

## 2015 TECHNICAL APPENDIX

### Overview

This technical report contains details about the development of the 2015 Healthy Aging Community Profiles. This includes information on indicators (e.g., technical definitions, the data sources and years of data used, definitions of the geographic units employed for various indicators) and the statistical methods used to estimate indicators derived from micro-level data.

### 1. Healthy aging indicator definitions

Due to resource limitations all healthy aging indicators are derived from existing secondary data sources and limited to those indicators for which secondary data are available for geographic subareas within Massachusetts. Table A-1 contains technical definitions for all the healthy aging indicators reported in this study. The socio-demographic variables used to describe the population composition of communities rely on standard definitions and, therefore do not require further explanation.

### 2. Data Sources

Multiple data sources are used in this study. Table A-2 contains a summary of all data sources, and the specific years of data used for population composition and healthy aging indicators. Estimates of community-level indicators of physical/mental health, chronic disease prevalence, access to care, wellness and preventive health behaviors, service utilization, and nutrition and diet were derived from two major data sources: the Medicare Master Beneficiary Summary File and the Behavioral Risk Factor Surveillance System. Population composition measures were drawn from the 2010 Decennial Census and 5-year American Community Survey produced by the U.S. Census Bureau. These major data sources, and other data sources used for other community, safety, and economic variables, are described below.

#### Medicare Master Beneficiary Summary File

Medicare claims data from the Centers for Medicare and Medicaid Services (CMS) are a rich source of data for measuring chronic disease prevalence and Medicare service utilization rates for individual cities and towns. The *Master Beneficiary Summary File (MBSF)* is an annual data file constructed by the Chronic Conditions Data Warehouse that includes individual records for all persons eligible for Medicare for at least one month during a calendar year. The MBSF is comprised of three data files containing different types of information:

- (1) The *Master Beneficiary Summary File-A/B/D (MBSF-A/B/D)* includes standard Medicare administrative data fields (e.g., sex, race, dates of birth and death), monthly variables indicating specific months of Medicare eligibility, managed care enrollment, and Medicaid state buy-in status, as well as geographic residence identifiers (state, county, zip code) based on each beneficiary's residence address used for Social Security Administration correspondence.

- (2) The *Master Beneficiary Summary File-Chronic Conditions (MBSF-CC)* includes indicators derived from Medicare algorithms applied to diagnostic codes on individual Medicare fee-for-service provider claims for 27 prevalent chronic conditions (e.g., diabetes, stroke, depression, Alzheimer's disease or related dementia, chronic obstructive pulmonary disease, hip fracture, cancer), as well as the earliest date since 1999 that the diagnostic criteria for prevalence were first met.
- (3) The *Master Beneficiary Summary File-Cost and Use (MBSF-CAU)* contains aggregated summaries of annual service utilization and reimbursements for various types of Medicare services (e.g., inpatient hospitalizations, physician visits, home health visits, skilled nursing facility stays, emergency room visits, hospital readmissions, and filled Part D prescriptions).

Each beneficiary record contains an encrypted individual identifier so that information from the three data files can be merged together. The three MBSF data files were obtained from CMS for all Medicare beneficiaries who were age 65 years or older on January 1<sup>st</sup> of the calendar year, and had a state residence code of Massachusetts for 2010 and 2011. The data were obtained under a formal data use agreement required for privacy protection of health information contained in research-identifiable data files

A major strength of the MBSF data is their coverage of 100% of aged Medicare beneficiaries living in Massachusetts. This permits the estimation of health indicators for relatively small individual towns. These rates can be potentially updated annually. The major shortcoming of the MBSF data are that they are derived from claims data. Since chronic condition prevalence is identified from diagnoses on Medicare claims, rates of chronic disease prevalence and service use can only be measured for Medicare beneficiaries who receive their care from fee-for-service providers. Managed care providers such as Medicare Advantage plans do not submit claims data to Medicare for processing. In addition, beneficiaries whose chronic condition is undiagnosed will not be identified as having that chronic condition. For example, a person with little or no access to a physician will not be identified as having that chronic condition. Finally, the health indicators constructed from MBSF data are limited in scope since they are based on administrative data. Nevertheless, these data are rich with respect to geographic specificity compared to other common data sources for health indicators.

### Behavioral Risk Factor Surveillance System (BRFSS)

The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based system of annual health surveys established by the Centers for Disease Control and Prevention (CDC) that collects information on health risk behaviors, preventive health practices, and health care access, primarily related to chronic disease and injury. The BRFSS provides a rich source of information about individual health behaviors such as smoking, excessive drinking, obesity, preventive health service use, which are relevant for the development of healthy aging indicators. A core set of questions about such health behaviors are included every year. The Massachusetts Department of Public Health (MDPH) is responsible for collecting BRFSS data for Massachusetts. The MDPH adds questions beyond the core CDC questions on relevant topics to support health care policy planning, to guide preventive health interventions, and to assess health status and its change over time for Massachusetts residents. Person-level

BRFSS data for were obtained from the Massachusetts Department of Public Health under a formal data use agreement required for individual privacy protection of health information.

The BRFSS survey is carried out under a complex survey design intended to enhance the efficiency of using limited sample population to produce reliable state-level estimates of health indicators. Interviews are administered in three alternative languages (English, Spanish, Portuguese) depending upon respondents' preferences. Respondents are oversampled in larger cities in the state under the BRFSS complex survey design to increase the representation of racial/ethnic minority respondents. Before 2008, BRFSS data were obtained entirely through land-line telephone surveys. Because of the rising prevalence of households with only cell-phones, the BRFSS survey design was modified in 2011 to include both land-line and cell phone samples. Furthermore, the method used to derive post-stratification factors was changed in 2011 to a raking procedure that permits finer adjustments to population weights based on multiple population attributes. These changes in the 2011 BRFSS survey design introduce some complexities. How these changes in survey design are addressed will be discussed later in the description of estimation methods.

A major strength of the BRFSS data is its rich information on health behaviors. To our knowledge no other secondary dataset has the range of variables on health behaviors of older Massachusetts residents. The BRFSS has several limitations for small area analyses. The BRFSS survey design was developed for obtaining the state-level estimates. Accordingly, the respondent sample sizes for most individual towns in Massachusetts in any year are far too small to produce reliable estimates for most towns. Even if appropriate adjustments are made because of unrepresentative samples for many small towns, small area estimation will require that BRFSS survey data be pooled over multiple years. For example, the number of respondents 60 years or older with valid geographic residence identifiers in the entire state BRFSS sample has ranged from 6,353 in 2009 to 8,689 in 2011. This is far too small to estimate town-level rates for all 351 cities and towns in Massachusetts.

Because of the small sample size of annual BRFSS surveys, multiple years of survey data were pooled together, and multiple cities and towns were aggregated together to create larger geographic areas containing multiple cities and towns. While most estimates were derived pooling three years of BRFSS survey data (2009-2011), one or two additional years of earlier data were added to the pool to obtain some estimates based questions that were not asked to the full BRFSS sample every year. Table A-2 shows the specific years of data used to derive estimates for each BRFSS indicator. Details about estimation methods are provided later on in the section describing BRFSS estimation methods.

### Medicare Compare Access to Care

Data on Medicare service providers (physicians, hospitals, nursing homes, and home health agencies) were obtained from Medicare website <<http://www.medicare.gov>>. Number of primary care providers was obtained from website (<http://www.medicare.gov/physiciancompare/search.html>) using the search term "city/town name, Massachusetts" and "Primary care". After initial searching with this term, we updated

search results by selecting within 5 miles option. Number of hospitals was obtained from website (<http://www.medicare.gov/hospitalcompare/search.html>) using the search term “city/town name, Massachusetts”. After initial searching with this term, we updated search results by selecting within 5 miles option. Number of nursing homes was obtained from website (<http://www.medicare.gov/nursinghomecompare/search.html>) using the search term “city/town name, Massachusetts”. After initial searching with this term, we updated search results by selecting within 5 miles option. Number of home health agencies was obtained from website (<http://www.medicare.gov/homehealthcompare/search.html>) using the search term “city/town name, Massachusetts”. There was no option for selecting within 5 miles for home health agencies. Home Health Compare lists agencies whose geographic service areas contain the selected zip code, city, or town.

### U.S. Census Bureau

Data on population composition were downloaded from the U.S. Census Bureau Fact Finder website <<http://factfinder2.census.gov>>. Total population estimates were obtained from 2010 Decennial Census data. All other population estimates reported in the community profiles were derived from American Community Survey data pooled over five years (either 2007-2011 or 2008-2012). Data were downloaded for all 351 individual cities and towns. In addition, census tract data were downloaded and aggregated for 16 planning districts within the city of Boston. Finally, Census tract definitions of Boston planning districts were downloaded from the Boston Redevelopment Authority website <<http://www.bostonredevelopmentauthority.org/research-maps/research-publications/neighborhoods>>.

### Walk Score<sup>®</sup>

Community-level indicators of geographic access to amenities and the overall walkability of communities are obtained from the Walkscore.com website (<http://www.walkscore.com/>). The reported Walk Score<sup>®</sup> was derived from existing proprietary software that creates a score for the walkability for any address. It is based on straight-line distance to various types of place amenities defined as commercial and public facilities (e.g., grocery stores, coffee shops, restaurants, banks) and amenities (e.g., parks). Points are assigned to each category of place types based on straight-line distance from an address to the site. The most points are assigned to places located within a five-minute walk from an address (operationalized as ¼ mile) with lesser points assigned to more distant places using a distance-decay function. Higher scores indicate greater accessibility by foot. While additional research on its validity is needed, one study has already provided some empirical support for the validity of the current Walk Score as an indicator of walkability (Duncan, Aldstadt, Whalen, Melly, & Gortmaker, 2011). A total walkability score scaled to range from 0 (least walkable) to 100 (most walkable) was downloaded for individual cities and towns and for planning districts within Boston using the search term “city/town name, Massachusetts” during July and August 2013. Current scores for some communities may differ from these since Walk scores are updated as commercial or public facilities open/close over time.

### Massachusetts Voter data

Data for voters of 18 years and older for 2012 were obtained for cities and towns from the Massachusetts Elections Division, Secretary of the Commonwealth. Data could not be reported separately for planning districts within Boston. A count of the number of registered voters age 18 and older and the % of registered voters age 18 and older who participated in the 2012 presidential election were reported for every city and town.

### Elder Economic Security Standard™ Index

Four measures of geographic comparative cost of living are reported at the county level using the Elder Economic Security Standard™ Index. This index contains county estimates of the minimum income needed by older households to attain a modest standard of living in the community that reflects economic security. “The Elder Index defines economic security as the financial status where elders have sufficient income (from Social Security, pensions, retirement savings, and other sources) to cover basic and necessary living expenses” (Gerontology Institute, University of Massachusetts Boston (2012), p 5). While Elder Index estimates are available at the county-level for 18 different types of community-resident households with a head 65 years or older defined by health status (excellent, good, poor), living situation (alone, couple), housing costs (owner with mortgage, owner without mortgage, renter), we report Elder Index estimates for four types of households in good health (single renters, single owners without mortgages, couple renters, and couple owners without mortgages). Elder indices for 2010 were downloaded for all counties in Massachusetts from the Wider Opportunities for Women Economic Security Database < <http://www.basiceconomicsecurity.org/EI/> >.

### Federal Bureau of Investigation Uniform Crime Reports

Data from 2008-2011 on violent crime and property crime rates were downloaded from the Federal Bureau of Investigation website <<http://www.fbi.gov/stats-services/crimestats>>. Since 2011 crime data were not available for all cities and towns in Massachusetts, we developed a simple procedure for assigning rates to towns. We first assigned crime rate data to towns using the most recent year of data available starting with 2011 through 2008. When town-specific information was not available in any of the five years, we computed the crime rate for an aggregated geographic area of bordering towns. Additional details about the assignment of crime rates to specific towns are provided in a later section discussing community geographic definitions.

### U.S. Environmental Protection Agency *AirCompare*

The AirNow website of the U.S. Environmental Protection Agency provides measures air quality with the Air Quality Index (AQI) with scores ranging from 0 to 500. Higher AQI values reflect greater levels of air pollution and a greater health concern. *AirCompare* provides county-level comparisons of the number of days in a year that AQI values are between 101 and 150 (code orange) and/or exceed 150 (code red) for specific subpopulations. For the subpopulation that includes older persons without specific health concerns, the total count of days includes code red days for any pollutant and code orange days for ozone and particulate matter. County values were obtained for 2013 from <<http://www.epa.gov/cgi-bin/broker?condition=oldyoung&citycounty=county&geocode=25001+25003+25005& debug=2& service=airco>>

[mp&\\_program=dataprog.wcj\\_bymonthyearhealth.sas&submit=Compare+My+Air](#)>. No data were reported for Franklin County.

### Area Health Resources File

County level data for one indicator on the supply of active dentists per 100,000 persons is derived from the 2012-2013 Area Health Resources File data posted on the Health Indicators Warehouse website <<http://healthindicators.gov/>>.

### Fatality Analysis Reporting System

Data on fatality related with a motor vehicle crash were downloaded from the National Highway Traffic Safety Administration (NHTSA) website <<http://www.nhtsa.gov/FARS>>. The Fatality Analysis Reporting System (FARS) is annual data on traffic crashes resulting in at least one fatality occurring within 30 days of the crash. The FARS contains data derived from a census of fatal traffic crashes within 50 states, the District of Columbia, and Puerto Rico. We selected fatal crashes with at least one death of vehicle occupants (e.g. driver or passenger) or non-motorist (e.g. pedestrian) occurring in Massachusetts only from 2008 to 2012.

## **3. Geographic Area Definitions of Communities**

Data availability limited the geographic specificity of the community definitions for which healthy aging indicators could be measured. There are two major factors that constrained how finely geographic communities could be defined. The first factor is the relatively small sample size of the Massachusetts BRFSS data. The second factor is the sparse actual populations of older persons residing in some Massachusetts towns, most of which are located in Western Massachusetts. Even if data were available for all older persons in some of these towns, the populations are too small for public reporting of town-level estimates because of privacy concerns.

In this study we addressed the problems associated with sparsely populated towns by selectively aggregating some smaller towns together into larger geographic areas to increase the sample size used for estimation. The estimates derived for the larger aggregated geographic area are then reported for all individual constituent cities/towns. This is an acknowledged limitation of this study.

### Geographic areas for Medicare MBSF indicators

Although the Medicare MBSF contains individual records for 100% of beneficiaries who are eligible for Medicare in at least month in a calendar year, geographic aggregation of some smaller towns in Western Massachusetts was necessary. We generated town-level estimates from Medicare MBSF data for individual towns with at least 200 aged Medicare beneficiary residents satisfying sample selection requirements (described below). Towns with fewer than 200 such beneficiaries are combined with one or more adjacent towns to form an aggregate geographic area with a combined sample size of more than 200 beneficiaries. Combined

towns had to border each other. The aggregation of specific bordering smaller towns together was guided by the following principles:

1. It is preferable to combine a smaller town with another smaller town rather than a larger town.
2. It is preferable to combine fewer towns rather than more towns together (e.g., a two-town geographic area is preferable to a three-town geographic area).
3. It is preferable to combine towns that are located in the same geographic Primary Care Service Area as defined by the Dartmouth Atlas of Health Care (see <http://www.dartmouthatlas.org/data/region/>).
4. It is preferable to combine towns located within the same county relative to towns in different counties.
5. It is preferable to combine towns located in the same Aging Services Access Point (ASAP) geographic service area relative towns in different ASAP areas.

Using these principles as a guide, we defined 310 geographic communities in Massachusetts for indicators estimated from Medicare MBSF data. Among these 310 communities there were 262 stand-alone individual actual cities and towns. There were 32 aggregated geographic areas comprised of two or more individual towns. One example of such an aggregate geographic area is comprised of three Massachusetts towns: Granville, Tolland, and Southwick. Table A-3 contains a list of the individual towns that were combined together to form the 32 aggregated geographic areas. The same common value for MBSF indicators is reported in the community profiles of towns that were combined together to form these aggregated geographic areas.

The city of Boston is disaggregated into 16 subareas that correspond to planning districts defined by the Boston Redevelopment Authority (BRA). A cross-walk file employed in previous research by Li, Kelsey, Zhang, Lemon, Mezgebu, Boddie-Willis, & Reed (2009) and Li, Land, Zhang, Keithly, & Kelsey (2009) was used to assign beneficiaries residing in individual 5-digit zip code areas in Boston to these 16 BRA Planning Districts (i.e., Charlestown, Central, Back Bay, Fenway/Kenmore, Allston/Brighton, South End, East Boston, South Boston, Mattapan, Roxbury, South Dorchester, North Dorchester, West Roxbury, Roslindale, Hyde Park, Jamaica Plain).

#### Geographic areas for BRFSS indicators

Given the small sample sizes of BRFSS respondents it was only feasible to estimate BRFSS indicators for the largest cities in the state. Given the potential utility of the healthy aging community profiles for Aging Service Access Points (ASAPs) we use the geographic service areas of the Massachusetts ASAPs as the starting point for defining aggregate geographic areas for indicators derived from BRFSS data. We defined 33 modified ASAP geographic areas for the state of Massachusetts as follows:



- 17 modified ASAP areas are actual ASAP geographic service areas;
- 6 modified ASAP areas are larger cities: Brockton, Fall River, Lowell, New Bedford, Springfield, Worcester;
- 6 modified ASAP areas are each comprised of all remaining towns in ASAP service areas other than the larger core cities listed above;
- 4 modified ASAP areas within the combined geographic area defined by Boston and the ASAP service area of Chelsea, Revere, and Winthrop. The four modified ASAP areas were defined on the basis of grouping together Boston Planning Districts, Chelsea, Revere, and Winthrop on the basis of similar values for median family income, percentage white/nonwhite population composition, and percentage of adults with less than a high school education. The four modified Boston ASAP areas are defined as: (1) Charlestown, Central, Back Bay, Fenway/Kenmore, Allston/Brighton, South End, (2) East Boston, South Boston, Chelsea, Revere, Winthrop, (3) Mattapan, Roxbury, South Dorchester, North Dorchester, and (4) West Roxbury, Roslindale, Hyde Park, Jamaica Plain

It is important to reiterate that the six ASAP areas with larger cities are each split into two modified ASAP areas: (1) a core larger city, and (2) a residual peripheral area surrounding the core city that is comprised of multiple towns. This was done because the socio-economic population composition of these core cities tends to differ from that of the surrounding peripheral towns in the same ASAP service areas. The Chelsea Revere Winthrop Elder Services ASAP geographic service area is combined with several Boston Planning Districts in Northeast Boston because of the small number of BRFSS respondents living in Chelsea, Revere, and Winthrop. Table A-4 contains a list of modified ASAP service areas and their constituent towns and/or Boston Planning Districts. The individual towns combined together to form modified ASAP service areas are all assigned the same common value for BRFSS indicators.

#### Geographic areas for FBI crime rate data

As noted earlier since 2011 crime data are not available for all individual cities and towns in Massachusetts, we developed a simple procedure for assigning crime rate data to towns. We first assigned crime rate data to individual towns using the most recent year of data available starting with 2011 through 2008. There were 280 cities and towns where FBI crime data was reported for the individual city/town. Town-specific data for 2011 is reported for 234 cities/towns. For 26 towns 2010 data is reported. Fourteen towns are assigned data from 2009, and six towns are assigned 2008 data. When crime data was not available in any of years for a town, we first attempted to compute a rate by combining data from bordering towns with crime data that were previously combined to form aggregated areas for indicators derived from Medicare data. When this was not possible, towns with missing crime data were simply combined with one or more bordering towns with reported crime data. Table A-5 contains a list of towns that were grouped together with other small towns in this way. For two towns,



grouping together adjacent towns did not produce reasonable results. 2011 computed crime rates based on the combined population and crime data for all adjacent towns (themselves reported individually) are assigned to Millis, and 2011 crime rates for the entire Franklin County are assigned to Buckland. We did not disaggregate crime rate data for the City of Boston into Boston Redevelopment Authority Planning Districts. The same Boston-wide crime rates are reported for all Boston Planning Districts.

#### Geographic areas for FARS crash data

FARS contains crash locations in cities / towns and counties in Massachusetts. We counted fatalities by city / town and county in Massachusetts. Note, we did not disaggregate number of fatality for the City of Boston into Boston Redevelopment Authority Planning Districts.

#### Geographic areas for Elder Economic Standard Index and dentist supply

Secondary data on the geographic distribution of dentists and the Elder Economic Standard Index were only available for the 14 counties in Massachusetts. For these indicators all cities and towns within the same county were assigned common values.

### **4. Geographic data sources**

Geographic information is used in this report in a variety of ways, ranging from the creation of cross-walk tables between different geographic units (e.g., 5-digit zip code areas to towns) to the mapping of healthy aging indicator estimates with GIS software. This section summarizes the sources of other geographic data used in the study.

#### Zip code database

A comprehensive list of valid 5-digit zip codes in Massachusetts for 2011 was obtained from a SASHELP data file shipped with SAS V9.3 software and updateable from online sources (see Hadden and Zdeb, 2006). This “zipcode.sas7bdat” data file contains individual records for all valid 5-digit zip codes, the city/town, county, and state it is located in, and the latitude and longitude coordinates of the centroid of the zip code area. It also contains an indicator of whether the zip code value represents a standard geographic zip code area, a point zip code (e.g., post office box), or a unique zip code assigned to certain entities such as a university. There are 697 zip code records for Massachusetts.

#### Zip code shape file

A zip code shape file used for mapping of 5-digit zip code areas was obtained from the U.S. Census Bureau based on the 2010 Census. The shape file was downloaded from the website <http://www.census.gov/geo/maps-data/data/tiger-line.html>. The SAS zip code data base contained about 697 records for all types of 5-digit zip codes (standard, point, etc.) in Massachusetts. The Census zip code shape file only contains 538 spatial 5-digit zip code areas. Zip code maps were used to checking the validity of matches between zip codes and

towns in BRFSS data and to make decisions about assignments of certain zip codes to individual towns. Some zip code areas are located in more than one town, and some small towns do not have their own zip code. Small towns without their own 5-digit zip code are aggregated together with a bordering town within the same 5-digit zip code. When multiple towns shared a 5-digit zip code, the entire zip code is assigned to the most populated town. Data from the zip code data base and zip code shape file were combined using ArcGIS ArcMap V10 software (<http://www.esri.com/>).

#### Town, county, and Boston neighborhood shape files

Town and county shape files for Massachusetts were downloaded from the MASS GIS web site (<http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/layerlist.html#polit> ). A shape file for Boston neighborhoods was downloaded from a city of Boston website (<http://www.cityofboston.gov/MAPS/default.asp>). These shape files are used with ArcGIS ArcMap V10 software to produce maps of the CMS and BRFSS health indicators listed in Table A-1.

#### Massachusetts Department of Transportation (MassDOT) Roads shape file

MassDOT roads shape file was downloaded from the MASS GIS web site (<http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/eotroads.html>). This shape file is used with ArcGIS ArcMap V10 software to produce maps of the location of fatal crashes in Massachusetts.

### **5. Estimation Methods for Medicare MBSF indicators**

#### Sample selection criteria

While the Medicare MBSF contains data on all Medicare beneficiaries with at least once month of Medicare Part A or B eligibility in a calendar year, estimates of chronic condition prevalence and service utilization rates can only be derived for beneficiaries who receive care from fee-for-service providers who submit claims to Medicare for reimbursement. Beneficiaries with prevalent chronic conditions are identified through algorithms applied to the diagnostic codes reported on Medicare claims over a defined surveillance period. Chronic condition prevalence is determined by the presence of one or several claims (depending on the condition) containing appropriate condition-specific diagnostic codes within surveillance period.<sup>1</sup> Most of these claims algorithms scan claims for both Medicare Part A and B covered services. Claims are not submitted to Medicare during any time interval in which an individual is not eligible for Medicare Part A and/or B and when a beneficiary is enrolled in a Medicare managed care plan that does not submit claims to Medicare for reimbursement. To reliably estimate chronic condition prevalence rates the sample population used for rate estimation should exclude

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<sup>1</sup> The diagnostic codes used in the algorithms used to flag Medicare beneficiaries are available from the Chronic Conditions Warehouse web site (<https://www.ccwdata.org/web/guest/condition-categories>).

beneficiaries for whom Medicare does not receive claims for services used. To retain such beneficiaries in the sample amounts to an implicit assumption that these beneficiaries used no Medicare covered services when they were not Medicare eligible or enrolled in a Medicare Advantage plan. Hence, rates of chronic condition prevalence and service utilization will generally be underestimated unless such beneficiaries are excluded from the estimation sample.

There are several analytic options for restricting the population sample and rate estimation under these circumstances. O'Donnell, Schneider, & Dean (2008) discuss some of the pros and cons of several options for imposing restrictions on the estimation sample. The most extreme option is to require "full coverage" where the sample is restricted to beneficiaries with a full year of Medicare Part A and B eligibility and who are never enrolled in a Medicare managed care plan during the year. While requiring full coverage ensures that claims were submitted for all Medicare services used by beneficiaries in a calendar year, such a restriction can result in underestimates of chronic condition prevalence rates because some beneficiaries with partial-year coverage have Medicare claims indicating prevalent chronic conditions in those months that claims were submitted. Under the "partial coverage" option, beneficiaries with nearly a full-year of Medicare Parts A and B eligibility and care from fee-for-service providers are retained in the sample. O'Donnell, Schneider, and Dean (2008) note that "a common recommendation is to allow for a one month break in coverage per year of surveillance. This is an attractive option to avoid losing many cases with the condition of interest (i.e., known cases, as indicated in claims) due to the occurrence of only partial FFS coverage" (O'Donnell, Schneider, & Dean (2008), p 7).

In this study we chose to use this "partial-year coverage" option for estimating population-based chronic condition prevalence and service utilization rates. The sample selection criteria used to apply the partial coverage requirements differ depending on the length of the claims surveillance period employed for the chronic condition of interest. While a one-year claims surveillance period is used for most chronic conditions reported in the Medicare MBSF, for some conditions such as congestive heart failure and diabetes, the claims surveillance period is two years. For Alzheimer's disease or related dementias the claims surveillance period is three years. With only two years of Medicare MBSF data (2010-2011) available to this study, we applied the two-year surveillance sample selection criteria for Alzheimer's disease or related dementia.

Since Part A and B Medicare service utilization rates are based on single-year claims surveillance, the same sample selection criteria are employed for single-year surveillance chronic conditions and all Medicare service utilization rates except for Part D prescription drug utilization.

#### Determination of chronic condition prevalence: Ever versus current year

For each beneficiary the MBSF contains two flag variables for each chronic condition that indicate whether or not the Medicare claims data diagnostic requirements were met for the condition. First, there is a variable noting whether there is claims data evidence of prevalence during the *current* surveillance period only. This variable reports whether or not full-year

surveillance coverage and/or diagnostic requirements from claims data were met for the chronic condition. The four categories are: (1) neither claims diagnosis nor surveillance coverage requirements were met, (2) claims diagnosis requirements were met but surveillance coverage requirements were not met, (3) claims diagnosis requirements were not met but surveillance coverage requirements were met, (4) both claims diagnosis claims and surveillance coverage requirements were met. Current-year prevalence requires that claims diagnosis requirements are met. If partial FFS coverage is used to select beneficiaries meeting surveillance coverage requirements then both (2) and (4) above are used to flag beneficiaries with claims data evidence of prevalence in the *current* year. For each beneficiary there is a second historical flag variable that contains earliest calendar year from 1999 onward that the CCW Medicare claims data diagnosis requirements for chronic condition prevalence were met.

Although chronic conditions can be managed effectively through medications, surgery, and/or diet and lifestyle changes, unlike acute illnesses they remain prevalent after onset. However, depending on the extent and type of a Medicare beneficiary's service use in any particular calendar year, there may be no *current-year* claims data evidence of chronic condition prevalence even when such claims data evidence exists in previous calendar years. While questions have been raised about the extent to which some prevalent chronic conditions may be missed for beneficiaries due to the brevity of the MBSF surveillance periods used to determine current-year prevalence<sup>2</sup>, current-year chronic condition prevalence rates are commonly reported (e.g., see Chronic Conditions Warehouse 508 Files <https://www.ccwdata.org/web/guest/interactive-data/chronic-conditions-dashboard>, Centers for Medicare and Medicaid Services, 2012).

In this report we have chosen to define chronic condition prevalence based on whether there was any CCW claims data algorithm evidence ever since 1999 rather than only current-year 2011 algorithm evidence. There are several reasons for this choice. First, self-reports of chronic conditions are typically based on questions asking whether a doctor *ever* told a respondent that he/she had a certain condition. The "ever-met" claims algorithm definition of prevalence is more similar to the "ever" time period used in self-reports. Second, while some studies have shown that for some conditions self-reports may result in underestimated prevalence rates (e.g., Porell and Miltiades, 2001), claims-based estimates based on finite surveillance time periods are more likely to understate than overstate prevalence rates (e.g., Gorina and Kramaroy, 2011).

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<sup>2</sup> Gorina and Kramaroy (2011) applied Chronic Conditions Warehouse (CCW) claims data algorithms to the Medicare claims of NHANES I Epidemiologic Follow-up Study respondents who were identified as having one or more of five chronic conditions (diabetes, ischemic heart disease, COPD, dementia, arthritis) *prior* to the claims surveillance time periods. Prior-period prevalence was determined from baseline and follow-up interview self-reports by respondents, records from baseline physical exams conducted by physicians (including X-ray results for arthritis). In the case of dementia, baseline responses to the Mental Status Questionnaire and follow-up interview questions were used to determine prevalence prior to the claims surveillance time period. Among respondents identified as having the chronic condition prior to the claims surveillance period, application of the CCW claims algorithms over defined surveillance periods identified between 17% (arthritis) and 69% (diabetes) of respondent identified as having those conditions from survey information prior to the surveillance period. While Gorina and Kramaroy (2011) acknowledge that there may be errors in pre-surveillance prevalence status based on survey data (e.g., erroneous self-reports of chronic conditions) their empirical results suggest that the CCW chronic condition surveillance time periods are more likely to be too short to identify prevalence for those chronic conditions where there is a lesser need to regularly use Medicare services for management of the condition.

Since prevalence rates based on any claims data surveillance evidence since 1999 will naturally include claims evidence from 2011, the prevalence rates reported in this study are higher than those based on current-year surveillance periods (e.g., Chronic Conditions Warehouse 508 files). We computed both current-year and ever-had (since 1999) prevalence rates for all reported chronic conditions. Current-year prevalence rate estimates were similar to those reported elsewhere (e.g., Chronic Conditions Warehouse 508 files). For a few conditions (e.g., glaucoma, hip fracture, and cancer) the ever-had prevalence rates are substantially higher than current-year prevalence rates. The reason for the much higher ever-had prevalence rate is clear for a condition such as hip fracture. A hip fracture diagnosis is unlikely to be recorded on Medicare claims long after a recovery period following the injury event causing the hip fracture even when a person with a past hip fracture is likely to have a greater current fall risk than his/her counterpart with no history of hip fracture. In other cases, the reasons for the differences are not as clear. The reader should keep these differences in mind when comparing our reported prevalence rates, which are based on ever meeting the claims data requirements for prevalence since 1999, to rates reported elsewhere, which are commonly based on current surveillance period claims data requirements.

#### Specific sample selection requirements

Even though chronic condition prevalence is determined on the basis of claims evidence prior to the current surveillance period, the beneficiaries selected to be counted in the denominator for prevalence rate estimation had to meet current-year surveillance rate requirements to avoid substantial under-estimation of prevalence rates because of beneficiaries enrolled in Medicare managed care plans. Below we describe the specific partial-year surveillance coverage requirements employed in rate estimation.

#### *Single-year surveillance chronic conditions and Parts A & B service utilization*

We followed the partial-year coverage requirements recommended by O'Donnell, Schneider, & Dean (2008) that differed depending upon whether or not a beneficiary survived the full calendar year. It is important to retain beneficiaries who die during the year in the estimation sample to mitigate potential biases. If a beneficiary dies on the day when a heart attack occurs he/she cannot meet full-year coverage requirement unless the heart attack occurs on December 31<sup>st</sup> and would not be counted as experiencing a heart attack. The bias of not including beneficiaries who die during the calendar may be substantial given the high medical costs experienced in the last years of life for many beneficiaries.

For all single-year surveillance chronic conditions and for all service utilization rates except Part D prescription fills and hospital readmission rates, partial-year coverage for beneficiaries alive at the end of 2011 requires that:

- a beneficiary have at least 11 months of both Medicare Part A and B eligibility and at most one month of Medicare managed care enrollment in 2011.

Beneficiaries who died in 2011 are required to have full coverage (Medicare Part A and B eligibility and no Medicare managed care enrollment) in all months that they were alive in 2011. All beneficiaries are further required to have a valid 5-digit residence zip code recorded in the 2011 Medicare MBSF for residence assignment to towns. There were 623,305 Medicare beneficiaries who met these sample selection requirements.

For the readmission rate indicator, we naturally imposed an additional condition that a beneficiary must have been hospitalized at least once during 2011. There were 220,050 Medicare beneficiaries who met this additional sample selection requirement for hospital readmissions.

### *Two-year surveillance chronic conditions*

For all other 2-year chronic conditions, partial-year coverage for beneficiaries alive at the end of the 2011 required that:

- a beneficiary have at least 22 months of both Medicare Part A and B eligibility and at most two months of Medicare managed care enrollment over the two calendar years 2010-2011.

Beneficiaries who died in 2011 are required to meet the partial-year coverage requirements in 2010 and meet full coverage requirements in the months they were alive in 2011. Beneficiaries are also required to have a valid 5-digit residence zip code recorded in the 2011 Medicare MBSF. There were 557,036 Medicare beneficiaries who met these sample selection requirements.

Since 2010 MBSF data were extracted based on beneficiary residence in Massachusetts in 2010, there are some beneficiaries with records in the 2011 MBSF who did not meet the two-year surveillance sample selection criteria because they did live in Massachusetts in 2010. Unfortunately these beneficiaries had to be excluded from the two-year surveillance estimation sample. If Medicare beneficiaries who recently moved to Massachusetts tend to have systematically better/worse health status than longer term resident beneficiaries, this difference will not be reflected in the town-level estimated prevalence and service utilization rates.

While beneficiaries younger than 65 years of age can be entitled to Medicare due to disability, most beneficiaries are not entitled to Medicare until they reach 65 years of age under Old Age Survivors Insurance status. Accordingly, to satisfy the one-year surveillance sample selection criteria most beneficiaries must have been 65 years old by February 1<sup>st</sup> of 2011. The two-year surveillance sample selection criteria require that such beneficiaries be 65 years old as of March 1<sup>st</sup> of 2010. While we do not make this distinction in our general descriptions of the chronic condition prevalence indicators, the prevalence rates for two-year surveillance period chronic conditions strictly pertain to an older population than the population for single-year conditions and service utilization rates. It is also possible that by employing the two-year sample selection criteria for Alzheimer's disease or related dementias (with a three-year

surveillance period), this may have produced underestimates of prevalence rates for this condition.

#### *Part D prescription drug utilization rates*

In contrast to other Medicare covered services the Medicare MBSF contains summary information about Part D prescription drug utilization for both beneficiaries receiving care from fee-for-service providers and Medicare managed care enrollees. Furthermore, some Medicare beneficiaries with Parts A and B eligibility may not have opted to enroll for Part D Medicare coverage. Because of these factors, the sample selection criteria for the Part D prescription drug utilization indicator differ from that employed for other Medicare covered services.

For Part D prescription utilization, partial-year coverage for beneficiaries alive at the end of 2011 requires that:

- a beneficiary have at least 11 months of Medicare Part D coverage.

Beneficiaries who died in 2011 are required to have Medicare Part D coverage in all months they were alive in 2011. Beneficiaries are also required to have a valid 5-digit residence zip code recorded in the 2011 Medicare MBSF. There were 401,888 Medicare beneficiaries who met these sample selection requirements.

#### *Medicaid dual eligibility and Medicare managed care status*

For our estimates of Medicare managed care enrollment status and dual eligibility for Medicare and Medicaid, no additional sample selection criteria are imposed beyond the basic age and state residence requirements used to select beneficiaries contained in the MBSF data for Massachusetts. Beneficiaries had to be 65 years or older on January 1<sup>st</sup>, 2011, eligible for Medicare for at least one month in 2011, and have a state residence code for Massachusetts. There were 941,155 Medicare beneficiaries who met these sample selection requirements.

#### *One-year age-sex adjusted mortality rates*

Although 2011 dates of death are reported for all beneficiaries with at least one month of Medicare eligibility regardless of managed care status, additional sample selection requirements are imposed for estimates one-year mortality rates. We also require that beneficiaries reside in the same town in 2010 as 2011 to mitigate any potential bias associated with beneficiaries whose move to a town in 2011 may have been motivated by health concerns in their last year of life. There were 847,662 Medicare beneficiaries who met these sample selection requirements.

#### Post stratification weights

Medicare beneficiaries are assigned to towns based on their 5-digit residence zip code using a cross-walk file that we created to link all valid 5-digit zip codes to a specific city/town or planning district within Boston. Because of the sample selection criteria that are employed to



ensure the potential presence of Medicare claims for all sample beneficiaries during the surveillance period, the age-sex distributions of these estimation samples in towns may differ from that of all aged Medicare beneficiaries actually residing those towns. Post stratification weights for 10 age-sex classes (males 65-69, males 70-74, males 75-79, males 80-84, males 85+, females 65-69, females 70-74, females 75-59, females 80-84, females 85+) were computed for each of the 311 geographic areas in the state defined for Medicare MBSF indicators. Individual beneficiaries in age-sex groups that are under-represented (over-represented) in the town's estimation sample relative to the total town beneficiary population are assigned post-stratification weights greater than (less than 1). These weights are computed so that when these post-stratification weights are applied, the weighted age-sex distribution of the estimation sample in each town matched the actual age-sex distribution of all Medicare beneficiaries in the town.

Different town-level post-stratification weights are computed for Medicare indicators depending upon on length of the current surveillance period (single-year versus two-year), and for Medicare Part D versus Medicare Parts A & B service utilization rates. In addition for estimates of state-level prevalence and service utilization rates, another set of post-stratification weights were computed at the state level to ensure that the weighted age-sex distribution of the entire state estimation sample matched the actual beneficiary age-sex distribution for the state. These state-level post-stratification weights did not ensure that the age-sex distribution of the estimation sample in each town matched the town's actual beneficiary age-sex distribution. In other words, the target population for these adjustments is the state rather than the town.

The post-stratification weights for Medicare service utilization rates were applied to beneficiaries in the estimation sample after another adjustment weight was applied. This additional weight is based on the portion of the year that potential claims could have been submitted for Medicare reimbursement. This first adjustment might best be explained with an example. Beneficiary A, who was continuously entitled for Medicare Parts A and B for a full calendar year and was never enrolled in a Medicare Advantage plan, has claims over the full year showing 6 physician visits. These six visits reflect an annual physician visit rate of 6 visits per year. Consider an otherwise identical beneficiary who had six physician visits before his/her death at the end of June. The annualized rate of physician visits for this beneficiary who died before the end of the year is actually 12 visits per year rather than 6 visits per year. However, in contrast to the former beneficiary who survived the full year, the latter beneficiary who died did was only at risk for making a physician visit for one-half of a year. Hence the decedent beneficiary contributed only  $\frac{1}{2}$  of a full person-year to the denominator used for calculating a mean physician visit rate for the town.

For all Medicare service utilization rate indicators, the service use reported in the MBSF for beneficiaries in the estimation sample are first annualized to reflect the expected utilization with full-year coverage (12 months). Then individual person-weights are assigned to all sample beneficiaries. These weights are equal to the fraction of the year (i.e., # months of full coverage/12) that they had full coverage. Sampled beneficiaries with full-year coverage are assigned a weight of one (12/12) and beneficiaries with less than full-year coverage are assigned a fractional weight less than one.

The post-stratification town-level weights were also computed differently for the one-year mortality rates. In this case the weights were computed so that the weighted age-sex distribution of the estimation sample in each individual town population matched the state-wide age-sex distribution of all aged Medicare beneficiaries. By computing the post-stratification weights in this manner, the one-year mortality rate in a town reflects the expected mortality rate if its age-sex beneficiary population composition matched that of the entire state.

Some caveats should be noted about what these post stratification weights do and do not do with respect to rate estimation. By applying these weights the prevalence and service utilization rate estimates are adjusted to reflect differences between the age-sex population composition of the sample and that of actual beneficiaries in the town. The age-sex distribution of all aged beneficiaries in each town contains beneficiaries who were excluded from the estimation sample because they did not have a sufficient history of fee-for-service Medicare claims. This includes the exclusion of Medicare Advantage enrollees. If such managed care enrollees are systematically younger than beneficiaries receiving care from fee-for-service providers, younger beneficiaries in the estimation sample will be assigned larger post-stratification weights to reflect their under-representation in the town estimation sample. However, application of these post-stratification weights will not adjust health indicators to reflect any systematic unmeasured health status differences between Medicare Advantage enrollees and fee-for-service beneficiaries within the same age-sex class. Past research has consistently found that Medicare managed care enrollees tend to be healthier than their counterparts receiving care from fee-for-service providers. A recent study suggests that this still is true in the Medicare Advantage program (Morrissey, Kilgore, Becker, Smith, & Delzell 2013).

The reported healthy aging indicators derived from the Medicare MBSF strictly only reflect the health status of fee-for-service Medicare beneficiaries. For this reason we report the percentage of Medicare beneficiaries with at least two months of Medicare Advantage enrollment as a town population composition attribute. Some caution should be exercised in interpreting MBSF indicators for towns where the Medicare Advantage market penetration rate is very high.

### Fixed Effects Estimation of Rates

Geographic residence dummy variables were constructed for beneficiaries in the estimation samples defined for the various MBSF indicator groups discussed above. Stata 12.0 was used to estimate separate fixed effects dummy variable ordinary least squares regressions with a suppressed constant on the full beneficiary estimation samples for each MBSF indicator noted in Tables A1 and A2. Beneficiary cases were weighted with individual population weights equal to the computed post-stratification weights for all MBSF indicators, except for Medicare service utilization rates where an additional partial-year weight adjustment was also made. The estimated dummy variable coefficients corresponding to weighted sample mean rates for towns or clusters of smaller towns. These estimated coefficients are the estimated MBSF rates reported in the main tables. Robust standard errors were estimated for the coefficient estimates. The 95% confidence intervals for these estimates are the reported margins of error for the estimates. The state-level estimates for the MBSF indicators along with their 95%

confidence intervals are similarly estimated on the sample of all beneficiaries in the state estimation sample using different population weights.

The estimates for health indicators derived from Medicare MBSF data and their margins of error are reported for all towns and planning districts within Boston on the community profiles with confidence intervals available for download. We took a conservative approach in distinguishing those indicators where the difference between the town rate and the state rate is statistically significant at the 5% level. We only distinguish those indicators where the 95% confidence interval of the town estimate does not overlap with the 95% confidence interval of the state estimate as ones where the difference is estimated with enough precision so that the reported difference is unlikely to be due to chance associated with sampling variation.

## **6. Estimation Methods for Massachusetts BRFSS indicators**

While there are some similarities in the methodologies used to obtain estimates from Medicare MBSF and Massachusetts BRFSS data, there were some important differences due to the complex survey design of the BRFSS and the much smaller respondent samples in the BRFSS.

### Sample selection criteria

The selection criteria for the estimation samples used to estimate BRFSS indicators were straightforward. The estimation samples included all BRFSS respondents who were 60 years or older with a valid residence zip code or town code. These selection criteria were applied to BRFSS data from 2007 through 2011.

### Assignment of respondents to geographic areas

As noted earlier, there were 33 modified ASAP geographic services areas defined for estimation of BRFSS indicators. Before assigning respondents to their appropriate ASAP area we examined the correspondence between the 5-digit residence zip codes and the town codes reported in the BRFSS data for all respondents selected for the estimation samples. Using a zip code-to-town crosswalk file derived from a SAS zip code database described earlier, we identified a relatively small number of cases where the reported zip codes and towns did not match those recorded in the SAS zip code data file. These inconsistent reported zip code–town combinations were reviewed to assess whether there was strong indication of a likely typographical error in the zip code or town code. While it was not possible to infer the basis for the majority of these inconsistent zip code-town combinations, for some of them there was a strong indication that the zip code was reported incorrectly. For example, there were cases where reversing two adjacent numbers in the zip code produced an exact cross-walk match with the reported town (e.g., 15 reversed to 51). In some other cases four consecutive digits of the five zip code digits matched the same four digits of a zip code for the reported town, suggesting that the fifth digit may not have been entered properly. In cases, such as these, where a modest change would produce a town match, we recoded the zip code to match the reported town. The reported town was accepted over the reported zip code in these situations.

We recoded 367 such zip codes outside of Boston over the five years 2007-2011 of BRFSS data to achieve a match between zip code and town. We also recoded 49 zip codes to missing over the same time period for BRFSS respondents with a town code of Boston and a zip code located far outside of Boston. After this modest zip code recoding for a small number of respondents, all respondents were assigned to their appropriate modified ASAP area of residence using the following procedure:

1. Respondents with a valid 5-digit zip code are assigned to the city or town mapped to that zip code in the SAS zip code to town cross-walk file.
2. If the zip code was invalid or missing then respondents are assigned to a city or town based on the reported town code with the exception of Boston. In the case of Boston, respondents are assigned to a BRA Planning District based on their residence zip code.
3. Respondents are assigned to a modified ASAP area using a cross-walk created from data on the individuals towns and cities served by each of the 27 regional ASAPs that obtained from the internet site "800 AgeInfo" (<https://contactus.800ageinfo.com/FindAgency.aspx>).

The estimation samples for specific BRFSS indicators varied depending upon whether the questions were asked of all respondents every year, to all respondents every other year, to all respondents in some years but to fewer respondents in other years, to a subset of respondents based on gender (e.g., use of mammograms). Due to occasional missing data for individual respondents, the sample sizes of the estimation samples also varied among indicators when the same years of BRSS data were used for estimation. For BRFSS indicators based on three years of data (2009-2011) most of the sample sizes exceeded 20,000 respondents. Sample sizes ranged from 15,066 for the colorectal cancer screening to 21,800 for having a regular doctor. Sample sizes for indicators estimated with four years (2008-2011) of BRFSS data were as follows: toothloss (13,591), disability (21,813), and fruit/vegetable consumption (14,157). Fall rates, the only indicator estimated on five years (2007-2011) of BRFSS data, was estimated on a sample of 17,740 respondents. The smallest estimation sample sizes were for life satisfaction (13,054), emotional support (12,704), and mammography (8,649) indicators estimated using two years (2008 and 2010) of BRFSS data. Table A-2 contains information about the specific years of data were used to estimate each of the BRFSS indicators.

### Survey design and post-stratification weights

The BRFSS data are derived from telephone surveys of the non-institutionalized adult population in Massachusetts. Since the BRFSS has a complex survey design in with unequal probabilities of respondent selection, statistical analyses of BRFSS data require the application of design weights to account for different probabilities of selection. The BRFSS uses disproportionate stratified sampling in its landline telephone surveys where the sampling rate differs depending on telephone density. There is also geographic stratification in the Massachusetts BRFSS sampling where some geographic areas are sampled at a higher rate than other ones. The probabilities of selection differ among BRFSS respondents due to this

stratification, telephone availability, type of phone (cell versus landline in 2011), the number of adults in the household, the number of telephones in the household, and rates of nonresponse by households. Since these factors can affect the representativeness of the sample data, survey design weights are produced to adjust for these factors in statistical analyses of BRFSS survey data.

In addition to these survey design weights, post stratification weights (before 2011) or raking weights (2011 and later) are computed so that summed counts of weighted BRFSS respondents match known state population totals along population characteristics such as age, sex, and race/ethnicity. The 2011 Massachusetts raking weights are also based on telephone source, education level, marital status, and renter/owner status.

The change from using post-stratification weights to raking weights and the addition of cell phone surveys in the 2011 BRFSS introduce some issues for comparisons of indicators based on 2011 BRFSS data with indicators derived from earlier years of BRFSS data.<sup>3</sup> However, the change from post-stratification to raking weights in 2011 did not really add many additional complications in this study because BRFSS data are being used to derive estimates for geographic subareas within Massachusetts. The “ready-to-use” post-stratification and raking weights provided with BRFSS data are only suitable for state-level estimates. Since we had to compute our own post-stratification weights to derive estimates for modified ASAP areas within the state, we decided to compute these weights the same way for BRFSS data from all years 2007-2011.<sup>4</sup>

Town-level population estimates for 12 age-sex classes (males 60-64, males 65-69, males 70-74, males 75-79, males 80-84, males 85+, females 60-64, females 65-69, females 70-74, females 75-79, females 80-84, females 85+) were obtained from the 2010 Census of Population for all cities and towns within Massachusetts and for BRA Planning Districts within Boston (<http://factfinder2.census.gov>). Data for individual towns was aggregated into the 33 modified ASAP geographic areas described earlier. These ASAP-level age-sex population distributions served as the target population matrix for computation of raked post-stratification weights. Post-stratification weights were computed using an iterative raking procedure in which inflation weights were computed to match by sex and then recomputed to match by age group. This process was repeated until stable post-stratification were obtained. Individual respondents in age-sex groups that were under-represented (over-represented) in the estimation sample relative to the modified ASAP Census population distribution were assigned weights greater

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<sup>3</sup> See Centers for Disease Control and Prevention (2013), Massachusetts Department of Public Health (2013), and Pierannunzi, Town, Garvin, Shaw, & Balluz (2012) for further discussion of the BRFSS sample design and changes made in 2011.

<sup>4</sup> In personal communication with Carol Pierrannunzi of the Centers for Disease Control and Prevention and Anthony Roman of the University of Massachusetts Boston Survey Research Center it was suggested that it was reasonable for us to address the problem of pooling 2011 BRFSS data with earlier years by only using the supplied BRFSS survey design weights and to compute our own post-stratification weights the same way for all years of BRFSS data used. Regarding the issue of cell-phone survey respondents in 2011 we speculate that this will not have much of an effect on our rate estimation since our estimation sample is limited to BRFSS respondents 60 years or older.

than (less than 1) so that when these post-stratification weights are applied, the weighted age-sex distribution of the estimation sample matched the 2010 Census age-sex distribution of the modified ASAP area.

Different post-stratification weights are computed for groups of indicators depending upon how many years and which years of BRFSS data were pooled together for the estimation sample. As noted earlier depending upon the health indicator, between two and five years of BRFSS data were pooled together over the years 2007-2011. For state-level BRFSS estimates another set of post-stratification weights were computed at the state level to ensure that the sum of weighted age-sex counts of the entire estimation sample matched the 2010 Census age-sex distribution for the state of Massachusetts. These state-level post-stratification weights did not ensure that the age-sex distribution of the estimation sample for each modified ASAP area matched the 2010 Census age-sex population distribution for the ASAP area. In other words, the target population for these latter adjustments was the entire state rather than individual modified ASAP areas.

The final population weights for individual BRFSS respondents are computed by multiplying the BRFSS survey design weights by our own computed raked post-stratification weights based on the 2010 Census age and sex population composition of either individual modified ASAP areas or the entire state.

### Fixed Effects Estimation of Rates

Geographic residence dummy variables were constructed for each respondent in the various sample populations used to estimating the set of BRFSS indicators. Because of the complex survey design of the BRFSS, a survey design effect regression procedure in Stata 12.0 “svy: regress” was used for parameter estimation. Separate fixed effects dummy variable ordinary least squares regressions with a suppressed constant are estimated on appropriate estimation samples for all BRFSS indicators shown in Tables A-1 and A-2. Respondent cases were weighted with individual population weights equal to the BRFSS survey design weight multiplied by our computed raked post-stratification weights described above.<sup>5</sup> The estimated coefficients for the geographic dummy variables from the regression models are the estimated rates for modified ASAP areas. The same estimated rates are reported for all individual cities and towns comprising the modified ASAP area reported in Table A-4. The 95% confidence intervals for these estimates reflect the margins of error of the estimates. State-level estimates for each BRFSS indicator along with their 95% confidence intervals were similarly estimated using weighted data from the full state estimation samples.

The estimates for health indicators derived from BRFSS data and their confidence intervals are reported all towns and planning districts in Boston on the community profiles with confidence intervals available for download. We take a conservative approach in distinguishing those indicators where the difference between the modified ASAP rate and the state rate is statistically significant at the 5% level. We only distinguish those indicators as significant where

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<sup>5</sup> Weighted ordinary least squares regression was also used to obtain estimates with robust standard errors without the standard Stata regress procedure. These estimates were virtually identical to those obtained with the Stata svy procedure.

the ASAP area 95% confidence interval does not overlap with the state 95% confidence interval as ones where there the difference between the ASAP area and state estimates is unlikely to be due to chance associated with sampling variation. We note that fewer ASAP BRFSS indicator estimates are distinguished as differing significantly from the state estimates than was found for Medicare MBSF town-level estimates. This is a consequence of the much smaller sample populations used to estimate the BRFSS indicators.

Some caution should be exercised in interpreting differences between the BRFSS indicators reported for individual towns for several reasons. First, rates for which there is no distinction made regarding the statistical significance of the difference between the town and the state rate may be due to sampling variation. Second, data from multiple towns was pooled together to obtain estimates for the larger modified ASAP service areas and the same estimates are reported for all towns within the geographic area. Actual BRFSS indicators are likely vary among individual towns that comprise the modified ASAP areas. Unfortunately BRFSS samples were too small to generate town-level estimates for most individual cities and towns.

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**Table A-1: Healthy Aging Indicator Definitions**

<b>HEALTHY AGING INDICATORS</b>	<b>Definition</b>
<b>POPULATION COMPOSITION</b>	
% of 65+ population who speak only English at home	The percentage of persons 65 years or older reporting that no language other than English was spoken at home.
% of 65+ population who are veterans of military services	The percentage of persons 65 years or older reporting to have served in the military forces for the United States (Army, Navy, Air Force, Marine Corps, or Coast Guard) in time of war or peace.
Age-sex adjusted 1-year mortality rate	The percentage of Medicare beneficiaries 65 years or older on January 1st, 2010 who lived in the same community for both 2010 and 2011 and who died in 2011 (beneficiary population is weighted to match state age-sex distribution of aged Medicare beneficiaries.
% moved within same county	The percentage of persons 65 years or older reporting to have changed residence within same county in MA since a year ago.
% moved from different county in Massachusetts	The percentage of persons 65 years or older reporting to have changed residence between different counties in MA since a year ago.
% moved from different state	The percentage of persons 65 years or older reporting to have changed residence between states since a year ago.
<b>WELLNESS and PREVENTION</b>	
% any physical activity last month	The percentage of persons 60 years or older who answered yes to the question- "During the past month, (other than your regular job) did you participate in any physical activities such as running, calisthenics, golf, gardening or walking for exercise?"
% injured with a fall in last 3 months	The percentage of persons 60 years or older reporting to have fallen at least once in the past 3 months resulting in injury (defined as causing one to limit regular activities for at least a day or to go see a doctor).
% ever had hip fracture	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating a hip/pelvic fracture since 1999. These criteria are having at least 1 inpatient or skilled nursing facility Medicare claim with appropriate diagnosis codes during a 1-year period.
% with self-reported fair or poor health status	The percentage of persons 60 years or older reporting fair or poor to question: Would you say that in general your health is: excellent, very good, fair, poor?
% with 15+ physically unhealthy days last month	The percentage of persons 60 years or older reporting at least 15 days to the question- "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good? "
% with physical exam/check-up in past year	The percentage of persons age 60 years or older who reporting seeing a doctor for a regular check up within the past year.

% flu shot past year	The percentage of persons age 60 years or older who answered yes to the question- “During the past 12 months, have you had a seasonal flu shot (or seasonal flu vaccine that was sprayed in your nose [added in 2010])?”
% pneumonia vaccine	The percentage of persons age 60 years or older who reported ever having a pneumonia vaccination.
% shingles vaccine	The percentage of persons age 60 years or older who answered yes to the question- “A vaccine for shingles has been available since May 2006, it is called Zostavax®, the zoster vaccine, or the shingles vaccine. Have you had this vaccine?”
% cholesterol screening	The percentage of persons age 60 years or older who had their cholesterol checked within past 5 years.
% mammogram within last 2 years (women)	The percentage of women 60 years or older whose last mammogram was two years ago or less.
% colorectal cancer screening	The percentage of persons age 60 years or older whose last proctoscopic exam was five years ago or less
% with complete tooth loss	The percentage of persons 60 years or older reporting to have had 6 or more teeth removed because of tooth decay or gum disease.
% with annual dental exam	The percentage of persons age 60 years or older who reporting visiting a dentist or dental clinic within the past year.
# dentists per 100,000 persons (all ages)	The number of professionally active dentists per 100,000 persons in the county.
<b>NUTRITION/DIET</b>	
% with 5 or more servings of fruit or vegetables per day	The percentage of persons 60 years or older reporting to have eaten five or more servings of fruit or vegetables per day in the last month.
% obese	The percentage of persons 60 years or older with a body mass index of 30 or higher
% high cholesterol	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating high cholesterol since 1999. These criteria are having at least one inpatient or skilled nursing facility Medicare claim, or two hospital outpatient or Part B Medicare claims with appropriate diagnosis codes during a 1-year period.
% current smokers	The percentage of persons 60 years or older reporting to have ever smoked at least 100 cigarettes and who now smoke on some or all days.
% excessive drinking	The percentage of persons 60 years or older reporting excessive alcoholic drinking during the past month. For men excessive drinking is defined as consuming 60 or more alcoholic drinks in the past month or consuming 5 or more alcoholic drinks on at least one occasion during the past month. For women excessive drinking is defined as consuming 30 or more alcoholic drinks in the past month or consuming 4 or more alcoholic drinks on at least one occasion during the past month. One drink is equivalent to a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor.

## MENTAL HEALTH

% with 15+ days poor mental health last month	The percentage of persons 60 years or older reporting at least 15 days to the question- "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?"
% satisfied with life	The percentage of persons 60 years or older responding very satisfied or satisfied to the question- "In general, how satisfied are you with your life?"
% receiving adequate emotional support	The percentage of persons 60 years or older responding always or usually to the question- "How often do you get the emotional support you need?"
% ever diagnosed with depression	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating depression since 1999. These criteria are having at least one inpatient, skilled nursing facility, home health, outpatient or Part B Medicare claim with appropriate diagnosis codes during a 1-year period.

## CHRONIC DISEASE

% with Alzheimer's disease or related dementias	The percentage of Medicare beneficiaries 66 years or older in 2011 who ever met the claims-based criteria indicating Alzheimer's disease or related dementia since 1999. These criteria are having at least one inpatient, skilled nursing facility, home health, hospital outpatient or Part B Medicare claim with appropriate diagnosis codes during a 3-year period.
% with diabetes	The percentage of Medicare beneficiaries 66 years or older in 2011 who ever met the claims-based criteria indicating diabetes since 1999. These criteria are having at least one inpatient, skilled nursing facility, home health Medicare claims, or at least two hospital outpatient or Part B Medicare claims with the appropriate diagnosis codes during a 2-year period.
% with stroke	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating a transient ischemic attack (stroke) since 1999. These criteria are having at least one inpatient Medicare claim or at least 2-hospital outpatient or Part B Medicare claim with appropriate diagnosis codes during a 1-year period.
% with chronic obstructive pulmonary disease (COPD)	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating chronic obstructive pulmonary disease since 1999. These criteria are having at least one inpatient, skilled nursing facility, or home health Medicare claim or at least 2 hospital outpatient or Part B Medicare claims with appropriate diagnosis codes during a 1-year period.
% with asthma	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating asthma since 1999. These criteria are having at least one inpatient, skilled nursing facility, or home health Medicare claim or at least 2 hospital outpatient or Part B Medicare claims with appropriate diagnosis codes during a 1-year

	period.
% with hypertension	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating hypertension since 1999. These criteria are having at least one inpatient, skilled nursing facility, or home health Medicare claim or at least 2 hospital outpatient or Part B Medicare claims with appropriate diagnosis codes during a 1-year period.
% ever had a heart attack	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating an acute myocardial infarction (heart attack) since 1999. These criteria are having at least one inpatient, skilled nursing facility, or home health Medicare claim or at least 2 hospital outpatient or Part B Medicare claims with appropriate diagnosis codes during a 1-year period.
% with ischemic heart disease	The percentage of Medicare beneficiaries 66 years or older in 2011 who ever met the claims-based criteria indicating ischemic heart disease since 1999. These criteria are having at least one inpatient, skilled nursing facility, or home health, hospital outpatient or Part B Medicare claim with appropriate diagnosis codes during a 2-year period.
% with congestive heart failure	The percentage of Medicare beneficiaries 66 years or older in 2011 who ever met the claims-based criteria indicating congestive heart failure since 1999. These criteria are having at least one inpatient, hospital outpatient or Part B Medicare claim with appropriate diagnosis codes during a 2-year period.
% with atrial fibrillation	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating atrial fibrillation since 1999. These criteria are having at least one inpatient Medicare claim, or at least 2 hospital outpatient or Part B Medicare claims with appropriate diagnosis codes during a 1-year period.
% with osteoarthritis/rheumatoid arthritis	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating osteoarthritis/rheumatoid arthritis since 1999. These criteria are having at least 2 inpatient, skilled nursing facility, home health, hospital outpatient, or Part B Medicare claims (or any combination of claim types at least one day apart) with appropriate diagnosis codes during a 1-year period.
% with osteoporosis	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating osteoporosis since 1999. These criteria are having at least one inpatient, skilled nursing facility, home health Medicare claims or at least 2 hospital outpatient or Part B Medicare claims with appropriate diagnosis codes during a 1-year period.
% with glaucoma	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating glaucoma since 1999. These criteria are having at least one Part B Medicare claim with appropriate diagnosis codes

	during a 1-year period.
% with cataract	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating cataract since 1999. These criteria are having at least one Part B Medicare claims with appropriate diagnosis codes during a 1-year period.
% women with breast cancer	The percentage of female Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating breast cancer since 1999. These criteria are having at least one inpatient or skilled nursing facility Medicare claims or at least 2 hospital outpatient or Part B Medicare claims (or any combination of outpatient or Part B claims at least a day apart) with appropriate diagnosis codes during a 1-year period.
% with colon cancer	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating colon cancer since 1999. These criteria are having at least one inpatient or skilled nursing facility Medicare claims or at least 2 hospital outpatient or Part B Medicare claims (or any combination of outpatient or Part B claims at least a day apart) with appropriate diagnosis codes during a 1-year period.
% men with prostate cancer	The percentage of male Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating prostate cancer since 1999. These criteria are having at least one inpatient or skilled nursing facility Medicare claims or at least 2 hospital outpatient or Part B Medicare claims (or any combination of outpatient or Part B claims at least a day apart) with appropriate diagnosis codes during a 1-year period.
% with lung cancer	The percentage of male Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating lung cancer since 1999. These criteria are having at least one inpatient or skilled nursing facility Medicare claims or at least 2 hospital outpatient or Part B Medicare claims (or any combination of outpatient or Part B claims at least a day apart) with appropriate diagnosis codes during a 1-year period.
% with hypothyroidism	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating hyperthyroidism since 1999. These criteria are having at least one inpatient, skilled nursing facility, or home health Medicare claim or at least 2 hospital outpatient or Part B Medicare claims with appropriate diagnosis codes during a 1-year period.
% with anemia	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating anemia since 1999. These criteria are having at least one inpatient, skilled nursing facility, or home health Medicare claim or at least one Part B Medicare claim with appropriate diagnosis codes during a 1-year period.
% with benign prostatic hyperplasia	The percentage of Medicare beneficiaries 65 years or older in



	2011 who ever met the claims-based criteria indicating benign prostatic hyperplasia since 1999. These criteria are having at least one inpatient, skilled nursing facility, or home health Medicare claim or at least 2 hospital outpatient or Part B Medicare claims with appropriate diagnosis codes during a 1-year period.
% with chronic kidney disease	The percentage of Medicare beneficiaries 65 years or older in 2011 who ever met the claims-based criteria indicating chronic kidney disease since 1999. These criteria are having at least one inpatient, skilled nursing facility Medicare claim or at least 2 hospital outpatient or Part B Medicare claims with appropriate diagnosis codes during a 2-year period.
% with 4+ chronic conditions (of 15)	The percentage of Medicare beneficiaries 66 years or older in 2011 who ever met the claims-based criteria indicating at least 4 of 15 chronic conditions since 1999. The 15 chronic conditions include Alzheimer's disease or related dementia, asthma, atrial fibrillation, cancer (breast, colorectal, lung, and prostate), chronic kidney disease, chronic obstructive pulmonary disease (COPD), depression, diabetes, congestive heart failure, hypertension, hyperlipidemia (cholesterol) ischemic heart disease, osteoporosis, osteoarthritis/rheumatoid arthritis, and stroke.
% with no chronic conditions (of 15)	The percentage of Medicare beneficiaries 66 years or older in 2011 who never ever met the claims-based criteria indicating any of 15 chronic conditions since 1999.

## LIVING WITH DISABILITY

% disabled for a year or more	The percentage of persons 60 years or older who are "disabled", defined as having one or more of the following conditions for at least one year: (1) impairment or health problem that limited activities or caused cognitive difficulties; (2) used special equipment or required help from others to get around; or (3) reported a disability of any kind.
% 65-74 with hearing difficulty	The percentage of persons age 65 and age 74 reporting to be deaf or has serious difficulty hearing.
% 75+ with hearing difficulty	The percentage of persons age 75 or older reporting to be deaf or has serious difficulty hearing.
% 65-74 with vision difficulty	The percentage of persons age 65 and age 74 reporting to be blind or has serious difficulty seeing even with corrective lenses.
% 75+ with vision difficulty	The percentage of persons age 75 or older reporting to be blind or has serious difficulty seeing even with corrective lenses.
% 65-74 with cognition difficulty	The percentage of persons age 65 and age 74 reporting cognitive difficulties (such as learning, remembering, concentrating, or making decisions) because of a physical, mental, or emotional condition.
% 75+ with cognition difficulty	The percentage of persons age 75 or older reporting cognitive difficulties (such as learning, remembering, concentrating, or making decisions) because of a physical, mental, or emotional condition.



% 65-74 with ambulatory difficulty	The percentage of persons age 65 and age 74 reporting to have a condition that substantially limits one or more basic activities, such as walking, climbing stairs, reaching, lifting, or carrying.
% 75+ with ambulatory difficulty	The percentage of persons age 75 or older reporting to have a condition that substantially limits one or more basic activities, such as walking, climbing stairs, reaching, lifting, or carrying.
% 65-74 with self-care difficulty	The percentage of persons age 65 and age 74 reporting to have a physical or mental health condition that has lasted at least 6 months and makes it difficult for them to take care of their own personal need, such as bathing, dressing, or getting around inside the home.
% 75+ with self-care difficulty	The percentage of persons age 75 or older reporting to have a physical or mental health condition that has lasted at least 6 months and makes it difficult for them to take care of their own personal need, such as bathing, dressing, or getting around inside the home.
% 65-74 with independent living difficulty	The percentage of persons age 65 and age 74 reporting to have a physical, mental, or emotional condition lasting six months or more that makes it difficult or impossible to perform basic activities outside the home alone.
% 75+ with independent living difficulty	The percentage of persons age 75 or older reporting to have a physical, mental, or emotional condition lasting six months or more that makes it difficult or impossible to perform basic activities outside the home alone.
<b>ACCESS TO CARE</b>	
% Medicare managed care enrollees	The percentage of Medicare beneficiaries age 65 years or older enrolled in a Medicare managed care plan (Medicare Advantage) for at least 1 month in 2011
% dually eligible for Medicare and Medicaid	The percentage of Medicare beneficiaries age 65 years or older with at least one month of full or restricted Medicaid entitlement in 2011. (Beneficiaries with restricted Medicaid entitlement are only entitled to some Medicaid benefits (e.g., drug coverage only, and/or premium/copayments for services).
% with a regular doctor	The percentage of persons 60 years or older reporting to have a personal doctor or health care provider.
% did not see doctor when needed due to cost	The percentage of persons 60 years or older responding yes to the question-“Was there a time during the last 12 months when you needed to see a doctor but could not due to the cost?”
# of primary care provider (within 5 miles)	A count of primary care provider (i.e., family practice, general practice, geriatric medicine, and internal medicine) within 5 miles of the center of the city/town.
# of hospitals (within 5 miles)	A count of short-term general hospitals within 5 miles of the center of the city/town.
# of nursing homes (within 5 miles)	A count of Medicare-certified nursing homes within 5 miles of the center of the city/town.
# of home health agencies (in same town)	A count of home health agencies serving patients living in the city/town.

## SERVICE UTILIZATION

Physician visits per year	Average Part B physician office visit evaluation and management services received in 2011 by Medicare beneficiaries 65 years or older
Emergency room visits/1000 persons 65+ years per year	Average number of emergency department visits (where beneficiaries were released or admitted to a hospital) in 2011 per 1,000 Medicare beneficiaries 65 years or older.
Part D monthly prescription fills per person per year	Average number of standard 30 days supplies of a filled Part D prescriptions in 2011 by Medicare beneficiaries 65 years or older.
Home health visits per year	Average home health visits in 2011 per Medicare beneficiary 65 years or older.
Durable medical equipment claims per year	Average Part B durable medical equipment services received in 2011 by Medicare beneficiaries 65 years or older
Inpatient hospital stays/1000 persons 65+ years per year	A count of inpatient hospital discharges in 2011 per 1,000 Medicare beneficiaries 65 years or older.
Inpatient hospital readmissions (as % of admissions)	The percentage of inpatient hospital discharges for Medicare beneficiaries 65 years or older which were followed by an admission to an acute care hospital for any cause within 30 days.
Skilled nursing facility stays/1000 persons 65+ years per year	A count of skilled nursing facility discharges in 2011 per 1,000 Medicare beneficiaries 65 years or older

## COMMUNITY VARIABLES & CIVIC ENGAGEMENT

Annual # of unhealthy days for older adults	The number of days in 2013 where there was an Air Quality Index score classified as "code red" or "code orange for ozone or particulate matter in the county.
Walkability score (0-100)	Walkability score categories: 90-100 " <b>Walker's Paradise</b> " Daily errands do not require a car 70-89 " <b>Very Walkable</b> " Most errands can be accomplished on foot 50-69 <b>Somewhat Walkable</b> Some errands can be accomplished on foot 25-49 " <b>Car-Dependent</b> " Most errands require a car 0-25 " <b>Car-Dependent</b> " Almost all errands require a car
# of registered voters (age 18+)	A count of registered voters aged 18 and older in 2012.
Voter participation rate in 2012 presidential election (age 18+)	The % of registered voters aged 18 and older who voted in the 2012 presidential election.

## SAFETY

Violent crimes / 100,000 persons	The number of violent crimes (murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault) in 2011 (or earlier year 2007-2010) known to law enforcement per 100,000 persons
Property crimes / 100,000 persons	The number of property crimes (burglary, larceny-theft, motor vehicle theft, and arson) in 2011 (or earlier year 2007-2010 for some towns) known to law enforcement per 100,000 persons

# of motor vehicle fatalities involving adult age 60+ / town	The number of motor vehicle fatalities in town involving an adult age 60 or older (driver, passenger, or pedestrian) from 2008 to 2012.
# of motor vehicle fatalities involving adult age 60+ / county	The number of motor vehicle fatalities in county involving an adult age 60 or older (driver, passenger, or pedestrian) from 2008 to 2012.
<b>ECONOMIC VARIABLES</b>	
% with income below the poverty level past year	The percentage of households with a householder (i.e., the person (or one of the people) in whose name the housing unit is owned or rented (maintained)) age 65 years or older with an annual family income below the appropriate official poverty threshold.
% households with annual income < \$20,000	The percentage of households with a householder (i.e., the person (or one of the people) in whose name the housing unit is owned or rented (maintained)) age 65 years or older with an annual income in 2010 less than \$20,000.
% households with annual income \$20,000-49,000	The percentage of households with a householder age 65 years or older with an annual income in 2010 between \$20,000 and \$49,000.
% households with annual income > \$50,000	The percentage of households with a householder age 65 years or older with an annual income in 2010 more than \$50,000.
<i>Elder Economic Security Standard Index</i>	
Single, homeowner without mortgage, good health	Annual income needed for a single homeowner with no mortgage in good health to attain a modest standard of living in the county
Single, renter, good health	Annual income needed for a single renter in good health to attain a modest standard of living in the county
Couple, homeowner without mortgage, good health	Annual income needed for a couple who are homeowners with no mortgage in good health to attain a modest standard of living in the county
Couple, renter, good health	Annual income needed for a couple who are renters in good health to attain a modest standard of living in the county

\*Variables highlighted in yellow added in 2015.

**Table A2: Years and Data Sources for Community Profile Indicators<sup>1</sup>**

INDICATOR	SOURCE AND YEARS
<b>POPULATION COMPOSITION</b>	
Total population all ages	United States Census Bureau / American FactFinder. "P12 : SEX BY AGE." <i>2010 Census</i> . U.S. Census Bureau, 2010. Web. 2013. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >
Population 60 years or older as a % of total population, Total population 60 years or older, % female	United States Census Bureau / American FactFinder. "B01001 : SEX BY AGE." <i>2007 – 2011 American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2011. Web. 2013. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
<i>65 yrs+ age composition:</i> % 65-74 years, 75-84 years, 85 years or older	United States Census Bureau / American FactFinder. "B01001 : SEX BY AGE." <i>2007 – 2011 American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2011. Web. 2013. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
<i>Race/Ethnicity:</i> % White, % African American, % Asian, % Other race, % Hispanic/Latino	United States Census Bureau / American FactFinder. "B010001A-B010011." <i>2007 – 2011 American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2011. Web. 2013. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
<i>Marital status:</i> % married, divorced/separated, widowed, never married	United States Census Bureau / American FactFinder. "B12002 : SEX BY MARITAL STATUS BY AGE FOR THE POPULATION 15 YEARS AND OVER." <i>2007 – 2011 American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2011. Web. 2013 < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
<i>Education:</i> % with less than a high school education, high school education or some college, with college degree % living alone	United States Census Bureau / American FactFinder. "B15001 : SEX BY AGE BY EDUCATIONAL ATTAINMENT FOR THE POPULATION 18 YEARS AND OVER." <i>2007 – 2011 American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2011. Web. 2013 < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >. United States Census Bureau / American FactFinder. "B09017: RELATIONSHIP BY HOUSEHOLD TYPE (INCLUDING LIVING ALONE) FOR THE POPULATION 65 YEARS AND OVER." <i>2007 – 2011 American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2011. Web. 2013. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
% of 65+ population who speak only English at home	United States Census Bureau / American FactFinder. "B16007: AGE BY LANGUAGE SPOKEN AT HOME FOR THE POPULATION 5 YEARS AND OVER." <i>2007 – 2011 American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2011. Web. 2014. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
% of 65+ population who are veterans of military services	United States Census Bureau / American FactFinder. "B21001: SEX BY AGE BY VETERAN STATUS THE CIVILIAN POPULATION 18 YEARS AND OVER." <i>2007 – 2011 American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2011. Web. 2014 < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
Age-sex adjusted 1-year mortality rate	2010 & 2011 Master Beneficiary Summary File –A/B/D from the CMS Chronic Condition Data Warehouse < <a href="http://www.ccwdata.org">www.ccwdata.org</a> >.

**Geographic Migration:**  
 % moved within same county, moved from different county in Massachusetts, moved from different state

United States Census Bureau / American FactFinder. "B07001: GEOGRAPHIC MOBILITY IN THE PAST YEAR AGE FOR CURRENT RESIDENCE IN THE UNITED STATES." 2007 – 2011 *American Community Survey*. U.S. Census Bureau's American Community Survey Office, 2011. Web. 2014. <<http://factfinder2.census.gov>>.

**WELLNESS and PREVENTION**

% any physical activity last month	2009-2011 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
% injured with a fall in last 3 months	2007-2011 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
% ever had hip fracture	2011 Master Beneficiary Summary File –A/B/D; 2011 Master Beneficiary Summary File- Chronic conditions from the CMS Chronic Condition Data Warehouse < <a href="http://www.ccwdata.org">www.ccwdata.org</a> >
% with self-reported fair/poor health status, 15+ unhealthy days last month,	2009-2011 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
% with physical exam/check-up in past year, flu shot, pneumonia vaccine, shingles vaccine, cholesterol screening , colorectal cancer screening,	2009-2011 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
% mammogram within last 2 years (women), with annual dental exam	2008-2010 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
# dentists per 100,000 persons	<i>Area Health Resources Files (AHRF)</i> . 2012-2013. US Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, Rockville, MD. Downloaded October, 2013 Health Indicators Warehouse < <a href="http://healthindicators.gov/">http://healthindicators.gov/</a> >.

**NUTRITION/DIET**

% with 5 or more servings of fruit or vegetables per day	2008-2011 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
% obese, smokers, excessive drinkers	2009-2011 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
% high cholesterol	2011 Master Beneficiary Summary File –A/B/D; 2011 Master Beneficiary Summary File- Chronic conditions from the CMS Chronic

**MENTAL HEALTH**

% 15+ days with poor mental health last month	2009-2011 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
% satisfied with life, receiving adequate emotional support	2008-2010 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
% ever diagnosed with depression	2011 Master Beneficiary Summary File –A/B/D; 2011 Master Beneficiary Summary File- Chronic conditions from the CMS Chronic Condition Data Warehouse < <a href="http://www.ccwdata.org">www.ccwdata.org</a> >.

**CHRONIC DISEASE**

% with stroke, chronic obstructive pulmonary disease, hypertension, heart attack, hip fracture, glaucoma, breast cancer, colon cancer, prostate cancer, lung cancer, osteoporosis, asthma, atrial fibrillation, glaucoma, hypothyroidism, anemia, benign prostatic hyperplasia,	2011 Master Beneficiary Summary File –A/B/D; 2011 Master Beneficiary Summary File- Chronic conditions from the CMS Chronic Condition Data Warehouse < <a href="http://www.ccwdata.org">www.ccwdata.org</a> >.
% with Alzheimer’s disease or related dementias, diabetes, ischemic heart disease, congestive heart failure, osteoarthritis/ rheumatoid arthritis, chronic kidney disease, 4+ chronic conditions, no chronic conditions	2010, 2011 Master Beneficiary Summary File –A/B/D; 2010,2011 Master Beneficiary Summary File- Chronic conditions from the CMS Chronic Condition Data Warehouse < <a href="http://www.ccwdata.org">www.ccwdata.org</a> >.

**LIVING WITH DISABILITY**

% disabled for a year or more	2008-2011 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
% with hearing difficulty	United States Census Bureau / American FactFinder. “B18102: SEX BY AGE BY HEARING DIFFICULTY.” 2008 – 2012 <i>American Community Survey</i> . U.S. Census Bureau’s American Community Survey Office, 2012. Web. 2014. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
% with vision difficulty	United States Census Bureau / American FactFinder. “B18103: SEX BY AGE BYVISION DIFFICULTY.” 2008 – 2012 <i>American Community Survey</i> . U.S. Census Bureau’s American Community



	Survey Office, 2012. Web. 2014. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
% with cognition difficulty	United States Census Bureau / American FactFinder. "B18104: SEX BY AGE BY COGNITION DIFFICULTY." 2008 – 2012 <i>American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2012. Web. 2014. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
% with ambulatory difficulty	United States Census Bureau / American FactFinder. "B18105: SEX BY AGE BY AMBULATORY DIFFICULTY." 2008 – 2012 <i>American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2012. Web. 2014. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
% with self-care difficulty	United States Census Bureau / American FactFinder. "B18106: SEX BY AGE BY SELF-CARE DIFFICULTY." 2008 – 2012 <i>American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2012. Web. 2014. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
% with independent difficulty	United States Census Bureau / American FactFinder. "B18107: SEX BY AGE BY INDEPENDENT DIFFICULTY." 2008 – 2012 <i>American Community Survey</i> . U.S. Census Bureau's American Community Survey Office, 2012. Web. 2014. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
# dentists per 100,000 persons	<i>Area Health Resources Files (AHRF)</i> . 2012-2013. US Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, Rockville, MD. Downloaded October, 2013 Health Indicators Warehouse < <a href="http://healthindicators.gov/">http://healthindicators.gov/</a> >.

## ACCESS TO CARE

% Medicare managed care enrollees	2011 Master Beneficiary Summary File –A/B/D from the CMS Chronic Condition Data Warehouse < <a href="http://www.ccwdata.org">www.ccwdata.org</a> >.
% dually eligible for Medicare/Medicaid	2011 Master Beneficiary Summary File –A/B/D from the CMS Chronic Condition Data Warehouse < <a href="http://www.ccwdata.org">www.ccwdata.org</a> >.
% with a regular doctor, did not see doctor due to cost	2009-2011 Behavioral Risk Factor Surveillance Survey from the Massachusetts Department of Public Health. < <a href="http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/">http://www.mass.gov/eohhs/gov/departments/dph/programs/health-stats/health-survey/brfss/</a> >.
# of primary care provider (within 5 miles)	The number of primary care providers downloaded from < <a href="http://www.medicare.gov/physiciancompare/search.html">http://www.medicare.gov/physiciancompare/search.html</a> > in August-September 2014 using the search term "city/town name, Massachusetts" and option for within 5 miles.
# of hospitals (within 5 miles)	The number of hospitals downloaded from < <a href="http://www.medicare.gov/hospitalcompare/search.html">http://www.medicare.gov/hospitalcompare/search.html</a> > in August-September 2014 using the search term "city/town name, Massachusetts" and option for within 5 miles.
# of nursing homes (within 5 miles)	The number of nursing homes downloaded from < <a href="http://www.medicare.gov/nursinghomecompare/search.html">http://www.medicare.gov/nursinghomecompare/search.html</a> > in August-September 2014 using the search term "city/town name, Massachusetts" and option for within 5 miles.
# of home health agencies (serving town)	The number of home health agencies downloaded from < <a href="http://www.medicare.gov/homehealthcompare/search.html">http://www.medicare.gov/homehealthcompare/search.html</a> > in August-September 2014 using the search term "city/town name, Massachusetts".

## SERVICE UTILIZATION



Inpatient hospital stays, skilled nursing facility stays, emergency room visits /1000 persons 65+ years per year	2011 Master Beneficiary Summary File –A/B/D; 2011 Master Beneficiary Summary File- Cost and Use from the CMS Chronic Condition Data Warehouse < <a href="http://www.ccwdata.org">www.ccwdata.org</a> >.
Inpatient hospital readmissions (as % of admissions)	2011 Master Beneficiary Summary File –A/B/D; 2011 Master Beneficiary Summary File- Cost and Use from the CMS Chronic Condition Data Warehouse < <a href="http://www.ccwdata.org">www.ccwdata.org</a> >.
Home health visits, physician visits, durable medical equipment claims, Part D monthly prescription fills per year	2011 Master Beneficiary Summary File –A/B/D; 2011 Master Beneficiary Summary File- Cost and Use from the CMS Chronic Condition Data Warehouse < <a href="http://www.ccwdata.org">www.ccwdata.org</a> >.

**COMMUNITY VARIABLES & CIVIC ENGAGEMENT**

Annual # of unhealthy days for older adults	Data downloaded from U.S. Environmental Protection Agency Air Compare website < <a href="http://www.epa.gov/cqi-bin/broker?condition=oldyoung&amp;citycounty=county&amp;geocode=25001+25003+25005&amp; debug=2&amp; service=aircomp&amp; program=dataprog.wcj_bymonthyearhealth.sas&amp;submit=Compare+My+Air">http://www.epa.gov/cqi-bin/broker?condition=oldyoung&amp;citycounty=county&amp;geocode=25001+25003+25005&amp; debug=2&amp; service=aircomp&amp; program=dataprog.wcj_bymonthyearhealth.sas&amp;submit=Compare+My+Air</a> >
Walkability score	Walkability scores downloaded from < <a href="http://www.walkscore.com/">http://www.walkscore.com/</a> > in July-August, 2013 using the finder term “city/town name, Massachusetts.”
# of registered voters (age 18+) 2012	From the Massachusetts Elections Division, Secretary of the Commonwealth
Voter participation rate in 2012 presidential election (age 18+)	From the Massachusetts Elections Division, Secretary of the Commonwealth

**SAFETY**

Violent and property crime rates per 100,000 persons	United States Department of Justice, Federal Bureau of Investigation. <i>Crime in the United States, 2011</i> . Web. October 2013. < <a href="http://www.fbi.gov/stats-services/crimestats">http://www.fbi.gov/stats-services/crimestats</a> >. Data for years 2008-2011 used for reporting of rates.
# of motor vehicle fatalities involving adult age 60+ / town/county	National Highway Traffic Safety Administration, Fatal Accident Reporting System. Data for years 208-2012. < <a href="http://www.nhtsa.gov/FARS">http://www.nhtsa.gov/FARS</a> >

**ECONOMIC VARIABLES**

% with income below the poverty level past year	United States Census Bureau / American FactFinder. “B17001: POVERTY STATUS IN THE PAST 12 MONTHS BY SEX BY AGE” 2007 – 2011 American Community Survey. U.S. Census Bureau’s American Community Survey Office, 2011. Web. 2014. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.
% households with annual income within income ranges (65+ householder)	United States Census Bureau / American FactFinder. “B19037: AGE OF HOUSEHOLDER BY HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2011 INFLATION-ADJUSTED DOLLARS) 2007 – 2011 American Community Survey. U.S. Census Bureau’s American Community Survey Office, 2011. Web. 2013. < <a href="http://factfinder2.census.gov">http://factfinder2.census.gov</a> >.

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*Elder Economic Security  
Standard Index* (4  
household types)

Gerontology Institute, University of Massachusetts Boston, "The National Economic Security Standard Index" (2012). *Gerontology Institute Publications*. Paper 75.  
<[http://scholarworks.umb.edu/gerontologyinstitute\\_pubs/75](http://scholarworks.umb.edu/gerontologyinstitute_pubs/75)>. Data downloaded from website September 2013. <  
<http://www.basiceconomicsecurity.org/EI/>>.

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1 Variable definitions, estimation methodology, geographic units, and geographic data sources are reported elsewhere in this Technical Appendix. Variables **highlighted in yellow** added in 2015.