The Dimensions of Displacement

Baseline Data for Managing Neighborhood Change in Somerville's Green Line Corridor

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Smart Growth & Regional Collaboration

The Metropolitan Area Planning Council (MAPC) is the regional planning agency serving the people who live and work in the 101 cities and towns of Metro Boston. Our mission is to promote smart growth and regional collaboration. We work toward sound municipal management, sustainable land use, protection of natural resources, efficient and affordable transportation, a diverse housing stock, public safety, economic development, an informed public, and equity and opportunity among people of all backgrounds.

For more information about the Green Line Extension Project, see the Massachusetts Department of Transportation's project-specific website at http://www.greenlineextension.org. To learn more about community members' involvement in shaping the project, visit the Somerville Community Corporation website at www.somervillecdc.org, or the Somerville Transportation Equity Partnership's (STEP) website at http://www.somervillestep.org/index.html.

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Executive Summary

The Green Line Extension through the City of Somerville will dramatically improve transit mobility for both residents and businesses. A trip to Boston that currently requires multiple transfers and modes will soon be possible with a "one-seat ride" on the Green Line, saving time, increasing the convenience of transit, and reducing auto reliance. New growth attracted to the Green Line corridor by this improved accessibility may expand housing opportunities, increase ridership and fare revenue, and bolster municipal finances with new tax revenue. However, previous experience in Somerville and across the country suggests that the creation of new transit service may result in unintended negative consequences if rising rents and land values cause the displacement of low-and moderate-income residents. Specifically, affected households may relocate to less-accessible areas where housing prices are lower but transportation costs are higher, and this movement of transit-dependent populations away from areas near stations may result in lower-than-anticipated ridership levels. Furthermore, widespread displacement would profoundly damage the city's social and cultural fabric.

It is also clear that the development and housing trends that contribute to these outcomes begin before construction even commences. In a city like Somerville, these trends may be influenced by many forces in addition to the new transit line. As a result, policies designed to counter the potential displacement effects of new transit must also be put in place well before the transit service begins, and should anticipate that the pace of real estate activity will only accelerate as the initiation of service approaches.

The Metropolitan Area Planning Council (MAPC) prepared this analysis in partnership with the City of Somerville, Somerville Community Corporation, Somerville Transportation Equity Partnership, Friends of the Community Path, and Massachusetts Smart Growth Alliance to illuminate the magnitude of displacement risk associated with the Green Line extension (GLX) in order to help focus action on the strategies with the best potential to mitigate that risk. The report first provides a baseline analysis establishing the current demographic and residential context into which the GLX is being introduced. The report then focuses on four mechanisms by which displacement can occur, and estimates the magnitude of displacement potential from each based on development patterns in comparable neighborhoods. An appendix supplements this analysis with details on modeling assumptions and calculations.

Our analysis suggests that higher rental costs and a shift from rental properties to condominiums will occur in the GLX corridor over the next ten to fifteen years. Interventions to mitigate the impacts of those changes on vulnerable populations are likely to have the greatest impact before the GLX is completed, and therefore must remain a primary focus for the next five years or more.

Key Findings

- **Increased overall housing production is critical to maintaining Somerville's affordability.** MAPC's population and housing demand projections anticipate demand for at least 6,300 housing units in the City of Somerville from 2010 to 2030, and as many as 9,000 units over the same period. Of this demand, about 35% of new units will be needed for low-income households, and the balance will be market-rate. If production lags substantially behind demand, prices may rise even more dramatically than they have over the past ten years, with the greatest pressure felt by low- and moderate-income households.

- **Increases in residential rents near new transit stations pose the greatest risk of displacement.** Transit-induced rent increases are projected to be highest around Ball Square, College Avenue, Route 16, Union Square, and Washington Street, where monthly rents could increase more than 25% and as much as 67%. Overall, we expect that 700 to 800 lower-income renter households will be forced to dedicate over 30% of their income to housing costs, and conditions will worsen for the 3,600 lower-income renters in the GLX corridor who are already housing cost-burdened.

- **Condominium conversion presents substantial risk of displacement in some station areas, but less so in others.** Conversion of single-owner two- and three-family homes to condominiums may impact as many as 475 renter households currently occupying those structures, with the greatest number of at-risk units in the Gilman Square, Washington Street, and Union Square station areas.

- **Nearly one twelfth of the city's designated affordable housing units are at risk of losing their affordability restrictions by 2020.** In the City of Somerville, there are 272 subsidized rental apartments that could be converted to market-rate housing before 2020, 8.4% of the city's total stock of designated affordable units. Unfortunately, nearly all of these units with expiring affordability restrictions are in GLX station areas where they will face great pressure for conversion to market rents. If real estate conditions heat up significantly with GLX construction, the prospect of converting expiring units to market rate will be even more enticing to owners.

- **Windfall increases in residential property values are likely to have a limited impact on tax bills or municipal tax receipts.** Average property values within walking distance of new T stations may increase 16% to 25% following the introduction of transit. It is possible that affected owners could see increases in their annual property tax bill in the range of $540 to $870, equivalent to less than 2% of the annual income for most of the 2,000 lower-income homeowners in Somerville. However, state law limits the annual increase in the city's total tax levy, and new commercial development following the introduction of transit may help to stabilize the tax base. Both factors will help determine the ultimate change in tax rates and revenue.

- **Somerville's highly mobile and increasingly diverse population could change rapidly even without displacement.** One in six Somerville residents moved to the city within the past year, and through this turnover the city continues to become more racially and ethnically diverse. If the characteristics of those newcomers change substantially, they could swiftly change the face of the city even if outmigration remains unchanged. Increased housing displacement would make that demographic transformation even more rapid.

In addition to the analysis summarized above, this report also presents a set of indicators that can be used to track how the City of Somerville and the GLX station areas change over the next decades as the new transit service becomes a reality. The indicators measure the city's demographic diversity, housing cost burden, auto ownership and usage, and livability. Most significantly, we present for the first time a set of indicators that seeks to distinguish between natural housing turnover and the displacement of households that wish to remain in Somerville, but can no longer afford to do so. These indicators can be tracked over time, in some cases on an annual basis, to help adjust public policies or identify where additional interventions are necessary.

MAPC will continue to work with community partners to help implement strategies to prevent and mitigate displacement. The agency has catalogued these strategies in a series of reports on Managing Neighborhood Change, available at http://www.mapc.org/neighborhood-change.

Introduction

The benefits of convenient and reliable public transportation are well documented. Access to high quality public transportation—services that are connected, frequent, and reliable—encourages walkable, mixed-use development, generates investment in neighborhoods, and connects residents to employment opportunities throughout a region. Employment access is particularly important in the Boston region, where 37% of jobs are located adjacent to T stations—an area that comprises only 5% of the region's land area.[1] The Green Line Extension (GLX) into Somerville and Medford, expected to open in 2017, will likely extend these benefits to neighborhoods and residents currently served only by conventional MBTA bus service.

Profound changes will almost certainly follow the introduction of new rail service in the GLX corridor. Improved access, upgraded streetscapes, and new development will make Somerville more attractive to a greater number of people, thereby increasing demand on the city's existing housing supply. Housing prices will rise on average as a consequence of this additional demand on the housing supply alone. Since housing turnover in Somerville is high (16% of residents lived in a different city or town a year ago),[2] the demographic makeup of the corridor may change rapidly if people moving out are increasingly replaced by higher income households. This effect will be accelerated if rising rents and property taxes in the corridor put pressure on lower-income residents who would otherwise prefer to remain in their homes—pressure that could result in a move to elsewhere in Somerville, or out of the city altogether. With its many new stations in a relatively small community, the GLX corridor project can be expected to affect land use and demographics in the city overall.

Real estate trends that make it harder for low-income households to move to or stay in Somerville can be cause for concern for several reasons. First, community engagement to date has demonstrated that the Somerville community values, and wishes to preserve, its demographic and socioeconomic diversity. Second, research demonstrates that having access to a range of transportation options helps people manage their transportation costs,[3] and displaced households may be forced to relocate to areas without such options. The households that tend to face the highest risk of displacement are those with lower incomes, that can least afford to have limited transportation options. Finally, the success of a transit system requires that it be used by a loyal set of "core riders," but those riders who use public transit most often for most kinds of trips are, again, precisely those who tend to face the highest risk of displacement.[4] Taking measures to mitigate displacement, in addition to measures to encourage higher-income individuals to rely on transit for more trips, therefore contributes to peak and off-peak ridership. This in turn helps maximize local economic and congestion-relief benefits, global environmental benefits, and the financial sustainability of the service itself.

The Somerville community's experience with Davis Square is a cautionary tale: a spike in demand for housing in the surrounding neighborhood following the opening of the new T station led to rapid increases in housing costs. Because of the dearth of adequate measures to mitigate displacement, the demographic makeup of the neighborhood changed quickly and dramatically. Median household

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[1] See MAPC 2012.
[2] ACS 2007-2011; statistic reflects population over one year old.
[3] See www.locationaffordability.info and www.htaindex.cnt.org
[4] See Pollack et al, 2010.

income in the neighborhood changed from $35,000 in 1990 to $56,000 in 2000, an increase of 60%. For comparison, the median income for the city overall only increased 43% over the same time period[5]. Currently, the median income of the tracts around Davis Square ranges from $82,000 to $92,000 dollars, while the median income for the city as a whole is only $64,000. Property values and rents in the Davis Square area experienced outsized increases as well, and as a result, the station area is more exclusive than the balance of the city. The community missed the opportunity to take measures that would have extended the benefits of the new station to a broader mix of existing residents, while at the same time ensuring the new stations remain accessible to the core riders it most needs.

As many cities across the country enjoy growing populations for the first time in decades, and as transit service in some of those cities expands to meet growing needs, communities like Somerville are learning how best to manage expected neighborhood change through policies that ensure a diversity of price points for residents of all income levels. A better understanding of the housing opportunities and challenges in areas targeted for a new transit investment is foundational to the development of appropriate policies, and the establishment of ways to track progress. This report is intended to assist Somerville decision makers and other stakeholders in that process.

The analysis examines the effect that the GLX will have on current residents of Somerville, focusing on displacement risks for lower-income residents in the corridor. We begin by looking at demographic and socioeconomic trends: how income levels, educational attainment, citizenship status, and race are changing. These trends provide a baseline against which post-GLX conditions can be compared. We analyze the most likely mechanisms through which current residents could be displaced: through rent increases, condominium conversions, the loss of subsidized housing units, and property tax increases. We forecast the increase in rents and property values around proposed GLX stations, and use data on current income and housing costs to estimate the number of renters and homeowners who may become burdened with high housing costs in comparison to their income level as a result of the GLX. We also estimate the number of condominium conversions that might take place, and provide data on the number and location of rent-restricted units that might to revert to market-rate rents due to deed restrictions that are set to expire in the near term. A companion report then proposes a set of indicators that could be used to track neighborhood change in ways that maintain focus on displacement mitigation.

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[5] Reconnecting America Center for Transit-Oriented Development, 2008

What is a Walkshed?

A key concept used in this analysis is the "walkshed." As used here, the walkshed is the area within a half-mile walking distance of a T station, taking into account the network of sidewalks and other pedestrian through-ways. A walkshed is therefore not a simple circle with a half-mile radius, but an irregular shape whose precise contour depends on the location of pedestrian routes. The walkshed around a particular T station is referred to by the name of the T station, e.g. the Lowell Street walkshed, and are drawn so that they do not overlap (locations within a half-mile of two stations are assigned to the station that is closer.) Somerville's station walksheds range in size from 400 to 4,200 households. The "GLX walkshed" represents the walksheds for all T stations along the GLX. The map below shows all Somerville station walksheds.

Walksheds
by MBTA Line & Station

A line walkshed is the half-mile walking network surrounding a transit line, such as the GLX Walkshed

A station walkshed is the half-mile walking network surrounding a transit station, such as the Davis Square station walkshed

STATION WALKSHEDS
- Green Line & GLX
- Orange Line
- Red Line

MBTA RAPID TRANSIT
- Proposed Stations
- Existing Stations
- Green Line Extension
- Existing Lines

MAPC 2013
Data Sources: MAPC Analysis, MassGIS

MAPC 50 YEARS
METROPOLITAN AREA PLANNING COUNCIL
SMART GROWTH AND REGIONAL COLLABORATION

Community Context

A City of Renters

In Somerville, fully two-thirds (67%) of households are renters, nearly half of whom (44%) experience *housing cost-burden*, meaning that they pay more than 30% of their gross household income on housing expenses.[6] This means that almost 9,000 households, one-third of the city, is housing cost-burdened even before the first yard of GLX track has been laid. The current burden of high area housing costs is even more pressing for many: of those 9,000 cost-burdened households, half pay more than 50% of their income on housing expenses, which the U.S. Department of Housing and Urban Development (HUD) defines as a *severe cost burden*.

The distribution of cost-burdened renter households is uneven, however. As shown in the chart below, the station walksheds with the largest number of cost-burdened households in Somerville are those around the Gilman Square, Davis, and Washington Street stations, which together are home to over 3,000 cost-burdened households. These walksheds don't have the largest *proportion* of cost-burdened households, however. That distinction belongs to the College Avenue, Sullivan Square, and Route 16 walksheds, relatively small areas in terms of population, which nonetheless contain more than 860 (10%) of Somerville's households considered to be housing cost-burdened.

Renter Housing Cost Burden By Household Income
by 1/2 Mile MBTA Walkshed

Data Source: American Community Survey 2007-2011 5-Year Estimates

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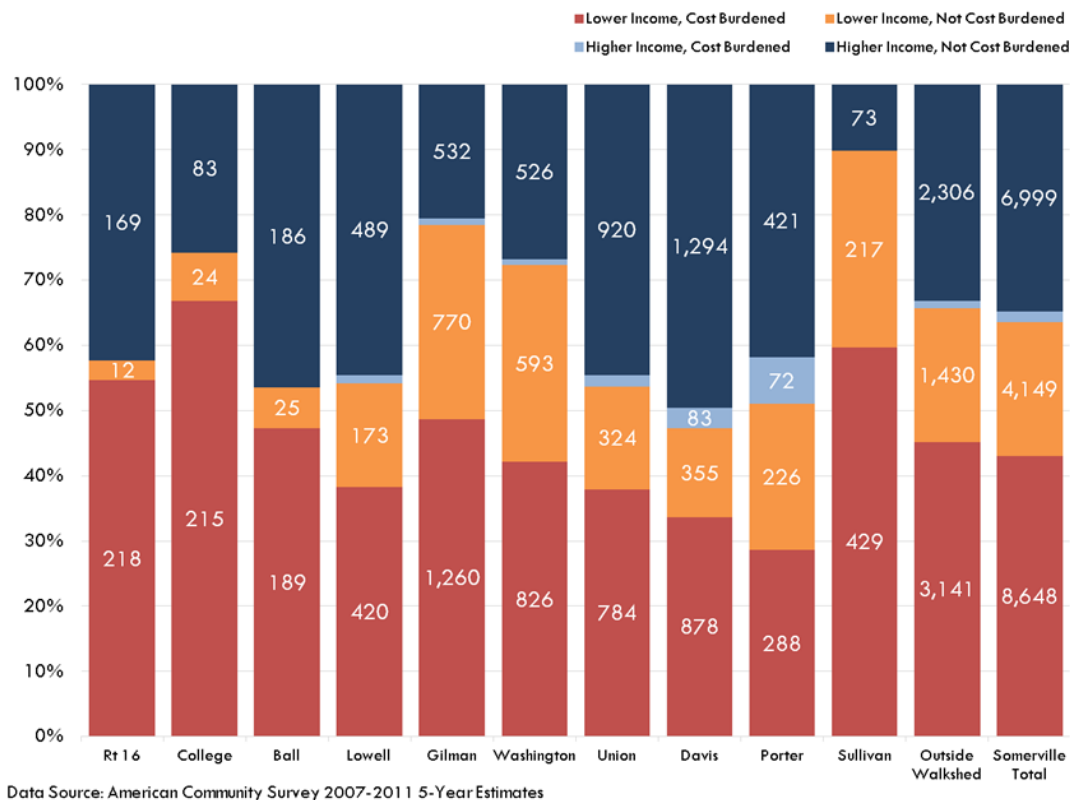
[6] See ACS 2007 – 2011, table B25070.

Housing cost burden is particularly troubling for lower-income households, which have less flexibility in their budgets to cover other basic needs and absorb life's contingencies. (For purposes of this analysis, we define "lower income" as a household of any size earning less than $75,000 per year).[7] Looking at each of Somerville's T station walksheds individually, as well as at the spaces in between (or those "outside walkshed"), we see that a) cost-burdened households are overwhelm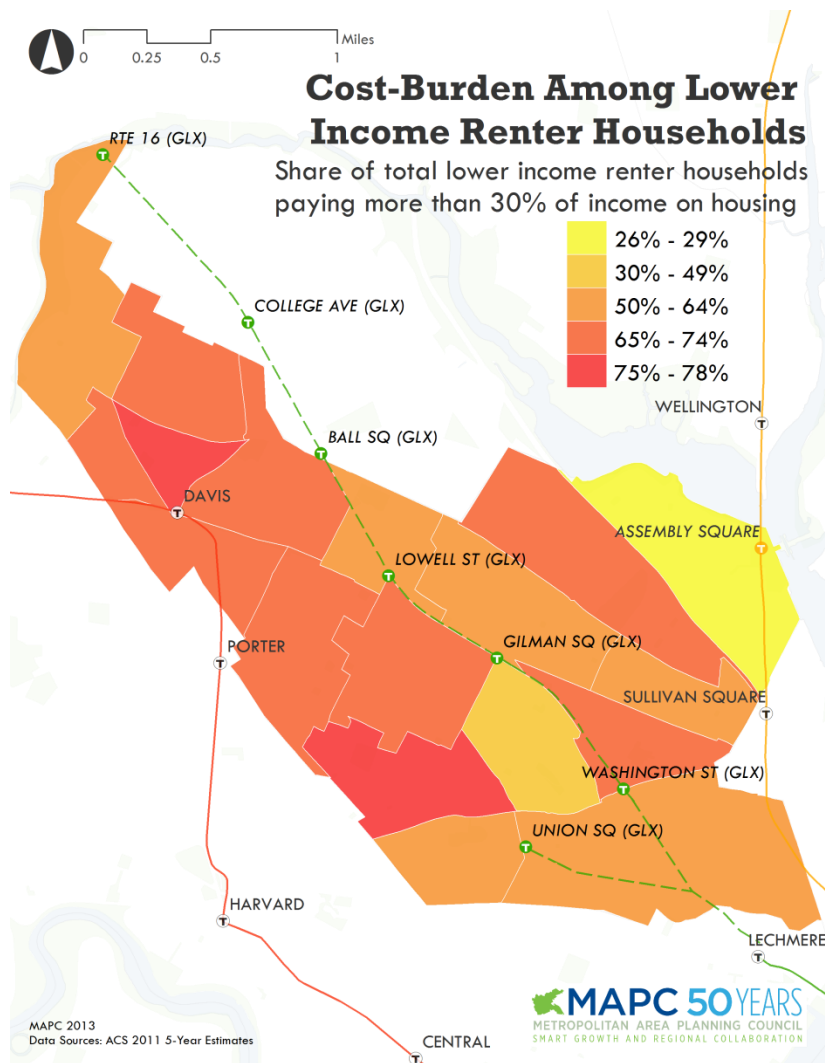ingly lower-income; b) a large to very large share of lower-income households in each area is cost-burdened; and c) higher-income households in each area are overwhelmingly *not* housing cost-burdened. Furthermore, census data show a clear disparity in household income between Somerville's renter- and owner-occupied households: median household income for owner-occupants is $89,200 while the median renter household earns $53,200.[8] We begin to see, therefore, that the threat of GLX-related displacement is likely to have the greatest impact on Somerville's renter households.

A closer look at renter households is provided on the map on the following page. It shows the distribution of cost-burdened, lower-income renter households. While 45% of renters overall are cost-burdened, the figure is approximately 68% for these lower-income households. Indeed, the inability to find affordable housing is almost uniquely a challenge at the lower end of the income scale: 96% of cost-burdened renters are lower-income households. In all but two census tracts in Somerville, more than half of renter households are cost-burdened, and in two tracts the share is nearly 80%. Tracts with more renters in general tend to also have the greatest number of cost-burdened renters. For example, see the tracts bordering I-93, the Spring Hill neighborhood between Gilman and Porter Squares, and West Somerville near Tufts University: together, these tracts comprise half of all the cost-burdened lower-income renters in the city. Clearly the strain of housing cost burdens is that much greater for a household earning closer to the median for renter households in Somerville ($53,231 per year).

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[7] HUD defines annual Low Income Limits based on a threshold of 80% of the area median household income for various household sizes. For a 3-person household in Somerville, the limit was $60,650 in 2011. The average household size in Somerville is 2.3 regardless of tenure, and the closest comparable income category in ACS data, on which much of this analysis is based, is $75,000. Our definition of "lower income" is therefore more expansive than strict HUD definition, and as a result our methods may slightly overstate the *number* of cost burdened Low Income households (by including some cost-burdened moderate income households in the count) while slightly underestimating the *rate* of cost burden (since the rate of cost burden is slightly lower for those moderate income households.) .
[8] Source: ACS 2007 – 2011, table B25119.

Cost-Burden Among Lower Income Renter Households

Share of total lower income renter households paying more than 30% of income on housing

- 26% - 29%
- 30% - 49%
- 50% - 64%
- 65% - 74%
- 75% - 78%

MAPC 2013
Data Sources: ACS 2011 5-Year Estimates

At this juncture, we examine whether and how the large student population in Somerville may affect interpretation of these data. A concentration of students in a particular neighborhood or small town can affect socioeconomic data because students typically have very little income to report. Furthermore, if the students' housing costs are absorbed by their parents or paid through student loans, students' reported housing costs could far outweigh their own reported income. Unfortunately, data limitations prevent us from removing students from the analysis of household income and housing cost burden. We attempt, then, to assess the degree to which the data may misrepresent housing cost burdens due to the presence of the student population.

Tufts University straddles the Somerville-Medford line and its 5,000-strong student population is a significant presence in Somerville. Third- and fourth-year undergraduates are allowed to live off campus, and many choose apartments in the areas around the College Avenue, Ball Square and Davis Square stations. There are also a number of graduate students at Tufts, some of whom choose to reside in Somerville, as well as students who attend other area schools while living in Somerville. The influence of the Tufts undergraduate population can be seen clearly on the map below, which shows

the student share of population in Somerville by census tract.[9] The census tract where the Tufts campus is located, at upper left, has by far the highest concentration of students at 57%. The student share of population in the city overall is 10%, while in census tracts along the GLX corridor the share varies from 1% to 10% of the population, i.e. at or below the city average.
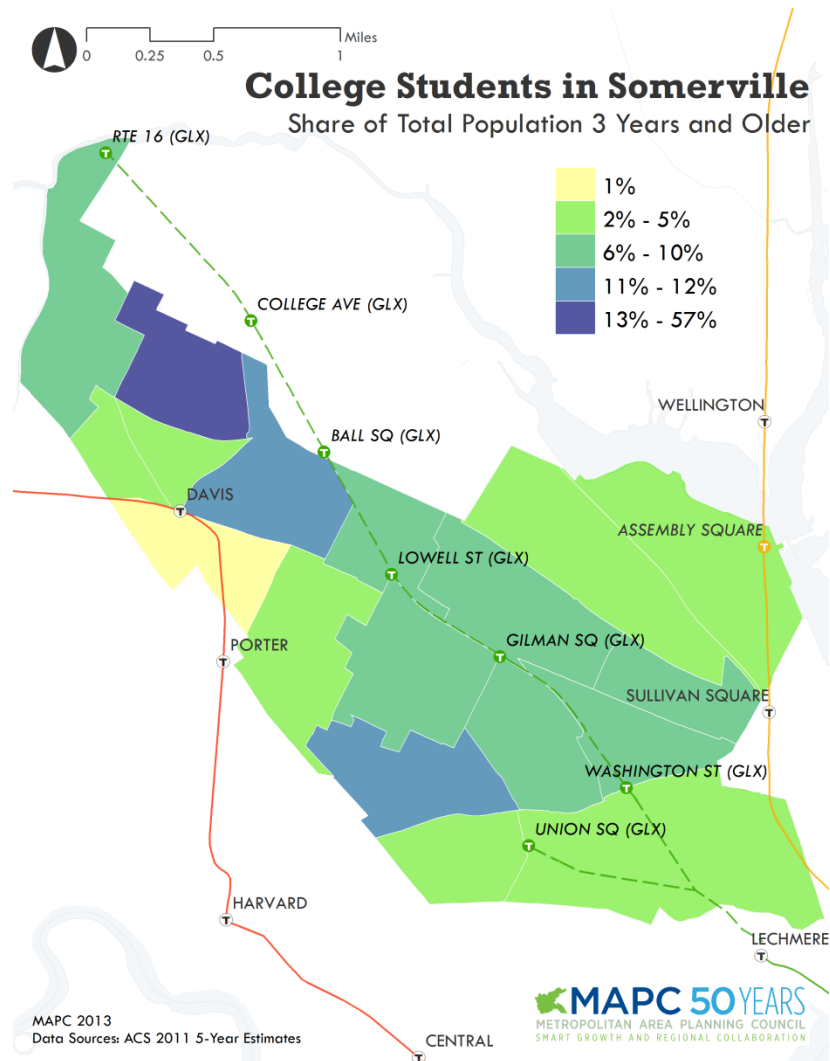
In the tract nearest Tufts University, the high proportion of students in the residential population may well skew income data downward and overstate the prevalence of housing cost-burdened households, but present less bias along the GLX as far as Lowell Street. Depending on what efforts are pursued to mitigate displacement along the GLX corridor, it may become necessary to evaluate this area further to refine the estimates of housing cost burden and, more broadly, to ensure that resources are appropriately expended to benefit target households in Somerville as a whole.

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[9] Reflects individuals above three years of age.

The Past as Potential Future: The Red Line

In this section, we compare income and housing costs in Red Line and GLX station walksheds, because we use data on Red Line development pressures to predict the effects of the GLX project.[10] While real estate development pressure and demographic trends in the GLX corridor may not follow exactly the same model as the Davis and Porter Square neighborhoods, the physical, municipal, and regional conditions are similar enough that it is likely to provide a useful analogue.

The Red and Green Line station walksheds , although similar in some key ways, show stark differences in household income patterns. The chart below shows that households within walking distance of Red Line stations have a distinctly higher income mix than Somerville as a whole, while households within walking distance of Green Line stations have an income mix that more closely resembles that of the city.

Household Income by Line Walkshed
2011 Dollars
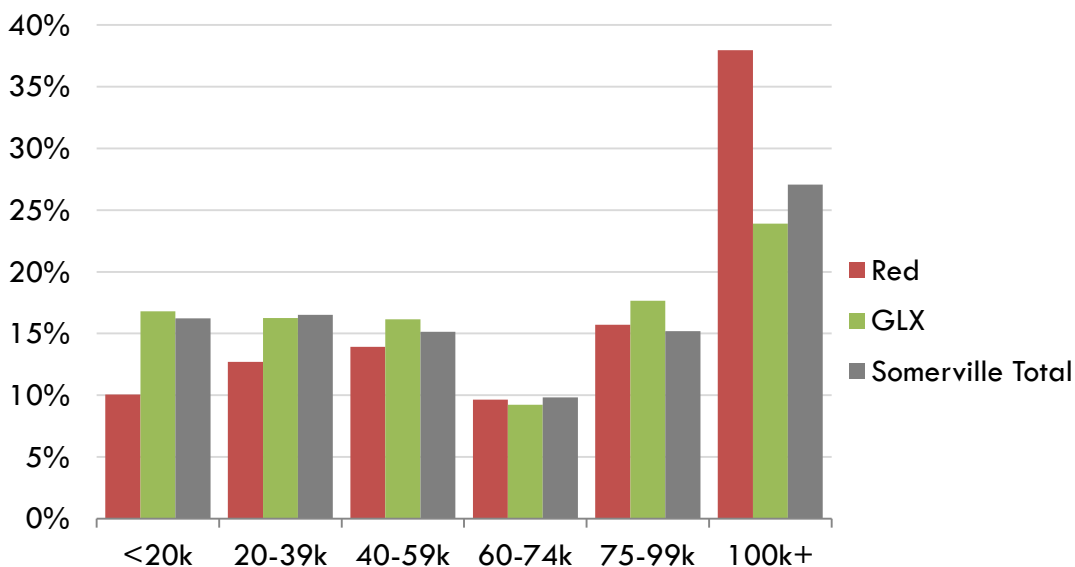
Data Source: American Community Survey 2007-2011 5-Year Estimates

We also observe that, although a significant share of households in the GLX walkshed earns $75,000 or more, those that earn less than $75,000 comprise nearly 60% of GLX walkshed households, and about one-third earn less than $40,000. If the GLX walkshed experiences demand pressure similar to that of the Red Line walkshed, it is reasonable to expect that its future income composition will begin to shift toward that of the Red Line walkshed via displacement. We turn next to an assessment of current housing costs in Somerville, with a focus on rental prices in selected walksheds, to better understand how these income profiles relate to the current market.

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[10] The Orange Line station areas are less useful for comparison because only the Sullivan Square walkshed extends into the city, yet is largely cut off from the surrounding neighborhoods and contains few housing units. The Assembly Square station is still in construction at the time of publication.

In order to develop a more detailed understanding of the rental market, MAPC analyzed data gathered by the website PadMapper, which collects rent prices from independent landlords and rental websites such as Craigslist, Oodle, RentalHomesPlus, Rent.com, and ApartmentFinder. The map below shows the location and rent level of each PadMapper datapoint, as well as average rental prices (per bedroom) by station walkshed.
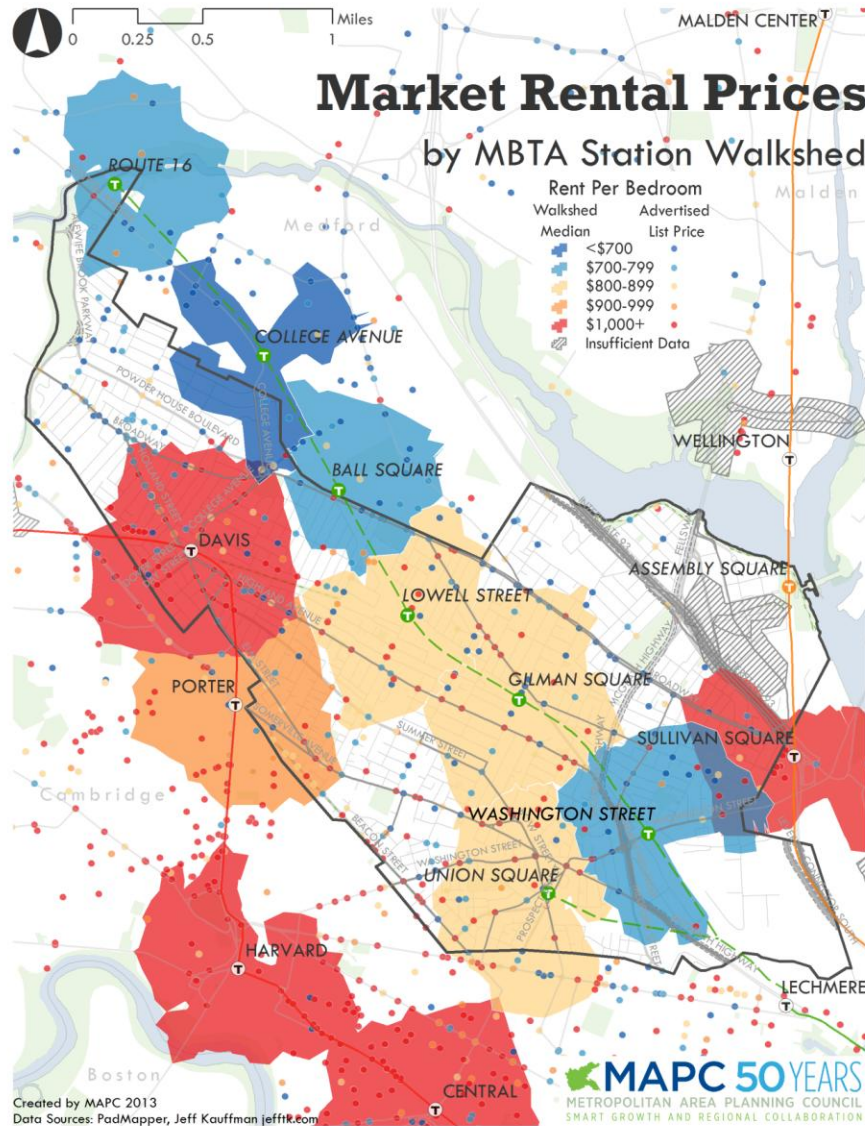
These data provides a different perspective on the housing market compared to the ACS data cited previously because it is more recent, offers a more fine-grained distinction in rent levels, particularly at the upper end of the rent spectrum; and reflects units that are actually available on the market for rent rather than all occupied units. For these reasons, PadMapper data give a more realistic (and, relative to ACS data, likely higher-cost) snapshot of rental prices from the viewpoint of a new resident looking for a place to live in 2013. The data shown on the map above were summarized from listings in June 2011 and January 2013. Prices are listed in advertised dollars per bedroom.

The bar chart below shows the distribution of rents in the walksheds around Somerville's Red Line stations (Porter and Davis Square), compared to existing rents in the walksheds around the proposed GLX stations. Currently, the GLX walkshed has more units available below $750 per bedroom (the approximate HUD affordability limit for a low-income family of three) and fewer units renting at the high end ($1,500 per bedroom or more). Subsequent sections of this report analyze what might happen to rents along the GLX if the rent profile becomes more like that of station walksheds along the Red Line.

Advertised Rent Per Bedroom
Davis/Porter (Top) and GLX Station Areas (Bottom)
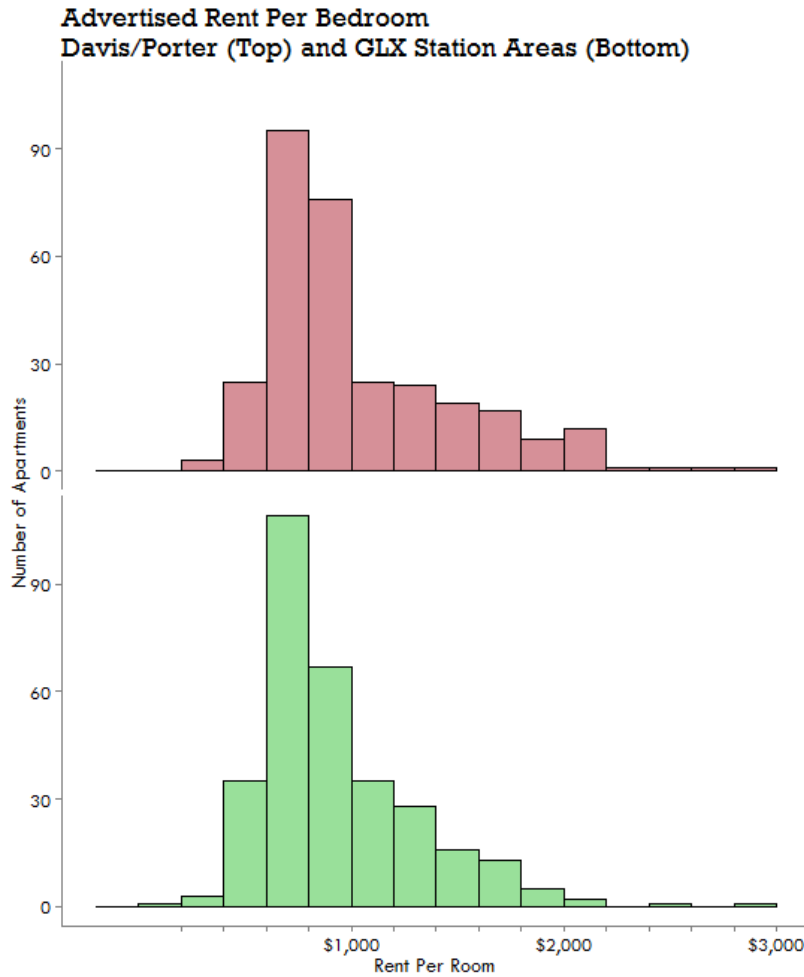
The graph below superimposes these two distributions of rents as smooth lines, with the reference point of the HUD affordability limit for a three-person household, and more clearly conveys the nature of the potential shift facing GLX neighborhoods.

Rent Distribution

1/2 Mile Station Area Walksheds
Somerville, MA
2011 and 2013

——	Red Line
——	Green Line (Proposed)

HUD Affordability Limit
For low income family of three

0      $500 $1,000 $1,500 $2,000

Monthly Rent Per Bedroom
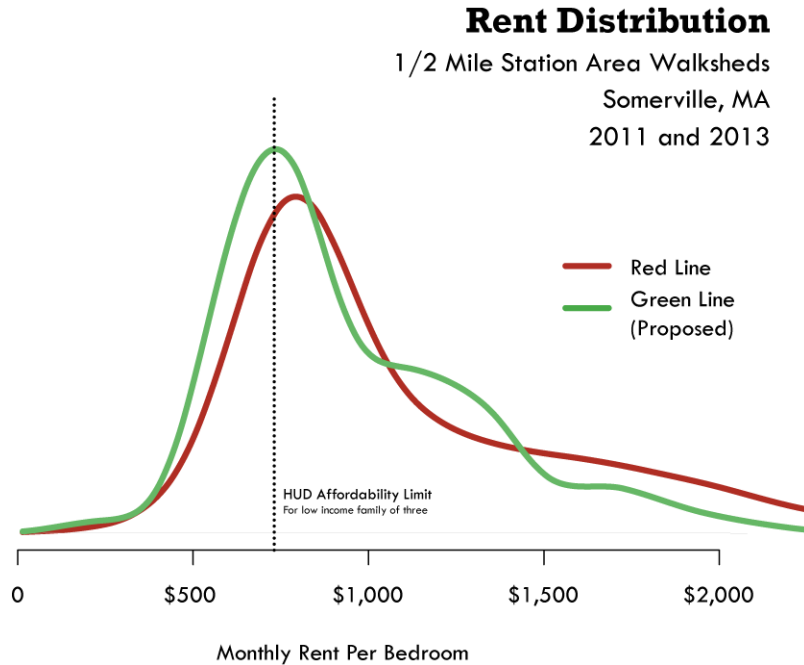
Combining this information on rents per bedroom and per unit with data on household size and income, we can generate a more meaningful assessment of rental market supply for various size requirements and income levels. To create the table below, MAPC calculated the number of advertised units that could accommodate a household of a given size and income, and divided by the total number of advertised units of that size to produce a percentage. The income levels Very Low and Low refer to households that make 50%, and 80% of Area Median Income (AMI), respectively, after adjusting for household size. The GLX walkshed clearly offers a larger supply of affordable units currently compared to the walksheds around Somerville's Red Line stations.

Percent of Apartments Affordable to Lower-Income Households		
Income Level	GLX	Davis/Porter
Very Low	14.1%	12.2%
Low	26.3%	16.5%
Source: Padmapper		

Migration and demographic change in Somerville

Gentrification is a pattern of neighborhood change in which a previously low-income neighborhood experiences reinvestment and revitalization, accompanied by increasing home values and/or rents. Gentrification, while frequently controversial, can be either good or bad for a neighborhood, depending on who benefits from the reinvestment and revitalization. Gentrification may or may not be associated with displacement, a pattern of change in which current residents are involuntarily forced to move out because they cannot afford to stay in the gentrified neighborhood. - Pollack, Bluestone, & Billingham (2010)

The definition above seeks to distinguish the phenomenon of gentrification from the displacement that sometimes accompanies it. However, displacement is not the sole mechanism driving demographic change in gentrifying neighborhoods, and must be evaluated as part of a more inclusive phenomenon—migration. Migration encompasses three distinct kinds of housing occupancy changes:

1. Turnover - natural turnover occurs in every city as people move in and out due to normal circumstances that may be largely unrelated to housing affordability. The demographics of in-migrants and out-migrants is similar, so the demographic composition of the overall population changes slowly, even as individuals and households come and go. The social cohesion of a community with high turnover may suffer even if residents are spared the pressures of displacement.

2. Replacement – replacement occurs when the number and composition of out-migrants does not change, but the people who move in have different demographics from those who left. Such a pattern indicates that current residents do not face pressure to leave, but those who do are replaced by residents who are different from the existing demographic profile.

3. Displacement – displacement occurs when out-migration exceeds the natural turnover rate because residents who otherwise would not consider moving feel pressure to do so due to changes in the cost and availability of housing. In-migrants are people who can afford a higher cost of living and tend to have a different demographic profile from those who moved out.

In this section we use three different sources of information to illuminate recent trends in migration as well as each of the three types of migration patterns described above, ultimately allowing us to isolate the effects of displacement.

Somerville's population is highly mobile. Approximately 23% of the city's population was living in a different home one year ago: 7% were in a different home Somerville, and 16% —almost one in six Somerville residents—lived in another city altogether. Census data indicate that the neighborhoods with the highest rate of turnover (above 30% annually) include parts of Davis Square, East Somerville, Spring Hill, and Cobble Hill.

This pattern of turnover is highly age-specific. Using a vital statistics approach, MAPC calculated net in-migration (arrivals outpacing departures) and out-migration (departures outpacing arrivals) for 18 different age cohorts over the two decades between 1990 and 2010. As shown below, the largest net annual in-migration to Somerville was among people aged 25- to 29-year-old at the end of the decade, whose arrivals offset departures by nearly 10,000 individuals over the course of the decade between 2000 and 2010, an increase of 25% from the net in-migration for the same age group in the prior decade. The next-largest source of

Geographic Mobility in the Past Year for Current Residents

Data Source: ACS 2007-2011
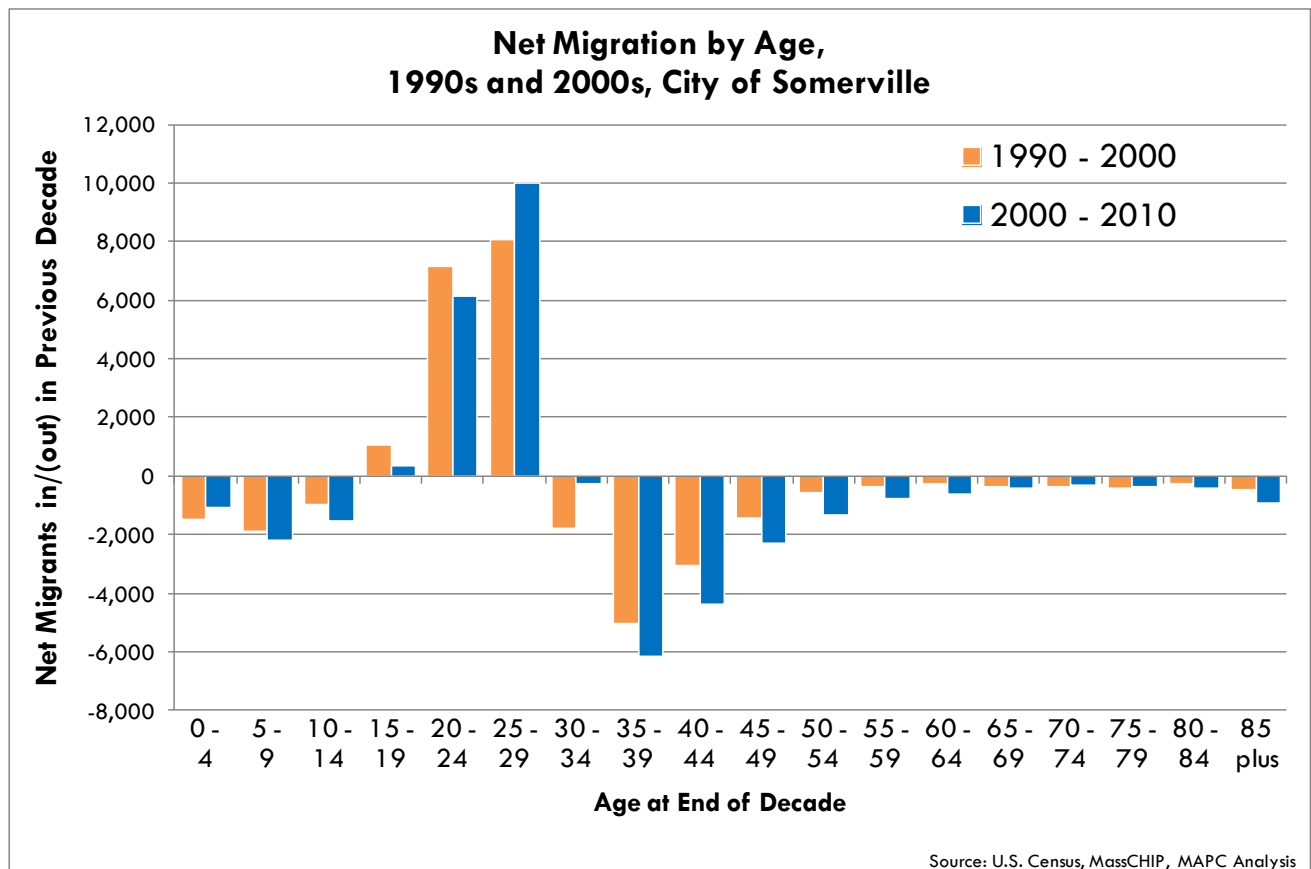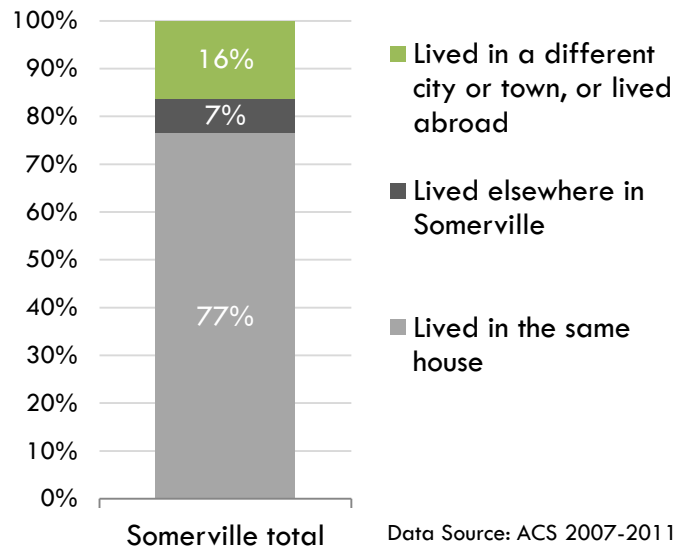
net in-migration was people age 20- to 24-years old in 2010, though this group saw a decline in net in-migration as compared to the previous decade. The two cohorts showing the largest net out-migration between 2000 and 2010 were those born between 1966 and 1975 (shown as 35- to 44-year-olds in 2010). Collectively well over 10,000 members of these two cohorts moved out of Somerville and were not replaced by their peers. Data from the 1990s indicate that this out-migration trend for this age group is increasing. The overwhelming pattern is one of significant net out-migration of school-age children, in-migration of college age students and young adults, and moderate to slow out-migration of people over the age of 25.

Shifts in the age composition of Somerville are only one place where the data tell a different story from common perceptions. Using data from the Public Use Microdata Sample (PUMS), MAPC has further estimated the composition of migrants in and out of Somerville by income, race, and nativity. While the PUMS data reflect a geographic area that also includes Everett (see sidebar next page), Somerville accounts for a sufficiently large share of that area to enable several important conclusions to be drawn from the series of charts on the subsequent pages.
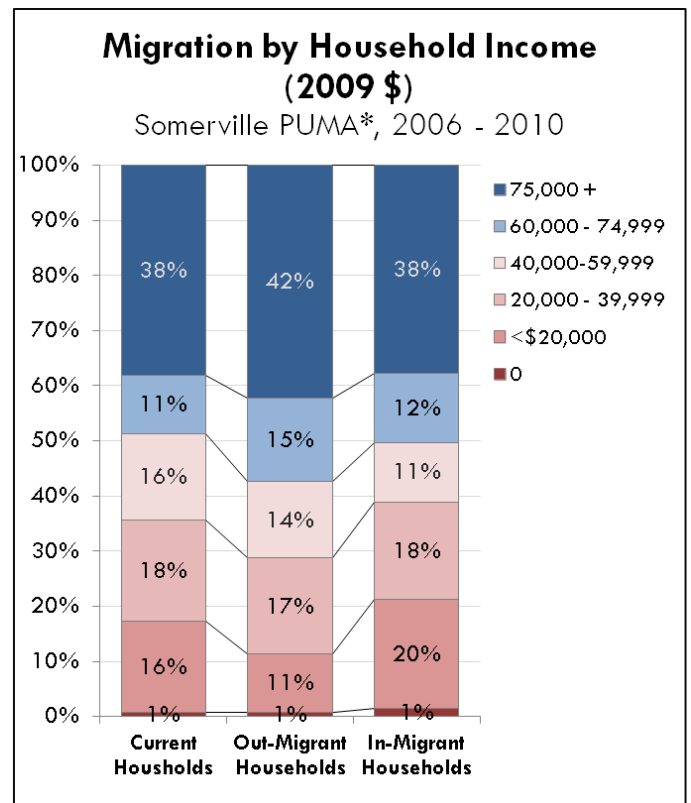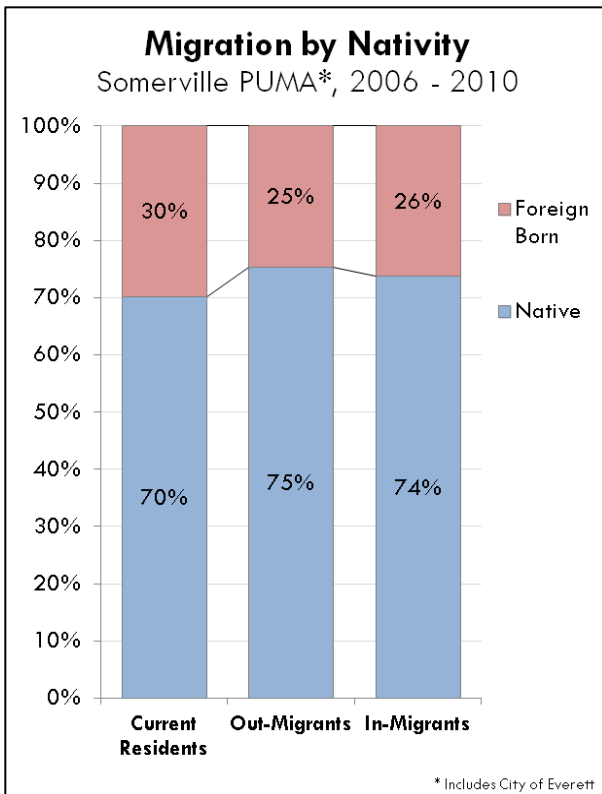
Our data show that migration into Somerville is not causing the city to become becoming wealthier and less-diverse, despite the widely-accepted conventional wisdom to the contrary. First, people in higher-income age groups are more likely to move out of Somerville, while those in lower-income age groups are more likely to migrate in to the city. PUMS data from the U.S. Census Bureau also corroborate the finding that residents over the age of 65 are moving out, but at a relatively slow rate. Second, Asian and Black residents are arriving faster than they are leaving, while White residents and those identifying as Other or Multi-racial are moving out, and Hispanics are remaining close to no net change. Third, the data show a fairly constant rate of in-migration and out-migration between native and foreign born residents. A net loss of foreign-born residents could have decreased GLX ridership, as recent immigrants tend to be core riders of public transit systems. Overall, then, the migration data indicate that, in-line with demographic trends since 1990, the city continues to become more racially diverse.

These data sources, while imperfect, help illuminate whether observed migration patterns reflect turnover, replacement, or displacement. Stability in demographic composition data would suggest that migration patterns can be attributed to *turnover*. If the data over time show changes in the demographic profile of net *in-migrants*, then the pattern is tending toward *replacement*. Finally, if the data over time were to show changes in the demographic profile of net *out-migrants*, then the pattern is tending toward *displacement*.

> **What do PUMS and PUMA mean?**
> PUMA stands for Public Use Microdata Area, a geographic boundary defined by the Census Bureau that contains a population of at least 100,000. The Census Bureau releases detailed demographic data, called the Public Use Microdata Sample (PUMS), at the PUMA level. This allows for more complex analysis than is possible with American Community Survey (ACS) records. Because Somerville's population is under the threshold for a PUMA (~75,000 for the 2007-2011 estimates), data for Somerville is combined with data for Everett (population ~40,000). This means that Everett accounts for about 35% of PUMS characteristics that are reported for the Somerville-Everett PUMA.

Migration by Age
Somerville PUMA*, 2006 - 2010

Legend:
- 65+
- 19-64
- 18 and Under

	Current Residents	Out-Migrants	In-Migrants
65+	10%	4%	2%
19-64	73%	83%	86%
18 and Under	17%	13%	12%

* Includes City of Everett

Migration by Race
Somerville PUMA*, 2006 - 2010

Legend:
- Asian
- Black
- Other
- Hispanic
- White

	Current Residents	Out-Migrants	In-Migrants
Asian	8%	9%	15%
Black	7%	8%	10%
Other	3%	7%	3%
Hispanic	12%	10%	9%
White	70%	67%	64%

* Includes City of Everett

Migration by Nativity
Somerville PUMA*, 2006 - 2010

Legend:
- Foreign Born
- Native

	Current Residents	Out-Migrants	In-Migrants
Foreign Born	30%	25%	26%
Native	70%	75%	74%

* Includes City of Everett

Migration by Household Income (2009 $)
Somerville PUMA*, 2006 - 2010

Legend:
- 75,000 +
- 60,000 - 74,999
- 40,000-59,999
- 20,000 - 39,999
- <$20,000
- 0

	Current Housholds	Out-Migrant Households	In-Migrant Households
75,000 +	38%	42%	38%
60,000 - 74,999	11%	15%	12%
40,000-59,999	16%	14%	11%
20,000 - 39,999	18%	17%	18%
<$20,000	16%	11%	20%
0	1%	1%	1%

Somerville is already more diverse than the region overall. People of color comprise 31% of the population in Somerville (11% Hispanic, 9% Asian, 7% Blacks, and 5% Multiracial or Other), compared to 28% of the MAPC region. However, racial diversity is markedly lower near Red Line stations, where residents of color make up only 16% of the walkshed population (4% Hispanic, 8% Asian, 2% Black, and 2% Multiracial or Other). Black and Hispanic Somerville residents largely reside east of the GLX corridor. The chart below shows Somerville's racial distribution by proximity to MBTA lines and the GLX. The distribution of the Asian population in the walksheds of the three different train lines matches their general representation in Somerville as a whole. Latino and Black residents, in contrast, are disproportionately located near Orange Line walksheds.

Race & Ethnicity in Somerville
Transit walksheds, city and region
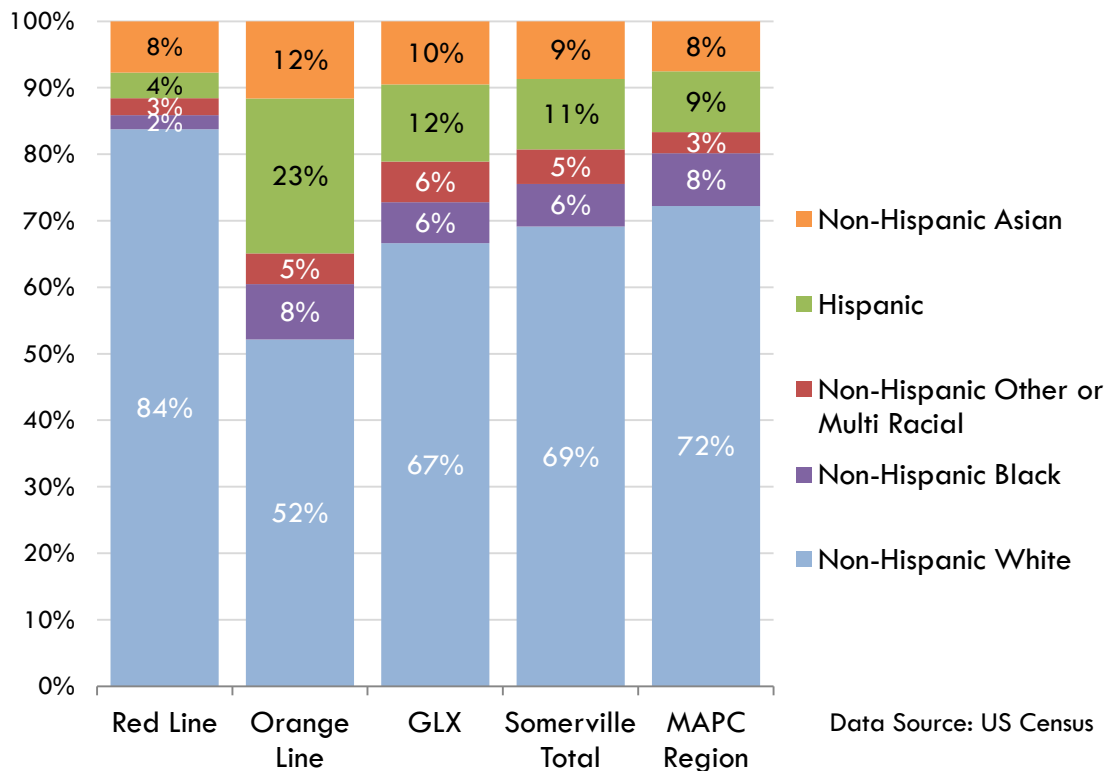
While members of different races and ethnicities are not evenly distributed across Somerville, the city continues to become more racially and ethnically diverse over time. as shown on the following page. The population of color (all Hispanic, Black, Asian, and other races) in the city grew by 2,200 from 2000 – to 2010, even as the city's population declined. As a result, the non-White share of the population grew from 27% to 31%, driven largely by growth in the Asian and Hispanic populations.

Somerville Population by Race & Ethnicity, 2000 - 2010

Percent of Total Population

	2000	2010
Asian	7%	9%
Hispanic	9%	11%
Other, two or more	5%	5%
Black, Non-Hispanic	6%	6%
White, Non-Hispanic	73%	69%
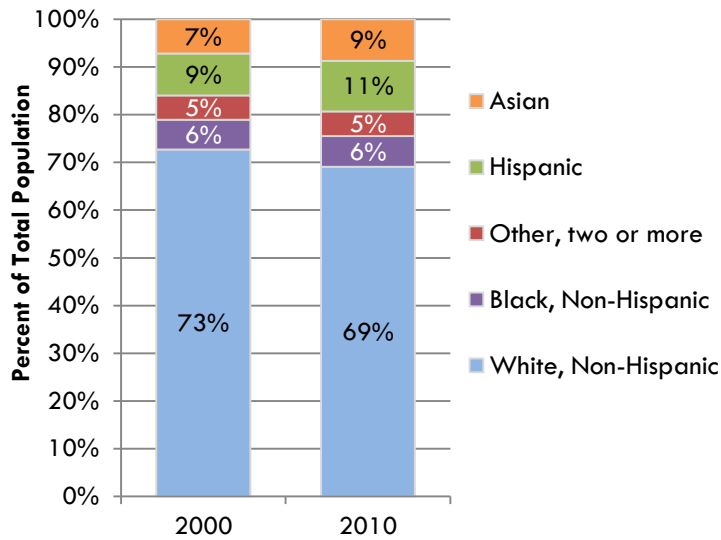
It is also clear, however, that the rate of racial and ethnic change has slowed considerably over the past ten years: the share of people of color in Somerville increased by 12% from 1980 to 1990 and again from 1990 to 2000. Growth slowed to 4% in the last decade, as seen in the line graph below. In comparison, the share of people of color in the MAPC region as a whole grew 6% over the same period. As a result, the racial and ethnic composition of the city increasingly resembles the region overall and is less like the rest of the Inner Core, which is predominately people of color.

Somerville's Population of Color
1980 to 2010

Percent Non-White

1980	1990	2000	2010
4%	16%	27%	31%
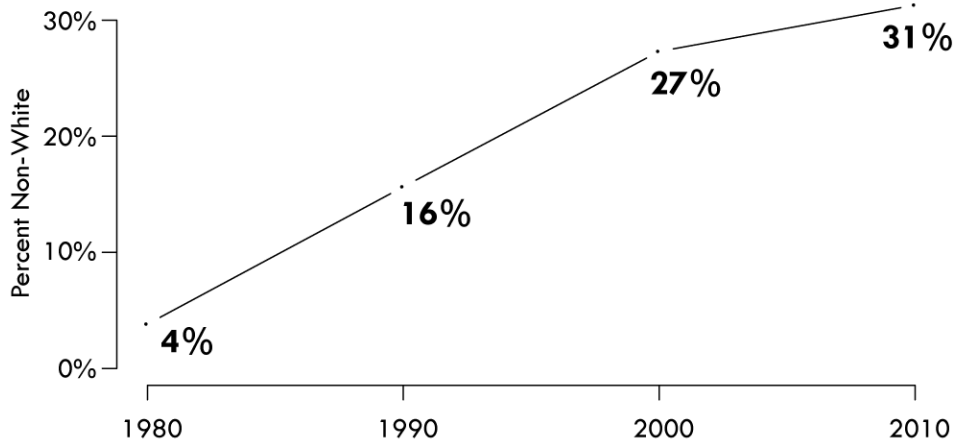
Source: Census 1980 - 2010

Future Housing Demand in Somerville

Even without the Green Line Extension, Somerville would need additional housing units over the coming decades to accommodate its growing population, decreasing household size, and changing housing preferences. MAPC has recently developed population and housing demand projections for each municipality in Metro Boston, based on current rates of fertility, mortality, migration, and housing occupancy, as well as assumptions about how those trends may change in the next 20 years[11].

While Somerville's population declined slightly from 2000 to 2010, we expect that the revitalization of the city and growing interest in urban living will cause the population to rebound over the next ten years, growing by at least 8% over each decade from 2010 to 2030 under a "Status Quo" scenario that assumes current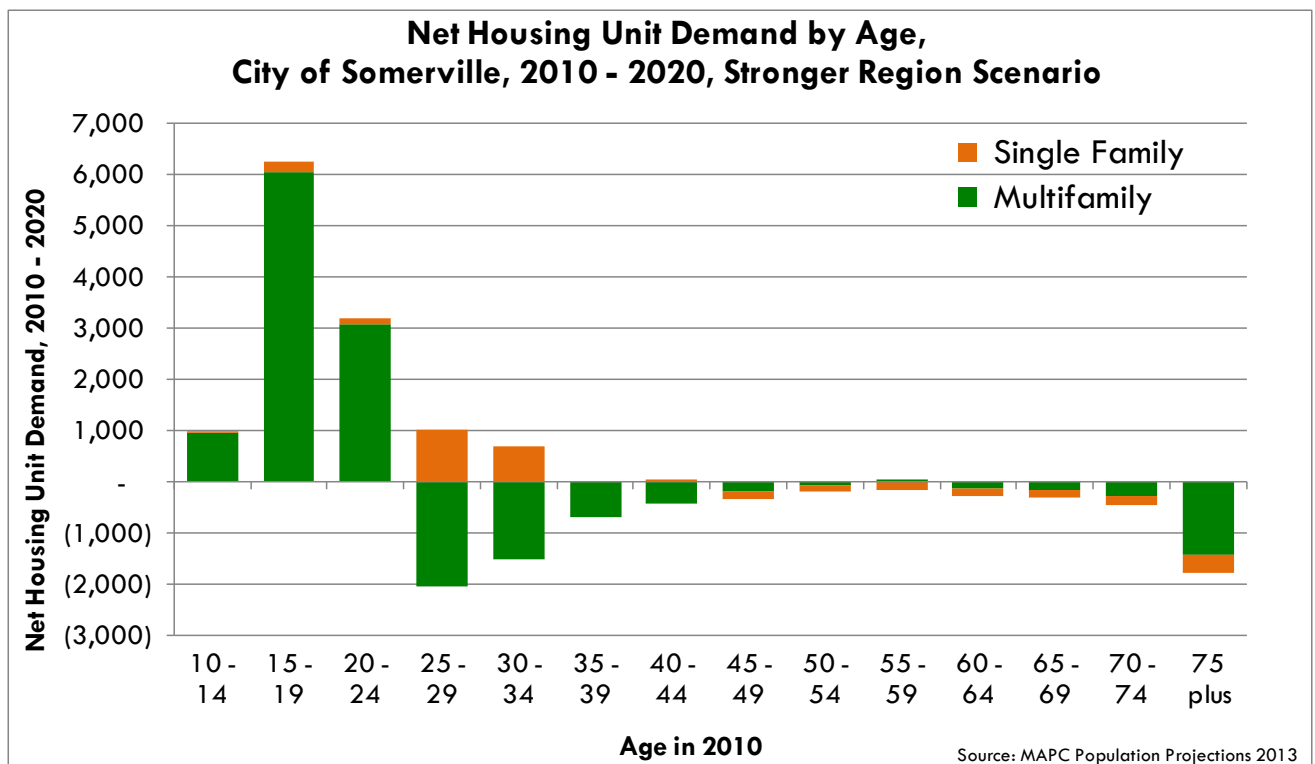 rates of migration and housing occupancy continue into the future. MAPC has also prepared a "Stronger Region" scenario that projects what will happen if the region is more successful at attracting and retaining young adults, and if more young families choose to remain in urban communities due to continued revitalization, improved schools, and expanded transit services. Under this scenario, Somerville may experience even more rapid growth, with population increases of nearly 25% by 2030.

Either way, the city will need a substantial supply of new housing to meet growing demand. The Status Quo scenario anticipates demand for at least 6,300 new housing units from 2010 to 2020 as new households seek to settle in the city. The Stronger Region scenario projects even greater demand: slightly more than 9,000 units. Under both scenarios, the vast majority of demand (75% to 80%) would be for multifamily housing, and about 55% of total demand would be for rental units. The chart below depicts the distribution of new demand across various age groups and housing types under the Stronger Region scenario. All net new demand can be attributed to cohorts who were under the age of 25 in 2010 and who will be forming new households or moving into the city over the coming years. Householders who were age 25 to 34 in 2010 will have transitioning housing needs over the coming decade: they will put 3,600 multifamily units back on the market as they move out of the city or move to single family homes. Most of the supply for single family homes will come from existing units that come back onto the market as older householders move out or pass away.

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[11] http://www.mapc.org/projections

**Net Housing Unit Demand by Age,
City of Somerville, 2010 - 2020, Stronger Region Scenario**

Source: MAPC Population Projections 2013

Additional production will also be needed to help stabilize the housing market in Somerville. In 2010, the vacancy rate for rental units in Somerville was only 3.9%. Many housing experts have adopted 7% as a target "natural vacancy" rate; vacancy rates below that level may indicate a very tight rental market where renters may have difficulty finding appropriate units or may be subject to escalating rents. In order to help reduce this observed shortage of vacant units, we project that the city may need to see production of up to 800 rental units over and above new housing demand in the coming decades. In contrast, the for-sale market in Somerville had vacancy rates of 1.7% in 2010, slightly higher than the commonly-accepted "natural vacancy" rate of 1.5%.

Our projections also indicate the housing demand in Somerville will be distributed across all income levels. Of the 4,700 new housing units needed over the coming decade, we project that 35% (1,600 units) will be needed for low-income households earning less than 80% of regional Area Median Income (AMI). Of those, nearly 500 will be very low income (30% to 50% of AMI) and 600 will be extremely low income (less than 30% of AMI.) Conversely, 65% of total demand over the next ten years—3,000 units under the Stronger Region scenario—will be for households earning 80% or more of AMI.

Two important conclusions can be drawn from these preliminary projections. First, there is a substantial need for subsidized housing production, with as many as 1,600 new affordable units needed to accommodate new low-income households. Second, there is growing demand for market-rate housing; if this demand is not satisfied by new construction, moderate and high-income households moving to Somerville will be more reliant on the existing housing stock, resulting in increasing rents and condominium conversions described a subsequent section of this report.

Implications for Displacement Analysis

The baseline analysis above indicates that the largest share of displacement risk is likely to be found among renters because they comprise the vast majority of the city's households, and a large proportion of renters are lower-income. The projections therefore largely focus on investigating and quantifying the major ways renters get priced out of a market: they can be displaced by other, higher-income renters as rents rise in unrestricted units; they can be forced to leave a deed-restricted unit as its term of affordability expires; or they can be displaced by new homeowners if the owner decides to convert a multi-family building to condominiums. The displacement risk faced by current homeowners is considered as well, both in terms of the increased tax burden they may face and the increase in equity they may find desirable.

Further, users of these analyses and projections should keep in mind the realities of Somerville's existing affordability challenge. To this end, projected cost pressures are broken out by income level in recognition that such increases are disproportionately painful at lower rungs on the income ladder. Also, the report emphasizes that the new cost burdens projected here do not comprise the extent of the affordability challenge, but rather the latest chapter of that challenge in a city with a large share of cost-burdened households. Effectively addressing this new challenge requires acceptance of the fact that more—probably many more—moderate- and high-income households will be looking to move to Somerville over the coming years. If much of this new demand can be met with new construction, and if it can be harnessed to create additional subsidized units, it will help reduce the pressure on the existing stock. If however, new construction is significantly curtailed by local opposition resulting from concern about neighborhood change, then new households will increasingly occupy the existing stock, resulting in rent increases and condominium conversions that have the greatest potential to displace existing residents, as described in the following section.

GLX Displacement Risks & Potential Magnitude

Displacement occurs where disruptive neighborhood changes, such as increases in rent and property taxes, intersect with vulnerable populations. In this portion of the report we estimate the potential for the GLX to drive certain neighborhood changes and the size of vulnerable populations, such as lower-income renters and homeowners. We can then apply some reasonable assumptions as to the number of households who will be actually be displaced or burdened by GLX-related neighborhood changes. Our analysis is based in large part on the changes that have occurred around the Davis and Porter stops since they opened in 1984. We have not specified a time period for the estimated change in rents and property values, but we expect that the change will be more rapid than previously observed, perhaps achieving the projected levels within ten years after the GLX service begins.

The table below outlines four potential drivers of displacement related to the GLX, the residents most likely to be displaced, and indicators that can be used to monitor both the relative force of the drivers and their specific impact on residents over time.

Displacement Risks		
Driver	Vulnerable population	Estimate
Rent Increases	Lower- income renters who are cost-burdened or severely cost-burdened	Number of lower-income renter households who are not cost-burdened as of 2013 but will become cost-burdened as a result of rent increases near GLX stops.
Condominium Conversion	Lower-income renters who are cost-burdened or severely cost-burdened	Number of anticipated condominium conversions near GLX stops.
Expiration of Affordability Deed Restrictions	Renters living in rent restricted units that may be converted to market rate rents after the affordability restriction expires	Number of privately-owned, project-based affordable units in Somerville and in GLX walksheds that are set to expire by 2020 and 2025
Property Tax Increases	Lower- and fixed-income owner-occupants who do not own rental property	Estimated increase in the average assessed value of residential properties within GLX half-mile walksheds.

Broadly, we calculated potential rent increases by projecting rent premiums at GLX stations based on their current rent premiums and those of existing, nearby MBTA stations. Income data were used to assess the number of current residents who would become rent-burdened as a result. Similarly, the potential for condominium conversions was estimated using data on the historical experience in nearby station walksheds, and data on the current housing stock in GLX station walksheds. Geo-coded data on deed-restricted affordable units provided the required snapshot of units set to expire in the near future, and the analysis of property tax increases was based on the methodology used to analyze rent increases, i.e. by calculating the increase in property values experienced in comparable station walksheds and examining the resulting increase in property taxes as a share of income for lower-income groups.

Displacement Risk # 1: Rising Rents

As demonstrated in the Community Context section above, Somerville contains a substantial number of cost-burdened renters, many of whom have little capacity to absorb additional rent increases. Among all renter households in Somerville, 44% and 22% are cost-burdened and severely cost-burdened, respectively. Among renter households who make less than $75,000 per year, fully 67% are cost-burdened. Potential rent increases in GLX walksheds are therefore of primary concern.

We project rent increases by comparing current rent premiums at GLX stations to rent premiums at existing, nearby MBTA stations. (The rent premium is the ratio of station walkshed mean rent to mean rent more than ½ mile from the station.) Projections are based on two models. The first is a weight-average approach that accounts for small sample sizes around some stations. The second uses a linear model to control for other neighborhood characteristics that may impact rental prices. Finally, we calculate the expected rent levels in the GLX station areas based on the expected premiums, and assess the number of current residents who would become rent-burdened as a result. We focus this section on presenting findings. Technical details are available in the Appendix.

Estimating Rent Premiums at Existing Stations

Rent premiums vary widely among the neighborhoods that surround stations. Among the 12 stations north of the Charles River in Cambridge, Somerville, Medford, or Malden, seven have positive and statistically significant rent premiums, a rate over seven times higher than for the system overall. This means the GLX stations will be located between the two lines that most consistently generate significant, positive rent premiums. This means that the GLX walksheds are themselves likely to see significant premiums, and also that using these sampled station walksheds is appropriate for estimating rent premiums in the GLX walksheds.

Assuming that GLX premiums will eventually achieve parity with those at existing, nearby stations, we use existing premiums to estimate rent increases near GLX stations. Using one method, the overall rent premium at existing MBTA stations in Cambridge, Somerville, Medford, and Malden is $350, or 29%. Using another method, the premium estimate is $241, or 20%. (Both methods are described in detail in the Appendix.) Premiums vary considerably among individual stations walksheds, with a high of 1.78 at Alewife to a low of 0.73 at Oak Grove; however, the clear trend is toward positive premiums.

Estimating Rent Premiums at GLX Stations

Next we estimate rent premiums for each GLX station separately. As above, the premiums vary considerably among individual station walksheds. The highest rent premium is in the Lowell St. walkshed (1.18-1.22, depending on the method used), which means renters near the future Lowell Street station are already paying relatively more than their counterparts more distant from that station. The lowest rent premium is in the Washington St. walkshed (0.72-0.80, depending on the method used).

Projecting Rent Increases

Projected rent increases in each GLX walkshed are calculated as the ratio of the average premium among the twelve existing station walksheds currently (those in Cambridge, Somerville, Malden, and Medford), to the current premium at each proposed GLX station walkshed. Premiums in proposed GLX

walksheds are assumed to not increase further if they are already in excess of those in existing station walksheds. This approach results in two estimates of rent increases that correspond to the methods used to estimate rent premiums above. For each station, the lower of these two estimates generates a lower bound on rent increases, and the higher estimate generates an upper bound, as shown in the table below.

The map on the following page demonstrates that projected rent increases vary along the GLX corridor. Washington St., Ball Sq., College Ave., Route 16, and Union Sq., face the sharpest potential increases, between 25% and 67%. Gilman Sq. and Lowell St. already have premiums in place, so we do not expect rents to rise sharply around these stations in the near term.

From Rent Increases to Renter Burden

Even modest rent increases have the potential to price lower-income households out of the rental market, especially if they are already cost-burdened. We use American Community Survey data to estimate the number of lower-income renters who will become burdened as a result of the GLX. ACS estimates include, for example, the number of renter households with incomes between $20,000 and $35,000 that pay between 20% and 24.9% of income on rent. Using standard statistical methods and assumptions for all income categories under $75,000, we estimate that 737 to 809 lower-income renter households may become cost-burdened as a result of rent increases that occur after the introduction of the GLX.

Rent increases represent a higher percentage of lower-income renters' budgets. The following table shows projected rent increases as a percent of rent income by income category.

Expected Rent Increase as Percent of Income
GLX Lower-Income Renter Households

	Less Than $10,000	$10,000 - $20,000	$20,000 - $35,000	$35,000 - $50,000	$50,000 - $75,000
Low	17.4%	14.3%	5.8%	3.8%	2.7%
High	20.9%	17.2%	6.8%	4.6%	3.1%
Households	1,003	1,032	1,011	1,231	1,539

Data from Padmapper and American Community Survey, 2007 - 2011.

We emphasize that these figures do not encompass the total challenge of affordable housing and housing cost burden in Somerville. The cost burden estimates here are best understood as adding to an existing challenge. Indeed, the households at the upper end of the "lower-income" groupings presented here may not be the most cost-burdened households in Somerville. There are likely even lower-income households outside the GLX walksheds who were not considered in these calculations, and therefore could be in an even more precarious situation. As highlighted in the Community Context section, as one moves down the income ladder any cost increase is more strongly experienced.

AVERAGE MONTHLY RENT PER BEDROOM

$$$
$$$
Current
Projected (Low)
Projected (High)
Projected dollar
increase (Low/High)

< $800
$900
$1,100
$1,300
$1,500

GLX Walkshed
Existing MBTA Lines
Existing MBTA Bus Routes
Green Line Extension

MEDFORD

ROUTE 16
$240
$275

COLLEGE AVENUE
$275
$295

BALL SQUARE
$275
$330

DAVIS SQUARE

LOWELL STREET
$0
$15

PORTER SQUARE

GILMAN SQUARE
$60
$85

SULLIVAN SQUARE

WASHINGTON ST
$440
$580

CAMBRIDGE

UNION SQUARE
$265
$275

LECHMERE

0   0.25   0.5   1 Miles

MAPC 2013 Data Sources: MAPC Analysis; Jeff Kauffman jefftk.com; PadMapper; MassGIS

Displacement Risk #2: Condominium conversions

Another displacement risk along the GLX corridor is the conversion of rental properties to condominiums. Moderate and high-income residents attracted to Somerville by the community's revitalization and presence of new transit service are also more likely to have the resources and inclination to seek out for-sale rather than rental housing. If new construction does not provide the supply sought by the increasing number of would-be homeowners, then owners of existing rental units may find it profitable to convert their properties to a condominium form of ownership and sell off the units individually rather than renting them.

Condominiums are also created as new construction, of course, rather than by converting existing structures. The distinction between the two sources of condominiums is important because new construction can supply housing to new residents in the ownership market without displacing existing residents, while conversions by definition reduce the rental housing stock and can lead to displacement of renters. The development trend across Somerville as a whole, though, is that conversions outpace new construction. Based on data from the Office of Strategic Planning and Community Development (SPCD), and Assessor's data, 3,000 condominium units in Somerville were created through the conversion of existing rental units since 1986, representing 9% of all residential units.

Data from SPDC also indicate that units in two- or three-family buildings comprise 55% of condominiums overall, but 70% of condominium conversions. Therefore, current renters living in apartment buildings with four or more units are at lower risk of condo conversion displacement than their counterparts in two- or three-family buildings. The chart on this page shows the distribution of condominiums (new and converted) across building types for the three transit line walksheds and the city overall. It indicates that the two- and three-family share of condominiums is lower along the GLX corridor and much higher around Davis and Porter Squares. Two conclusions are implied by these data: first, that the Red Line station areas have experienced more conversion of multifamily homes, and second, that new construction condos are an important component of supply along the GLX and Orange Line.

The map on the following page depicts the distribution of different types of condominiums across the city. It shows that the density of two- and three-family condominiums is higher around Davis and Porter Squares than it is elsewhere in the city.

Condo Unit Building Types in Somerville
Total New and Converted Condos
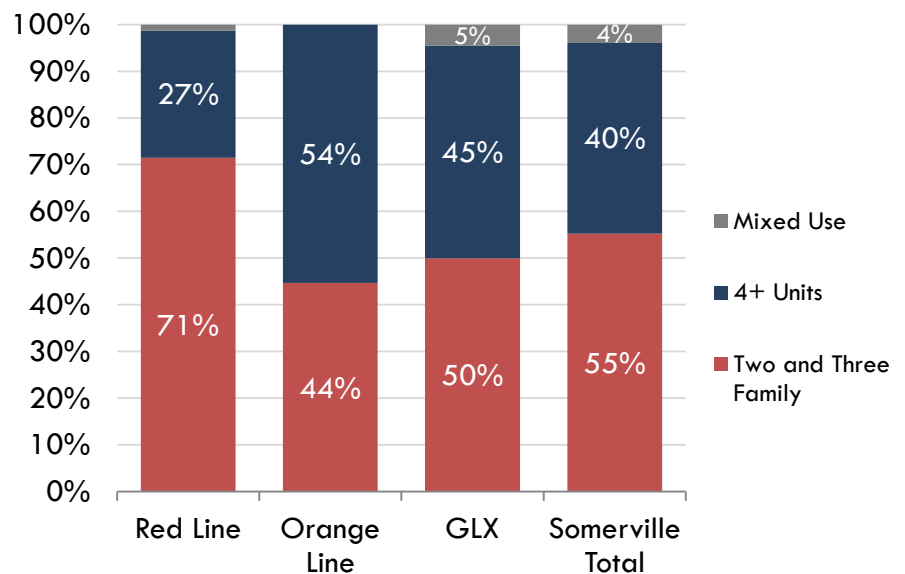
Data Source: Somerville Assessing Department, MAPC analysis
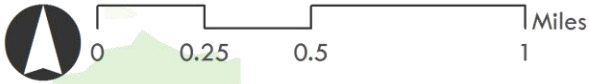
Condominium Parcels
New and Converted Condos

RESIDENTIAL CONDO PARCELS

- 2 & 3 Family Converted Condos
- New Construction or > 3 Units

STATION AREA WALKSHEDS

- Green Line & GLX
- Orange Line
- Red Line

MALDEN

MEDFORD

WELLINGTON

ASSEMBLY SQUARE

SULLIVAN SQUARE

CAMBRIDGE

LECHMERE

RTE 16 (GLX)

COLLEGE AVE (GLX)

BALL SQ (GLX)

DAVIS

LOWELL ST (GLX)

GILMAN SQ (GLX)

PORTER

WASHINGTON ST (GLX)

UNION SQ (GLX)

HARVARD

CENTRAL

0   0.25   0.5   1   Miles
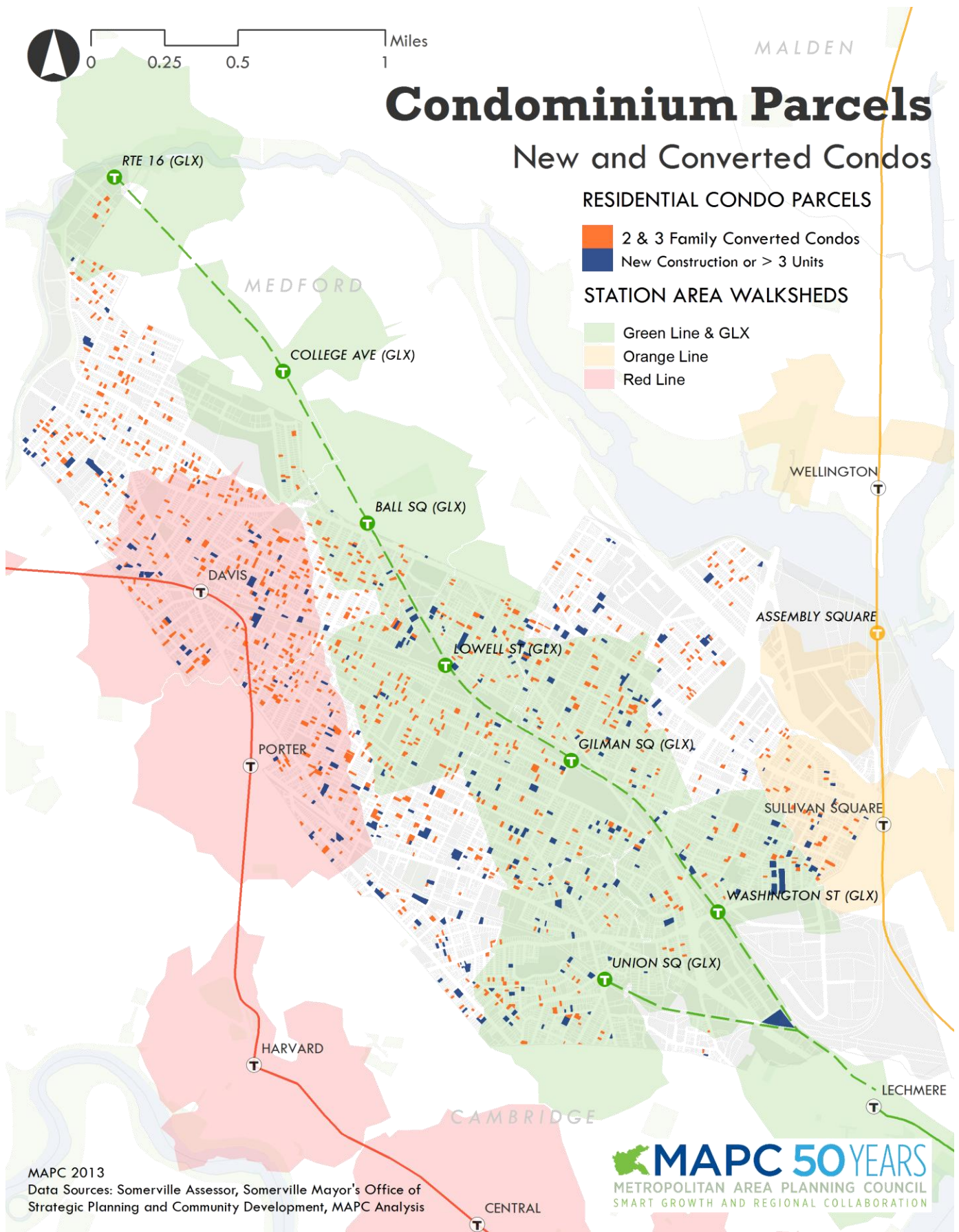
MAPC 2013
Data Sources: Somerville Assessor, Somerville Mayor's Office of
Strategic Planning and Community Development, MAPC Analysis

MAPC 50 YEARS
METROPOLITAN AREA PLANNING COUNCIL
SMART GROWTH AND REGIONAL COLLABORATION

To project the number of likely condominium conversions in two- and three- family homes, MAPC again used Somerville's Red Line stations as a model for future change along the GLX. We first established the prevalence of condominium conversions near the Red Line, then calculated how many conversions in the GLX walksheds would result in an equivalent prevalence. The chart below indicates that 15% of all two- and three-family units in Red Line walksheds are now in a condominium form of ownership, compared to 11% citywide and only 7% and 9% in the Orange Line and GLX walksheds, respectively. The second chart shows the same data by station area.

Our condo conversion estimates assume, as we do with rental prices, that housing in the GLX walkshed will experience the same changes that have occurred to similar housing within the Red Line walkshed. Specifically, we project what would happen if the two- and three-family condo conversion rate reaches 15% as it has near Davis and Porter Squares. If that occurs, we project that as many as 475 rental units in two- and three-family homes may be converted to condominiums.

The chart on the following page depicts these projections by station area. Inside the GLX walkshed, Gilman Square, Washington Street and Union Square station areas are at the greatest risk of conversion. Gilman Square is a densely populated residential neighborhood with the largest number of residential units of any of the GLX station areas, as seen in the first figure in this section. Currently, the Gilman Square walkshed has a two- and three-

Condominium Conversions in 2-3 Family Homes as Percent of Total 2-3 Family Residential Units by Line Walshed
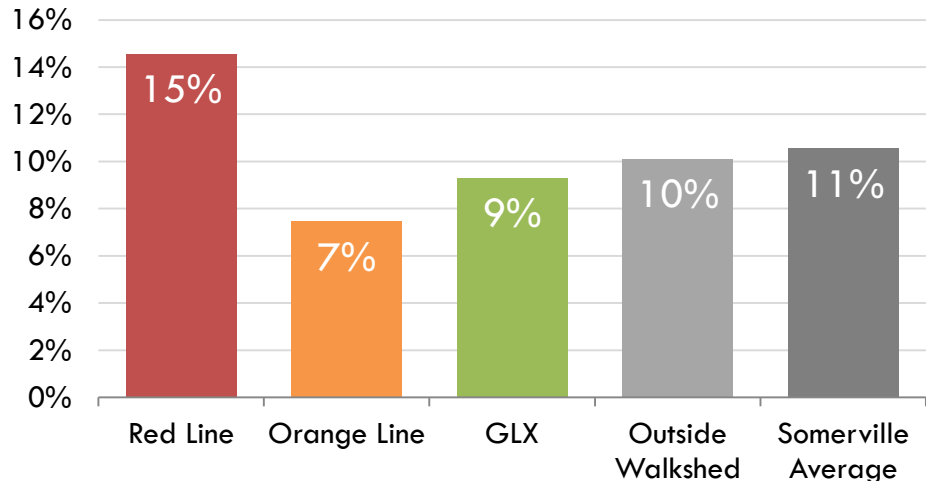
Red Line: 15%, Orange Line: 7%, GLX: 9%, Outside Walkshed: 10%, Somerville Average: 11%

Condominium Conversions in 2-3 Family Homes as Percent of Total 2-3 Family Residential Units by Station Area Walshed

Davis Sq: 15%, Porter Sq: 14%, Sullivan Sq: 7%, Rt 16: 12%, College Ave: 6%, Ball Sq: 12%, Lowell St: 12%, Gilman Sq: 10%, Washington St: 6%, Union Sq: 8%
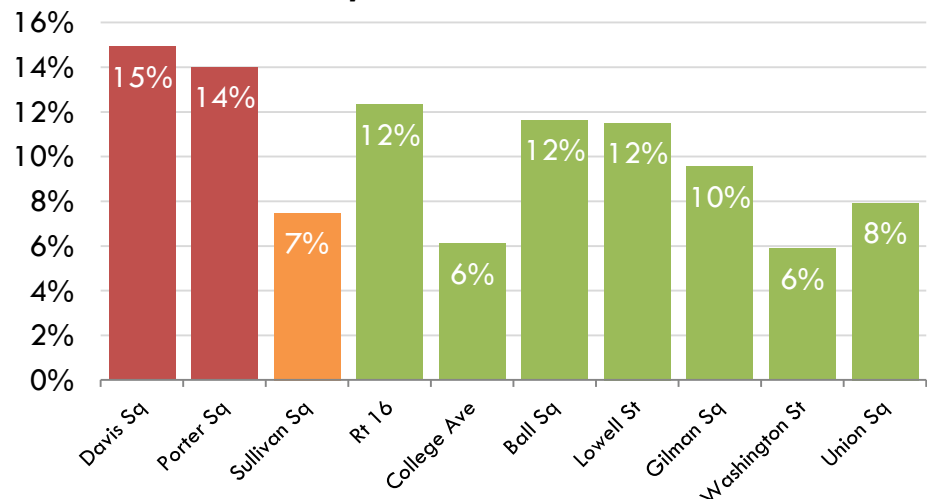
Note: Data only available for the city of Somerville; walksheds that extend outside the city reflect only units within Somerville. Data Sources: SPCD, Somerville Assessing Department

family condo conversion rate (10%) slightly above for the GLX corridor, but five percentage points below the Red Line station average. As a result, we calculate that 123 units are likely to be converted to condominiums over the coming 10 to 20 years, the most of all GLX station areas. The Washington

Street walkshed currently has the lowest rate of condo conversions, at 5%, and the second highest number of units at risk at 117. Union Square station, at 7% condo conversion also has a large number of units at risk, at 115. College Avenue station area has a low condo conversion rate, at 6%, but the station area is only partly within Somerville city limits, and only a small number of units are at risk. Additionally, the College Ave station area is dominated by Tufts University, so may be less at risk than other areas of Somerville due to the high rental demand and turnover of college students.

Projected Condo Unit Conversions
by GLX Walkshed
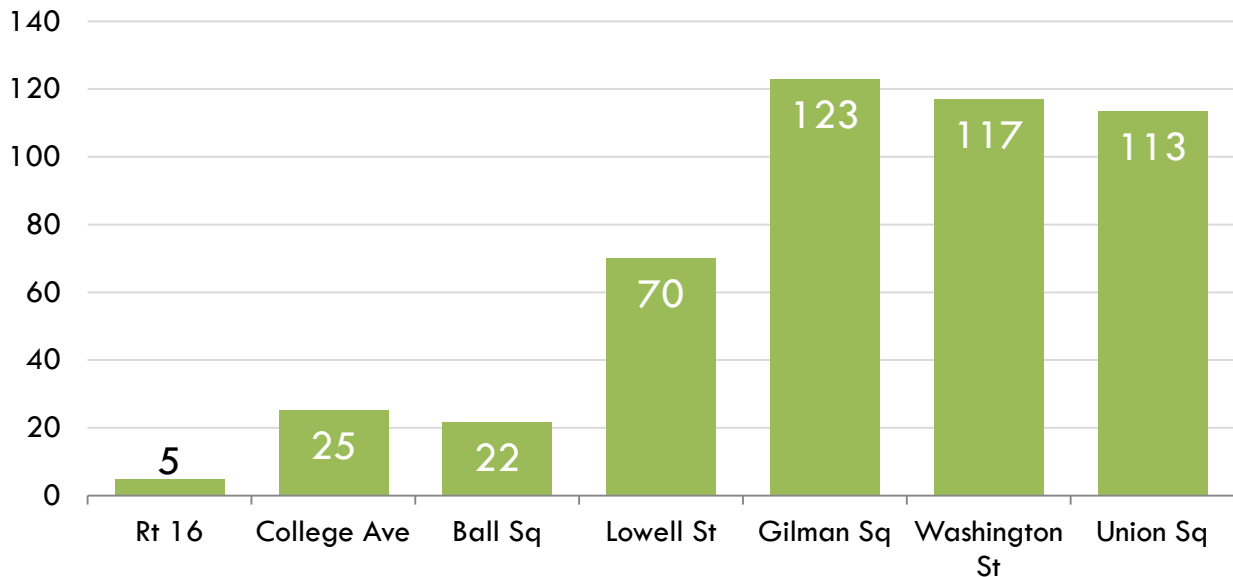
It should be noted that our estimates of conversion include all units in two- and three family structures, though the number of rental units lost through condo conversion depends in part on whether any units in the structure were owner-occupied prior to conversion. By matching the property address to owner address listed in Assessor's data, we estimate that 30% of units in common-ownership two- and three family structures are occupied by the owner of the building, so the number of lost rental units could be as low as 375 if all structures were owner occupied prior to conversion, and as high as 475 if all are investor-owned.

Displacement Risk #3: Expiring Affordable Housing

For many low-income households, publicly subsidized housing units may provide the only opportunity to remain in Somerville as rental prices rise, and the loss of these units may force more such households to move out of the city. Certain kinds of affordable housing are project-based, meaning a specific physical structure is offered for rent by a private entity that uses State or Federal subsidies to make housing units available at prices below fair market rent[12]. A regulatory and deed restriction and affirmative fair marketing ensures that units are affordable to lower-income households and follow fair housing rules when advertised and rented. Currently there are about 3,200 deed-restricted affordable units in the City of Somerville, about 10% of the city's total housing stock. Of these subsidized units, 36% are within the GLX walkshed.

Many rent restrictions have a specified term—often ranging from 30 to 100 years—after which they no longer apply and the units can be rented at market rates. Owners can choose to renew their affordability contracts before they expire, or not. For example the affordability of 224 units in the Cobble Hill apartments within the Washington Street walkshed was set to expire in 2016, but the owners recently chose to refinance, enabling them to extend affordability on the units to 2048. Owners in appreciating housing markets may have less incentive to renew their contracts and choose instead to convert units to market rate, displacing lower-income households from a development. To evaluate the displacement risk from expiring affordable housing, then, MAPC simply evaluated the number of permits set to expire in the near term in Somerville overall and in the GLX walksheds in particular.

The most recent data available from the SPCD indicate that Somerville has 272 privately-owned, project-based affordable rental units with rent restrictions expiring by 2020, comprising 8.5% of the total subsidized units in the city. An additional 35 rent-restricted units will expire between 2020 and 2025, and 639 units are set to expire later than 2025. Fortunately, Somerville has 2,063 rental units with affordability in perpetuity (64% of all subsidized units). The map on the following page shows the location and year of expiration of all project-based rent-restricted buildings in Somerville, along with the number of units in each building.

Unfortunately, 244 of the units set to expire by 2020 are in GLX station walksheds, mostly clustered around Gilman Square station, and another 277 units in GLX walksheds will expire later than 2025. Altogether, one fifth of the subsidized units in the GLX walkshed could be converted to market rents by the year 2020. Fortunately, just over half of the GLX subsidized units (54%, 627 units) are protected in perpetuity.

In a city with a tremendous amount of cost pressure on lower-income residents, the loss of any rent-restricted units is problematic. The time frame of some of these expirations is just outside of the ten-year period on which this analysis is generally focused, however we include these affordable units in the analysis of displacement risk because they play a significant role in housing the most vulnerable populations, and because replacing those units may take a long time.

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[12] Deed restrictions may also be used to limit the resale cost and eligible purchase of ownership units, but such units comprise less than 1% of all subsidized hosuing in Somerville.

Expiring Affordable Housing

Subsidized Housing Inventory

Number of Units
- 10
- 100
- 500

Year of Expiration
- 2015
- 2020
- 2025
- 2025+
- Perpetuity

Map labels:

MALDEN

RTE 16 (GLX)

BOSTON AVENUE

ALEWIFE BROOK PARKWAY

POWDER HOUSE BOULEVARD

MEDFORD

COLLEGE AVE (GLX)

COLLEGE AVENUE

BROADWAY

HOLLAND STREET

COLLEGE AVENUE

BALL SQ (GLX)

WELLINGTON

DAVIS

DOVER STREET

DAY STREET

HIGHLAND AVENUE

ELM STREET

SOMERVILLE AVENUE

LOWELL ST (GLX)

MYSTIC AVENUE

MYSTIC AVENUE

ASSEMBLY SQUARE

FELLSWAY

MYSTIC AVENUE

BROADWAY

GILMAN SQ (GLX)

PORTER

SUMMER STREET

MCGRATH HIGHWAY

SULLIVAN SQUARE

WASHINGTON ST (GLX)

BEACON STREET

WASHINGTON STREET

UNION SQ (GLX)

CONCORD AVENUE

MEDFORD STREET

MCGRATH HIGHWAY

INTERSTATE 93

HARVARD

LECHMERE

CAMBRIDGE

CENTRAL

MAPC 2013
Data Source: Somerville Mayor's Office of Strategic Planning and
Community Development, MA Department of Housing and Community Development, MassGIS

MAPC 50 YEARS
METROPOLITAN AREA PLANNING COUNCIL
SMART GROWTH AND REGIONAL COLLABORATION

Displacement Risk #4: Property Tax Increases

Many stakeholders in Somerville have voiced concerns that rising property values may cause tax bills to increase, creating a housing cost burden for low-income homeowners and senior homeowners on a fixed income. To estimate the potential increase in property values and the resulting impact of property tax increases on homeownership affordability in Somerville, MAPC first evaluated Assessor's data to determine how the assessed value for comparable homes changes based on the proximity of those properties to a rail station. We use a standard statistical method called "willingness to pay," which is commonly used to establish the value of a single attribute of a product when that attribute is not priced separately. Since we did not have access to individual transaction data, we relied on assessed property values generated by the Somerville Assessing department based on accepted Massachusetts' appraisal techniques. A database of 12,177 residential parcels included attributes such as lot size, number of units, number of rooms, and year built. The "willingness to pay" method (described in the Appendix) isolated the variation in assessed value that can be attributed to station proximity.

We estimate that Somerville properties within a half mile of existing station areas are worth, on average, 27% more than comparable properties more distant from those stations. We take this value as the "proximity premium" that has accrued in station areas since transit service was initiated (about 30 years ago, in the case of Davis and Porter Squares.) MAPC then applied this "proximity premium" to properties in the GLX walkshed to determine the potential increase in assessed value for homes in the GLX station walksheds. From these values, simple calculations provide the estimated increase in property taxes and the percentage of income such an increase would represent at various income levels.

Our model is intended to estimate the range of potential increases, not to forecast the value of specific properties or the relative increase in specific station areas. Furthermore, we recognize that future real estate values depend upon a number of factors that cannot be fully modeled, such as housing production elsewhere in the city, catalytic developments that may change the character and attractiveness of a given station area, safety and quality of life improvements, and retail or entertainment amenities. Finally, while it has taken the areas around Davis and Porter Squares 30 years to achieve the observed rent premium, we expect that the real estate transition will occur much more quickly around new GLX stations (indeed, it has already begun.)

Our model projects that average assessed value of residential properties within GLX half-mile walksheds is likely to increase by 16% to 25% above the FY 2012 value over the coming decades, equivalent to $68,000 to $106,000 for the average single family home. The resulting property tax increases are not expected to displace significant numbers of households for four reasons. First, the difference in property taxes that residents could pay as a result of the rising assessed value is relatively small as a percent of household income, even for very low-income households. Second, lower-income households tend to be renters, not owner-occupants. Only 659 owner-occupied households in GLX station walksheds have incomes below $35,000, one-fifth the number of renter-occupied households in the same income range. Third, property tax increases are limited by Proposition 2 ½, a state law that, since 1982, caps the growth in total property tax revenues that can be collected by a municipality at 2.5% per year. Finally, new growth and in particular new nonresidential growth has the potential to reduce the overall tax burden on existing homes.

Using substantially the same approach as we did for estimating rent increases, MAPC prepared a low and high estimate of the potential tax increase for homes in the GLX walkshed. In the table below, these low and high estimates are expressed as a percentage of household income at various income levels.

Potential Property Tax Increase as Percent of Household Income
GLX Lower-Income Homeowners

	Less than $10,000	$10,000 - $20,000	$20,000 - $35,000	$35,000 - $50,000	$50,000 - $75,000
Low	5.4%	2.7%	1.5%	1.1%	0.7%
High	8.7%	4.3%	2.5%	1.7%	1.2%
Total Households	77	177	405	480	858

While any increase in property taxes represents an added burden to homeowners, the percentage-of-income increases estimated here are, for most homeowners, very small relative to those faced by renters in the previous section. We also emphasize that the impact to lower-income homeowners is minimized simply because there are few of them relative to the numbers of lower-income people who would be affected by other displacement mechanisms. Furthermore, to the extent that any are senior citizens on fixed incomes, the State's current tax code allows tax rebates for cost-burdened seniors to offset local property taxes, and a local Senior Tax Deferral allows income-qualified seniors to defer property taxes until the property is inherited or sold.

Finally, although it was not possible within the scope of this analysis to estimate the subset of current cost-burdened homeowners who might be pleased to sell their home in order to capitalize on increased property values, presumably some portion of homeowners would view the situation as a positive opportunity to cash in on an investment. For all of these reasons, we conclude that the risk of displacement from property tax increases is weak and that policy interventions to mitigate displacement would be better directed at the other three sources of displacement risk explored in this analysis.

Conclusion

The extension of the Green Line through Somerville will dramatically improve transit mobility in the city, but is also likely to bring added pressure to the city's residential housing stock, and with it, the risk of displacement. In this report we focused on four mechanisms by which displacement can occur, and estimated the magnitude of displacement potential from each, generally based on development patterns in comparable neighborhoods. First we project that between 740 and 810 lower-income households may become newly cost burdened , if the balance between supply and demand along the GLX matches that near the existing Red Line stations. Second, conversion of two- and three-family homes to condominiums may displace up to 475 renter households. Third, another 245 households in the GLX corridor face the very serious prospect of expiring affordability restrictions by 2020. Finally, we found that property tax increases, fortunately, will not be a significant source of displacement risk.

All of these estimates must be considered in the context of growing housing demand for the city overall, with a need for 6,000 to 9,000 new housing units over the coming twenty years. Robust housing production that provides adequate supply for moderate- and low-income households will reduce the pressure on the existing housing stock, mitigating the potential displacement forces described above. Conversely, lack of new construction will force more new households to compete for existing units, resulting in steeper rent increases, more prevalent condo conversions, and accelerating displacement.

The information in this report can be used by the city, local nonprofits, and other stakeholders to help target efforts to produce more housing and protect the affordability of the existing stock. Specific strategies to achieve these goals have been extensively documented in other reports by MAPC and other organizations. In addition to the analysis above, we also offer a set of indicators that can be used to monitor neighborhood change in Somerville, in order to evaluate the progress of mitigation strategies and possibly tailor them to shifting trends. While the GLX will create numerous economic, environmental, and quality of life benefits for the Somerville community and the surrounding region, there is no doubt that it also introduces potentially disruptive change to the lives of vulnerable populations. We commend the City of Somerville for all of its pro-active engagement around the issue of displacement and look forward to continued work in this important area to ensure that the benefits of this major transit investment extend to all members of the community as much as possible.

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Tracking Neighborhood Change: Benchmark Indicators

In order to track changes in Somerville's demographics, housing stock, and local economy over the coming decades, MAPC has identified a set of local benchmark indicators that can be updated over time to assess how the city is changing. These indicators are organized into three broad categories: Demographics and Migration, Housing and Households, and Transportation. MAPC will continue to work with Somerville stakeholders to identify additional indicators related to economic opportunity, environmental health, and other critical issues.

Why are some indicators not available for the GLX Corridor specifically?

Indicators were created for the GLX Walkshed geography level where possible, but data for several of our indicators are only available at the Census Tract level. Unfortunately the Census Tract boundaries do not fit within GLX Walkshed boundaries in a way that is useful for this analysis, as shown in the map below.
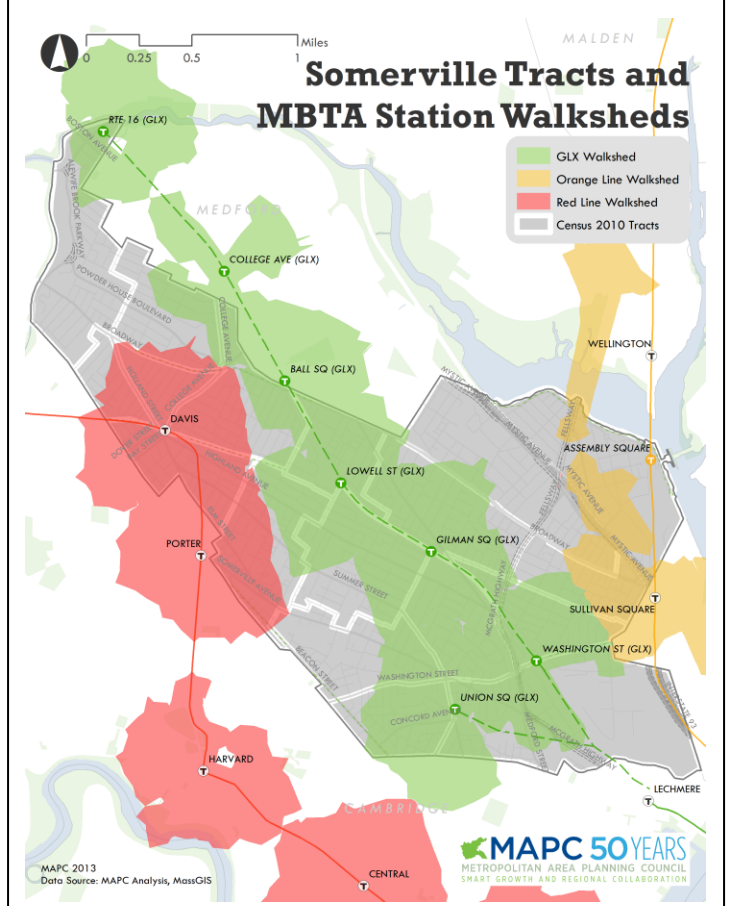
Demographics and Migration

Economic Diversity

Number of Low-Income Households in Somerville: 13,545 (statistically unchanged since 2000)
Low Income Share of Somerville Households: 42.4% (statistically insignificant decline since 2000)
Somerville's share of Region's Low Income Households: 3.0% (insignificant decline since 2000)
Somerville's share of Inner Core's Low Income Households: 4.7% (insignificant decline since 2000)
Loss of economic diversity in Somerville is cited as a significant potential negative impact of the GLX. Increasing rents and a restricted rental supply could result in fewer low-income households able to find housing they can afford. Many residents are concerned that these trends have already begun and are accelerating. Tracking the number and share of low-income households in Somerville can help gauge the degree to which displacement or replacement is occurring and whether mitigation strategies are working. A stable or increasing *number* of low income households indicates a low rate of displacement or replacement by higher income households; a declining number may mean such processes are underway. A stable or increasing low income *share* of households means that the city has been able to create new affordable housing opportunities as it grows.

Findings
The number of low income households in Somerville held steady at around 13,500 over the period from 2000 to 2006 – 2010, while the low income share of Somerville households declined marginally, from 44% to 42%, a change that was within the margin of error for the 2006 – 2010 estimate, and therefore not statistically significant. In other words, the city had not yet seen a definitive, transformative decline in the low income population by the year 2010. However, the city also saw shifts within the low income population which indicate increasing polarization of income levels: the number and share of "moderately" low income households (50% to 80% of AMI) declined, while the number and share of Very Low and Extremely Low Income households (30% to 50% AMI and <30% AMI, respectively) held steady or increased. These same trends were observed regionwide.

Regional Context
It is important to benchmark Somerville's numbers against those of the region in order to measure against more wide-spread regional changes that may be happening concurrently. The low income share in Somerville is higher than the MAPC region overall, but lower than the Inner Core subregion (see chart). Between 2000 and 2010, the city's share of the low

Somerville Low Income Households, 2000 to 2006 - 2010

Source: US Dept. Housing and Urban Development (CHAS)
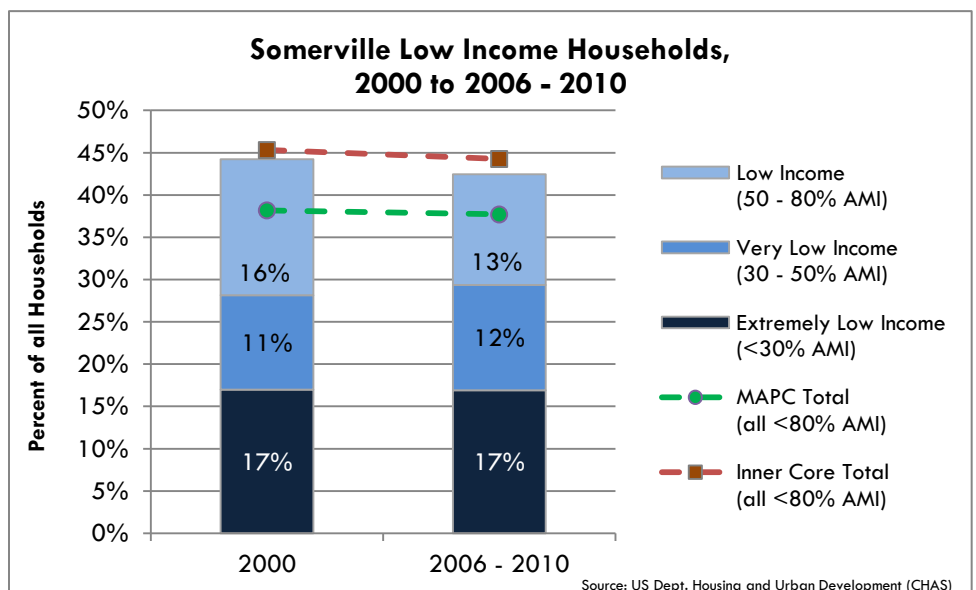
income population within both the region and the subregion remained statistically unchanged at 2.9% and 4.7%, respectively. (For comparison, Somerville comprised 2.6% of the region's households and 4.9% of those in the Inner Core.)

These indicators suggest that the city's low income population has not changed dramatically relative to its neighbors. It should also be noted that the higher prevalence of low income households in Somerville relative to the region is a symptom of the income segregation that characterizes Metro Boston overall, with more low income households in urban communities and relatively fewer in many suburban towns. If the region becomes more economically integrated, then the low income share of all communities would more match their share of total households. In Somerville's case, this would mean a decline to 2.6%.

About the data
The US Department of Housing and Urban Development (HUD) defines three tiers of low income limits: Low, Very-Low and Extremely-Low, based on 80%, 50% and 30% of area median income, respectively. The specific thresholds for each are also depended on household size. (For example, Area Median Income in the Boston region is currently $94,000 for a 4-person household and $75,300 for a 2-person household.) Estimates of the number of households in each category are published by HUD in the Comprehensive Housing Affordability Strategy dataset (CHAS.)

Racial and Ethnic Diversity

Population of Color, GLX corridor, 2010: 10,050 (increase of 110 since 2000)
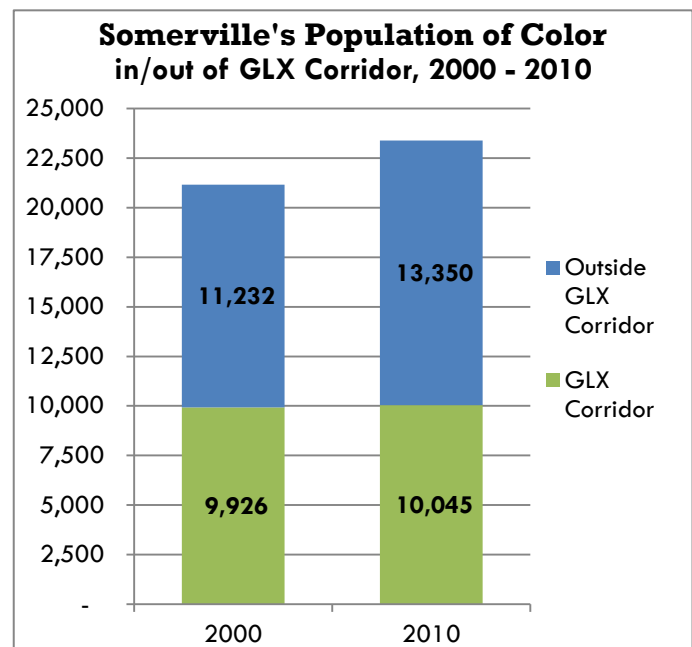**GLX Share of Somerville's Population of Color, 2010 : 42.9%** (decrease of 4% since 2000)
Somerville Share of Region's Population of Color, 2010: 2.7% (decrease of 0.5% since 2000)

While displacement is largely driven by income disparities, the fact that higher-income households are disproportionately White and lower-income households are disproportionately non-White means that displacement risk also carries implications for the racial diversity of the GLX walksheds and the community as a whole. The city prides itself as a welcoming community that has been home to many waves of immigrants and communities of color. There is a great desire for the city to continue playing this role as the region becomes more diverse overall. Meanwhile, it is important to ensure that non-White residents have access to new transit service, and are not increasingly marginalized in neighborhood distant from stations. A stable or increasing number of residents of color in the GLX corridor indicates a low rate of displacement or replacement by White residents; a declining number may mean such processes are underway. An increasing share of the city's population of color in the corridor indicates increasing equity; a decreasing share means that relatively fewer residents of color have access to the new service. .

Findings

There were 10,050 residents of color (Hispanic, Black , Asian, and other non-White races) in the GLX corridor in 2010, reflecting little change from 2000 to 2010. This relative stasis indicates that displacement and replacement have not yet substantially diminished the corridor's diversity. Over the same period, the population of color in the city increased by 2,200 (and the share increased from 27% to 31%), but almost all of that occurred outside the GLX corridor, so its share of the city's population of color declined to 43% from 47%. In other words, Somerville's population of color grew rapidly during the 2000s, but not near the future transit stations.

Somerville's Population of Color in/out of GLX Corridor, 2000 - 2010

	2000	2010
Outside GLX Corridor	11,232	13,350
GLX Corridor	9,926	10,045

Regional Context

For decades residents of color have been more prevalent in Somerville than the region overall. In 2000 the city held 2.5% of the MAPC region population and 3.2% of its population of color. By 2010, the regional share of population slipped to 2.4%, while the city's share of the non-White population dropped half a percent to 2.7%. As with the concentration of low-income households, the higher prevalence of non-White residents in Somerville and the Inner Core is an expression of the racial and ethnic segregation that exists in the region. If the region becomes more integrated, the disparity between the Inner Core and the rest of the region will diminish over time. However, the disparity in non-White population between Somerville and the rest of the region decreased by half

over the past decade, and continuation of those trends would make the city less diverse than the region overall by 2030.

Data Source: Census 2000 and 2010 SF1

Somerville's Population of Color
compared to the MAPC region, 2000 - 2010

Legend:
- Somerville's share of Region's Population
- Somerville's share of non-White Population

2000: 2.5%, 3.2%
2010: 2.4%, 2.7%
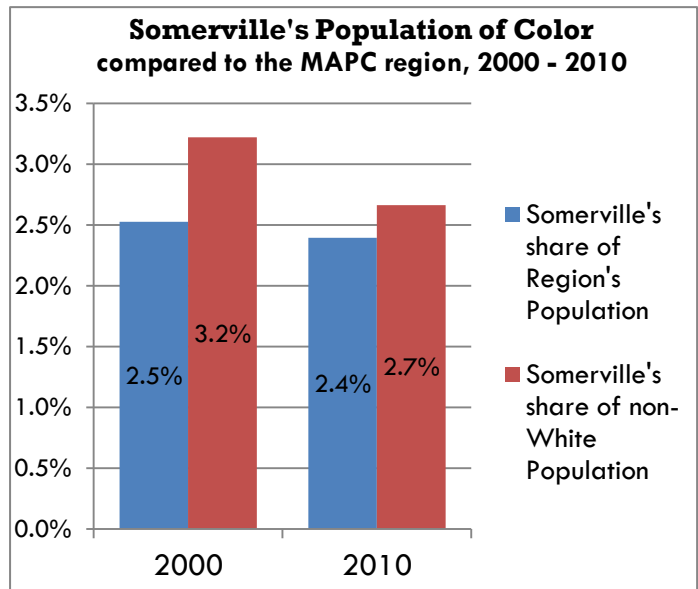
Migration

Lower-income households as a share of all out-migrant households 58%
Lower-income households as a share of all in-migrant households 62%
Non-White individuals as a share of all out-migrants 33%
Non-White individuals as a share of all in-migrants 36%

Nearly one in six Somerville residents moved into the city within the last year, and a similar share moves out annually. As a result, the composition of in- and out-migrants has a substantial impact on the city's demographics. Changes in the characteristics of in-migrants could cause a rapid demographic transition, even if the pace of outmigration remains constant. If low-income households and people of color begin moving out of the city at an even higher rate, then this demographic transition would occur even more rapidly. The four indicators here describe the characteristics of in- and out-migrants and can be used help differentiate turnover and replacement from displacement. An increasing share of moderate / high income households or White Non-Hispanic people among the in-migrants—and in particular a greater share relative to the current population—indicates that demographic "replacement" is taking place. Conversely, if the share of low-income households and people of color among the outmigrants increases, it is a clear indication of displacement.

Findings
Low income households are relatively less likely to move out of the Somerville area than are higher income households, and are more likely to be moving in. People of color are more likely to move out than are White Non-Hispanic residents, but also make up a larger share of in-migrants. As a result, the city is becoming more racially and ethnically diverse.

Data Source: American Community Survey (ACS) Public Use Microdata Sample (PUMS) 2006-2010

Migration by Race
Somerville PUMA*, 2006 - 2010

* Includes City of Everett
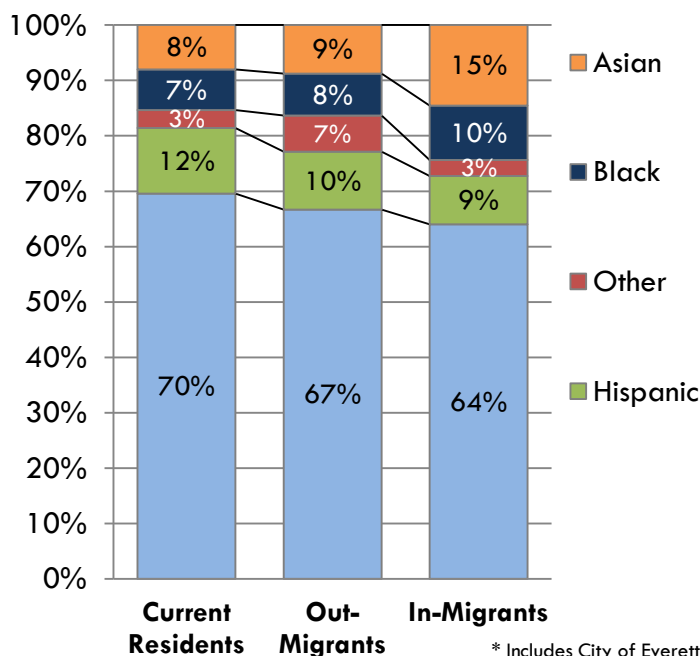
Migration by Income
Somerville PUMA*, 2006 - 2010

* Includes City of Everett

Housing and Households

Housing Cost Burden

Percent of low-income households with high housing cost burden, 2010: 74% (up 8% since 2000)
Number of low income households *not* cost burdened, 2010: 3,500 (down 1,200 since 2000)
Low Income cost burden relative to the region, 2010: 5.9% higher (up 0.2% since 2000)

The size of the population most vulnerable to displacement could itself change over time, perhaps during a broader economic recession, or simply due to st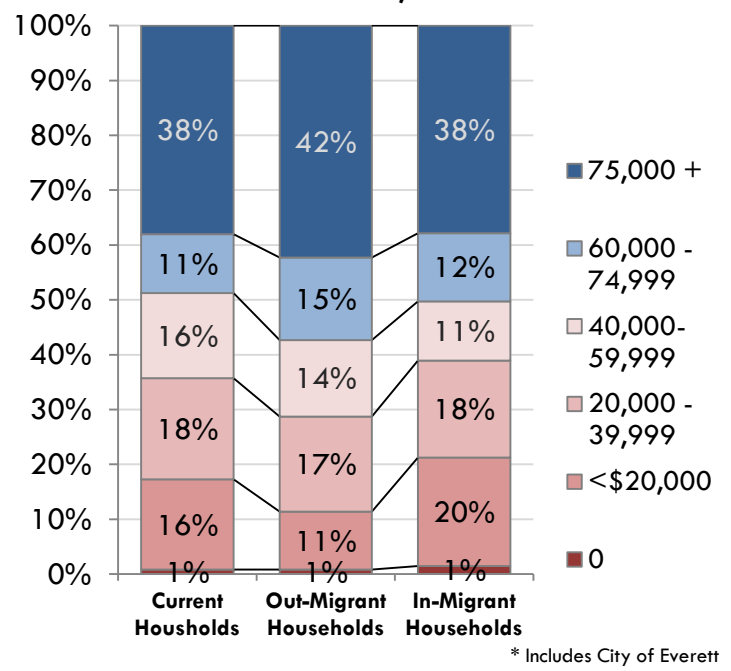agnating wages nationally in a local context of rising housing costs, as has been the trend in recent decades. If the share of lower-income households who are cost burdened rises, it indicates that lower-income households are facing growing difficulty finding affordable housing. If this indicator declines, it could mean that lower-income households are managing to secure affordable housing. However, it could also mean that such households have left the city. Consequently, we also suggest tracking the number of *non*-cost burdened low income households; an increase in this number means that more low income households can stay in the city without being unduly strained by high housing costs. It is also relevant to compare incidence of cost burden to the region overall, to determine if he city is following regional trends or becoming more of an outlier.

Findings
The incidence of cost burden among low-income households rose from 66% in 2000 to 74% in 2010. There were an additional 860 such households, for a total of 10,075 low-income cost burdened households. There were 1,200 fewer low income households that were not cost burdened. As discussed previously, the number of low income households and their share of the total population was statistically unchanged since 2000.

**Cost-Burdened Low Income Households
Somerville, 2000 - 2010**

Legend:
- Moderate & High Income Households
- Low Income Households, Not Cost-Burdened
- Low Income Households, Cost-Burdened

2000: Moderate & High Income Households 17,600; Low Income Households, Not Cost-Burdened 4,700; Low Income Households, Cost-Burdened 9,200
2010: Moderate & High Income Households 18,400; Low Income Households, Not Cost-Burdened 3,500; Low Income Households, Cost-Burdened 10,100

Regional Context
While cost burden among low income households increased in Somerville, it also increased across the MAPC region. By 2010, 68.5% of low-income households in the MAPC region were cost burdened, up 8% since 2000. Somerville's cost burden remained about 6% higher than the region across the whole time period.

Data Source: American Community Survey
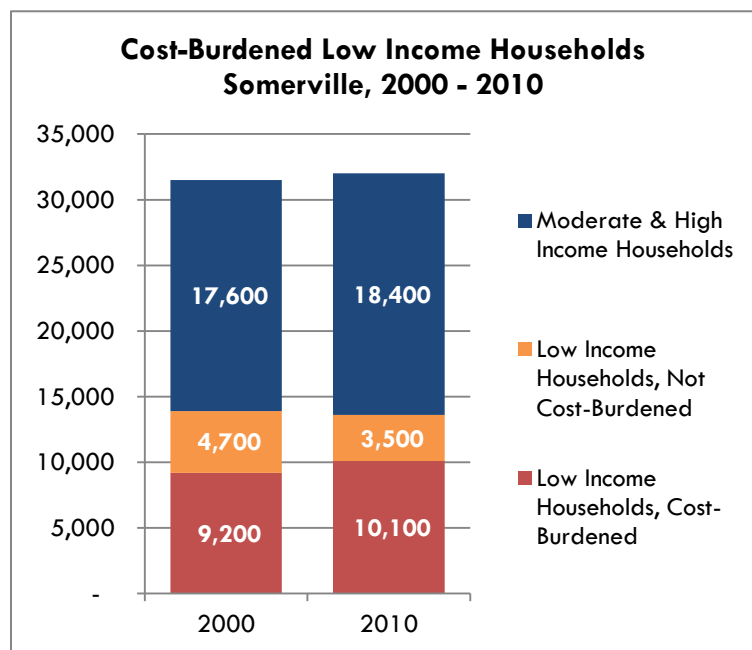
Families with Children

Number of Families with Children in Somerville, 2010: 5,633 (down 970 since 2000)
Somerville share of Inner Core Families with Children, 2010: 3.4% (down 0.6% since 2000)
Somerville share of Region's Families with Children, 2010: 1.5% (down 0.3% since 2000)
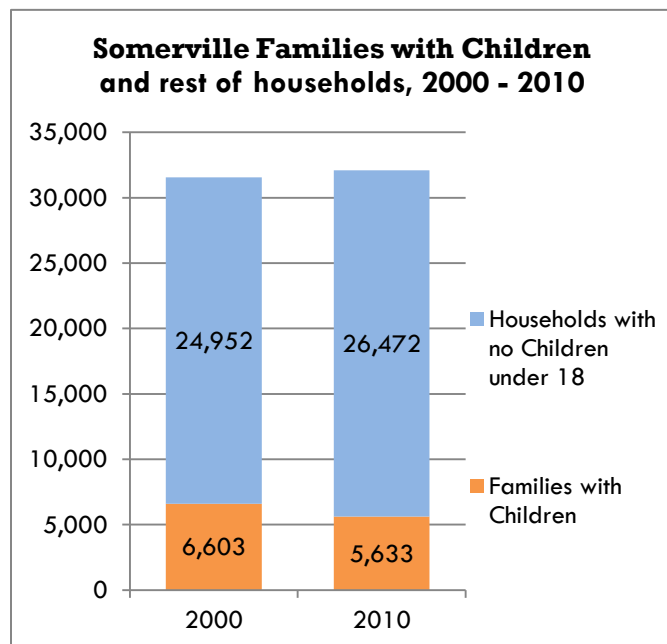
Many residents of Somerville express a desire for the city to become an even more welcoming place to raise a family. However, the real estate trends likely to ensue after introduction of the Green Line may make it harder for families to put down roots. Development of smaller units and subdivision of large homes into multiple condominiums may result in slow growth of family-friendly housing. While smaller units can be an appropriate and desirable choice for single people, young professionals, and seniors, such units often do not provide enough space for households with children. Tracking this indicator supports an understanding of how the changing housing stock is accommodating families with children, an important component of a vibrant city's population. A smaller number of families with children in the city means that this population is on the decline. However, since the number of such households is likely to decline regionwide, it is also useful to compare Somerville's characteristics to the Inner Core subregion and the region as a whole, to see if the decline is representative of regional trends or occurring faster than the region overall.

Findings
The number of families with children under age of 18 fell to 5,633 in 2010, a decline of 14.5% since 2000. Families with children now comprise 17.5% of the households in Somerville, a decline from 20.9% in 2000.

Regional Context
The number of families with children declined regionwide, though by less than 1%. Somerville's share of families with children in both the region and the Inner Core declined, meaning that families are growing less common in Somerville as compared to its neighbors.

Somerville Families with Children and rest of households, 2000 - 2010

	2000	2010
Households with no Children under 18	24,952	26,472
Families with Children	6,603	5,633

Data Source: Census 2000, 2010

Equitable Homeownership

Black-White Homeownership Gap, GLX corridor: 9%
Black-White Homeownership Gap, Somerville: 13%

Renter households are particularly vulnerable to displacement for the many reasons discussed previously. Since people of color make up a disproportionate share of renter households, these communities are at a greater risk. Furthermore, homeownership is an important avenue of asset creation for lower-income households, many of whom struggle to build wealth without the benefit of real estate. A greater parity in homeownership rates between whites and people of color means that this inequity is on the decline. In particular, we focus on the disparity in homeownership rates between Whites and Blacks.

Findings
The disparity between White and Black homeownership rates in the GLX walkshed is 9%, less than the disparity observed across the city (13%) and far less than the disparity observed regionwide. This is due in part to the fact that two thirds of Somerville householders are renters, so the potential disparity is limited.

	White Homeownership Rate	Black Homeownership Rate
GLX	36%	27%
Somerville	35%	22%
MAPC	65%	31%
Massachusetts	69%	35%
Metrofuture	68%	34%
Inner Core	51%	29%

Data Source: Census 2010

Designated Affordable Housing

Number of deed-restricted affordable housing units in the GLX corridor: 1,165
GLX Corridor share of deed restricted units in Somerville: 36%
Deed-restricted units as a share of total units: 9.6%

Designated affordable housing is a critical resource for Somerville's low-income population. If the absolute number of deed-restricted affordable units is rising and its share of total units is stable, this supports a conclusion that Somerville is at least keeping pace with, if not reducing, the scale of the affordability challenge relative to its overall population growth. If the absolute number of subsidized units is growing but its share of total units is declining, then the City should consider strategies to increase its ability to produce affordable housing. If the number and share of affordable units is declining, major efforts are needed to augment this supply.

Data Source: Somerville Mayor's Office of Strategic Planning and Community Development, Massachusetts Department of Housing and Community Development Chapter 40B Subsidized Housing Inventory, 2013; Census Housing Unit Count, Census 2010 SF1 DP-1

Transportation

Vehicle Ownership and Mileage

Registered vehicles per household, GLX corridor, 2010: 0.97 vehicles per household
Vehicle Miles Traveled per household, GLX Corridor, 2010: 29 miles per day

Two key policy objectives of the GLX are to reducing dependence on automobiles and increasing the availability of robust, convenient, and attractive modes of mobility other than private vehicles. If the rate of vehicle ownership per household declines, it may indicate that the provision of transit service and the growth of nearby jobs and amenities has reduced the necessity to own a private vehicle. An increasing vehicle ownership rate indicates that transit options are not sufficiently meeting residents needs, or that high-income, less transit-dependent households make up an increasing share if the population. The estimated daily mileage per household is an indicator of actual vehicle usage and is intended to decline over time due to closer proximity of destinations and an improved choice of alternative modes.

Data Source: Massachusetts Registry of Motor Vehicles

Commute Mode Share
Percent of workers commuting by transit: 32.5%
Percent of workers commuting on foot: 9.8%
Percent of workers commuting by bike: 4.6%

The rationale for this indicator is similar to the above, however this indicator allows for conclusions to be drawn about transportation behavior related only to the work commute. Specifically, all things being equal, if the share of workers commuting by transit, on foot, or by bike increases, it supports a conclusion that people are able to reduce their dependence on private vehicles for commuting to work, which is the trip purpose that accounts for the largest share of unique riders on public transit. Commuting via public transit has vastly outweighed commuting on foot or by bike for the last several decades, and all three modes tend to rise and fall in parallel because the conditions that support transit usage are strongly related to the conditions that support walking and biking to work. This indicator should be evaluated in conjunction with an awareness of broad economic conditions, however, as broader trends such as a recession and a spike in gasoline prices can also result in modal shifts.

Data Source: American Community Survey 2006-2010 5-Year Estimate, Table B08301

Transit Commute Times
Average commute time for Somerville transit commuter: 38 minutes
Percent of Somerville transit commutes 30 minutes or longer: 77%
Percent of transit commutes to Somerville employment 30 minutes or longer: 79%

Currently, the only transit mode available within the half-mile GLX walkshed is the bus. Because of longer wait times and more frequent stops, bus commutes are typically longer than rail commutes. In theory, the operation of the GLX will shorten commute times for residents within the GLX walkshed, especially for those who are currently taking the bus to a train station and transferring for the remainder of their commute. The indicator on commute times to Somerville employment provides an indication of whether transit is a viable option for people working in Somerville

Data Source: ACS 2006-10, Tables C08136 (aggregate commute time by mode) and B08301 (commuters by mode); ACS 2006-10, Tables B08534 (commute time by mode)

Appendix:
Methods Used to Estimate Displacement Risk

Methods Used to Estimate Displacement Risk from Rising Rents

Projecting Rent Increases at GLX Stations

Rent premiums for proposed stations (P_i) are calculated as:

$$P_i = \frac{R_{1/2,i}}{R_{1,i}},$$

where $R_{1/2,i}$ is the mean rent within the half-mile walkshed of station *i*, and $R_{1,i}$ is the mean rent within one mile of station *i*. P_E is the ratio of the mean rent within the half-mile and one-mile walksheds of all existing stations.

Projected rent increases within proposed GLX station half-mile walksheds are then calculated as:

$$I_i = \frac{P_E}{P_i},$$

where I_i is the projected rent increase at station *i*, P_E is the overall rent premium at existing MBTA stations in Cambridge, Somerville, Medford, and Malden, and P_i is the current rent premium at station *i*.

Weighted Average Method

Mean rents within the proposed half-mile ($R_{1/2,i}$) and one-mile ($R_{1,i}$) walksheds were estimated in two ways. The first estimates station-level means as the weighted average of station-level means and the overall GLX mean, according to the formula:

$$R_{w,i} = \frac{\frac{n_{w,i}}{\sigma_{w,i}^2}\overline{y_{w,i}} + \frac{1}{\sigma_{w,G}^2}\overline{y_{w,G}}}{\frac{n_{w,i}}{\sigma_{w,i}^2} + \frac{1}{\sigma_{w,G}^2}},$$

where $R_{w,i}$ is the mean rent estimate for walkshed *w* (half- or one-mile) at station *i*, $n_{w,i}$ is the number of apartment listings for walkshed *w* and station *i*, $\sigma_{w,i}^2$ is the variance of the rents for walkshed *w* and station *i*, $\overline{y_{w,i}}$ is the mean rent for walkshed *w* and station *i*, $\sigma_{w,G}^2$ is the variance for rents within walkshed *w* of all GLX stations, and $\overline{y_{w,G}}$ is the mean for rents within walkshed *w* of all GLX stations.

This estimation method tends to pull station-level walkshed estimates toward the overall GLX walkshed means if they have a high variance, small sample size, or deviate significantly from the overall GLX means. It leaves station-level estimates with low variance and high sample sizes relatively unchanged. The estimate for the average rent premium at existing stations (P_E) that corresponds to this method is simply the ratio of the average rent within the half-mile walkshed of existing stations to the average

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rent within the one-mile walksheds. For the existing stations in Cambridge, Somerville, Medford and Malden, this ratio is 1.29.

Linear Regression Method

The second method for estimating station-level means – and by extension, rent premiums – uses a linear regression model that includes a categorical variable that indicates whether or not an apartment is located within a half-mile walkshed. The regression model for GLX rent premiums is:

$$\frac{Rent}{Bedroom} = \alpha_0 + \alpha_1 Station + \alpha_2 Walkshed + \alpha_3(Station \cdot Walkshed) + \alpha_4 Income +$$
$$\alpha_5 Vacant + \alpha_6 Renter + \alpha_7 Family + \alpha_8 Education.$$

where Rent is rent for an apartment, Bedroom is number of bedrooms, Station is the nearest GLX station, Walkshed indicates whether an apartment is within the half-mile walkshed, Income is Median Household Income, Vacant is the vacancy rate, Renter is the percent of occupied units that are renter occupied, Family is percent of households that are family households, and Education is the percent of the population 25 and over with a bachelor degree or higher. Income, Vacant, Renter, Family, and Education all correspond to the block group that contains the apartment.

The regression model for rent premiums at existing stations is the same, except it does not include the interaction term between Stations and Walksheds. This means that we calculate a separate rent premium for each proposed GLX station (P_i), but only one average rent premium for the existing stations (P_E); using the linear model, P_E is 1.20.

Using the weighted average method and regression method, we obtained two sets of premium estimates for GLX stations (P_i) and existing stations (P_E). The ratio of these two numbers is the projected rent increase for each station. The table below shows rent premium estimates for both method. For each station, the Low and High columns show the lower and higher of the two estimates for that station. Note that for some stations the weighted average method may produce the higher estimate, and for other stations the linear model estimate may be higher. The column Projected Rent Increase ($) is the product of the projected rent increase (I_i) and the current mean rent within the half-mile walkshed.

Rent Premium Estimates for GLX Station Areas						
	Current Rent Premium (P_i)		Projected Rent Increase (I_i)		Projected Rent Increase ($)	
Station	Low	High	Low	High	Low	High
Ball Square	0.89	0.93	1.29	1.34	$277	$330
College Av.	0.88	0.89	1.35	1.37	$277	$295
Gilman Sq.	1.11	1.13	1.06	1.08	$61	$84
Lowell St.	1.18	1.22	0.98	1.01	$0	$14
Route 16	0.91	0.94	1.28	1.32	$241	$274
Union Sq.	0.95	0.96	1.25	1.26	$264	$277
Washington St.	0.72	0.80	1.51	1.67	$442	$580

From Rent Increases to Renter Burden

To estimate low-income renters who will become burdened as a result of the GLX, we use American Community Survey (ACS) tables that crosstab renter household income with the percent of income that is spent on rent. ACS estimates include, for example, the number of renter households with incomes between $20,000 and $35,000 that pay between 20% and 24.9% of income on rent. Within each income range, we assume all households make the upper income limit, and that rent as a percent of income is uniformly distributed from the lower to the upper limit. For example, if the ACS estimates that ten renter households make between $20,000 and $35,000 and pay between 20% and 24.9% of their income on rent, we assume that all ten households make $35,000, that two pay 20% in rent, two pay 21%, and so on.

Assuming that rent as a percent of income is uniformly distributed within each income category allows us to interpolate rent increases within those categories. For example, assume that rents are projected to increase by $250 per month, or 8.7% of household income at $35,000. Households paying 30% - 8.7% = 21.3% of income or more on rent pre-GLX would become burdened as a result of the increase. Assuming uniformly distributed rents allows us to estimate the number of newly burdened households from among the ten households above as $10 \times \frac{24.9-21.3}{24.9-20.0} = 7.3$. Applying this method across all income categories under $75,000, we estimate that between 737 and 809 low-income renter households may become cost-burdened as a result of rent increases after the GLX expansion.

Identifying a 'Treatment Group'

The preceding analysis compared proposed GLX stations to the twelve existing MBTA stations north of the Charles River. These stations are more likely than the rest of the MBTA system to have positive and statistically significant rent premiums. The following map shows the 46 stations that have at least five apartment listings in both their half-mile and one-mile walksheds. Among these 46 stations, 29 have a positive rent premium, but only 12 of those premiums are statistically significant, as indicated by red station logos. Among the four cities north of the Charles, however, seven out of nine stations have a positive and significant rent premium, a rate over seven times higher than the system overall. GLX stations will be located between the two lines that most consistently generate significant, positive rent premiums. We based our projections of GLX rent increases on these stations because they are closest to the GLX stations, and the above pattern suggests that stations north of the Charles River have a marked tendency to generate rent premiums.

Even though our projections are based on the average premium among stations north of the Charles River, we note that premiums vary considerably among these stations, with a high of 1.78 at Alewife to a low of 0.73 at Oak Grove.[13] Despite differences in magnitude, however, the clear trend is toward positive premiums. The only negative premiums, at Community College and Oak Grove, are statistically insignificant and correspond to small sample sizes.

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[13] Premiums were not calculated for Wellington because no apartments were listed within its half-mile buffer.

MBTA Rent Premiums

Comparable Stations

1.50

1.78 1.40

1.56

1.12

1.43

1.18 1.29

Positive & statistically significant rent premiums north of the Charles River, and their premium ratio

T Positive & statistically significant rent premium

T No statistically significant rent premium

Fewer than 5 rental points within half-mile and 1-mile buffers, therefore excluded from analysis

Existing MBTA Lines

Green Line Extension

Somerville

MAPC 2013
Data Sources: MAPC Analysis, jefftk.com, Paddmapper, MassGIS

MAPC 50 YEARS
METROPOLITAN AREA PLANNING COUNCIL
SMART GROWTH AND REGIONAL COLLABORATION

Rent Premiums at Existing MBTA Stations
(Cambridge, Somerville, Medford, and Malden)

Station	Half-Mile	One-Mile	Premium	Premium Ratio	Sample Size
Alewife	$2,038	$1,142	$896	1.78	268
Sullivan Square	$1,485	$954	$531	1.56	120
Malden Center	$1,244	$831	$413	1.50	128
Lechmere	$1,432	$1,004	$429	1.43	84
Davis	$1,357	$969	$388	1.40	344
Kendall/MIT	$2,364	$1,837	$527	1.29	106
Central	$1,556	$1,323	$233	1.18	323
Harvard	$1,636	$1,466	$170	1.12	195
Porter	$1,296	$1,220	$76	1.06	277
Community College	$1,571	$1,658	-$86	0.95	31
Oak Grove	$1,056	$1,452	-$396	0.73	14

Data from PadMapper. Wellington is not listed due to insufficient data.

Data

Data on apartment rental rates are from PadMapper, a site that aggregates apartment listings from sites like Craiglist, Zillow, and Oodle. The benefit of using apartment listings versus ACS data on rental housing costs is that listings reflect current market conditions, what would-be renters in Somerville can expect to pay. In addition, PadMapper is point-level data, so it can be aggregated to small, idiosyncratic geographies, like walksheds.

The data are from 2011 (4,470 listings) and 2013 (3,404 listings). During this time period, apartment rates increased in the Boston area significantly, as a tight mortgage market and economic uncertainty kept many potential homebuyers in the rental market. To ensure that these trends did not affect our analysis, we de-trended the data by first adjusting 2011 rates for inflation, and then adding the difference in mean rental prices between 2013 and 2011 to the 2011 rates. The result of this transformation is that 2011 rental rates have the same mean as 2013 rates.

Methods Used to Estimate Displacement Risk from Rising Property Values

The methods we used to estimate property value increases around GLX stations are similar to those we used to estimate rental price increases. The assessed value increase within GLX half-mile walksheds is estimated as:

$$I_{GLX} = \frac{P_E}{P_{GLX}},$$

where I_{GLX} is the mean assessed value increase within the combined GLX walksheds, P_E is the assessment premium within the Davis and Porter walksheds, and P_{GLX} is the current assessment

premium within the GLX station walksheds. The main differences between this and the estimate for rent increases above is that we are now estimating a single increase for all GLX stations – not different station-level estimates – and we are comparing GLX stations to Davis, Porter and Sullivan Stations only, not all stations north of the Charles River, because it can be difficult to compare assessed values across municipalities.

The premiums P_{GLX} and P_E are defined in the same way as rent premiums above:

$$P_{GLX} = \frac{A_{1/2,GLX}}{A_{1,GLX}},$$

where $A_{1/2,GLX}$ is the mean assessed value within GLX half-mile walksheds, and $A_{1,GLX}$ is the assessed value within one-mile walksheds. As with rents, we used two methods to estimate mean assessed values within each walkshed.

Simple Means
The first method was extremely simple: calculate the mean assessed values within the half-mile and one-mile walksheds. Unlike rents, it was not necessary to employ a weighted average approach because we had a large amount of Assessor's data, and we were not trying to calculate station-level estimates. Using this method, the assessed value premium for existing stations at Davis and Porter is 1.27, close to the rent premium of 1.29 for existing stations calculated above.

Linear Regression Method
The second method for calculating means used a linear regression model that included whether a parcel was within a half-mile walkshed as a categorical variable:

$$\frac{Assessed\ Value}{Units} = \alpha_0 + \alpha_1 Station + \alpha_2 Walkshed + \alpha_3 Use + \alpha_4 Year + \alpha_5 \left(\frac{Rooms}{Unit}\right),$$

where Assessed Value is the Somerville Assessor's data value, Units is the number of residential units on the property, Station is the nearest MBTA station, Walkshed indicates whether property is within a half-mile walkshed, Use indicates property use (e.g. single family or condominium), Year is year built, and Rooms is the total number of rooms on property. The assessment premium for existing stations using this method is 1.17, compared to 1.20 for rent premiums calculated above.

The table below shows rent premium estimates for both methods. Projected assessment increases in dollars are the product of the Low and High I_{GLX} with the mean property assessment within GLX half-mile walksheds. Property tax increases are the product of the assessment increase in dollars with Somerville's millage rate of 0.01342.

Rent Premium Estimates for GLX Station Areas								
	Current Assessment Premium (P_i)		Projected Assessment Increase (I_{GLX})		Projected Assessment Increase ($)		Projected Property Tax Increase ($)	
	Low	High	Low	High	Low	High	Low	High
GLX Stations	1.01	1.02	1.16	1.25	$40,393	$64,680	$542	$868

Source: PadMapper 2011 and 2013

Data

Assessor's data are from the 2013 MassGIS Level 3 parcel file. We based our analysis on residential properties with eight or fewer units. This includes single family homes, two- and three-family homes, condominiums, and four-to-eight unit apartment buildings.

List of Acronyms

ACS   American Community Survey

CEDAC   Community Economic Development Assistance Corporation

GLX   Green Line Extension

MAPC   Metropolitan Area Planning Council

MBTA   Massachusetts Bay Transit Agency

PUMS   Public Use Microdata Sample

PUMA   Public Use Microdata Area

SCC   Somerville Community Corporation

SPCD   Mayor's Office of Strategic Planning and Community Development

STEP   Somerville Transportation Equity Partnership