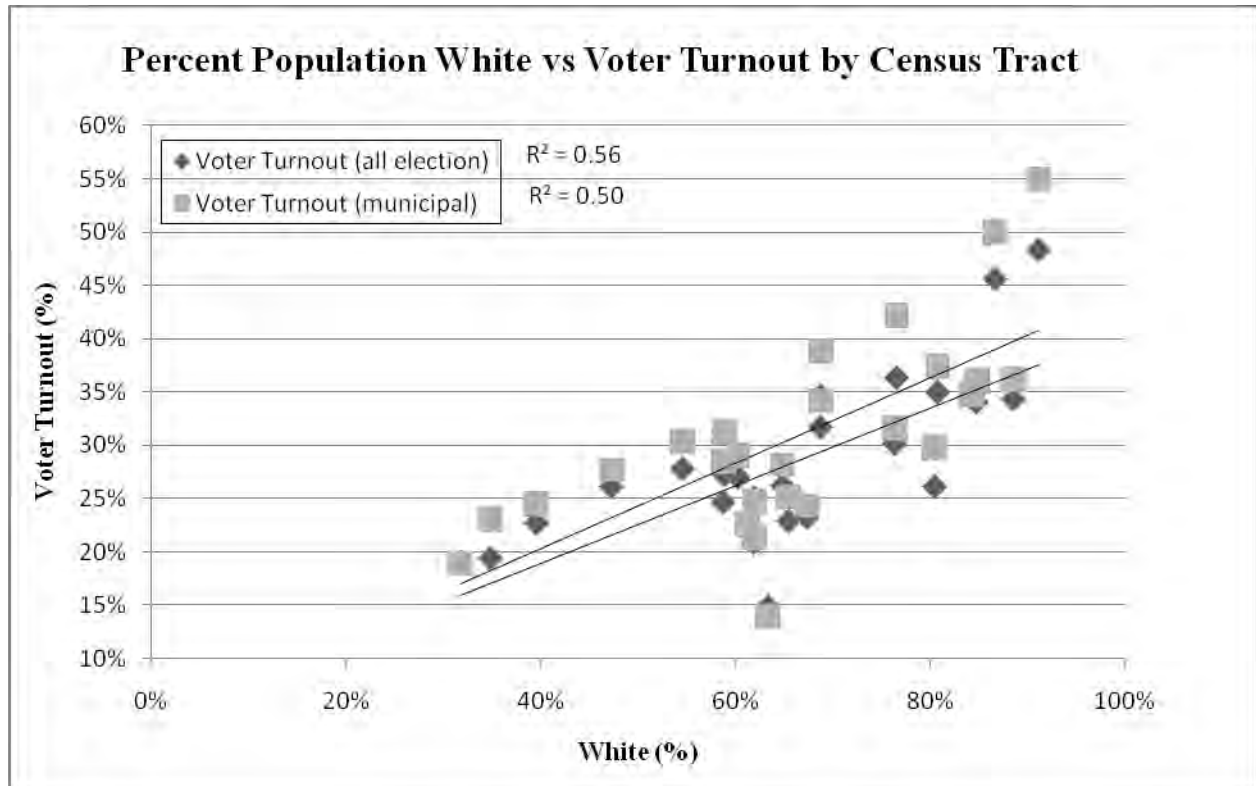
Percentage of Population White and Voter Turnout – Chart

Exhibit 91

Percentage of Population Black - Maps

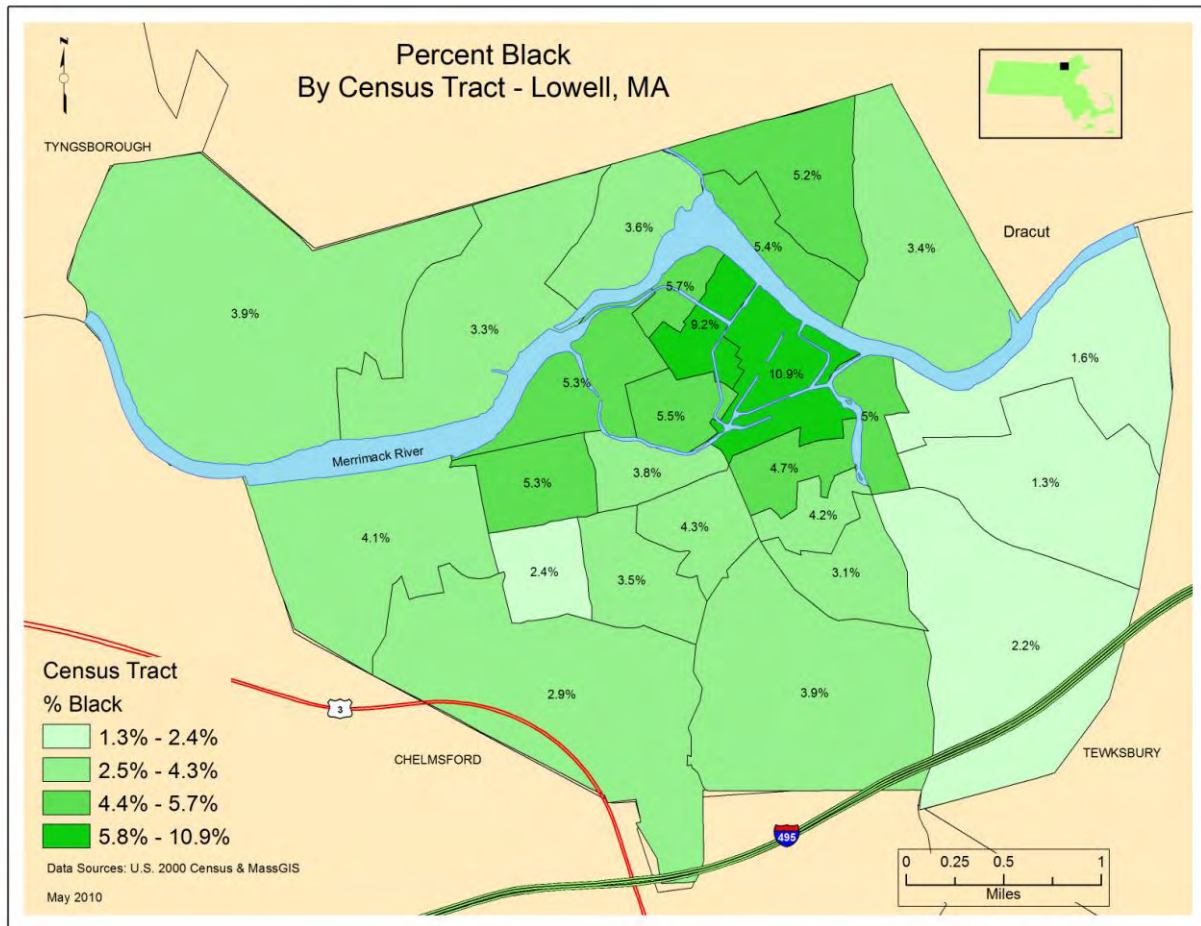


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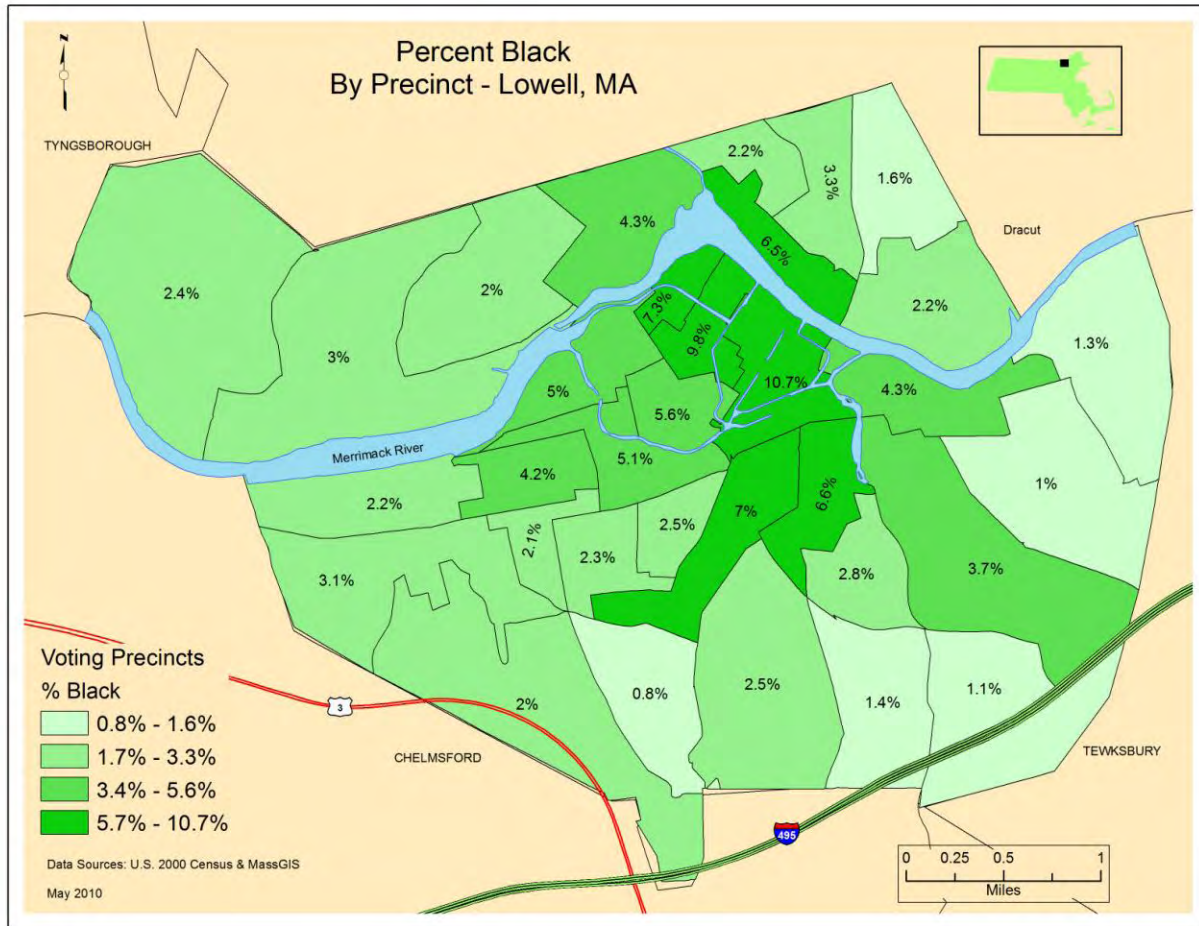


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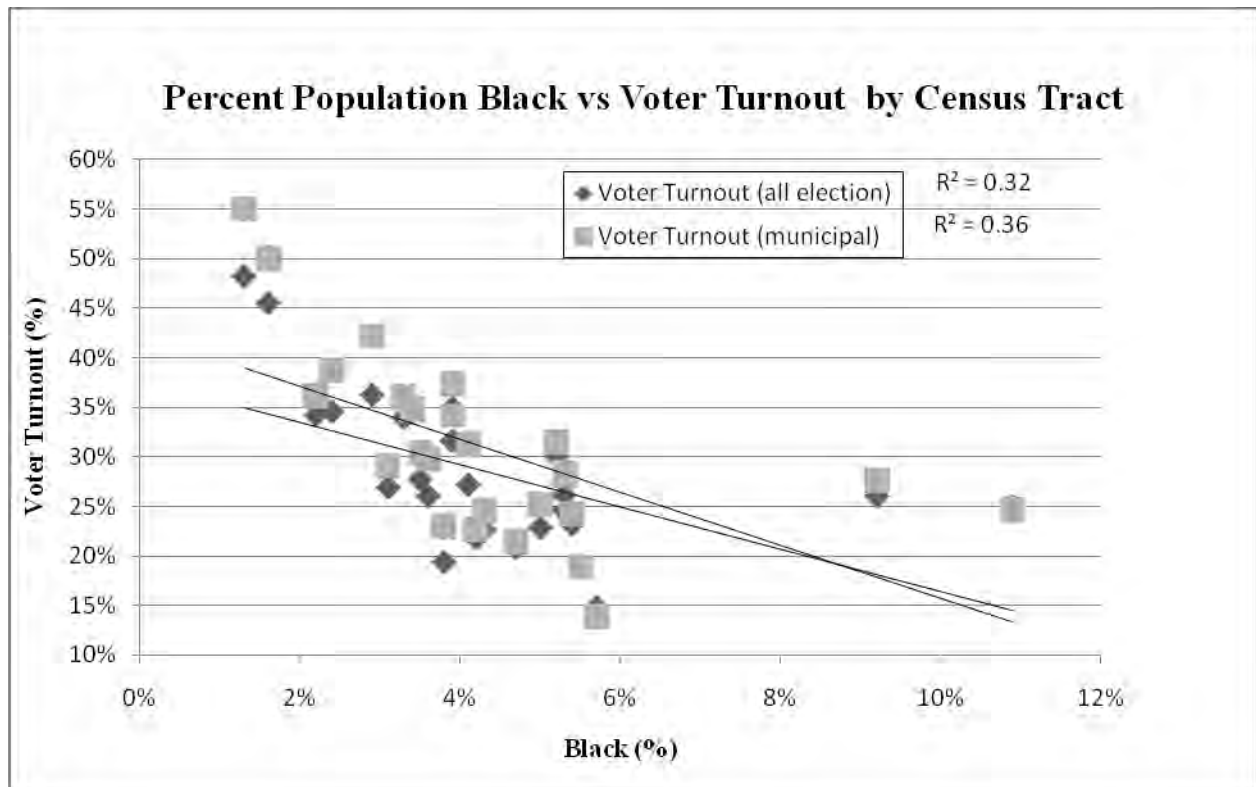
Percentage of Population Black and Voter Turnout – Chart

Exhibit 94

Percentage of Population Hispanic – Maps

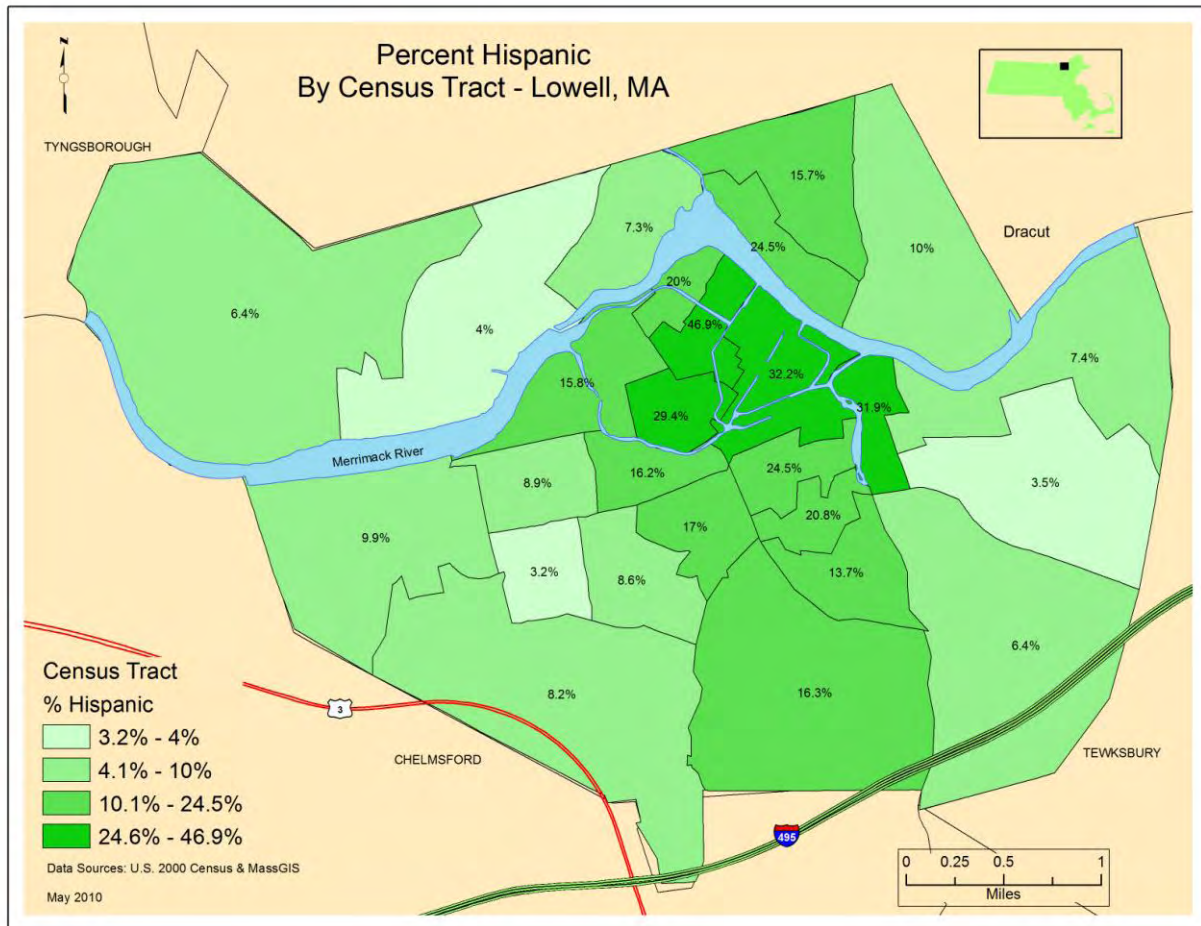


Exhibit 95

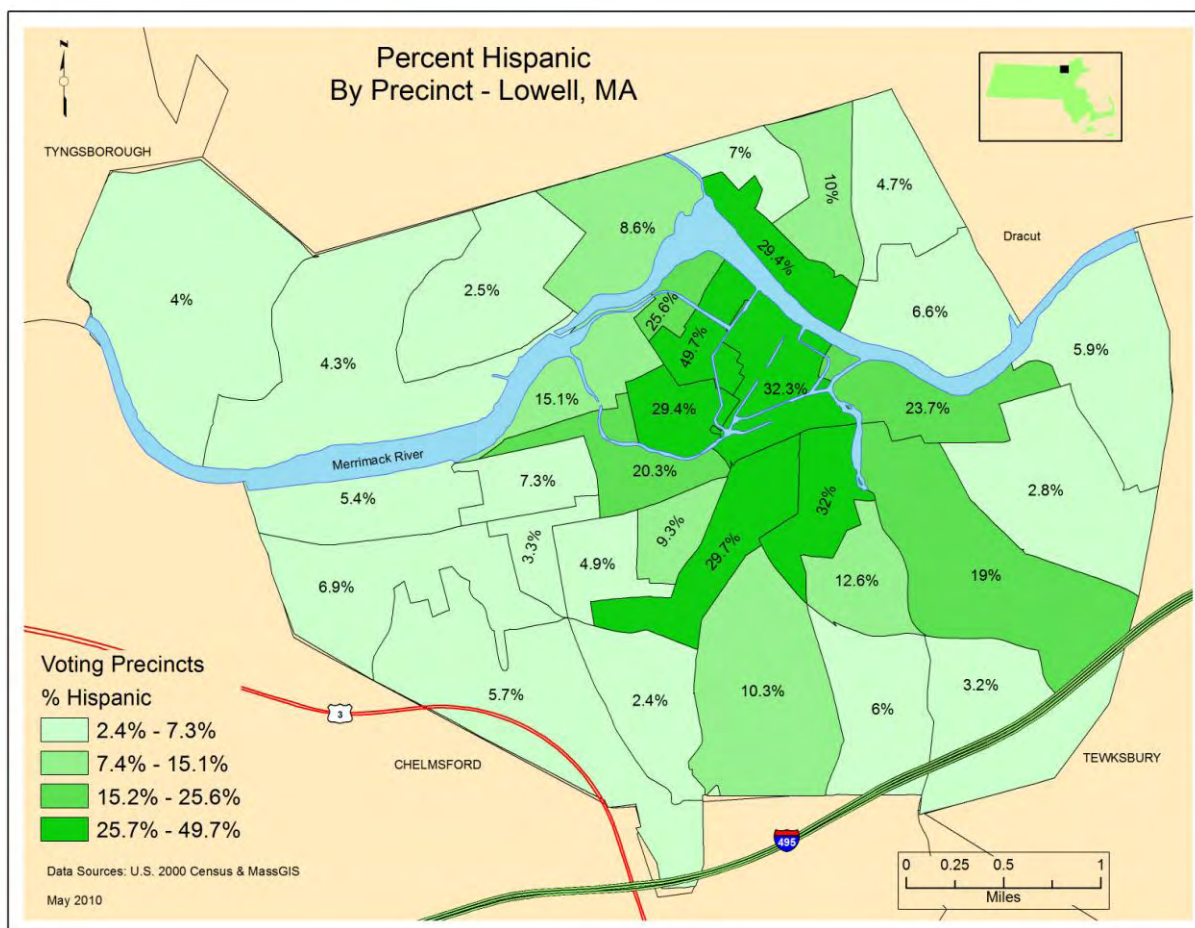


Exhibit 96

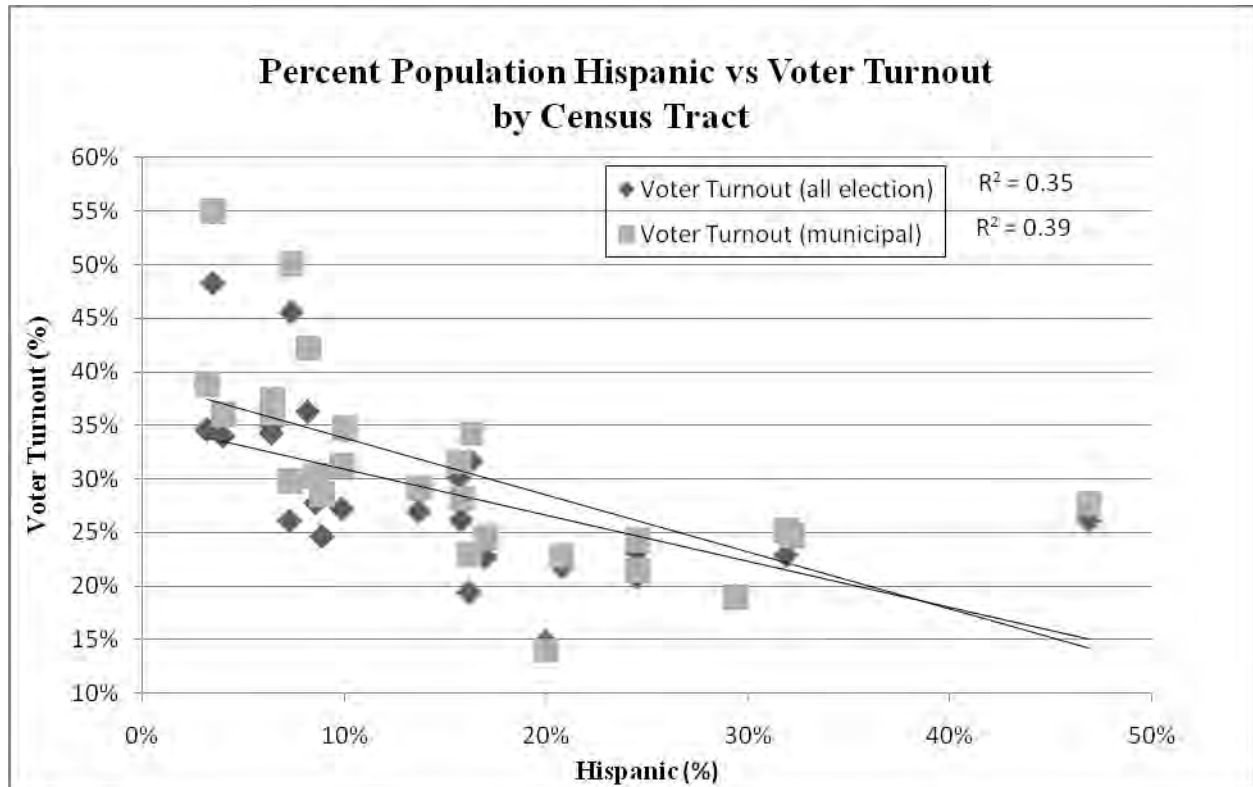
Percentage of Population Hispanic and Voter Turnout – Chart

Exhibit 97

Percentage of Population Puerto Rican – Maps

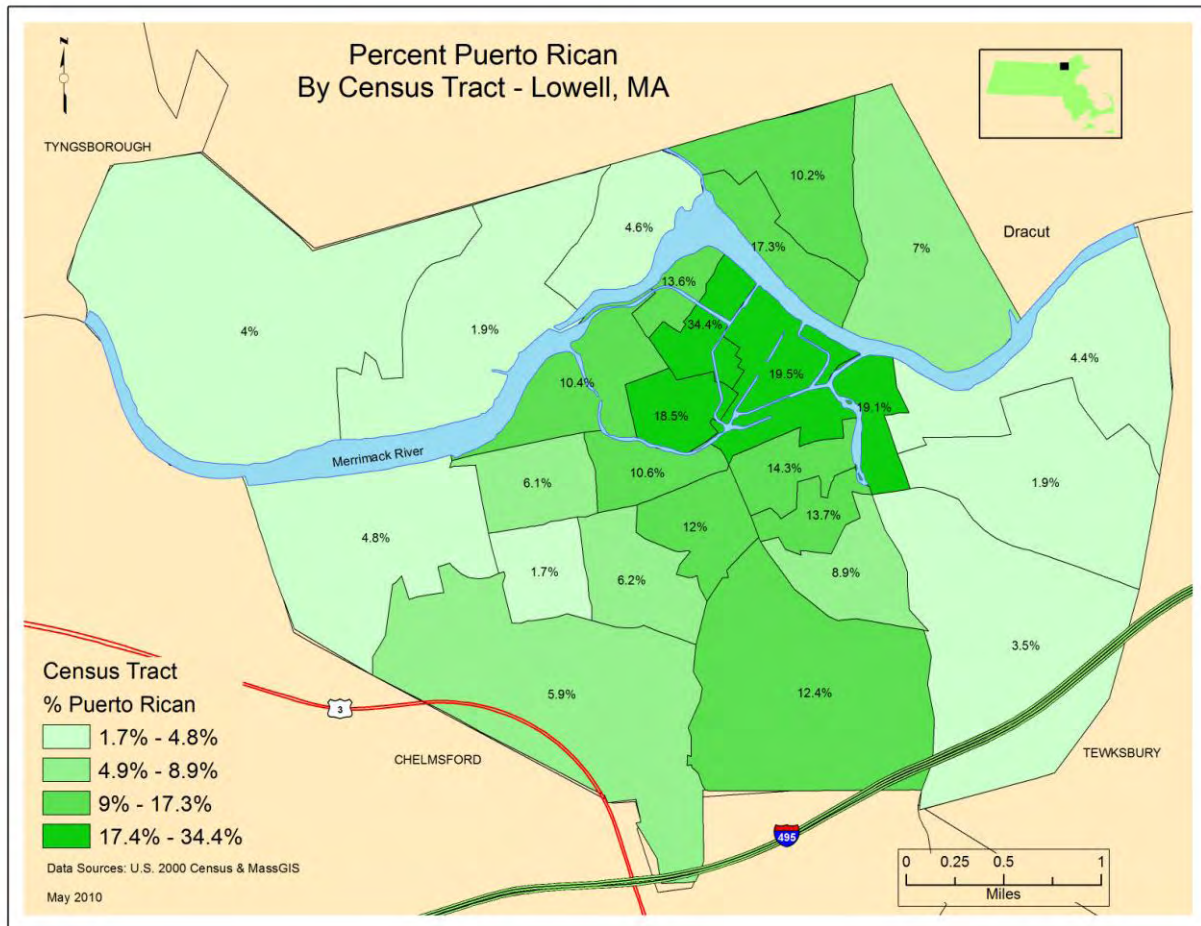


Exhibit 98

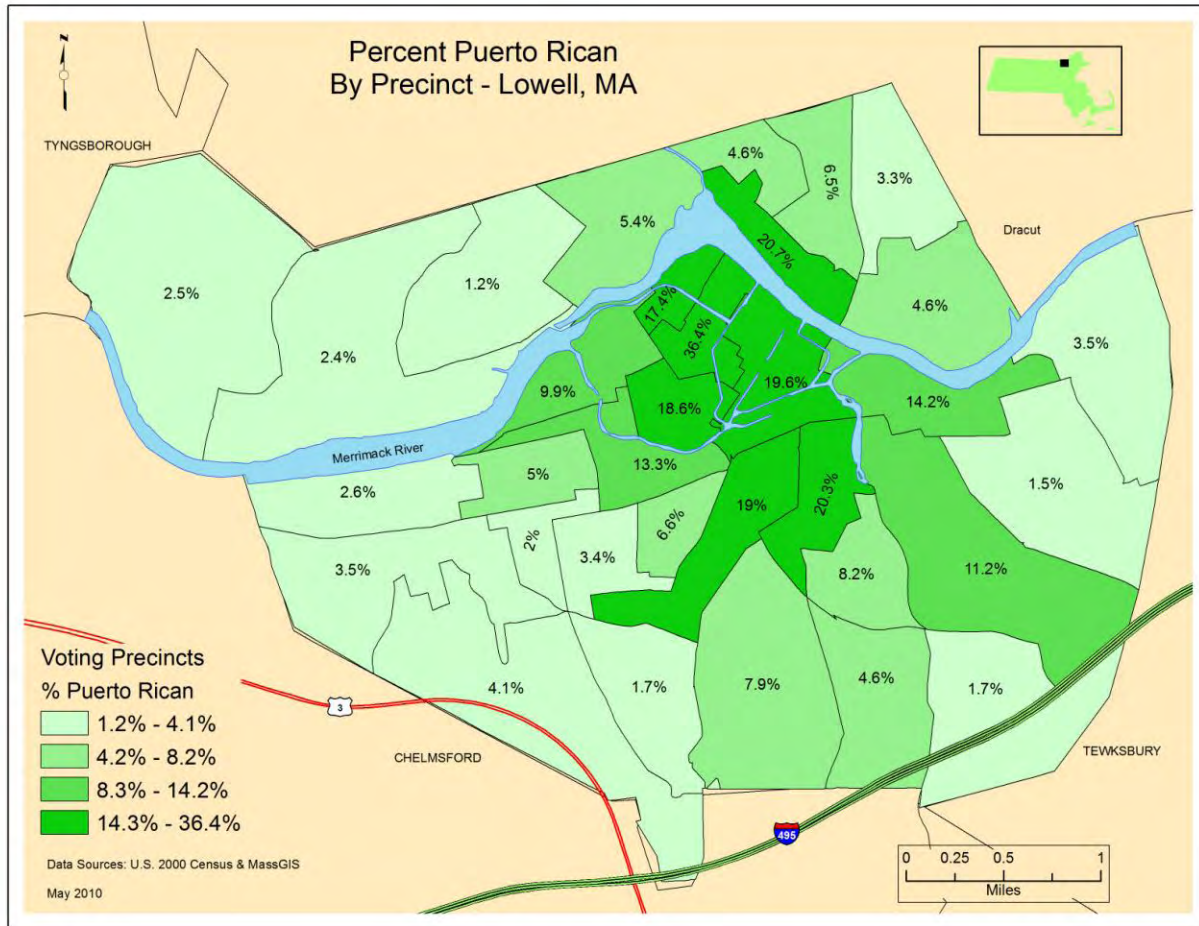


Exhibit 99

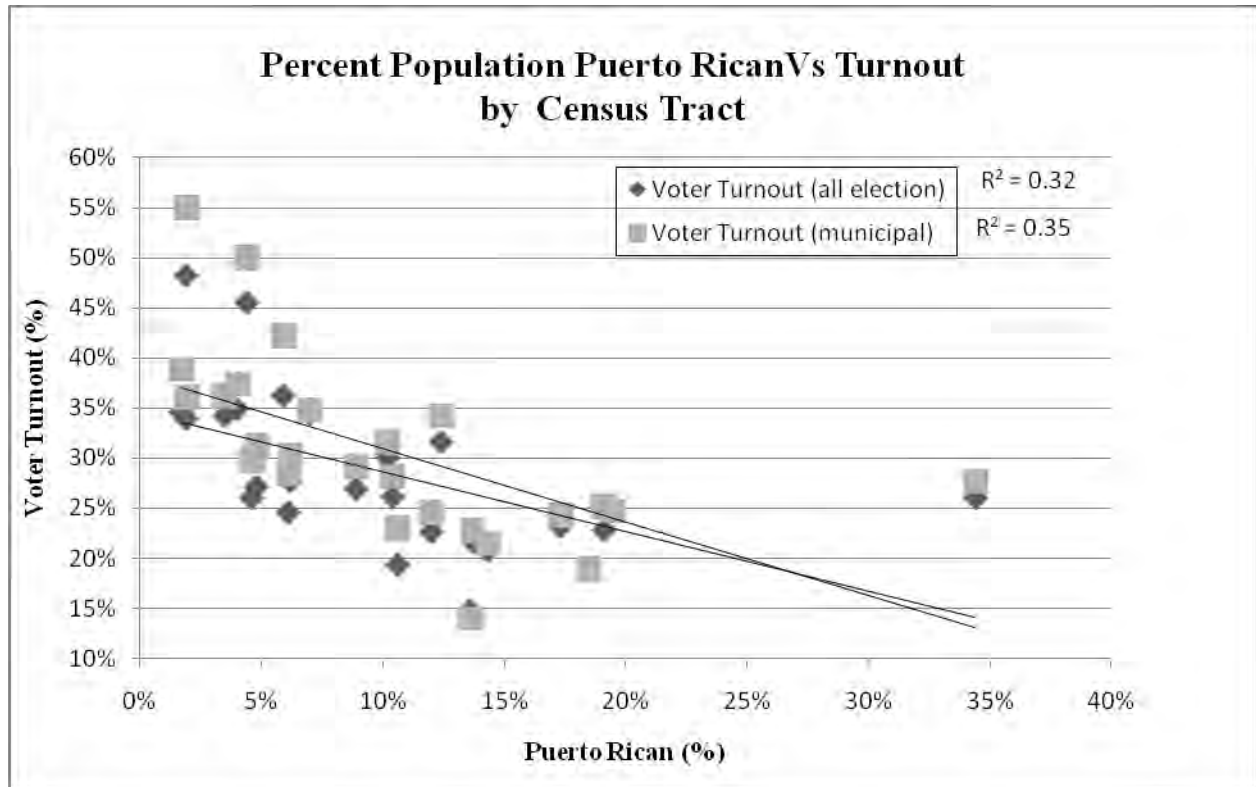
Percentage of Population Puerto Rican and Voter Turnout – Chart

Exhibit 100

Percentage of Population Asian - Maps

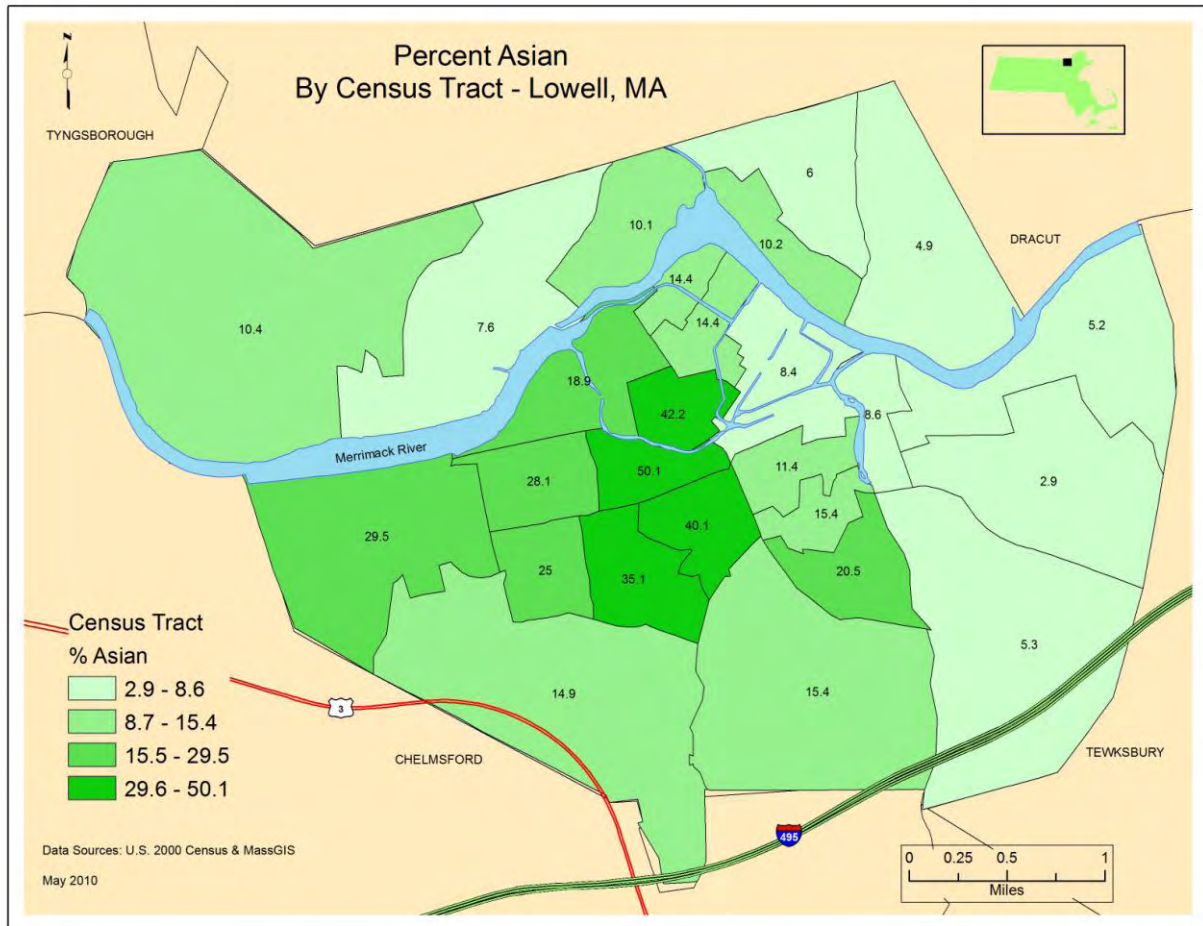


Exhibit 101

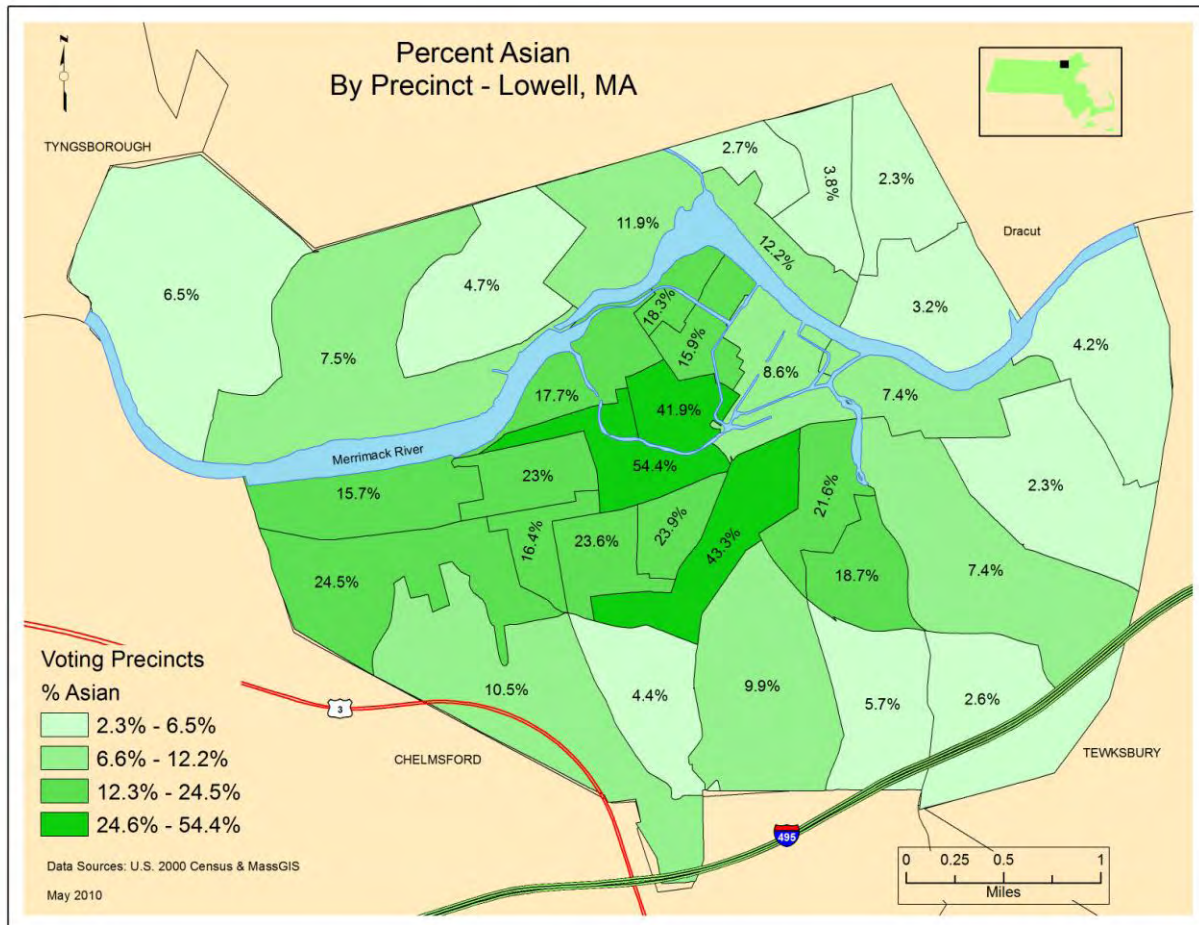


Exhibit 102

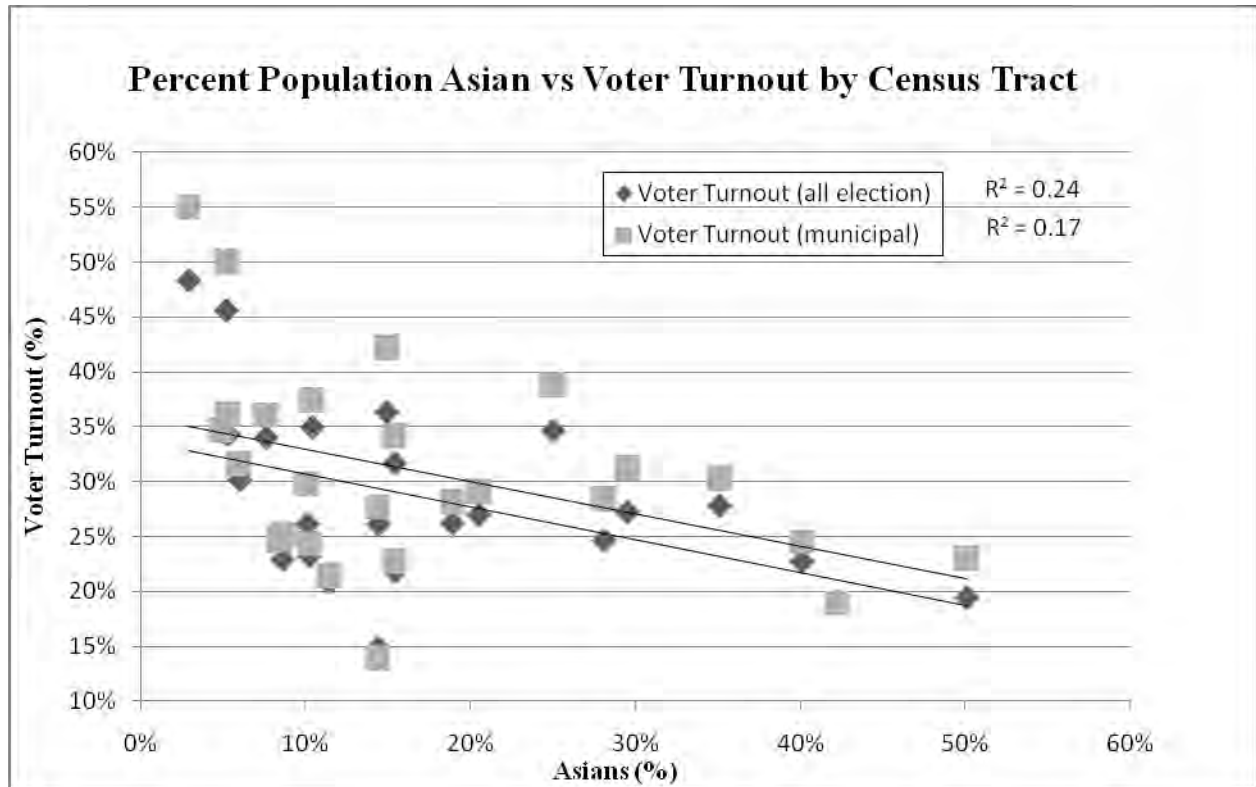
Percentage of Population Asian and Voter Turnout – Chart

Exhibit 103

Percentage of Population Minority - Maps

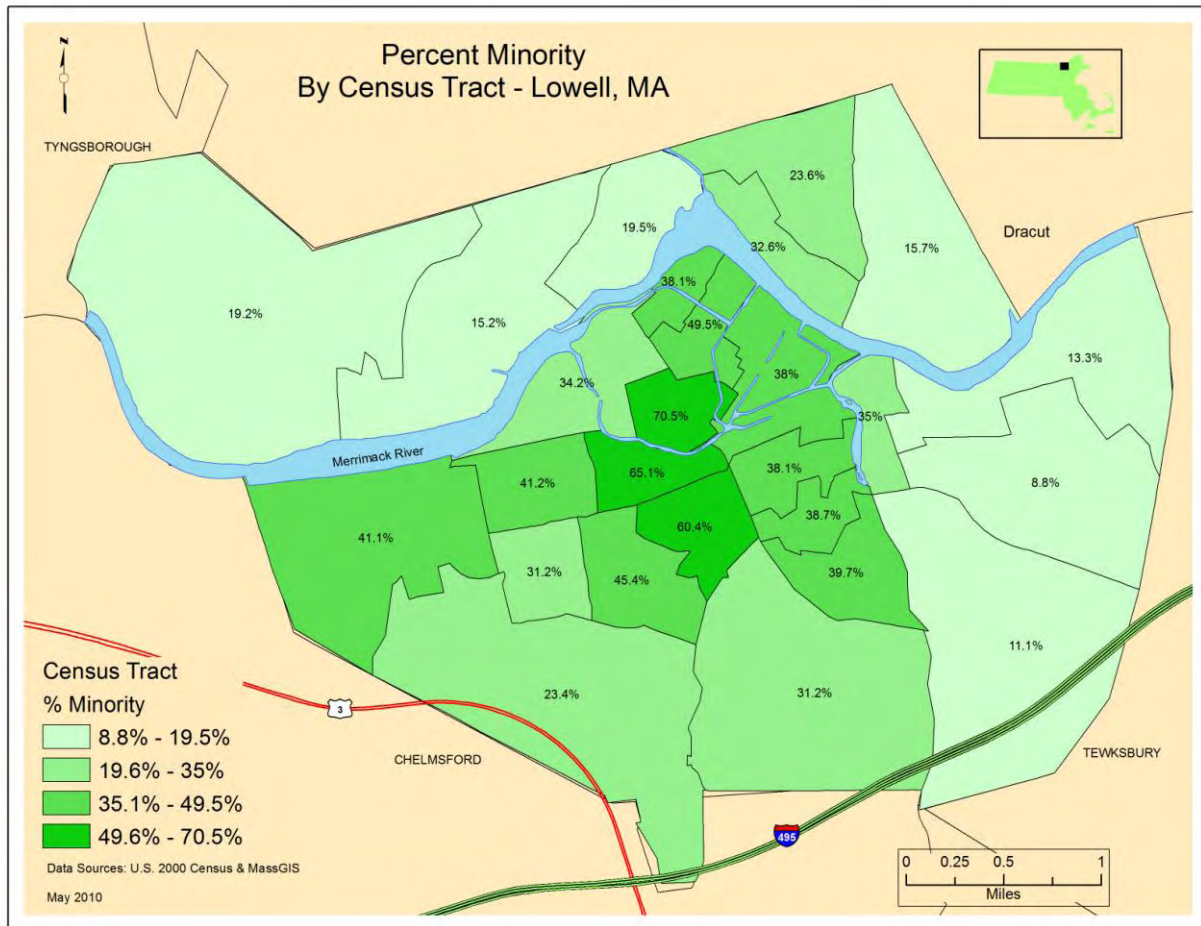


Exhibit 104

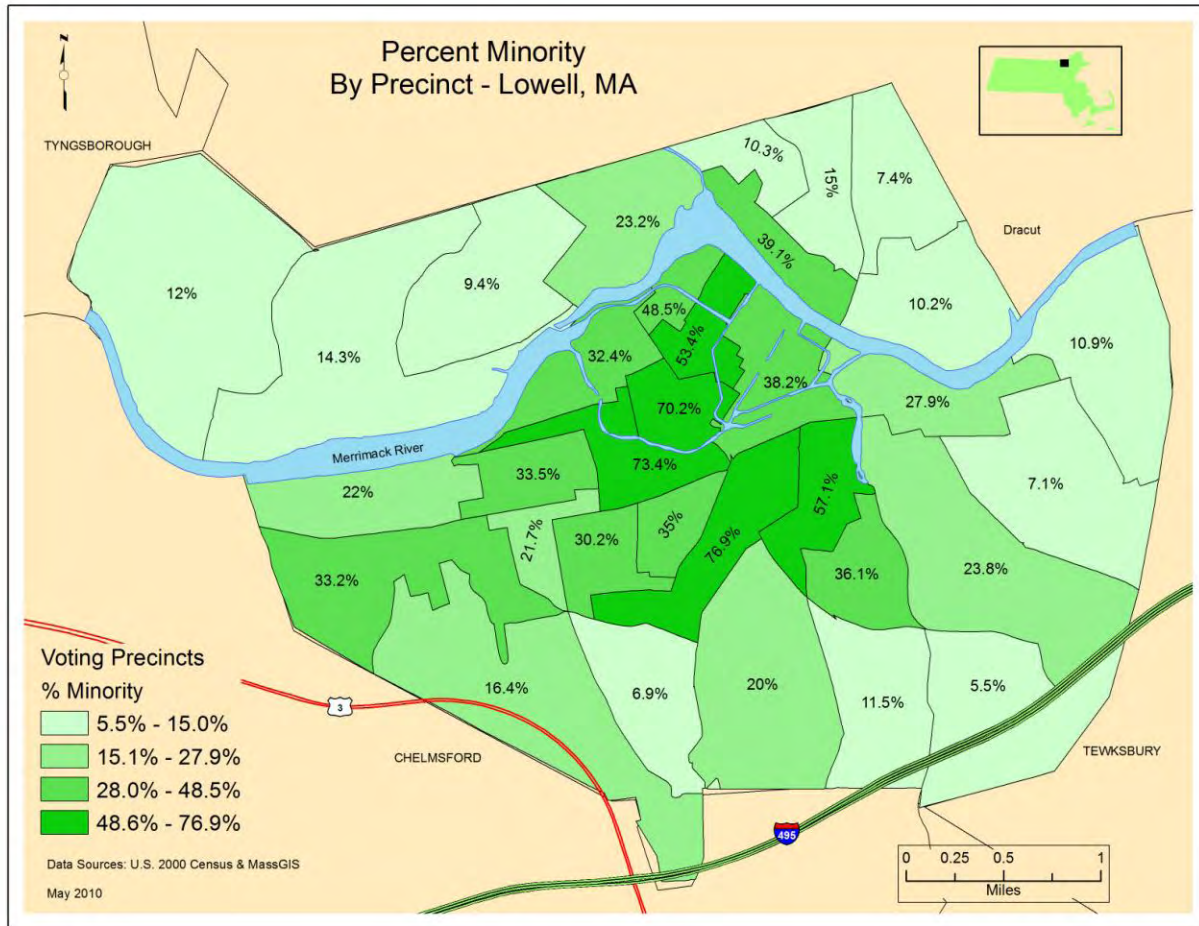


Exhibit 105

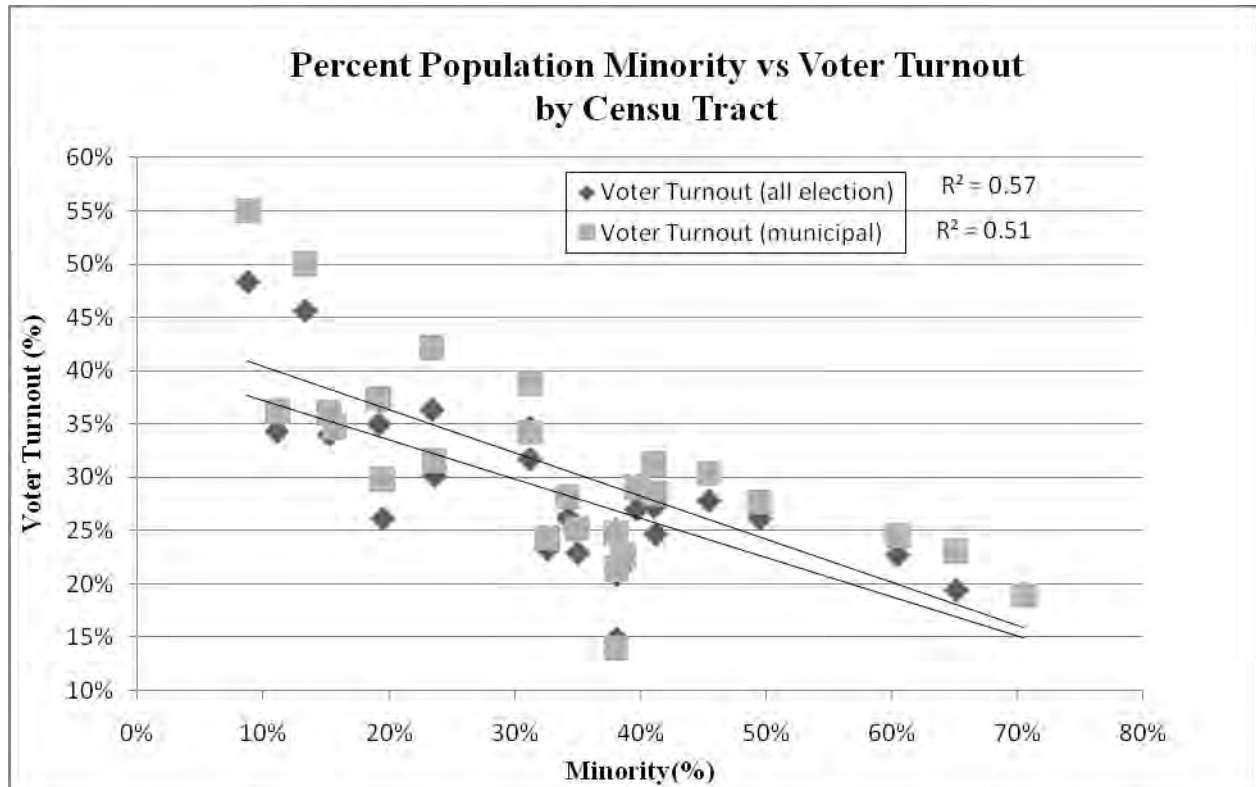
Percentage of Population Minority and Voter Turnout – Chart

Exhibit 106

Discussion

The results of our study played out essentially how we expected, with some interesting nuances. Income has a straightforward positive association with voter turnout. Age shows itself to be most relevant for those under the age of twenty-five or over the age of fifty, with negative and positive correlations respectively. The essential result being that voting does increase with age.

Because the census tables for age and education are also broken down by gender, both these variables reveal an unexpected finding. Like the age variable, a higher education is positively associated with voter turnout. In addition, being a woman strengthens the correlation. An older or more educated woman is more likely to vote than a man of the same age or education.

Homeowners have the strongest positive relationship found. Duration of housing tenure also has a strong positive relationship, but whether owner or rent occupied is irrelevant. As the majority of Lowell residents rent, it makes sense that no difference is found in owner versus renter tenure. Median gross rent also shows the expected relationship to voter turnout rate, though the association is not particularly strong.

The negative relationships also were in line with expectations. Across the board minorities—whether broken down specifically or considered all together—are less likely to live in areas with higher voter turnout. Among the specific language demographics used as a proxy for ethnicity, Khmer-, Vietnamese- and Spanish-language speakers had moderately strong negative relationships. Linguistically isolated households, regardless of language spoken, were associated with low voter turnout. Unsurprisingly given Lowell's low naturalization numbers, foreign-born residents were also amongst the negatively correlated demographics.

Although our results turned out as posited, there are limitations to our study. Time and resources restricted us to comparing one variable at a time against voter turnout. A multivariate analysis would probably provide much stronger predictors of participation. However any kind of regression analysis is inherently limited in that it only shows relationships, not the underlying cause. Not all variables of interest could be found available at the desired lowest level of granularity—the block group. In these cases census tract was used but gradations of each variable were lost, as can be seen where we have maps for both. The voter registration lists used to calculate voter turnout are not regularly updated to reflect those who have moved from and within Lowell, meaning the numbers of registered voters may be slightly inflated. Finally, we compared demographics from one point in time to elections occurring over a 10 year range. The demographics of a particular census tract or block group may have shifted slightly from the 2000 Census data to when the elections occurred.

For future study, it would be worthwhile to consider these demographics against recent Lowell election voter turnout once the 2010 census is published. It is quite possible to automate the tasks of incorporating election and voter files, as well as decennial census demographic data, into a unified database to support ad hoc inquiry. Output from such an inquiry can be presented in traditional tabular

or graphic form or tailored to be displayed geographically, and interactively, using freely available services such as Google Maps® or Bing Maps®. Running the voter registration names through the United States Postal Service National Change of Address Registry would help identify addresses that were no longer valid (Gimpel et al) and thus return more accurate voter turnout rates.

Research into voter participation has been going on for decades, but it is only relatively recently that demographics beyond education, income and age have been properly investigated. Our results line up with traditional findings as well as those of contemporary studies into minority populations. As Lowell has a higher than average number of minority, foreign-born and/or linguistically isolated residents, local authorities should be concerned to find that they seem not to be participating in elections. Hopefully our detailed maps and analysis can help the local government and ONE Lowell pinpoint more accurately exactly which voter precincts are vulnerable to under-representation.

Appendices

Appendix A – Sources and Methods Used to Analyze Demographic Data

All demographic data were compiled from the U.S. Census Bureau's 2000 Decennial Census via the Factfinder website (www.factfinder.census.gov). We gathered data at the most granular level of census geography available for each demographic. The block level was not available for any of our variables. The block group was available for about half; where we could not find block group we used census tract.

Following is a detailed accounting of the sources used for each variable we examined, as well as descriptions of any manipulation that was necessary to adjust the raw data.

Percent Owner Occupied Residences

Data for this variable are found in Summary File 3, *Table H7. Tenure (Occupied Housing Units)*. The data are available at the census tract level and describe how many housing units are occupied by owners, and how many by renters. The percent owner-occupied variable was derived by dividing the number of owner occupied units by the total number of housing units per census unit.

$$\frac{\text{\# owner occupied units}}{\text{total \# housing units}} = \% \text{ owner occupied}$$

Residential Tenure

Residential Tenure was calculated based on data found in Summary File 3, *Table H39. Median Year Householder Moved into Unit by Tenure*. The data describe the duration of residency in years. This information is broken into 3 categories: (1) owner occupied housing units, (2) renter occupied housing units, and (3) total housing units. The median move in year for each area is subtracted from the year 2000 to yield the median number of years since move in, which is used to determine residency duration.

$$2000 - \text{median move in year} = \text{median residency duration}$$

Median Gross Rent

Data for this variable are located in Summary File 3, *Table H63. Median Gross Rent*. These data are available at the block group level and describe the median monthly rent, plus all utilities, for a given area.

Median Household Income

Data for this variable are located in Summary File 3, *Table P53. Median Household Income (in 1999 dollars)*. The data is available at the census block group level and describes the median income of the entire household (all occupants combined).

Education

Data for educational attainment are found in Summary File 3, *Table P37. Sex by Educational Attainment for the Population 25 Year*. The data are available at the census block group level and are broken down by sex for individuals aged 25 and above. The educational attainment categories we investigated are: (1) high school graduate (includes equivalency), (2) Associate's degree, and (3) Bachelor's degree. Educational attainment measures were derived by comparing the population over age 25 at a certain education level with the total population over age 25, separately for males and females.

Race and Ethnicity

Data for the variables Asian, Black, Hispanic, and White were collected from Summary File 3, *Table P6. Race* and *Table P7. Hispanic or Latino by Race* at the census tract level. Because ethnicity is not reported explicitly at the block group or tract level in the Decennial Census, we estimated the number of Lowell residents belonging to individual ethnicities – Cambodian, Laotian, Vietnamese – by using the data found in Summary File 3, *Table PCT10. Language Spoken at Home by Ability to Speak English for Population 5+ Years*. This table also provided the number of Portuguese speakers, which we used as a proxy for Lowell residents of Brazilian descent, the number of speakers of African languages, which we used as a proxy for Blacks of African descent, and the number of Spanish speakers. Data on the Puerto Rican population is located in Summary File 1, *Table DP-1. Profile of General Demographics: 2000*. We calculated the variable “All Minority” by subtracting “White” from the total population.

Language Ability

We used census data enumerating the population living in linguistically isolated households to estimate aggregate language ability. Census defines a linguistically isolated household as one in which no one over age 5 speaks English well. These data are found in Summary File 3, *Table P20. Household Language by Linguistic Isolation*.

Age

Data for age are located in Summary File 3, *Table P8. Sex by Age*. The data are available at the census tract level and describe age, separately by sex, broken down into 18-24, 25-29, 30-39, 40-49, 50-59, and 60+ age categories. The percentage for each category was calculated by dividing the number of people in the category by the total population.

Foreign Born Population

Data for this variable are located in Summary File 3, *Table P22. Year of Entry for Foreign-Born Population*. The data are available at the census tract level and describe the 5 year time interval that a foreign born individual entered the United States. The percentage of foreign population was calculated by dividing the number of foreign born residents by the total population.

$$\frac{\text{Total Foreign Population}}{\text{Total Population}} = \% \text{ Percentage Foreign Born}$$

Appendix B – Calculating Voter Turnout Rates and Applying Demographics

We calculated voter turnout rates by comparing two pieces of information for each election, the list of actual voters for that election, and an estimate of the number of registered voters at the time of the election. The voter turnout rate for any given area is simply the number of actual voters divided by the number of registered voters, times 100%. For example, if the number of actual voters and registered voters in Area A are 95 and 150, respectively, then Area A's voter turnout rate is $95/150 * 100\%$, or 63.3%. In order to determine if voters act differently in local elections than in other types of elections, we developed two measures of voter participation, one based solely on the local elections, the other based on all elections. The local voter turnout rate for each geographic unit is calculated by averaging the voter turnout rates for all local elections for that area. Similarly, the overall voter turnout rates are calculated by averaging the voter turnout rates for all elections.

We obtained a list of actual voters for each election under analysis and three lists of registered voter from the City of Lowell, MA. The list of actual voters contains basic information about the election, as well as a detailed list of voters participating in that election. Specifically, each election voter list contains: (1) voter id, (2) voter name, (3) street address, (4) ward, (5) precinct, (6) election type, and (7) election date. These files are archived by election and provide a voting record for each registered voter that voted in that election.

Because voter registration lists are fluid documents, and in fact may change every day as names are added and deleted, we had access to accurate lists of registered voters only for the three days the lists were extracted from Lowell's registration system, 6/6/2007, 10/19/2009, and 2/1/2010. We used these lists of registered voters to analyze the elections occurring around these times. However, because

we lacked actual lists of registered voters corresponding to the earlier elections, we estimated voter lists for the other years.

To do this, we used the voter registration date for each voter found in the voter list to create “virtual registration lists” for earlier years. For any missing year, the next closest list was used. So for 2005, the given list from 2007 was combed for voters with registration dates prior to 2006. Those voters would be considered as eligible to voters for 2005. For 2004, the 2007 list was used again (because it was the next closest, just as it was for 2005), and combed for entries prior to 2005 to infer those eligible to vote in 2004, and so on. This treatment was consistent for any missing year, so for 2008, the 2009 list was used in the same manner. Working backwards from the “true” lists of registered voters, plausible estimates of registered voters for earlier years were developed.

We obtained spatial layers showing voting district boundaries from the U.S. Census Bureau voting district boundary files. From MassGIS we obtained census tract, census block group, town, roads, and parcel layers. We then used ArcGIS 9.3 tools to geocode the addresses of actual and registered voters for each election. This means that we assigned an exact spot in Lowell to each voter address. This allowed us to group voter information by voting precinct, census tract, and census block group. Using these groupings we developed voter turnout rates for each of these three geographic levels. As explained above, these voter turnout rates were then aggregated to create average voter turnout rates for local elections and for all elections, for each level of geography – census tracts, block groups, and voting precincts.

Because our demographic data correspond to census geography – census tracts, and in some cases, block groups – no special manipulations were required to compare voter turnout rates at the tract and block group level to demographic variables. However, to perform this analysis at the voting precinct level, we regrouped demographic variable to conform to voting geography. Specifically, in cases where the boundaries of census geography and voting precincts do not coincide, we weighted the values of the demographic variables according to the proportion of overlap each census unit contributed to the precinct or ward. The proportion of contribution from each census unit was then multiplied by the census variable being investigated to determine the amount to be applied to the precinct or ward. These constituent values were then grouped by precinct or ward and summed to generate census demographic data for precincts and wards. We were then able to calculate R^2 s for each demographic variable, which show how much of the variation in voter turnout rate can be explained by variation in the demographic variable.

Appendix C – R² Values for All Variables

| R ² Values for Each Variable | | |
|---|-----------------|---------------|
| Variable | Local Elections | All Elections |
| Age and Gender | | |
| 18 - 24 Years Old - Males | 0.21 | 0.2 |
| 18 - 24 Years Old - Females | 0.46 | 0.45 |
| 25 - 29 Years Old - Males | 0.04 | 0.06 |
| 25 - 29 Years Old - Females | 0 | 0 |
| 30 - 39 Years Old - Males | 0.02 | 0.01 |
| 30 - 39 Years Old - Females | 0.06 | 0.04 |
| 40 - 49 Years Old - Males | 0.18 | 0.18 |
| 40 - 49 Years Old - Females | 0.02 | 0.02 |
| 50 - 59 Years Old - Males | 0.22 | 0.21 |
| 50 - 59 Years Old - Females | 0.43 | 0.42 |
| 60+ Years Old - Males | 0.32 | 0.35 |
| 60+ Years Old - Females | 0.25 | 0.26 |
| Education | | |
| High School and Higher - Males | 0.63 | 0.62 |
| High School and Higher - Females | 0.65 | 0.67 |
| Associate's Degree and Higher - Males | 0.65 | 0.61 |
| Associate's Degree and Higher - Females | 0.73 | 0.71 |
| Bachelor's Degree and Higher - Males | 0.64 | 0.6 |
| Bachelor's Degree and Higher - Females | 0.72 | 0.7 |
| Foreign-born | 0.35 | 0.42 |
| Residential Tenure | | |
| Owner-Occupied | 0.07 | 0.07 |
| Renter-Occupied | 0.17 | 0.16 |
| All | 0.59 | 0.58 |
| Owner-Occupied Housing | 0.71 | 0.7 |
| Median Gross Rent | 0.19 | 0.2 |
| Median Household Income | 0.52 | 0.52 |
| Linguistically Isolated Households | 0.37 | 0.39 |
| Ethnic Origins and Racial Groups | | |
| African Language-speakers | 0.01 | 0 |
| Cambodian-speakers | 0.17 | 0.22 |
| Laotian-speakers | 0.06 | 0.1 |
| Portuguese-speakers | 0.04 | 0.04 |
| Spanish-speakers | 0.37 | 0.33 |
| Vietnamese-speakers | 0.19 | 0.24 |
| Asian | 0.17 | 0.24 |
| Black | 0.36 | 0.32 |
| Hispanic | 0.39 | 0.35 |
| Minority | 0.51 | 0.57 |
| Puerto Rican | 0.35 | 0.32 |
| White | 0.5 | 0.56 |

Exhibit 107

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