Alan Lamberg
Saint Louis University, Department of Public Policy Studies
(314) 495-4553 alan@seelenadel.net

Community-based voter advocacy assisted by geographic information systems (GIS)

Abstract: This investigation created a model for describing voter behavior among the smallest ecological units that differentiate characteristics of place. Year 2000 data from U.S. Census Bureau and Year 2004 data from City of St. Louis Board of Elections was utilized to ascertain the percentages of voters and non-voters (non-registered citizens of voting age) in levels of Census block and Census Block Group. Voter behavior was compared to socioeconomic variables, including poverty status, education, age, race, etc. The census block is the chosen unit of analysis because it is large enough to facilitate GIS display relative to other Census blocks while being small enough to realistically implement the outreach efforts of voter advocacy groups. Maps generated from the model will not only assist voter advocacy groups to more efficaciously target particular clusters of non-voters, but also assess the relationship between socioeconomic variables and voting behavior by census block.

Republics are created by the virtue, public spirit, and intelligence of the citizens. They fall, when the wise are banished from the public councils, because they dare to be honest, and the profligate are rewarded, because they flatter the people, in order to betray them.

-- Joseph Story (1779 - 1845), Associate Justice of the United States Supreme Court.

INTRODUCTION

The Importance of the Problem

Economic disparities are present in the United States, and varying degrees of economic segregation have been observed (Dreier, Mollenkopf, & Swanstrom 2002) that inhibit the general prosperity of its citizens in many locations. For a community to benefit its citizens, there is needed social capital, civic engagement and trust (Brehm & Rahn 1997). From here, a community may build up its political capital, which is everything that enables leaders to build consensus among stakeholders and lead to success for the community. There are a multitude of strategies and methods to stimulate or regulate socioeconomic conditions in a community. One strategy among many is civic participation. One way to encourage this activity is to encourage citizens to vote. People who vote are more likely to engage in other civic activities, such as letter writing to political representatives, attending civic meetings, and so on (Putnam 2000: Chapter 2).

Unfortunately, our nation has seen a steady decline in civic engagement since the second world war, and voting turnout numbers barely represent the majority of the eligible electorate. Winner (1995: 73) points out that social scientists are seldom aware of the connection between the weakened modern citizenship and the social relations of technology. Low voter turnouts, citizen apathy, the triviality of political campaigns are often cited as "consequences of the failure of modern democracies to include citizens in meaningful activities" (Winner 1995: 73). There have been a variety of studies on what effects voting behavior, particularly socioeconomic status. However, it is insufficient to analyze behavior of individuals; there is more to be explained in the nature of places.

This study illustrates **a model for describing voter behavior among the smallest ecological units that differentiate characteristics of place.** In other words, whereas some studies used geographic units of analysis such as the election district (voting precinct), this study utilizes units of analysis that are on the smallest hierarchical level, thus increasing resolution. It is important to study the characteristics of place because variables associated with place can consistently explain a significant portion of variance (Olson 1997).

Reasons for doing the work now

Why should we map voter behavior? This question goes hand in hand with why we should study voter behavior in general. Obviously, since the United States is a democratic republic, citizen participation is what drives the spirit of our government, ideally. As the above quote by Justice Story implies, if citizens do not participate in governance, then they no longer govern themselves, leaving a vacuum of power to be filled by self-serving elites. "The price of freedom is eternal vigilance," as Thomas Jefferson famously said. To insulate democracy from self-destruction, it is important to study what drives or discourages voter behavior and then formulate good public policy in response. **We have at our disposal technology that can analyze data on many ecological levels; geographic information systems (GIS) can aggregate data on the smallest ecological level in quick and efficient ways that humans with paper and pen cannot.**

Contribution of the Project

Previous studies of this kind have explained at a level of detail limited to election districts. By explaining variance on levels that range between 4 and 10 times smaller, mapping of voting behavior and other variables at the smallest ecological levels can help social scientists further explain the variance in voter behavior at the highest level of detail.

BACKGROUND

The act of voting is an important civic behavior because voters are likely to engage in other forms of civic participation (Olson 1997: 7). However, in the year 2000, voter turnout was lower than 50%. The worst turnout in modern history was 41.9% of the voting age population, recorded from the midterm congressional elections of 1998, noting that turnout in 1998 was lowest modern turnout since at least 1942 (Day & Gaither 2000). The figures are even worse when one looks just at the House of Representatives. Jacobson (2001) reports that only 36% of the voting age population voted for House

candidates in 1998, the same number as in 1994, and up only three points from the mere 33% House turnout in 1990, the lowest in modern history. This was a culmination of a four-decade trend. In the congressional elections held throughout the 1960s, the average turnout was 54.6%; by the 1990s, it had dropped nine points to 45.7% (Conway 2000; Day & Gaither 2000). Furthermore, non-voting may erode legitimacy, which may be followed by cynicism and alienation in the populace (Olson 1997: 9). However, it is important to study why people choose not to vote, and then form public policy in response. Benjamin Ginsberg (1976, cited in Olson 1997: 10) questioned whether many elections deserve being legitimized via participation. In other words, the choices of candidates or issues, in some cases, are like choosing between *Tweedle Dee* and *Tweedle Dum*. In cases such as these, it is imperative to rally citizens out of their complacency with the political situation by educating each other about the alternative ideologies and platforms that are buried underneath the noise of conglomerated and questionable mass media. Although increasing voter turnout is not the one-all solution to the problems that plague society, it is an important and meaningful component to the well being of democratic society.

Those who advocate for civic participation can help citizens become involved in elections. Some organizations are active in voter registration and advocacy. For example, Metropolitan Churches United (MCU), an interfaith, multi-racial community organization of 76 member congregations impacting more than 700,000 people, have been active in facilitating training sessions for voter registration and neighborhood canvassing in St. Louis, Missouri (Burford 2004). These organizations that reach out to the community typically rely on text-only records of election data to target non-voters in registration efforts. The same can be said for the targeting of voters by canvassers for political candidates running for office. Many of these groups, however, lack clear, geographic maps to display clusters of non-voters and voters. Therefore, these groups often spread their resources thin by blindly and inefficiently targeting non-voters and voters utilizing textual records alone.

LITERATURE REVIEW

Much of this study reviewed heavily Olson's (1997) hypothesis that voting turnout is negatively affected by changes in places were people live. Olson sought to understand the social underpinnings of differential mobilization across social groups, which is critical to explaining the organization of electoral political power. Across space there is significant variation in both political and demographic characteristics. One can identify differential "propensities to vote" across space (12-13). He expounded that two major schools, the socio-psychological and the structural approaches, did not sufficiently explain the variation in turnout that exists among places (14). The socio-psychological approach finds a positive relationship between socioeconomic status (SES) and voter turnout (Schneider 1996; Galbraith 1992). It also explores how voters and nonvoters are separated by their attitudes (Hadley, 1978, cited in Olsen 1997: 35-36). However, the strength of these relationships varies depending on the electoral environment (15), and only explains 10% of variance (155). Thus, socioeconomic correlations were "insufficient explanations" (Gaventa 1990; cited in Olson 1997: 119).

Essentially, these schools explain turnout as a function of differing characteristics of people, not places. Huckfeldt and Sprague (1995; cited in Olson 1997: 61) argued that

spatially structured social interactions influence political behavior. Olson furthered this argument by viewing voting as an activity that has geographic roots in neighborhoods. It shifts emphasis from the individual to the place where the person lives (17). To test his hypothesis, Olson used ecological regression, which helped infer individual behavior from aggregate data (75-76). This method also prevented aggregation bias, as Olson heeded Robinson's (1950; cited in Olson 1997: 74) warning against inferring individual behavior from aggregate data using flawed methodology. In his testing of relationships to voting behavior, Olson used variables such as income and education (as part of SES), and home ownership and mobility (how long a person has lived in a home.) These latter variables helped explain the consistent positive relationship between voting behavior and neighborhood stability (Olson 1997: chapter 6). In elections where low SES did not prevent high turnout, Olson (145) explained that "Mobility ... can offset the effects which SES may have on turnout." Non-voters will vote if they live in an environment which they receive incentives for, and reinforcement from, participation (Olson 1997: 192). In Olson's words, "Place Matters." Mobility and homeownership may increase likelihood of voter mobilization (144).

RESEARCH QUESTIONS

Three questions are prominent in this study. First, does targeted voter advocacy work? There are many uses for geographic information systems (GIS), especially for visualizing important information so policymakers and community leaders can easily understand it. A map made from this model can assist organizations in identifying locations where to promote voter advocacy. Subsequently, organizations can target clusters of non-voters for registration and voters for political canvassing. Perhaps utilizing a map that is detailed down to the block level, these organizations -- with resources scarce and limited number of people doing the legwork -- will be more successful in their efforts. Second, does mapping particular variables, such as income, poverty status, age, race, and educational attainment help explain what affects voting behavior? Third, are there errors in voter records and within the collected community-level socioeconomic data? How significant are these errors, and, what explains these errors so administrators can prevent them in the future? These questions will be considered with the resulting maps and the literature review.

DATA

The City of St. Louis was chosen for this study because of two reasons. First, the researcher was committed to community-level advocacy in his city of residence. Second, central cities are known for being diverse places in terms of demographics and other characteristics. It makes a good starting point if one wanted to study the metropolitan area.

In this study, voter rates of registration and turnout were analyzed. These data were used instead of survey data because data collected from surveys are limited to self-perceptions and may be inadvertently deceiving, while the Missouri voter data will provide a more accurate account of voting behavior. For population variables, the *Census Summary File 1 (SF 1) - 100-Percent Data, year 2000* was used on the block level. Summary File 1 presents demographic and residential information collected from all

persons and housing units. For other population and socioeconomic variables, *Census Summary File 3 (SF 3) - Sample Data, year 2000* was used on the block group level. Summary File 3 presents detailed population and housing data (such as place of birth, education, employment status, income, value of housing unit, year structure built) collected from a 1-in-6 sample and weighted to represent the total population. In studying voter behavior, the block group and block levels are advantageous because they are smaller than election districts (precincts). The smaller the geography, the more "differences in characteristics of places will be captured" (Olson, 1997: 23). It is important to note that, regarding Census data, accuracy decreases as resolution increases. In other words, a variable for an entire city is rather precise, but the same variable down to the block group or block level is purposely inaccurate. The U.S. Census Bureau does this to protect the respondents who recorded their personal socioeconomic information in the survey. In other words, the U.S. Census Bureau is ethically obliged to prevent their data to be used in such a way that reveals the almost precise locations of people who reveal information such as income, race, family status, etc. Fortunately, for the purpose of mapping voter behavior, data swapping does not effect total count of persons because samples of households that are selected for data swapping have similar characteristics in number of persons (Technical Documentation for Summary File 1, Census of 2000 population and housing. 2003. Washington: Bureau of the Census, p. 8-3).

In order to describe voter behavior, such as registered address, precinct, ward/township, active status, dates of voting, political party and/or candidates, *Election Data, cumulative year 2004* was used. Data was collected from Board of Elections from each voter's activity during each Election Day. It is publicly available on CD-ROM from the Board of Elections of each County in the State of Missouri.

A limitation was encountered when using **the centralized voter database of the Missouri Secretary of State** because running a query to isolate those living in the city of "ST LOUIS" did not necessarily exclude those living outside the City of St. Louis. Of the 3.9 million voter records for the State of Missouri, it rendered approximately 550,000 voter records as geo-coded points. However, this is an obvious error, because the population of the City of St. Louis is 360,000. In other words, approximately 300,000 voter records that do not live in the City of St. Louis have their "city" listed as St. Louis, because of the common assumption that one does not have to be specific about listing their city name in the St. Louis Metropolitan Area, when postal addressing only matters by ZIP code. Unfortunately, the geo-coding software used for this project was only specific for street addressing match, and did not analyze by ZIP code. Many street names that were common in the City of St. Louis and outside the City were mistakenly recorded as being inside the City of St. Louis. Thus, a large amount of records were geo-coded within the spatial boundaries of the City of St. Louis, rendering the data useless.

Data from the **City of St. Louis Board of Election Commissioners (BEC)** were naturally self-contained within the spatial boundaries of the City. Therefore, the above problem was not repeated. It rendered approximately 197,000 voter records as geo-coded points. These voter records were ***active voters*** who are registered with the municipal election authority and had voted in general elections within two years. Incidentally, the BEC also record ***registered voters who are inactive***; i.e., voters who had not participated in a general election for over two years. These records were omitted from data because (1) presumably, the voters had not notified the BEC of an address change, (2) the

individuals are deceased, or, (3) they still live at the same address and are no longer interested in participating in elections.

Shape Files (for Geographic Information System), year 2000, are electronic files used for spatial referencing (mapping) of places (political and natural boundaries,) lines (streets, routes), points (street addresses). Many types and kinds of shape files are available from a variety of sources. The U.S. Census Bureau makes publicly available "TIGERline" shape files, which are especially useful when mapping Census geographies such as blocks or block groups. Municipalities, such as the City of St. Louis, also have shapefiles. The centerline street shape file used for geo-coding addresses was obtained from the St. Louis Water Department.

Unit of Analysis

The Census block unit of analysis is highly effective at determining differentiation among places because it is large enough to make an aggregate distinction relative to other Census blocks while being small enough for the purposes of advocacy groups' targeting efforts. Each block can display a percentile for each variable. Blocks, according to the U.S. Census Bureau, are "small areas bounded on all sides by visible features such as streets, roads, streams, and railroad tracks, and by invisible boundaries such as city, town, township, and county limits, property lines, and short, imaginary extensions of streets and roads" (Technical Documentation. 1991. Washington: Bureau of the Census, p. A-3). Blocks are the smallest geographic area for which Census data can be gathered. For socioeconomic variables, the Census block group was used, which is the next sized geography on the Census data hierarchy.

MAPS

Maps were generated at the block level, the smallest unit of analysis in the U.S. Census. The five maps created can be most useful for voter advocacy groups in targeting clusters of voters or non-voters (see maps V0001blk, V0002blk, and V0003blk.) However, it is important to note that there may be a margin of error because of inaccuracy in data for various reasons at the block level (see map "data errata").

Map "V0001blk" shows the percent of 2004 active voters by 2000 voting age population. The most appropriate denominator to use in calculating percent of active, registered voters is the ***number of approximate voting age population*.** The Census variable that measures the eligible electorate (persons over 17) is available from the 2000 U.S. Census, Summary File 1 (SF1) (Table P12). This figure includes non-citizens, along with persons who are for whatever reason disqualified from voting, i.e., felons. SF1 does not tabulate non-citizens nor felons, etc. The numerator used to estimate rates of registered voters was the ***total number of registered voters***. An accompanying map, "data errata," displays the blocks where various types of data error exist. This will be further explained in the below "Findings" section. Despite the errors, the map portrays a good sense of how voter registration lacks uniformity across the city. Even if one were to overlay election districts (precincts) over the map, there would likely be significant differences in registration within each district. The resolution of the map at the block level reveals clusters of registered voters in some places, and clusters of non-voters in other places. The implications of this observation regarding voter advocacy will be explained in the findings.

Map "V0002blk" shows the percent of 2004 active voters who voted in primary election of February, 2004. The denominator used ***active voters in 2004***, while the numerator used ***active voters who voted in primary election of February, 2004***. The resulting turnout seems generally low, with most of the map displaying turnout below 25%. In the City of St. Louis there were 197,000 registered voters. Only approximately 35,000 voted, making citywide turnout only 17.7%. However, it is important to note that the southwest side of the city reveals turnout between 25%-50%. A reasonable explanation for this higher turnout may be because it is the hometown and political center of Richard Gephardt, a long-time Congressman who was running in the Democratic presidential primary. However, by February, 2004, Gephardt quit the race. Nonetheless, it appears that a significantly greater number of voters in those blocks were mobilized as compared to the rest of the city.

Map "V0003blk" illustrates the percent of 2004 active voters who participated in general election of November, 2000. The denominator used ***active voters in 2004***, while the numerator used ***active voters who voted in primary election of November, 2004***. The resulting turnout seems mostly uniform, with the exception of the blocks on the southwest side.

Several maps were generated at the block group level, which is a unit of analysis one step up the geographic hierarchy in the U.S. Census. While not precise as block level data, the block group level holds certain advantages. First, block groups are usually smaller than election districts, thus helping to better examine the differences among places. Second, the Census data tabulated for the level are more accurate than block level. Ten maps were generated that can be useful for socioeconomic observations, and may raise interest in pursuing further research to correlate other variables with voter behavior (see maps V0001, V0002, V0003, V0201, V0301, V0401, V0402, V0501 and V0502).

Maps "V0001," "V0002," and "V0003" are block group versions of the previous block level maps. The numerator for "V0001" is different; i.e., ***number of voting age citizenry***. The Census variable is available from the 2000 U.S. Census, Summary File 3 (SF3) (Table PCT44). As opposed to SF1, this variable in SF3 accounts for citizens. However, it still does not account for persons for whatever reason disqualified from voting. It is crucial to note, especially in map "V0001," how much more uniform voter registration rates have become. This is a disadvantage if advocacy groups chose to rely on the block group level.

Map "V0201" shows percent of year 2000 population above the age of 65. The denominator is **total population** (SF3, Table P1), while the numerator is the **sum of male and female population 65 and over** (SF3, Table P8, sum of columns 35 to 40, plus sum of columns 74 to 79). The elderly population appears to be randomly dispersed throughout the city. However, in the southwest section of the city, there is a high cluster of elderly persons. Keep in mind that there are other high clusters of elderly persons with lower voter rates. This supports that, while some SES variables are positively correlated with voter rates, they do not fully explain the variance.

Map "V0301" displays percent of 2000 population by race (African-American and Caucasians). Again, the denominator is **total population**, and the numerator is the **number of persons who are white alone** (SF3, Table P6, column 2). Since the majority of people in St. Louis City claim either African-American or Caucasian as their race, most of the people who are "non-white" are actually African-American. Note how the

city is segregated along north and south lines. According to Farley's (2000) segregation index, the St. Louis Metropolitan Statistical Area is 9th most segregated among top 50 areas in the nation. Moreover, the southwest part of the city contains a high percentage of persons who are Caucasian. Again, as with the elderly variable, race does not explain the majority of variance in voter rates.

Map "V0401" depicts the percent of 2000 population with income below the poverty level. In this case, the denominator is **population for whom poverty status is determined: total** (SF3, Table P87, column 1). The numerator is **population for whom poverty status is determined: income in 1999 below poverty level** (SF3, Table P87, column 2). Income makes a strong case as a variable to explain voter behavior. It is evident that the entire southwest side of the city appears to be insulated from high rates of poverty. Keep in mind, however, Olson's research demonstrates that income only explained 10% of variance in voting behavior.

Map "V0402" shows percent of 2000 population with income at least twice that of poverty level. Again, the denominator is **population for whom poverty status is determined: total** (SF3, Table P87, column 1). The numerator is **population for whom poverty status is determined: ratio of income in 1999 to poverty level; 2.00 and over** (SF3, Table P88, column 10). This variable explores middle income status. It fails to help explain variance of voting behavior. Therefore, it may be advantageous to use more extreme income levels instead of middle income.

Map "V0403" shows per capita income in 2000 relative to metropolitan statistical area average. The denominator is **total population**, while the numerator is **per capita income in 1999** (SF3, Table P82). The display explores income levels relative to the St. Louis IL—MO MSA average ($22,698). In other words, the map elucidates what places in the city contain the lower, middle and upper income classes. The southwest side is predominantly upper class, which supports the SES premise that high levels of income are positively correlated with voter rates. However, as a reminder that SES did not explain all the variance in Olson's work, and it is important to note that there are other places in the city with high income that exhibit lower voting rates as compared to the southwest side.

Map "V0501" shows percent of 2000 population enrolled in college and above. The denominator is **total population**. The numerator is the **sum of male and female population over 3 years of age enrolled in college and above** (SF3, Table P36, sum of columns 18 to 23, plus sum of columns 41 to 46.) This variable seems to be insufficient in showing a relationship between people enrolled in higher education and voting behavior. However, Map "V0502" shows percent of 2000 population with educational attainment of college (associate) and above. It describes a more credible relationship, particularly with regard to the hot spot on the southwest side. Nonetheless, as Olson warns, education only describes 10% of variance. For this variable, the numerator is the **sum of male and female population 25 years and older who attained college and above** (SF3, Table P37, sum of columns 14 to 18, plus sum of columns 31 to 35).

METHODS

This investigation the usage of several kinds of computer software programs, primarily GIS. In sum, the chronology included testing of software; IRB approval; procurement of data; procurement of shapefiles; projection of shapefiles; query and

export of data; geo-coding data using street name address matching into spatial points; spatially joining data points into an ecological shapefile (polygons as ecological geographies; i.e., blocks, block groups); joining an ecological shapefile with socioeconomic variables using a common field, i.e. FIPS (Federal Information Processing Standard) code; analysis of data histogram to determine display criteria; display using symbolic color gradient; export map as scalable vector graphic (SVG or EPS); import into vector typesetter; create typeset map with legend; export as portable document format (PDF).

The process is explained, in detail, as follows: First, Institutional Review Board (IRB) approval was obtained. Next, voter data was obtained from both the Secretary of State of Missouri and the St. Louis City Board of Election Commissioners, for a reasonable flat fee. The data were imported into a database program. Unnecessary fields, such as voter name, year of birth, etc., were removed from the database to ensure confidentiality. The following fields were selected for geo-coding: street name (including block number), ZIP code, year of registration, elections participated. SQL queries were performed in order to export the data in such a way that was compatible with geo-coding. For example, the geo-coding engine required the input of a "streetname" field that includes address number, and the voter database is tabulated with separate fields for block number, street, and street type, then these three fields must be concatenated. Usually, the database software has ways to perform such operations. For the purpose of this study, the researcher performed the above task. Unfortunately, the geo-coding engine used did not utilize ZIP codes, which risks a slight inaccuracy for streets that have the exact same name in different places. Other SQL queries exported data only for voter records that voted in particular elections. A limitation in the data queries existed because the field "year of registration" was not utilized to exclude those who registered after the year 2000. This limitation will need to be avoided in future work to produce a more accurate version of maps that used year 2000 population data.

Shapefiles for the City of St. Louis were located in the Stupp GIS Laboratory in Saint Louis University. These files, when loaded into GIS software, identified spatial boundaries of a defined place. The shapefiles used for this study included Census blocks, Census block groups, place boundary, and water polygons (U.S. Bureau of the Census (2000, February). TIGER/Line Files, Redistricting Census 2000.) The street centerlines were TIGER/Line modified for better geo-coding accuracy by the St. Louis Development Corporation. The shapefiles were calibrated onto the same projection, otherwise they would not properly display. For instance, shapefiles provided by the U.S. Census Bureau might be projected differently than those from the City of St. Louis. GIS software has the ability to calibrate projections. The Census TIGER/Line files originally utilized geographic coordinates, decimal degrees: NAD83 (North American Datum, year 1983) for the 48 contiguous states. The street centerline file was different because it used NAD27 (North American Datum, year 1927). For the purpose of this project, all shapefiles were converted to projected coordinates, meters: WGS1984 (an ellipsoidal datum) UTM (Universal Transverse Mercator) Zone 15 North (which includes eastern Missouri).

GIS software has the ability to code individual points of data onto a geographic plane. This process is known as geo-coding. A person can either manually enter each street address or perform a macro operation that would geo-code all data. This is prone to some error due to spelling mistakes of streets; therefore, this process must be double-

checked or calibrated. The next step in the investigation required geo-coding the voter data. The GIS software had a geo-coding option that utilized two files types: the street centerline shapefile, and an exported database file (text-only, tab-delineated). In the effort to geo-code all registered voters in the City of St. Louis, a new shapefile was generated that contained at least 197,000 data points that were spatially arranged according to their street addresses.

By loading the data point shapefile on top of the ecological Census block shapefile, one can see how all of these voter records relate to each block. Next, these data points were merged with the ecological shapefile by performing a spatial join. This operation generates a new shapefile that contains the same information as a polygon shapefile with additional fields that describe calculations -- such as sum -- based on the spatial relationship from the data points. In other words, the data points virtually fall into polygons. In this study, the resulting shapefile not only displays the ecological polygons of Census blocks, but also contains the total number of registered voters who reside in each block.

The next step required calculating the percent of active voters in each block. It is necessary for the Census block polygons to contain relevant data such as total population. To add these data to the shapefile, the database file (DBF) that accompanies it was modified. By utilizing a common field that contains unique place identifiers (such as FIPS code), the ecological database file was joined with another DBF that was extracted from the U.S. Census Bureau. Once these files were joined, it was easy to append a data field to the ecological database file. Once the joining and appending operations were complete, additional fields reserved for particular calculations were created. For example, a census block in ward 19 of St. Louis City might turn out to have 20 active voters. Divide this number by the total persons eligible to vote, which might be 100. The resulting ratio would be 0.2, which means that 20% of the population contains active voters. From this, we can infer that 80% of the population contains non-voters.

Once the percentiles were available, histograms were created and utilized to determine how the numbers should be broken down and displayed on a map using a symbolic gradient color scale. For instance, it seemed sensible to show voter behavior in four symbolic colors, each representing a 25% increment. One can find tune the display by adding an additional color and representing 20% increments. At this point, the map should be helpful in describing voter behavior. Further steps can be taken to publish the map by exporting it as a vector file and typesetting it.

FINDINGS

The following research was conducted is in response to the three research questions. First, does targeted voter advocacy work? Observing clusters of non-voters and voters on the Census block level can assist voter advocacy organizations in their decisions to allocate their resources and canvassers. Second, does mapping particular variables, such as income, poverty status, age, race, and educational attainment help explain what affects voting behavior? While socioeconomic variables help explain voter behavior, especially in the southwest side of the City of St. Louis, Olsen's research provides insight in being more thorough and vigilant with regard to explaining variance in voting behavior. In other words, it is critical to not rely, solely, on socioeconomic maps. Other maps on neighborhood stability should be generated to help provide a more

comprehensive picture. Third, significant errors were found with regard to the Census block level maps on percentage of active voters. An examination of the "data errata" map reveals that there were at least five classifications of errors. The most prominent were the first classification, which involved Census blocks with active voting percentiles between 110%-150%. This meant that these blocks reported more active voters than voting age population. Possible explanations for this error could be derived from the following: (1) the inclusion of registrants for the years of 2001 through 2004, which should have been excluded because of comparing year 2000 population; (2) typographical and administrative errors in creation of voter records and inaccuracies in street centerlines (Tweedle, Ledbetter, & Johnson 2004); (3) mismatching street names because of lack of ZIP codes in geo-coding. During Olsen's study, he observed data errors in some places that observed voter turnout as over 100 percent. In one election, this occurred for 0.4 percent of the places. He attributed these errors from "bad data, errors in estimation, or differences in the time at which different data was collected by different sources" (1997: 86, footnote 7). Another classification of error, rather minor, was of stray geo-coded data points falling into uninhabited areas.

It is noteworthy to mention that the centralized database from the State was not utilized because a major portion of the database included voter records that stated their city of residence as "St. Louis" when in fact they did not live in the City of St. Louis. This error is attributed to a common cultural error for many people to equate the region with their city of residence.

CONCLUSION AND RECOMMENDATIONS FOR FURTHER RESEARCH

Regarding the source of voter data, in order to reduce inaccuracies, election authorities should consider what sources of voter addressing are most reliable. It may not be enough to rely on the voter to submit the correct address. Upon entering the voter record, the address should be checked against a reliable source such as Emergency 911 addresses (Tweedle, Ledbetter, & Johnson 2004; Waymack 2004).

In the pursuit of accuracy, the researcher should use election data that are of the same year as the other variables included in the analysis. For instance, the City of St. Louis Board of Election Commissioners database devotes a field to "date of registration," meaning that one could run a database query that removes records registered after a particular year. Unfortunately, this study neglected to perform this task in the interest of mapping behavior of voters during the recent Presidential primary election of February, 2004. If future maps, with the above correction implemented, still yield major errors, then research needs to be performed on the actual source of the data at the election authorities. Furthermore, it is interesting to note that most of the errors for the map in this study are concentrated on the north side of the city, where African-Americans predominantly live. That raises the question whether or not these errors are significant to that population.

For future mapping projects, it might be helpful to analyze other socioeconomic variables, such as median household income; median family income; other ages; other races; employment status; transportation use; housing occupancy status, etc. After examining the maps generated from this study, particularly the observations from the southwest side of the city, one might draw a simple conclusion that socioeconomic plays a large role in explaining voter behavior. However, there is even more work to be done.

If Olson's hypothesis applies to St. Louis City, then it is predicted that the southwest side should be highest in neighborhood stability, compared to the rest of the city. A person familiar with St. Louis will find this premise feasible, and it merits further study. Maps should be made to display homeownership and mobility.

The maps generated in this study help provide insight into voter behavior, and may be utilized by those who are ready to advocate for registration or mobilization in these communities. However, these groups must take Olson's (201) heed that voter mobilization "must have a grass-roots or social basis. Simply tinkering with registration or election procedures will not necessarily produce radical changes in patterns of participation in America." In order to solve the problem of nonparticipation, we must strengthen and stabilize the communities in which we live. As your wade through all the rhetoric of political campaigning, your ideologies fueling an ever-narrowing focus on goals, you must stand up to this challenge of engaging with the community. To do otherwise would be done in vain.

REFERENCES

Brehm, J. & Rahn, W. (1997). Individual-Level Evidence for the Causes and Consequences of Social Capital. *American Journal of Political Science*, Vol. 41, No. 3, 999-1023.

Burford, X. (2004, February 12). "Committed to the Core in 2004: Building Rolling Thunder." Metropolitan Congregations United for St. Louis (MCU). From Regionwise website: http://www.regionwise.org/main/showstory.asp?storyid=193 Also see Metropolitan Churches United (MCU), an interfaith, multi-racial community organization of 76 member congregations impacting more than 700,000 people. http://stlmcu.org

Day. J.C. & Gaither, A.L. (2000). Voting and Registration in the Election of November 1998, at 1 fig.1 & n.1 (U.S. Census Bureau, P20-523RV)

Conway, M.M. (2000). Political Participation in the United States 152 (3d ed.) at 7 tbl.I-I and Census Report, and Day & Gaither, at 1 fig.1.

Dreier, P., Mollenkopf, J., & Swanstrom, T. (2002). *Place matters: Metropolitics for the Twenty-First Century*. Lawrence: University Press of Kansas.

Farley, J.E. (2000). "Racial Housing Segregation in the St. Louis Metropolitan Area, 2000." Department of Sociology and Institute for Urban Research, Southern Illinois University: Edwardsville, Illinois.

Galbraith, John Kenneth. (1992). *The culture of contentment*. Boston : Houghton Mifflin Co.

Gaventa, J. (1980). *Power and Powerlessness: Quiescence and Rebellion in an Appalachian Valley.* Urbana, IL: University of Illinois Press.

Ginsberg, Benjamin. (1976). Critical Elections and Public Policy. *American Political Science Review,* 70: 41-49.

Hadley, A.T. (1978). *The Empty Polling Booth.* Englewood Cliffs, NJ: Prentice-Hall.

Huckfeldt, R., & Sprague, J. (1993). "Citizens, Contexts, and Politics." In *Political Science: The State of the Discipline II*. Ada W. Finifter. (Ed.) Washington, D.C.: American Political Science Association.

Jacobson, G.C. (2001). *The Politics of Congressional Elections*. (5th ed). Longman: New York.

Olson, D.G. (1997). Place Matters: Explaining turnout in New York City elections, 1988-1994. Thesis (Ph.D.)--State University of New York at Albany. 282p.

Putnam, Robert. (2000.) *Bowling Alone.* Simon & Schuster: New York.

Schneider, Pauline. (1996, October). Social barriers to voting. *Social Education*; Oct96, Vol. 60 Issue 6, p355, 3p.

Tweedle, J. Ledbetter, F. & Johnson, S. (2004). Madison & Monroe County HAVA GIS Pilot Results. Arkansas Geographic Information Office, Secretary of State Elections Division: Counties of Monroe and Madison, Arkansas.

Waymack, M. (2004, May 5). Press release: "New Technology Could Help Counties Better Manage Voter Information." Brinkley, AR. Retrieved May 9th, 2004, from: http://www.sos.arkansas.gov/news/pr/2004/050504.html

Winner, L. (1995.) "Chapter 4: Citizen virtues in a technological order." In *Technology and the Politics of Knowledge.* Feenberg, A., & Hannay, A. (Eds.) Indianapolis: Indiana University Press.

ACKNOWLEDGEMENTS

Thanks to Professor Todd Swanstrom for his mentorship and recommending the dissertation of David Olson, whom I also thank. Thanks to Professor Gary Higgs for allowing me to broaden my horizons in the Stupp GIS Lab, for which this paper and accompanying maps are products of the laboratory facilities. Thanks to Andrew Covey for making sure that I don't work too much. And thanks to Stacie Metz, my lovely editor.

APPENDIX

The maps generated for this study reside at: http://portfolio.seelenadel.net/gis/