

Access to Open Space

In Belmont, Cambridge, and Somerville

Background

Green spaces in urban environments offer a variety of health benefits (Seltenrich, 2015). Spending time in green space has been shown to improve mental and physical health markers beyond the health benefits of exercise, including protecting eyesight and strengthening focus. In addition, green spaces help to protect the environment by reducing pollution.

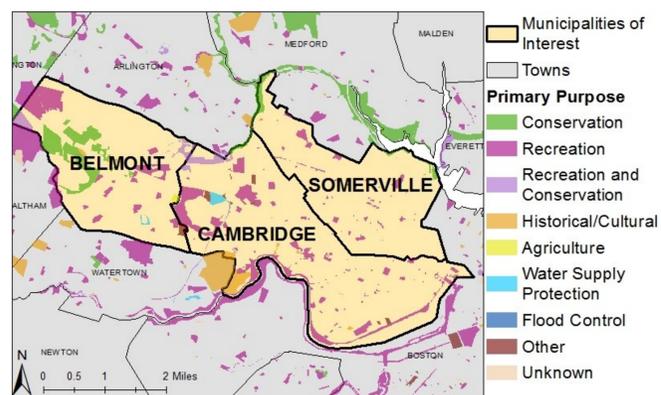
Previous work has found that closer proximity to these spaces correlates with increased levels of exercise (Coutts et al., 2013). In addition, researchers have found that efforts to expand these spaces without accounting for environmental justice factors may simply increase access for high-income populations (Ngom et al., 2016).

This project examines the availability of open spaces in Belmont, Cambridge, and Somerville, Massachusetts. It explores the impact of distance to open space of different types (e.g. recreation, conservation) on property value, a common measure of the worth owners assign to access (Payton et al., 2008). It also evaluates the relationship between access to open space and social determinants of health such as socioeconomic status to assess potential environmental justice concerns.

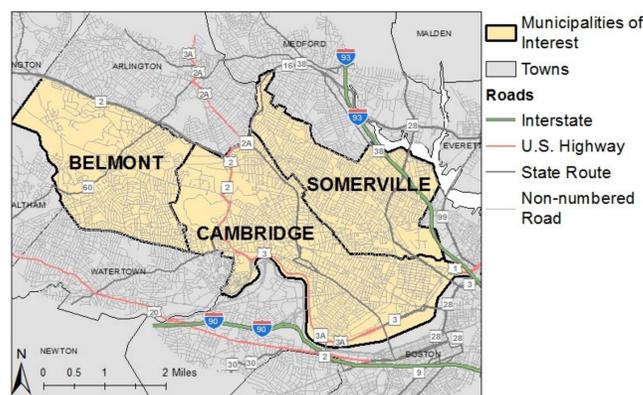
Analysis

Analysis focused on tax parcels in Belmont, Cambridge, and Somerville (Metropolitan Area Planning Council). Road networks and open space data (MassGIS) as well as demographic data (American Community Survey) were included for a 2000 meter buffer around the three municipalities to account for access to these facilities across municipal borders. Network analysis was conducted to calculate routes to the nearest open space centroid from each parcel centroid, as well as the nearest open space centroid of each type.

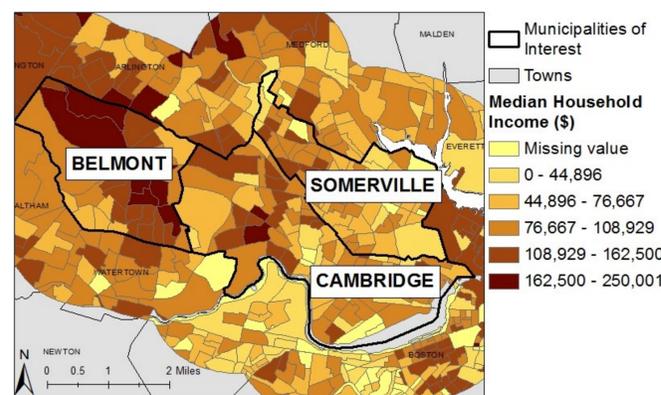
Regressions were conducted to analyze the relationship among tax parcel variables (e.g. number of rooms, year built), demographic data (e.g. income, race), and property value as measured by the natural log of sales price.



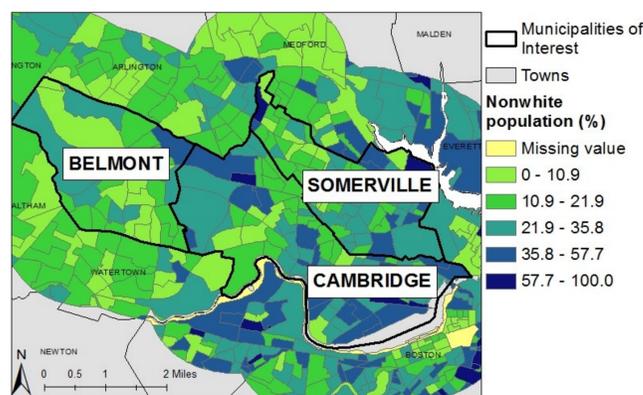
Open Space Types



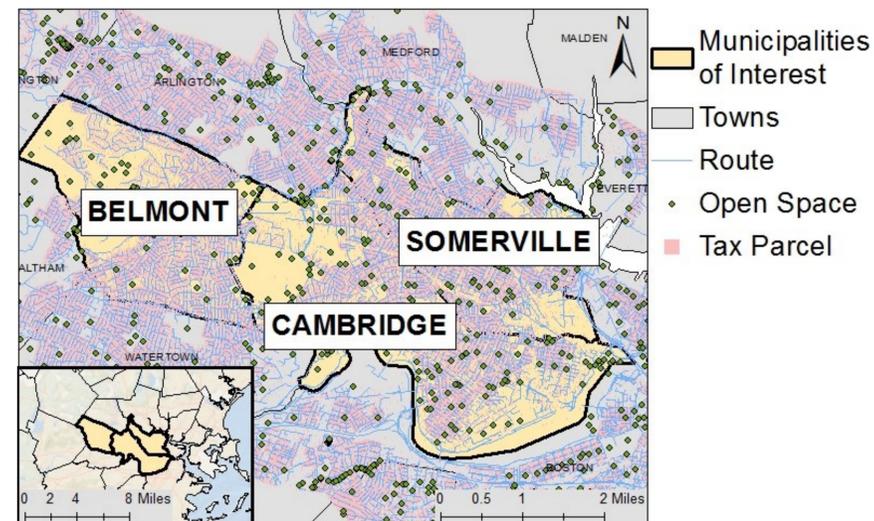
Roads



Income



Race



Routes to Nearest Open Space

Conclusion

Variable	Description	Coefficient
Tax Parcels		
Property value	natural log of last sale price	-0.530683*
Demographics		
Nonwhite race	% population	-1.42194*
Income	median household, \$	0.000867*
Employment	% employed age ≥16	-0.19325

Predictors of open space access

Outcome: distance to nearest centroid of open space. $R^2 = 0.06$
*P < 0.05

Overall, the predictors explored in these models account for very little variation in property value or open space access ($R^2 = 0.07$ and 0.06 respectively for data shown). Models were limited by averaging of census data for some parcels and removal of records with missing data. Some variables previously associated with property value were not available (e.g. number of bathrooms). Other environmental justice measures could be used (e.g. as access to indoor recreation). Future work could incorporate surveys or other data to examine the impact of demographic factors at the household level, as well as other information such as health status and physical activity.

Cayla Saret
May 2017 • GIS 102: Advanced Geographical Information Systems (GIS) • NAD 1983 Stateplane Massachusetts Mainland (FIPS 2001) • Lambert Conformal Conic Projection

References:
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Resources: American Community Survey 2015 5-Year Estimates • ESRI • MassGIS • Metropolitan Area Planning Council • U.S. Census 2010

Variable	Description	Coefficient
Tax Parcels		
Open space access	distance to nearest	-0.000723*
Residential size	area, sq ft	0.000011*
Rooms	number	0.026076
Lot area	sq ft	-0.000003
Building size	area, sq ft	-0.000017
Age	year built	0.005757
Demographics		
Nonwhite race	% population	0.005603
Income	median household, \$	0.000005*
Employment	% employed age ≥16	0.000338

Predictors of property value

Outcome: natural log of last sale price. $R^2 = 0.07$

*P < 0.05