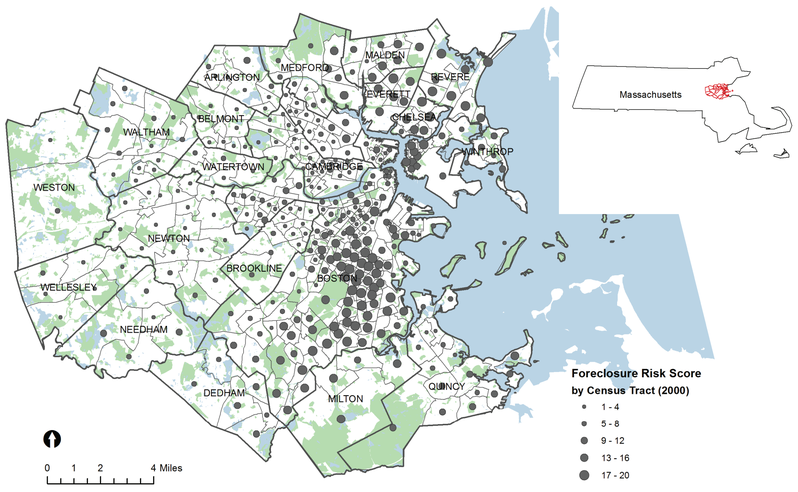
Home Foreclosure Risk in Greater Boston: a Search for Indicators

Foreclosure Risk Score



Project Overview

The recent housing market crash and foreclosure crisis that rocked the world beginning in 2007 continues to have major consequences in cities across the United States. Within U.S. cities today, some neighborhoods continue to show major foreclosure problems while other neighborhoods are nearly free of foreclosures. To address this pernicious problem, municipal governments have funded mortgage counseling programs and have also sued predatory lenders, with moderate success (Gilderbloom 2012).

Despite large amounts of research on the foreclosure crisis, a rich explanation of foreclosure variance across neighborhoods has only just begun to be elucidated. A clearer picture would be helpful for planners and policymakers alike, who struggle with addressing these issues. Using regression analysis, (Gilderbloom 2012) identified how changes in neighborhood walkability can be used to predict foreclosure levels to a modest degree. One study in Philadelphia performed a similar statistical analysis with the percent people of color acting as a rather robust predictor.

GIS has been a useful tool in this process, and some scholars have used it as a way to complement statistics with spatial patterns. For example, the Woodstock Institute performed a GIS foreclosure study, and they overlaid foreclosure points over a % resident of color vector dataset. The resulting map showed clear clusters of foreclosures in neighborhoods of color (Al-Kodmany 2012).

With the passing of the federal Home Mortgage Disclosure Act in 1975, foreclosure-related data has become readily available from financial institutions. The Neighborhood Stabilization Program (a division of the federal Department of Housing and Urban Development block grant program) was developed to fund neighborhoods in particular need of foreclosure-related resources. The NSP2 was a program in 2009 that compiled information on a neighborhood's level of need of foreclosure-related assistance. They created a need score, from 1 to 20, paying particular credence to factors such as the presence of current subprime loans and past foreclosures in the neighborhood.

Like many other cities, Boston area's low-income minority neighborhoods have been hit worst by the housing and foreclosure crisis. The main purpose of this project was to see how GIS tools can be used to explore Boston-area foreclosure issues.

Methodology

The approach to using regression analysis and cluster analysis to identify relationships with urban foreclosure rates and other factors has been utilized by a number of scholars (Al-Kodmany 2012). Tabular data of foreclosure risk, mean household income, and numbers of people who speak French Creole by census tract were joined with census tract polygon data in the Boston area. A new field was added to the resulting attribute table, and the Field Calculator was used to divide the Creole-speaking population by the total population in each census tract. The Zonal Statistics as Table tool was then used to bring canopy cover raster grid cells up into the census tract polygons, and that resulting mean canopy cover column was joined with the large attribute table.

One layer was reserved for showing foreclosure risk score by census tract using graduated circles. Three other layers were used to show quintiles for: mean canopy coverage, percent that speak French Creole, and median household income. Open Geoda 1.2.0 was then used to create a scatterplot of each of the three independent variables over the dependent variable (foreclosure risk score). Open GeoDa 1.2.0 was subsequently used to perform regression analysis on these variables.

Cartographer: Jesse Seamon
May 8th 2013 - UEP 232 - Tufts University
Urban + Environmental Policy + Planning

Projection: NAD 1983 StatePlane Massachusetts Mainland (Meter)

Data Sources: MassGIS (2000); U.S. HUD (2008); U.S. Census (2000); USDA National Agricultural Statistics Service (2000)

References:

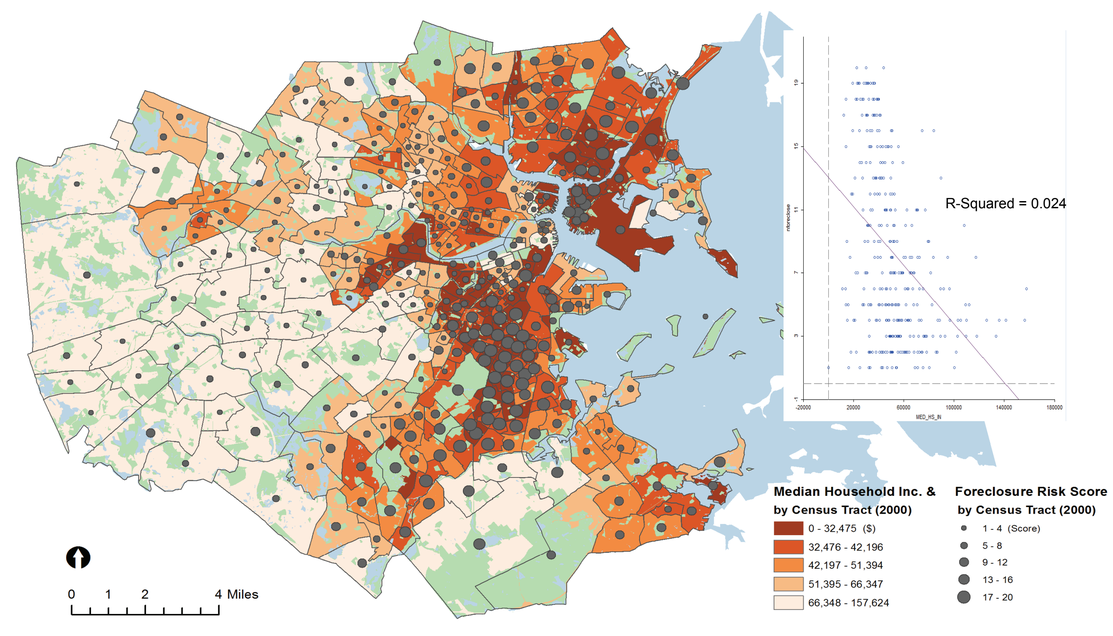
Al-Kodmany, Kheir (2012). Utilizing GIS in Nonprofit Organizations for Urban Planning Applications: Experience from the Field. *Journal of Geographic Information System*. (4) 279-297. doi:10.4236/jgis.2012.44034

Results

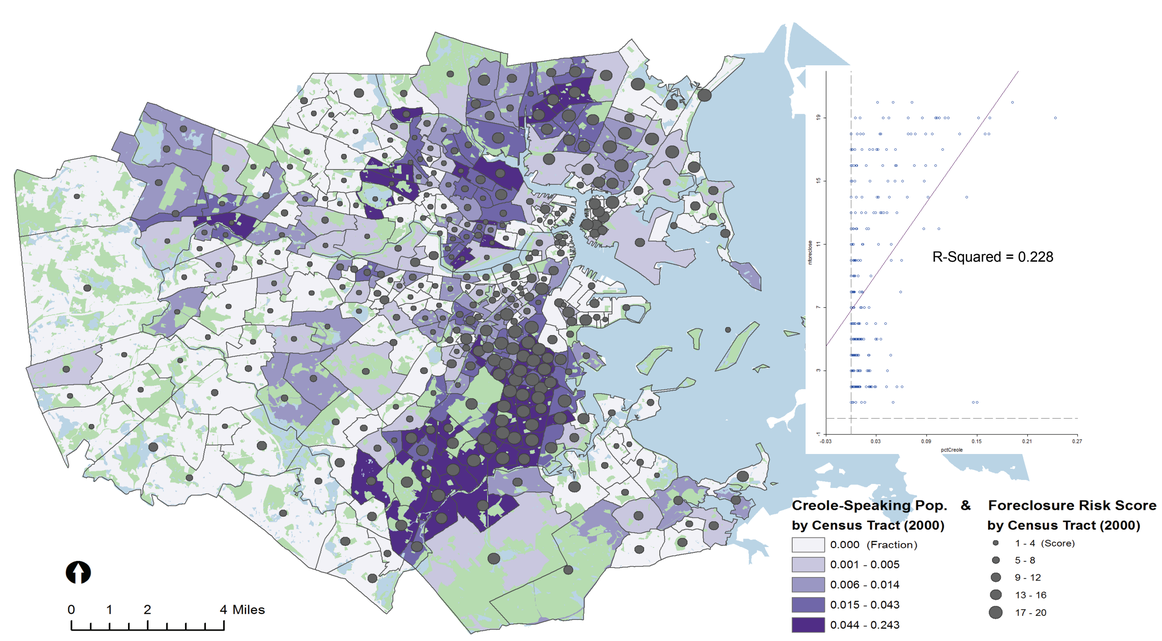
Visual analysis of the three maps below suggests that the Roxbury and Mattapan neighborhoods of Boston exhibit a clustering effect of all three independent variables with respect to the foreclosure risk score. In addition, East Boston as well as the towns of Everett and Revere may contain clustering in terms of household income and mean canopy coverage (also with respect to the foreclosure risk score).

The geographic relationship by Boston-area census tract between foreclosure risk score and the concentration of the French Creole-speaking population may be statistically significant, with an R-Square value of 0.228 from regression analysis (specific test: ordinary least squares estimation). However, household income and mean canopy cover revealed R-Squared values of 0.024 and 0.027 respectively, and thus lacking statistical significance. Implications for these relationships are inconclusive. Do they simply describe relationships between factors that are intrinsically linked through external factors, such as institutional racism? Or do they have greater explanatory power? In either case, this kind of analysis might be helpful to those working to improve foreclosure risk as Boston area residents continue to struggle with foreclosures.

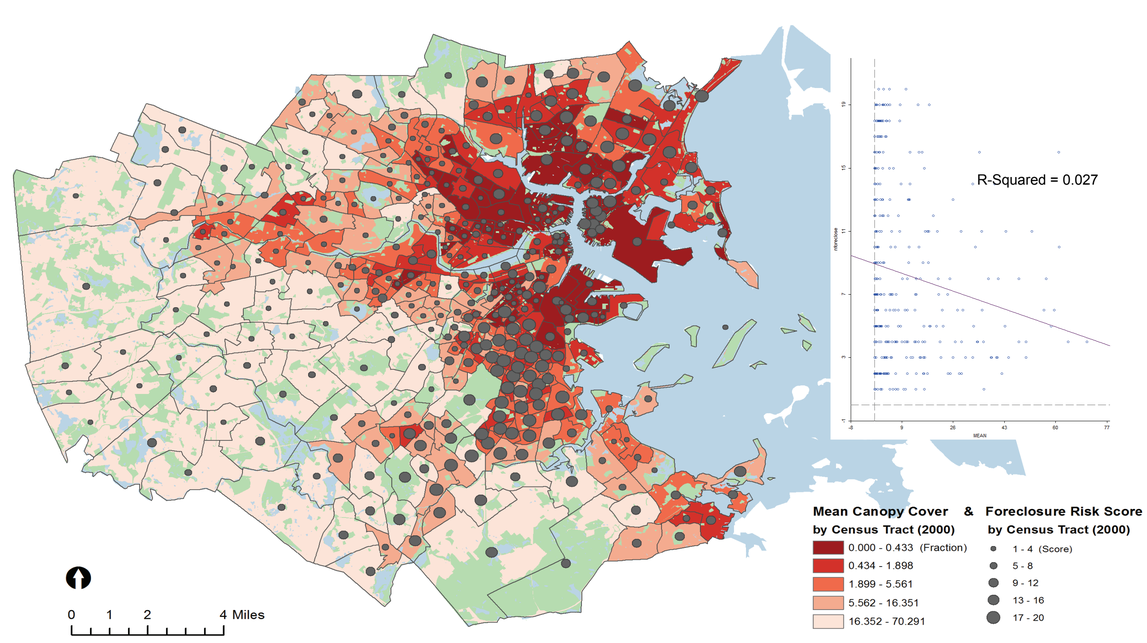
Household Income and Foreclosure Risk Score



Creole-Speaking Population and Foreclosure Risk Score



Mean Canopy Coverage and Foreclosure Risk Score



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Despite large amounts of research on the foreclosure crisis, a rich explanation of foreclosure variance across neighborhoods has only begun to be painted. A clearer picture would be helpful for planners and policymakers alike, who struggle with addressing these issues. Using statistics, (Gilderbloom 2012) identified how changes in neighborhood walkability can be used to predict foreclosure levels to a modest degree. One study in Philadelphia performed a similar statistical analysis with the percent people of color acting as a rather robust predictor.

GIS has been a useful tool in this process, and some scholars have used it as a way to complement statistics with spatial patterns. For example, the Woodstock Institute performed a GIS foreclosure study, and they overlaid foreclosure points over a % resident of color vector dataset. The resulting map showed clear clusters of foreclosures in neighborhoods of color (Al-Kodmany 2012).

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Research question: To what degree do the neighborhood factors of: 1. Mean Tree Canopy Coverage; 2. Concentration of Creole Speakers; and 3. Mean Household income significantly predict foreclosure variances?

Mean Canopy Coverage:

-The density of tree canopy per census tract, derived from a raster dataset produced by the USGS used high resolution orthographic images to estimate tree canopy density.

Concentration of Creole Speakers

-Number of people 18 years and older that speak French Creole. Taken from 2000 Census data by census tract, divided by total population per census tract.

Mean Household Income

-Median household income in 1999, includes renter and owners

Methodology

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Results

Although the main purpose of this project was simply to practice the GIS tools, the results should be mentioned here. Visual analysis of the three maps suggests that the Roxbury and Mattapan neighborhoods of Boston exhibit a clustering effect of all three independent variables around the foreclosure risk score. In addition, it appears as if East Boston, as well as the towns of Everett and Revere exhibit clustering in terms of household income and mean canopy coverage.

The geographic relationship by census tract between foreclosure risk score and the concentration of the French Creole-speaking population may be statistically significant, with an R-Square value of 0.228 from the regression analysis (ordinary least squares estimation). However, with household income and mean canopy cover, R-Squared values of 0.024 and 0.027 respectively suggest insignificance. Implications for these relationships are inconclusive. Do they simply describe relationships between factors that are intrinsically linked through external, institutionally-grounded factors such as racism? Or do they have greater explanatory power? In either case, this kind of analysis might be helpful to better determine spatial patterns in the aftermath of Boston's foreclosure crisis, and what might best be done about it.

References

Al-Kodmany, Kheir (2012). Utilizing GIS in Nonprofit Organizations for Urban Planning Applications: Experience from the Field. *Journal of Geographic Information System*. (4) 279-297. doi:10.4236/jgis.2012.44034

Gilderbloom, G.I. (2012). Investors: The Missing Piece in the foreclosure racial gap debate. *Journal of Urban Affairs*. 34 (5) 559-582. DOI: 10.1111/j.1467-9906.2012.00619.x

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Projection: NAD 1983 StatePlane Massachusetts Mainland (Meter)

Data Sources: Massachusetts Geographic Information Systems, United States Department of Housing and Urban Development, U.S. Census Bureau: 2000 Census, American Community Survey 2006-2010; U.S. NLCD