

REGIONAL HOUSING MARKET ANALYSIS AND 10-YEAR FORECAST OF HOUSING SUPPLY AND DEMAND

BARNSTABLE COUNTY, MASSACHUSETTS

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and the
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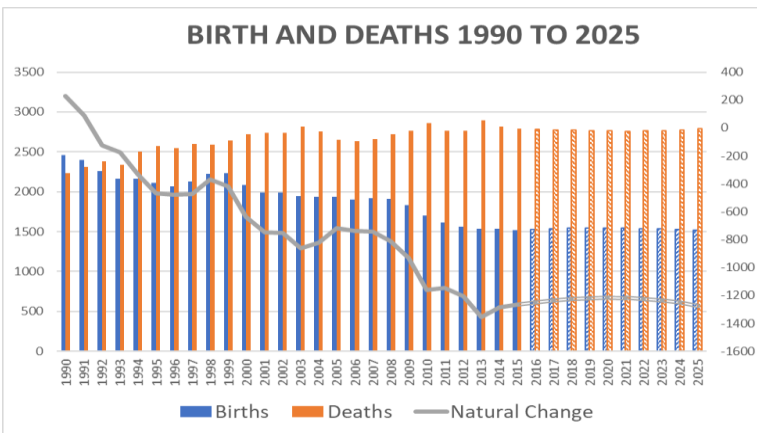
EXECUTIVE SUMMARY

Housing on Cape Cod experienced significant changes in its composition and market demands over the last 10 years. This study analyzes these changes and helps plan for a resilient, healthy, and vibrant Cape Cod by understanding its housing status and where the housing market it is likely going. Housing markets are dovetailed so tightly into the overall economy that it is debatable which one drives the other. Labor and wages dictate affordable housing prices but wages are limited by what employers can afford. Since the mid-2000's the Cape's housing markets have been impacted by large, uncontrollable macro-economic forces including: the rise of a strong Boston metropolitan economy; the housing market crash of 2009; the retiring baby-boom being attracted to Cape Cod's beauty; and the Cape's seasonal economy serving long-standing, historic traditions as a vacation destination for generations. These macro-economic forces, combined with natural resource constraints and local government growth control policies, have resulted in low prevailing wages but high demand for seasonal homes and retirement homes, and created a highly constrained housing market for residents to a level which has never been experienced. The Cape Cod Commission recognized the critical role that housing plays in a region's economy and initiated this study to fully understand how these housing market dynamics are impacting the lives of all residents.

Planning for housing that is obtainable to all Cape Cod residents is the overall objective of this study. To meet this objective, the Commission hired the consulting team of Crane Associates, Inc and Economic and Policy Resources, Inc of Burlington Vermont in January 2017. The consultants completed: a forecast of population, households and the economy of Barnstable County to the year 2025; an inventory of housing unit supply; a forecast of housing supply and demand for the year 2025; and an affordability gap analysis.

Forecast

The forecast is based on the underlying economy of the United States, Massachusetts and

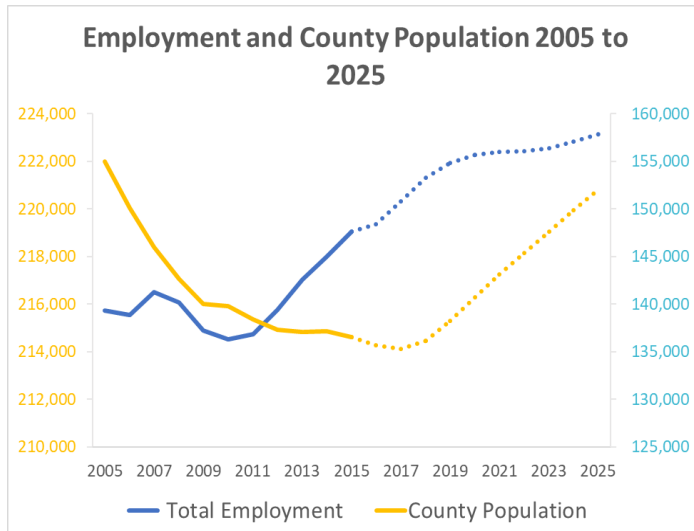


Barnstable county, which then drives assumptions on future growth in specific sectors of the economy and a demand for labor. The forecast's net migration numbers are integrated with Barnstable's County's natural growth (births-deaths) to arrive at a final forecast of people and households. The forecast methodology was created specifically for Barnstable County

and arrives at conclusions that refute prevailing opinion that Cape Cod is losing people. While natural population is decreasing, overall net population will increase due to employment growth.

Cape Cod has declining natural growth. Since 1992 there have been more deaths than births every year up to today. On average, there are 1,003 more deaths each year than births since 2005.

Births and death rates are slow moving statistics, driven by natural causes and therefore they are expected to continue to decline through the forecast period (2025).



Year	Upper Cape	Mid Cape	Lower Cape	Outer Cape
2016	85,703	81,904	34,023	12,646
2020	86,176	83,094	34,217	12,807
2025	87,517	85,325	34,841	13,137

NET POPULATION GROWTH				
Year	Upper Cape	Mid Cape	Lower Cape	Outer Cape
2020	256	1,181	84	151
2025	1,598	3,412	708	481

Employment on the other hand is expected to rise steadily over the forecasts period and result in a net in-migration of people. From 2005 to 2011 the county experienced a sluggish economy, and then major recession, which caused a net out-migration of people. The forecast for 2017 to 2025 is that the economy will grow slowly. Employment growth will grow stronger than the loss of natural population and the result will be a net in-migration.

In total, there will be 6200 new people on the Cape over the next 10 years and a clear majority will be a result of employment growth and in-migration. The mid-Cape will have 55% of this growth, followed by the Upper Cape, Lower Cape and Outer Cape in that order. Seniors, those over 64 years of age will make up 35% of the entire population. The next largest age group is the next youngest, 45 to 64 years aged cohort. Between these two cohorts, 66.7% of the entire population on the Cape will be over 45 years old.

The population and economic forecast forms the foundation of this entire study. It is what creates households and what causes the underlying demand for housing units. Since most of the Cape’s population has already formed independent households, the demand for new units would normally decrease. However, the declining household’s sizes (caused by deaths and smaller families) will offset slow formations of households and result in an increased demand for new units. Overall, for the next 10 years, Barnstable County’s population will increase by 3.3%; households will increase by 3.4%; employment will increase by 5.5%; and housing stock will increase by 4%

Housing Market Analysis

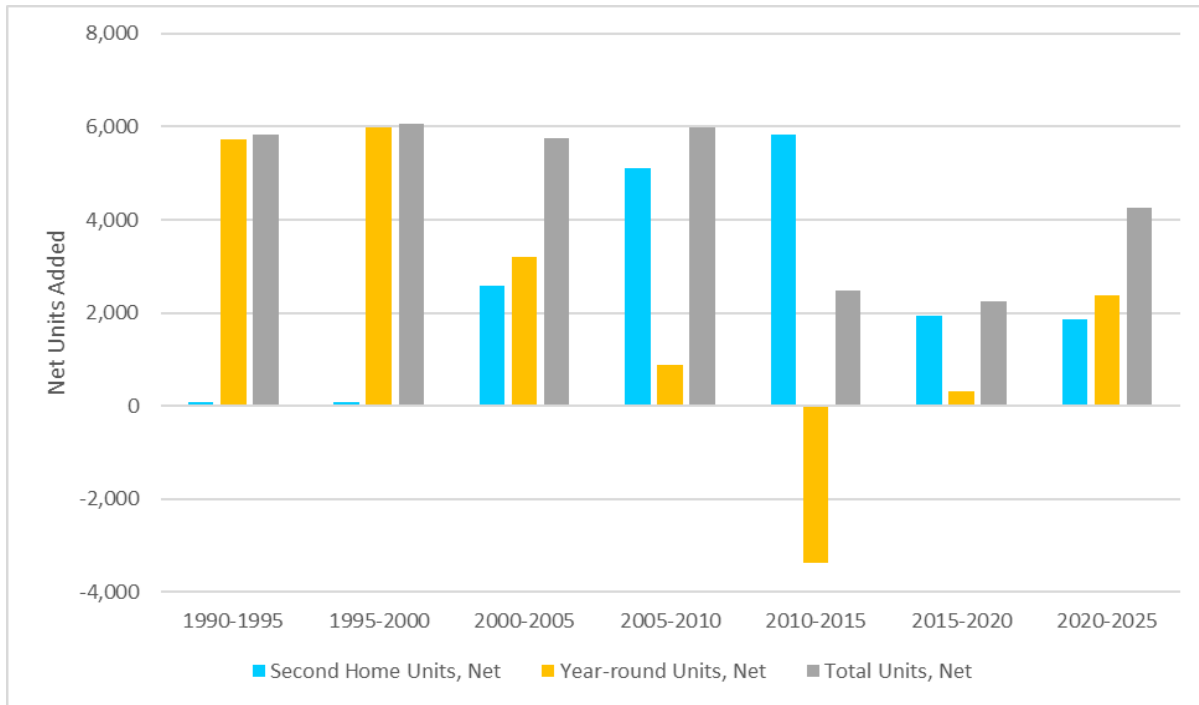
Under normal market conditions, if total housing stock increases faster than household growth, there shouldn’t be a housing shortage. However, market conditions on the Cape are impacted by external forces that most housing markets don’t experience. The cost of the housing stock will be unobtainable to about half of Cape Cod’s population due to low wage growth. The affordable

hourly wage for a single owner of a median priced home on the Cape is \$38.37 or a few dollars less than \$80K/ year. The median wage for the seven most common employment sectors all fall below this amount. In a free market, like housing, price is set where supply meets demand, so an oversupply of housing stock should adjust prices downward but they don't on the Cape. This is because Cape Cod's housing market is serving much more than Cape Cod households. A majority of the 4% growth in the total housing stock will serve seasonal house buyers. Seasonal unit demand will grow by 6% or twice as fast as year-round units. It is the presence of the strong seasonal demand that makes housing unobtainable to many residents. Seasonal population in the county, when averaged over a full calendar year, is equivalent to 68,856 full-time residents and this number will steadily increase.

While second homes have been part of Cape Cod's landscape and economy for decades, the unprecedented housing crisis of 2009, created something that Cape Cod's housing market never experienced.

The Cape is experiencing a long-term surge in seasonal unit demand that it has never experience before. While second homes have been part of Cape Cod's landscape and economy for decades, the unprecedented housing crisis of 2009, created something that Cape Cod's housing market never experienced. The Great Recession, and subsequent recovery by households in the Boston and New York metropolitan areas, resulted in a historically large number of new seasonal unit demand, including new additions and conversions from year-round units. This shift in market dynamics occurred in a relatively short period of time, from 2010 to 2015, but will continue to have a long-lasting effect on Cape Cod's housing market for at least the next decade. The conversions in units

away from year-round units to seasonal units is illustrated by the over 3,000-unit decline in year-round units the county experienced over the 2010 to 2015 period. This in-turn creates a "market momentum" for additional seasonal unit demand that will last for an extended period of time.



Continued growth in seasonal units will likely make it more difficult for year-round households to find year-round units at affordable prices as increasing seasonal unit demand puts upward pressure on housing prices. This will constrict the supply of available units suitable for year-round residents as the year-round unit supply experiences conversions to seasonal units.

The long history of decisions by municipalities to limit growth and to protect their natural resources should be commended because it created the Cape Cod that most people know and love. However, we must also recognize that these decisions created a seasonal economy ...

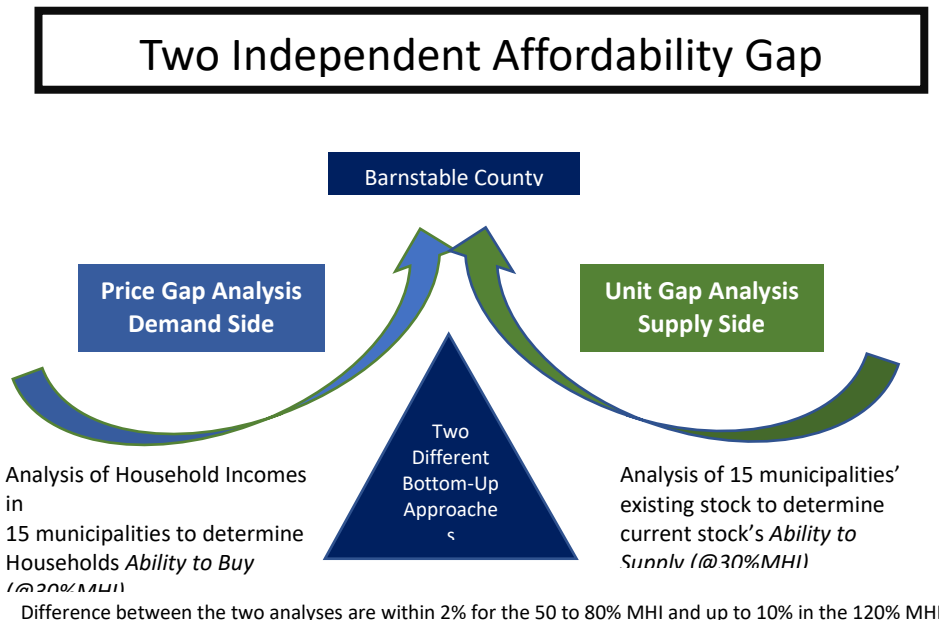
Seasonal homeowners choose to buy property on the Cape because it beautiful. Its protected natural areas, fresh air, and amazing beaches are what attracts seasonal home buyers, weekly vacationers, and retired couples. The long history of decisions by municipalities to limit growth and to protect their natural resources should be commended because it created the Cape Cod that most people know and love. However, we must also recognize that these decisions created a seasonal economy in which most jobs are seasonal leading to part time residents who do not pay property taxes which further increases municipal government’s incentive to attract more seasonal homeowners. The people on the Cape who are struggling to find year-round housing are the same people struggling to find year-round employment. Analysis of

the economy shows that 49% of all employment on the Cape is in the 3 economic sectors that primarily serve tourists and second home owners.

To determine the affordability of housing to Cape Cod residents of different municipalities, tenures and income levels, two bottom-up “affordability gap analyses” were completed. An affordability gap analysis will show the estimated difference between the number of housing

units demanded and the number of housing units available in the supply. Data was compiled and analyzed in two different ways—namely demand and supply. Each calculation and escalation to forecast supply and demand was also done individually for all 15 municipalities and the results of each set of calculations for each individual municipality was then summed to obtain the county total.

The analysis calculated ownership markets and renter markets to determine what was obtainable to households in four separate income categories: 50%, 80%, 100%, 120% of MHI in each of the 15 municipalities. The County numbers result from summing all the municipalities. Then an additional independent countywide analysis was used to cross check the findings.



Affordable housing means that 30% of a household’s total monthly income is greater than or equal to its monthly housing costs. For ownership markets, the MMHI is about \$1800 and their housing cost are mortgage, taxes insurance, and utilities. For renters, MMHI is \$826, which must pay for rent and utilities.

Findings

The study estimated that, in calendar year 2015, the county had a total affordable housing unit gap of 26,364 units (including an estimated gap of 21,924 owner units and 4,441 renter units) for household income levels at or below 80% of median household income. For owner and renter units at and below 120% but above 80% of median household income, unit demand and unit supply were better balanced in the county in calendar year 2015, with a total of 7504 more units supplied than demanded at the above 80% to 120% of median income category. This includes 6,743 units cumulatively for those two household income categories for owners and 761 rental units for those at 120% of MHI. This means that, in theory, there is an oversupply of 7,400

housing units obtainable to those households earning 100% to 120% MHI, or units priced between \$230,000 to \$400,000.

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However, the reader should be aware that at least a portion of the 7,400 units in 2015 were obtainable (or affordable) to the 100% and 120% of median household income households but not available because they were occupied by households paying less than 30% of their household income on housing. This is likely the cause of a housing supply bottleneck at 100%-120% of median household income as households—many of whom have many housing choices versus the lower income households—were occupying units affordable at that level. This bottleneck was particularly evident in the seniors (and “empty nesters”) in the area, where seniors were still living in larger family units despite no longer needing them.

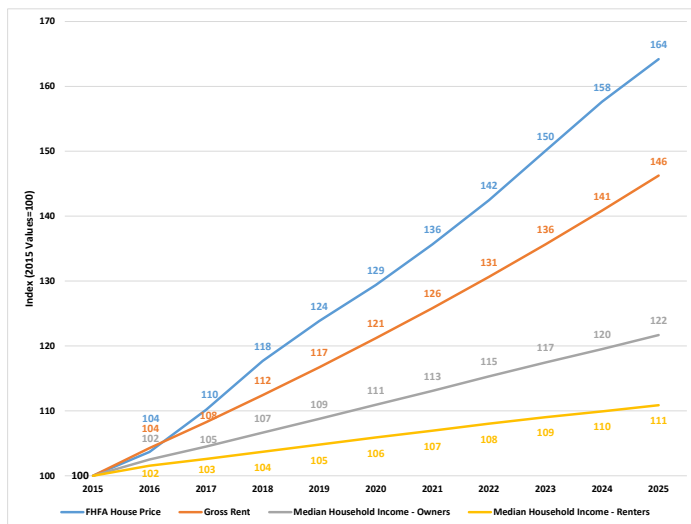
If seniors were given the option of downsizing into appropriate sized units, this option could potentially fill about one-third of the current housing gap. However, this was viewed as a challenge because there was a lack of diversity in housing units on the Cape in 2015. In other words, even those seniors that want to downsize were unable to find a more appropriate unit at an affordable price.

Barnstable County-Estimated Affordable Gap for Owner Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income (County Average)	\$36,125	\$57,799	\$72,249	\$86,699	
Affordable Price (County Average)	\$125,043	\$212,438	\$271,473	\$330,618	
Estimated Unit Demand	17,379	12,908	8,477	7,858	32,753
Estimated Unit Supply	3,041	5,322	10,557	12,521	47,934
Affordability Gap in Units (demand minus supply)	14,338	7,586	-2,080	-4,663	
Cumulative Demand	17,379	30,287	38,764	46,622	79,375
Cumulative Supply	3,041	8,363	18,920	31,441	79,375
Cumulative Gap	14,338	21,924	19,844	15,181	
Barnstable County-Estimated Affordable Gap for Renter Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income (County Average)	\$16,530	\$26,447	\$33,059	\$39,671	
Affordable Rent (County Average)	\$413	\$661	\$826	\$992	
Estimated Unit Demand	5,232	3,540	1,978	1,646	9,009
Estimated Unit Supply	2,363	1,969	1,807	2,407	12,858
Affordability Gap in Units (demand minus supply)	2,869	1,572	171	-761	
Cumulative Demand	5,232	8,772	10,750	12,396	21,405
Cumulative Supply	2,363	4,332	6,139	8,546	21,405
Cumulative Gap	2,869	4,441	4,611	3,850	

The gap analysis was completed for each municipality and for the four sub-regions of the county. There were significant disparities between the regions with the Outer Cape experiencing the

greatest housing cost stress and the Upper Cape experiencing the least. Likewise, some municipalities were facing housing stress at income levels below 50% of HMI while others were stressed at all income levels. This disparity between sub-regions only adds to the body of evidence that a regional, intermunicipal strategy is needed to address all of the county’s housing issues.

The 10-year forecast indicates that housing costs versus forecasted increases in household income within the county will worsen. The estimated gap in units that would be affordable at or below the 80% of median household income level is expected to increase. This prospective deterioration of affordability is expected to be more significant in the owner tenure category. Looking forward to calendar year 2025, it is unlikely that many of the 2,712 net year-round unit additions between calendar years 2016 and 2025 will enter the county’s housing supply at either affordable price points (for owner units) or affordable rent levels (for renter units), other than a limited known list of housing development projects currently being developed in the Upper-Cape and/or Mid-Cape regions.



The study forecasted that the trajectory of owner unit housing price points was likely to increase by an average of 5.1% per year over the calendar year 2015 to calendar year 2025 period, and affordable gross rent levels for renter units across the county estimated to increase at the rate of 3.9% per year over the same time frame, with the utilities portion increasing at a rate one-half of that at 1.5% per year. In contrast, county-wide median household income growth was forecasted to increase at a more modest 2.0% per year

(on average) for owner households over the calendar year 2015 to calendar year 2025 period, and median household income for renter households was forecasted to increase at the average annual rate of 1.0% per year in the county (on average) over the same period. As a result, this forecasted housing cost-household income disparity made it clear that housing affordability in the county was expected to erode further going forward.

The study shows that the current trajectory of trends in housing costs and income growth are likely to result in a significant increase in the total affordable housing unit gap for the county. By calendar year 2025, the study forecasted that the county would likely have a total housing unit gap of 33,597 units (including an estimated gap of 28,494 owner units and 5,103 renter units) for households at or below the 80% of median household income level—a net increase of 6,571 owner units from calendar year 2015 and a net increase of 663 renter units from calendar year 2015.

Moving Forward

This study's research and analysis confirms that Cape Cod has an unusual and complex housing challenge. It is most important to remember two overarching messages about the Cape's housing challenges before presenting solutions. First, it is the convergence of four major societal elements, demographic, economic, natural, and physical, not any one alone, which makes the challenge so difficult. Second, Barnstable County is currently short about 22,000 housing units obtainable to all income categories below \$90,000. The County is forecasted to be short only another 2700 over the next ten years. Therefore, the real estate situation that the Cape is facing today didn't occur in the last 5 or 10 years but is a result of "deferred maintenance" from a long series of decisions made over the last two or three decades by 15 independent municipalities. These two overarching messages call for an integrated approach that relies on intermunicipal cooperation and that addresses all four elements of the problem concurrently.

The strategies presented here are intended to address both the demand and supply sides of the equations. A demand-side problem means that the buyer does not have enough income to pay for the housing units available, and therefore doesn't "demand" one. Supply side housing problems mean that there is not enough stock in the supply to meet the current demand. Demand side strategies are intended to increase household revenue while supply side strategies are intended to increase the stock of housing.

Strategies that simply increase the supply side of the equation will not address the underlying causes of the housing challenges on the Cape today. Increases in the supply and types of units for all households, at all income levels, is indeed an immediate need in the county, however, if housing unit supply increases without addressing the demand side issues, there will be a strong economic incentive for the new construction to be converted to seasonal units. The short-term forecast shows that seasonal units will continue to compete for year-round units and newly built condominiums, rental units or even year-round single-family units will continue to be attractive to seasonal buyers.

if housing unit supply increases without addressing the demand side issues, there will be a strong economic incentive for the new construction to be converted to seasonal units.

Housing strategies on the Cape must address all four major societal elements: demographics, economics, physical infrastructure, and natural resources. They all must be addressed in a comprehensive and integrated approach. The care and conservation to protect Cape Cod's natural resources created an attractive place for second home owners and retirees. This success must be leveraged to now attract year-round employers. However, year-round employers need something more than homeowners, they need physical infrastructure. Sewer, water, public transportation, advanced telecommunications, and energy infrastructure are needed to diversify the economy and make housing more obtainable to a wider range of households and families. Conservation

through land preservation and growth control policies, such as low-density housing, works well but only up to the point where groundwater and private septic systems become too close to each other, when roads become clogged, and habitat on privately held land becomes developed. At that point, land becomes scarce and therefore more expensive, and the cycle of dependency on a

seasonal economy becomes reinforced. The Cape’s past conservation efforts worked well but are now at a crossroads, where new approaches are needed that depend on the concentration of infrastructure, housing, and employment. Likewise, the diversification of the economy and housing types also depends on the concentration of infrastructure, which then attracts new businesses and employees looking for both urban conveniences and conserved recreation lands for a well-balanced life of work and play. The report concludes with the following recommendations:

Adopt the following Housing Targets and create an Economic Efficient distribution to increase supply.

Table 7.1__ Targets for Total Ownership Units Demanded		22000
Year-Round Ownership Market	% of Market	Unit Demand
>65 aged at 100% + MHI	28%	6160
>65 aged at 80-100% MHI	7%	1540
>65 aged at< 80% MHI	5%	1100
Family Households at 50% to 80% MHI	8%	1760
Family Households at 80% to 120% MHI	30%	6600
Households w/out children at 50% to 80% MHI	7%	1540
Households w/out children at 80% to 120% MHI	15%	3300
Total Ownership Units Demanded	100%	22000
Total Rental Units Demanded		4800
Year Round Rental Market	% of Market	Unit Demand
>65 aged at 100% + MHI	28%	1344
>65 aged at 80-100% MHI	17%	816
>65 aged at< 80% MHI	15%	720
Family Households at 50% to 80% MHI	10%	480
Family Households at 80% to 120% MHI	2%	96
Households w/out children at 50% to 80% MHI	22%	1056
Households w/out children at 80% to 120% MHI	6%	288
Total Ownership Units Demanded	100%	4800

The 15 municipalities should adopt these housing target and then divvy up these totals based on economic efficiency, not based on equal or proportional shares. The most appropriate development should occur in the most appropriate places and therefore increase the efficiency of housing and land. This may mean that some municipalities do not take on any new development of a certain market segment while others take a disproportionately larger percentage. As long as all target market segments are distributed across the County the net effect will be an improved housing market in the County and further progress towards a year-round economy. The approach would require creating a Decision Support Model that used objective economic and housing market criteria such as data on land, infrastructure, and market preferences to distribute the housing targets. We created a draft list of housing targets for 14 different market segments of owners and renters for your to further refine as a launching point for discussions.

Increase the Diversity of Senior Housing

The senior household population on the Cape can absorb 11,000 units divided over 5 major housing types: independent ownership, independent rentals, continuing care retirement communities, assisted living facilities and skilled nursing homes. We recommend creating detailed strategies for dividing these 11,000 units into specific market segments for seniors. A special Senior Housing Committee (SHC) of developers, real estate professionals, non-profit advocacy groups, and other specialist should be formed to determine the appropriate allocation.

Increasing the supply of senior housing is probably the single most important action you can take to relieve housing cost stress across all households of all ages and incomes. Expanding options for developing retirement communities that will attract seniors out of their current, oversized homes and into appropriately designed units is critical for the Cape today.

Increase the Diversity of Multi-Family Housing

Similar to the senior housing approach, the total demand should be broken down into 7 market segments: 3 for seniors; 2 for families; and two for households w/out children. Specific strategies on location, product types, and funding are needed for each market segment. A housing preference study should be used to help guide these decisions

Expand on this report

This report is not finished. While the data collection and analysis is completed. due to timing constraints, a thorough understanding of the findings was not possible by all stakeholders. There are many interrelated development issues, policies, and history that brought the County to its current housing status. We believe the County would benefit from more time interpreting the findings and developing policies. This report needs to be read thoroughly; the data analyses and findings need to be understood. Then a more comprehensive program of public involvement and stakeholder dialogue should be engaged for the purposes of creating implementation policies. One of the most prominent outcomes of a recent policy session on this project was the need to continue this dialogue. Knowing the data and findings of this report is key to ensuring that the policy discussions are based on facts.

Consider a Detailed Housing Market Preference Study

A market preference study will provide critical information on how to distribute countywide housing targets by different market segments. It feeds information to the Decision Support Model that we recommend and provides objective data on an economically efficient distribution of units. It will also provide a level of housing market details that has not been generated previously for Barnstable County. For example, why are seniors still living in oversized 4 bedroom homes that are falling in disrepair and are expensive to maintain? This is not a rational choice. Healthy seniors are not downsizing and this puts a strain on the existing stock to serve the current population. A housing preference study would answer this and many other questions about what all market segments are requesting including: Unit types; Degree of Compactness;

Location; Municipality: preferred municipality and why; Public Infrastructure; Interior design; Exterior Design.

Accommodate life stages through better urban design

Single and two person households over 65 years of age is the demographic group that will dominate the Cape in the next 20 years. The demographic that the Cape's economy needs to attract now but doesn't have is young professionals between 25 and 35 years of age working in non-tourist sectors such as finance, technology, science and engineering. There is one common element that these two groups share: they are both demanding compact urban forms. Yet, the Cape in general (with some exceptions) is not meeting these demands. A concerted effort between 15 municipalities is needed to design new urban forms, complete with the public infrastructure amenities, that these groups are seeking. It would behoove all 15 municipalities to combine efforts and adopt a regional growth plan. Their task would be to create regional growth centers that are designed and planned to absorb 70%- 80% of all future growth on the Cape. That growth includes 22,000 year-round ownership units; 4,800 year-round rental units; and 8,000 new jobs.

CHAPTER 1: INTRODUCTION

This report describes the methodology and findings of a benchmark study of housing on Cape Cod, Massachusetts. The Cape Cod Commission recognizes that a balanced housing market is a critical component to a strong and sustainable economy. As safe and decent housing becomes out of reach for middle-income residents, more employees will migrate off Cape for work, which puts pressure on existing businesses. Cape Cod's housing market is primarily influenced by its aging demographics and seasonal economy. These factors, combined with proximity to Boston's urban wealth, environmental conditions, and limited public infrastructure all affect the supply and demand for housing. Adding to these pressures, the global real estate and financial crisis of 2009 created an unusual and long-term effect on the Cape's housing market: it permanently altered the balance between seasonal housing and year-round housing for the foreseeable future. The Commission hired Crane Associates, Inc. of Burlington VT and Economic and Policy Resources Inc. of Williston VT, to provide a foundational, fact-based analysis on the housing market and to provide a forecast of housing supply and demand 10-years forward.

The Cape Cod Commission staff worked closely with the consultants to scope, prepare, and present the assessment of housing supply and demand across all 15 municipalities and the four main sub-regions of the Cape (Upper, Mid, Lower and Outer). This study identifies current, and potential future, housing gaps between the demand households are willing and able to pay versus the supply of the housing stock to meet that demand. The housing gaps are calculated for renters and owners separately, at four different household incomes (50%, 80%, 100% and 120% of the median household income), in each of the municipalities, the four sub regions and the county. The project goals are to: develop benchmark ranges (by Region and Sub region) of the number of housing units by type to meet current needs and projected market demand (size; rental ownership and market; age/preference); develop an assessment of the strengths, weaknesses, opportunities and constraints of the regional housing market and; begin to outline regional strategies to expand the housing market.

It is recommended that future municipal and county planning efforts should be based on these forecasts to ensure consistency, accuracy, and cohesion between municipalities. The results provided in this report can be used to save each municipality significant time and money on completing their own independent forecasts.

The work involved creating an economic and demographic forecast model specific for Barnstable County. It reviewed past population and economic forecasts for this region and researched the accuracy of this past work. The results directed the researchers to create a new independent forecast model specific to Barnstable County. The model provides a forecast of population by age cohort, the workforce and employment rates, household formation rates, household incomes and housing unit supply for each municipality and the whole county. With this forecast, the gap between the supply of housing at different price points, and the demand for housing that is obtainable at 30% of the household's median income is calculated.

The results show the number of housing units that the county is short for different tenure and income levels in each municipality. It also shows the shortage in wages in several popular job types and the increases needed to spend 30% or less of household income on housing costs.

This report should function as a foundational study. It gives the county, and each municipality, the most accurate forecast available today on demographics, economics and housing. It is recommended that future municipal and county planning efforts should be based on these forecasts to ensure consistency, accuracy, and cohesion between municipalities. The results provided in this report can be used to save each municipality significant time and money on completing their own independent forecasts. This report can be used to complete Housing Production Plans for each municipality since housing supply and demand gaps are already calculated. Likewise, it can support Comprehensive Plans, local economic development planning, and similar planning work. This report provides suggestions not prescriptions. The results show the number of housing units that need to supply the market today, and in the next ten years, and provides some recommendations for how to achieve them. The housing gaps can be used as housing targets or goals so long as the reader recognizes that there is flexibility in the numbers. Each municipality should take on housing production targets that are most suitable to their abilities and use this report as a guide. This report does not provide specific tools for each municipality because these are local decisions made at the local level and not by the county.

CHAPTER 2: DEMOGRAPHIC AND ECONOMIC FORECAST METHODOLOGY

Introduction

The Crane Associates team created a demographic and economic forecast model specifically tailored to recognize Barnstable County's unique demographic composition. The Model starts with an integrated macroeconomic forecast for the U.S. economy and the county provided by Moody's Analytics. This forecast approach was used in order to have a fully integrated set of demographic and economic supplemental data (e.g. forecasted escalation rates for key cost items and future mortgage interest rates used in the affordability calculations). This approach allowed for the integration of key components of the historical Barnstable County economic and demographic environment, and housing market to

This approach allowed for the integration of key components of the historical Barnstable County economic and demographic environment, and housing market to be brought forward over the next ten years instead of the forecast being completed with a series of independent analyses conducted in silos.

be brought forward over the next ten years instead of the forecast being completed with a series of independent analyses conducted in silos. For this forecast, the Crane Associates Team used the Moody's baseline data from the December 2016 macro forecast and adjusted it by incorporating the U.S. Census Bureau's updated mid-year population estimates (July 2011 through July 2016 for Barnstable County). The result was a demographic and economic forecast that includes a gradually strengthening economy, but adjusts downward the forecasted population relative to what Moody's December 2016 baseline alone had forecasted for the County. However, the forecast also expects

positive population growth for the County over the next ten years based on economically-induced in-migration. This is a marked contrast to the 2015 UMASS Donahue Institute demographic projections for Barnstable County.

Components and Methodology

The Moody's Analytics December 2016 macro forecast is a structural macroeconomic model that includes over 1,800 important economic and demographic indicators from various sources to predict the change in a set of key economic variables for Barnstable County. The December 2016 Moody's macro forecast was the first post-U.S. election comprehensive forecast of the U.S. economy, and by extension the county economy, that included consideration of policy changes proposed by the new administration. Among these key variables included in the forecast were: consumer spending; gross private domestic investment; international trade; government spending and fiscal policy; aggregate supply; inflation; monetary policy and fiscal markets; personal income and corporate profits; labor markets; housing; natural population dynamics (births, deaths, ages of key cohorts); net migration; households; employment (total non-agriculture payroll jobs); and several income concepts. These variables are fully explained in the methodology chapter. They were identified as the key variables to provide forecasted data from 2016 through 2025. As total

population is the cornerstone of demographic projections and forecast, the Crane Associates Team established this as the key variable to which all other variables are linked.

Using the Moody's Analytics historical data and future forecast as a baseline (from 1980 through 2025), the Crane Associates team took the revised 2010 through 2015 population data for the county and the newly released 2016 data point from the U.S. Census Bureau and constructed an updated county population forecast for 2017 through 2025. After examining this initial forecast and comparing it to the demographic projections from the Donahue Institute, the Crane Associates team decided to revise our initial population forecast to reflect the downward trend of natural population growth promoted by the Institute. We believe that the Moody's forecast does not fully incorporate the unique demographic circumstances of Barnstable County. The resulting population forecast indicates that the Barnstable County can expect some population growth in the future as predicted by Moody's Analytics, although not to the scale predicted by using only the Moody's December 2016 baseline forecast. For comparison, the Moody's Forecast expected an increase of 9,612 people in Barnstable County from 2015 to 2025. The Donahue Institute forecasted a decrease of 15,783 from 2015 to 2025. This was based on the actual historical population change experience in the county over the 2005-14 period. Our forecast predicts an increase of 6,199 people from 2015 to 2025 based on a statistical integration of Moody's forecast, Donahue Institute, and the most recent US Census county-level population estimates published in April 2017.

The remainder of the county-level economic and demographic variables are linked to the adjusted demographic forecast. The county forecast also employed a broader concept of jobs versus the Moody's Forecast. The county forecast used total jobs, both full-time and part-time, for all salaried and wage employees and sole proprietors from the U.S. Bureau of Economic Analysis. This is a more comprehensive measure of employment than the total U.S. non-agricultural payroll jobs forecasted by Moody's Analytics and was thought to be more appropriate for a housing demand and supply study.

Municipal forecasts performed by the Crane Associates team were developed using the broader county forecasts in conjunction with the historical data for each municipality. While the reader will notice that there is some variation from 2016 through 2025 in the municipal growth rates, the forecasts are a reflection of the long-term historical shares and trends in those historical shares versus the county forecast.

Table 2.1 Moody's Forecast: U.S. Macro Baseline Forecast (December 2016)

Moody's Forecast: Moody's Analytics: U.S. Macro Baseline Forecast (December 2016)									Annual	Annual	Annual	Annual	Annual	Annual	Annual	
Macro-Variable	1980	1990	2000	2005	2010	2015	2020	2025	% Change 1980-00	% Change 2000-05	% Change 2005-10	% Change 2010-15	% Change 2015-20	% Change 2020-25	% Change 2015-25	
	History						Forecast			History				Forecast		
Gross Domestic Product: Total, (Bil. Chained 2009 \$, SAAR)	6,450.40	8,955.03	12,559.65	14,234.25	14,783.80	16,397.20	18,280.48	20,320.13	3.4%	2.5%	0.8%	2.1%	2.2%	2.1%	2.2%	
Income: Total Personal, (Bil. 2009 \$, SAAR)	5,268.44	7,275.32	10,389.04	11,503.50	12,273.82	14,112.88	15,876.82	17,498.27	3.5%	2.1%	1.3%	2.8%	2.4%	2.0%	2.2%	
Income: Wage & Salary Disbursements, (Bil. Nominal \$, SAAR)	1,373.43	2,741.20	4,825.85	5,691.98	6,377.53	7,854.83	10,346.91	12,500.77	6.5%	3.4%	2.3%	4.3%	5.7%	3.9%	4.8%	
Median Household Income, (Nominal \$, SA)	18,167	31,102	42,349	46,242	50,046	55,775	65,470	74,583	4.3%	1.8%	1.6%	2.2%	3.3%	2.6%	2.9%	
Jobs: Total Non-Agricultural, (Mil.)	90.53	109.53	132.03	134.04	130.35	141.83	151.50	156.76	1.9%	0.3%	-0.6%	1.7%	1.3%	0.7%	1.0%	
Employment (Household Survey): Total Employed, (Mil.)	99.30	118.80	136.90	141.71	139.08	148.84	156.61	162.02	1.6%	0.7%	-0.4%	1.4%	1.0%	0.7%	0.9%	
Employment (Household Survey): Unemployment Rate (%)	7.2	5.6	4.0	5.1	9.6	5.3	4.7	4.6								
Population: Total, (Mil.)	227.53	250.04	282.51	295.88	309.64	321.72	333.55	345.40	1.1%	0.9%	0.9%	0.8%	0.7%	0.7%	0.7%	
Population: Ages 0-4, (Mil.)	16.51	18.90	19.19	19.92	20.18	19.91	20.38	20.77	0.8%	0.7%	0.3%	-0.3%	0.5%	0.4%	0.4%	
Population: Ages 5-19, (Mil.)	55.82	53.08	61.42	62.13	62.96	62.21	61.71	61.97	0.5%	0.2%	0.3%	-0.2%	-0.2%	0.1%	0.0%	
Population: Ages 19-64, (Mil.)	129.43	146.73	166.80	177.12	185.93	191.64	194.89	196.63	1.3%	1.2%	1.0%	0.6%	0.3%	0.2%	0.3%	
Population: Ages 65+, (Mil.)	25.77	31.32	35.10	36.71	40.57	47.96	56.57	66.01	1.6%	0.9%	2.0%	3.4%	3.4%	3.1%	3.2%	
Households, (Mil.)--Annual Average	81.10	92.07	106.10	112.71	117.16	123.23	130.26	137.36	1.4%	1.2%	0.8%	1.0%	1.1%	1.1%	1.1%	
FHFA All Transactions Home Price Index, (Index 1995Q1 = 100, NSA)	102.70	165.00	234.63	346.77	323.45	358.75	419.67	511.57	4.2%	8.1%	-1.4%	2.1%	3.2%	4.0%	3.6%	
Notes: NA Means "Not Available." FHFA means Federal Housing Finance Agency.																

Table 2.2 Moody's Analytics: Barnstable County Economic and Demographic Baseline Forecast (December 2016)-Unadjusted

Moody's Analytics: Barnstable County Economic and Demographic Baseline Forecast (December 2016)-Unadjusted									Annual	Annual	Annual	Annual	Annual	Annual	Annual	
Macro-Variable	1980	1990	2000	2005	2010	2015	2020	2025	% Change 1980-00	% Change 2000-05	% Change 2005-10	% Change 2010-15	% Change 2015-20	% Change 2020-25	% Change 2015-25	
	History						Forecast		History				Forecast			
Gross Metro Product: Total, (Bil. Chained 2009 \$, SAAR)	3.79	6.18	9.69	10.72	10.25	10.35	11.39	12.47	4.8%	2.0%	-0.9%	0.2%	1.9%	1.8%	1.9%	
Income: Total Personal, (Mil. 2009 \$, SAAR)	3,770.30	6,418.38	9,820.20	10,736.27	11,307.63	12,488.88	13,735.53	14,996.76	4.9%	1.8%	1.0%	2.0%	1.9%	1.8%	1.8%	
Income: Wage & Salary Disbursements, (Mil. Nominal \$, SAAR)	581.58	1,504.93	2,785.78	3,486.58	3,720.55	4,479.28	5,706.99	6,849.10	8.1%	4.6%	1.3%	3.8%	5.0%	3.7%	4.3%	
Median Household Income, (Nominal \$, SA)	16,613	31,356	47,586	54,899	57,423	66,102	76,318	86,155	5.4%	2.9%	0.9%	2.9%	2.9%	2.5%	2.7%	
Jobs: Total Non-Agricultural, (Ths.)	53.93	72.48	90.98	95.75	91.14	98.05	105.20	107.35	2.6%	1.0%	-1.0%	1.5%	1.4%	0.4%	0.9%	
Employment (Household Survey): Total Employed, (Ths.)	NA	89.92	108.65	116.02	99.80	104.51	109.23	109.75	NA	1.3%	-3.0%	0.9%	0.9%	0.1%	0.5%	
Employment (Household Survey): Unemployment Rate (%)	NA	7.3	3.3	4.9	9.9	6.3	6.0	6.4								
Population: Total, (Ths.)	149.24	187.55	223.14	221.99	215.93	214.33	219.38	223.94	2.0%	-0.1%	-0.6%	-0.1%	0.5%	0.4%	0.4%	
Population: Ages 0-4, (Ths.)	8.12	12.16	10.59	9.51	8.86	8.17	8.39	8.47	1.3%	-2.1%	-1.4%	-1.6%	0.5%	0.2%	0.4%	
Population: Ages 5-19, (Ths.)	30.56	30.83	38.90	37.00	32.77	29.46	27.83	27.07	1.2%	-1.0%	-2.4%	-2.1%	-1.1%	-0.6%	-0.8%	
Population: Ages 19-64, (Ths.)	79.45	103.20	122.28	124.30	120.26	115.57	113.98	110.02	2.2%	0.3%	-0.7%	-0.8%	-0.3%	-0.7%	-0.5%	
Population: Ages 65+, (Ths.)	31.10	41.36	51.37	51.20	54.05	61.14	69.18	78.39	2.5%	-0.1%	1.1%	2.5%	2.5%	2.5%	2.5%	
Households, (Ths.)--Annual Average	59.11	78.00	95.29	96.98	95.88	97.18	101.31	105.64	2.4%	0.4%	-0.2%	0.3%	0.8%	0.8%	0.8%	
FHFA All Transactions Home Price Index, (Index 1995Q1 = 100, NSA)	NA	111.36	155.85	301.23	255.63	272.14	352.09	446.79	NA	14.1%	-3.2%	1.3%	5.3%	4.9%	5.1%	
Notes: NA Means "Not Available"	FHFA means Federal Housing Finance Agency.															
The county forecast from Moody's Analytics presented in the above table is unadjusted for "facts on the ground." The final county population forecast was adjusted for the March 2017 release of county population estimates for July 1, 2016 from the U.S. Census Bureau																

CHAPTER 3: CURRENT SOCIO-ECONOMIC LANDSCAPE OF BARNSTABLE COUNTY AND REGIONAL DEMOGRAPHIC-ECONOMIC FORECAST

Introduction

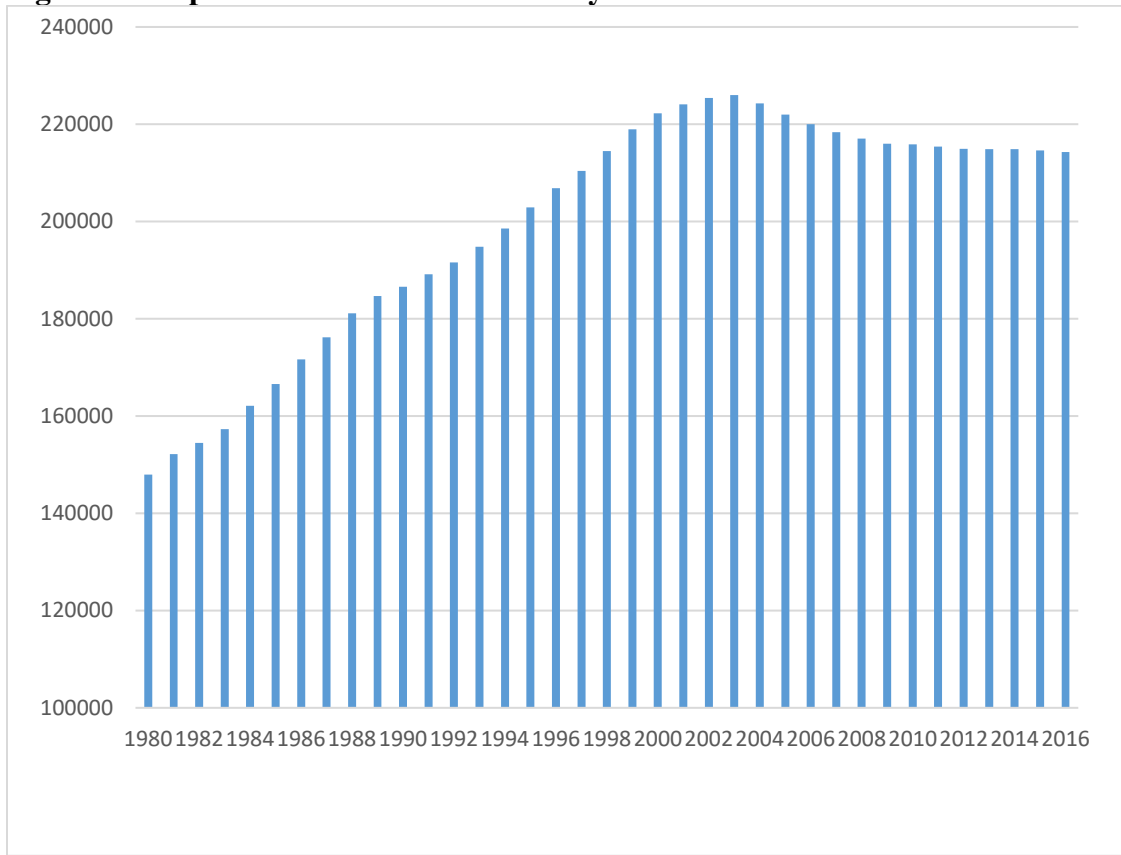
This chapter provides an overview of past economic and demographic trends in Barnstable County; and presents regional economic and demographic forecast. This overview includes recent information on population, households, employment, visitation, household income, commuting patterns and other important data relative to housing demand in the region as well as within each individual town in the study area. The long-term forecast builds upon this regional demographic-economic profile.

Socio-Economic Profile of Barnstable County

Population Trends – 1980-2016

The county has seen slow and declining population over the past 13 years. The county had a 2016 population of 214,276 year-round residents—an overall decrease of 11,735 people and -0.41 percent annual decline. Recent population decline in the county is in marked contrast to the booming 1980s and 1990s when annual population growth averaged 2.08 percent. During that period, the county was one of fastest growing counties in the Commonwealth; in comparison, Massachusetts had an average annual statewide growth rate of 0.47 percent.

Figure 3.1 Population in Barnstable County 1980-2016



Population change over the decades varied across towns and Cape Cod regions. Since the county’s peak year (2003), population declined across all regions and every town except for Bourne and Mashpee. Population decline was most pronounced in the Mid-Cape towns of Dennis and Barnstable and the Outer-Cape towns of Provincetown and Eastham. Current population counts within these communities are at levels previously reached during the early 1990s and prior

Table 3.1. Population in Barnstable County, 1980-2015 (Select Years)

Region/Town	1980	1990	2000	2010	2015
Upper-Cape	49,941	67,401	84,463	85,966	85,804
Bourne	13,874	16,087	18,721	19,754	19,681
Falmouth	23,640	27,972	32,660	31,531	31,524
Mashpee	3,700	7,876	12,946	14,006	14,154
Sandwich	8,727	15,466	20,136	20,675	20,445
Mid-Cape	61,707	75,898	88,601	83,193	81,803
Barnstable	30,898	40,958	47,821	45,193	44,331
Dennis	12,360	13,804	15,973	14,207	14,005
Yarmouth	18,449	21,136	24,807	23,793	23,467
Lower-Cape	25,574	31,202	35,446	34,078	34,087
Brewster	5,226	8,454	10,094	9,820	9,918
Chatham	6,071	6,594	6,625	6,125	6,143
Harwich	8,971	10,317	12,386	12,243	12,180
Orleans	5,306	5,837	6,341	5,890	5,846
Outer-Cape	10,703	12,104	13,720	12,651	12,639
Eastham	3,472	4,464	5,453	4,956	4,915
Provincetown	3,536	3,571	3,431	2,942	2,968
Truro	1,486	1,578	2,087	2,003	2,007
Wellfleet	2,209	2,491	2,749	2,750	2,749
Barnstable County	147,925	186,605	222,230	215,888	214,333
Source: U.S. Census Bureau					

Factors Behind Population Growth and Decline:

Rapid growth and contrarily decline are attributed to a combination of natural change—births vis-à-vis deaths, and net migration--domestic and international. In prior periods--1980s and 1990s, the county stood out as one of the fastest growing counties due to natural increase—more births than deaths, and net migration from other regions and countries.

The eventual slow-down and more recent trend of decline is due to the age profile of Barnstable County affecting birth and death rates. As a population grows older, the bulk of its population ages out of childbearing years and eventually into higher mortality age cohorts. Thus, the number of deaths will eventually outnumber new births in the region. In the county, the effect of this aging is more pronounced as the county has the oldest median age (52.5 years) in the state. [In comparison, the median age in Massachusetts and the United States is 39.4 years and 37.8 years, respectively.] The birth rate (i.e., number of births per 1,000 residents) in the county peaked in 1990 at 13.12; since then, the birth rate has steadily declined to its current low of 7.09. For the

county, 1991 marked the year in which its natural increase (births minus deaths) flipped to natural decrease (deaths minus births).

The aging population in the county can be viewed as shifting shares of broad age cohorts between 1980 and 2015. These broad age groupings are:

0-19 years: Infants to school age adolescents to prospective new workforce entrants and college-age population.

20-44 years: New household formations; new entrants in workforce to workers in their prime years;

45-64 years: Maturing persons and workers with accumulated skills and experience; and

65 years and older: Principally retirees.

In 1980, more than half of the county’s population were in the age cohorts of 0-19 years and 20-44 years; by 2000, equal halves were in the broad age groups of younger/older than 45 years; and currently, three out of every five persons in the county is 45 years or older. Less than one out of every five persons is younger than 19 years.

Table 3.2 Population by Broad Age Cohorts in Barnstable County, 1980-2015

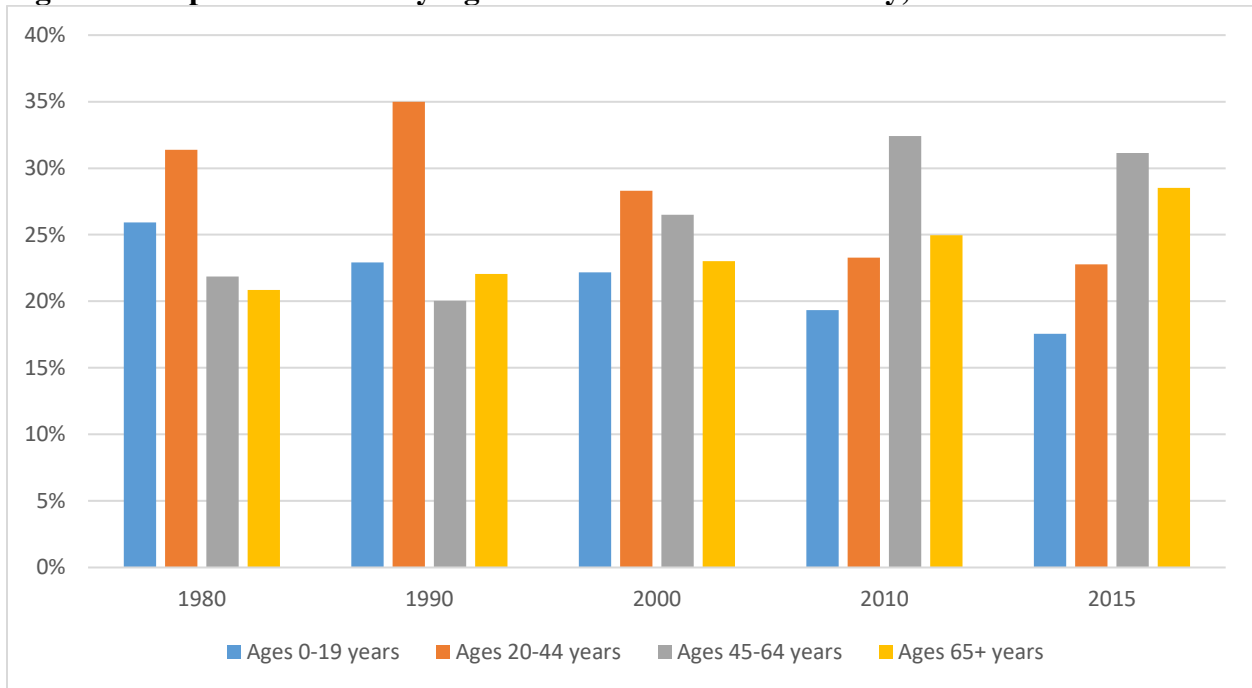
Age Cohort	1980	1990	2000	2010	2015
Ages 0-19	38,684	42,987	49,464	41,547	37,557
Ages 20-44	46,829	65,622	63,127	50,196	48,771
Ages 45-64	32,622	37,578	59,095	70,097	66,701
Ages 65+	31,105	41,362	51,345	54,089	61,275
Total	149,239	187,550	223,031	215,930	214,305

Source: U.S. Census Bureau

With the exception of the oldest age cohort (65 years and older), growth and change in broad age cohorts are illustrated by bell-shaped curves. For instance, persons in the youngest age cohort increased until 2000 and has since declined. This is further supported by declining school enrollments in the county.¹

¹ Massachusetts Department of Elementary and Secondary Schools. *School Attending Children Reports*

Figure 3.2 Population Share by Age Cohort in Barnstable County, 1980-2015



A similar curve can be viewed for the age cohort of 20-44 years. For this group, further analysis has suggested that a significant share of these residents move off the Cape to attend college and technical schools elsewhere; as the U.S. Census counts college students at their place of residence, these enrolled students are no longer counted as year-round residents in Barnstable County.² While this may be the case, further numerical losses within this broad age group can be traced to diminished job prospects during the years of the Great Recession. For a five-year period (2005-2009), the county experienced significant net out-migration (high outflow of residents versus low in-migration).

This extended period of net out-migration was coincident with declines in labor force, employment, and regional economic performance.

The share size of the 65 years and older group has increased between 1980 and 2015. Though much of these gains are due to natural aging, there is also a net migration of “retirees.” As the general population continues to age, the elderly will constitute an increasing share of region’s population base, making the “graying” of the Cape Cod a significant socio-economic development for the region.

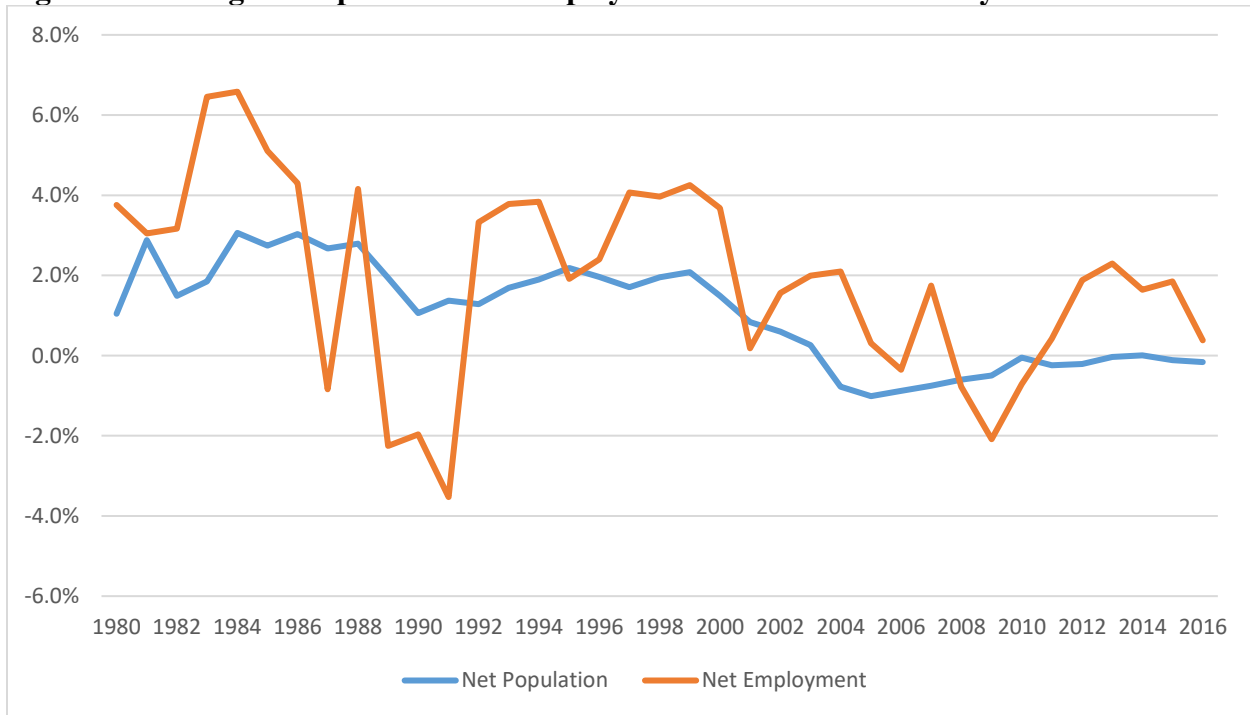
The aging population of the county can readily be seen in the broad age cohorts of 45-64 years and 65 years and older. While persons within the broad age group of 45-64 years has recently declined between 2010 and 2015, this cohort continues have the largest share of population in the county. “Retirees” have grown in both absolute and relative terms between 1980 and 2015.

² See Ramachandran, Mahesh. *Demographic Changes on Cape Cod*. December 2016. Cape Cod Commission.

The share size of the 65 years and older group has increased between 1980 and 2015. Though much of these gains are due to natural aging, there is also a net migration of “retirees.” As the general population continues to age, the elderly will constitute an increasing share of region’s population base, making the “graying” of the Cape Cod a significant socio-economic development for the region.

As noted earlier, a region’s population can change due to natural increase (or decrease)—namely births minus deaths; and net migration—the balance of persons moving into and out of an area. While natural increase (or decrease) has historically played an important role in population change in Barnstable County, the migratory component is significantly related to local economic performance. Though somewhat muted compared to past regional economic cycles, people follow jobs. In general, as job prospects increase within an area, people will migrate to that area from elsewhere, attracted by the likelihood of employment. Such migrants, however, tend to arrive well after economic expansion is under way; thus, a region’s population growth will tend to lag behind its employment growth.

Figure 3.3 Change in Population and Employment in Barnstable County

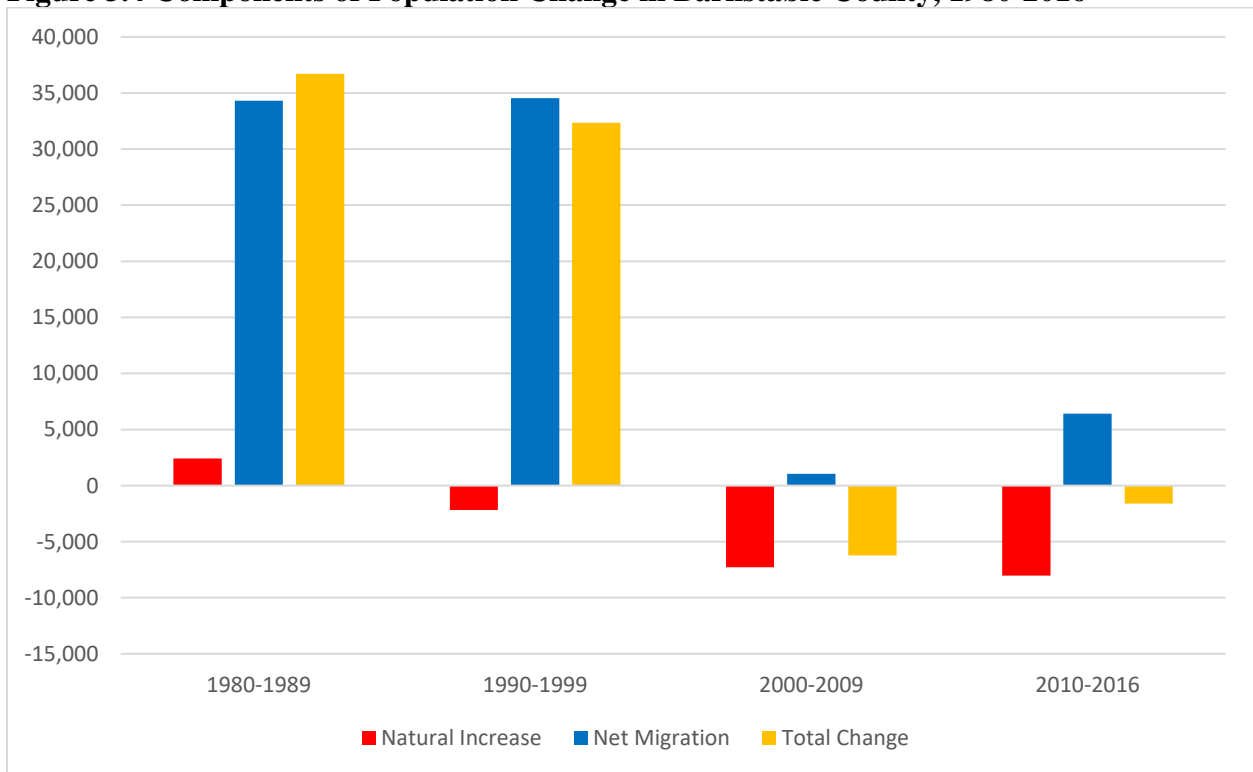


In sum, natural increase (or decrease) and net migration have contributed to the county’s population over the last three and a half decades. During the 1980s decade, natural increase was slight (net 24 births over deaths); leaving net migration as the virtually the sole contributor to population growth in the county. In the early 1990s, net natural increase eroded to the point where deaths outnumbered births, thus flipping to net natural decrease. In the 1990s decade, natural decrease was a slight subtractor (net 630 deaths over births), while net migration continued apace adding 875 people per annum. Net migration in total diminished over the 2000s; with a string of five middle years signaling a net outflow of people from the county. For the 2000s, net migration was slightly positive (900 net in-migrants) while natural decrease was the dominant contributor to

For the 2000s, net migration was slightly positive (900 net in-migrants) while natural decrease was the dominant contributor to population decline.

population decline. Thus far in the 2010s, natural decrease and net migration have nearly equaled each other; resulting in a slight decrease in population since 2010.

Figure 3.4 Components of Population Change in Barnstable County, 1980-2016



Commuting Patterns

There is a daily dynamism of movement from residents to work places. These commuting worker flows include (1) internal movements—county residents traveling to in-county workplaces; and (2) external movements, composed of either county residents commuting to workplaces located outside of the county, or nonresidents commuting to workplaces in the county. The table below, which presents the most recent commuting behavior of residents and workers in the county, indicates that the county is—for the most part—a net exporter of workers to employment centers, both near and far. In 2013, there were about 14,200 residents holding jobs outside of the county—mostly in nearby Boston or Providence metropolitan regions. In addition, the commuting pattern table shows that the county imports about 9,800 non-residents to work in its employment centers; with nearly nine out of every ten workers coming from communities within the nearby Boston and Providence metropolitan regions.

county commuters in 2015 brought back \$930 million in labor earnings from employment sites outside the county; about 13 percent of total labor earnings of \$7.24 billion.

The implications for out-commuting of the county residents to employment centers is that net labor earnings (i.e., wages and salaries and proprietors' incomes) are brought back home. If the county workers are like other commuters, then paychecks are spent for consumer goods and services closer to home, thus supporting local retailers and services firms. The amount of net labor earnings brought back into the county is substantial. According to the U.S. Bureau of Economic Analysis, the county commuters in 2015 brought back \$930 million in labor earnings from employment sites outside the county; about 13 percent of total labor earnings of

\$7.24 billion.

Table 3.3 Commuting Patterns in Barnstable County, 2013

Place of Residence	Commuting Workers to:	Place of Work
Barnstable County	59,119	Barnstable County
Other Massachusetts	20,136	Barnstable County
Other New England	1,261	Barnstable County
Other States/Countries	1,076	Barnstable County
	81,592	Barnstable County, Total*
Barnstable County	28,307	Other Massachusetts
Barnstable County	1,907	Other New England
Barnstable County	2,276	Other States/Countries
Barnstable County, Total**	32,490	
Total Residing in Barnstable County	91,609	
Notes: * Total employed in Barnstable County; **Total residing in Barnstable County but working outside of County.		
Source: LEHD, U.S. Bureau of Labor Statistics		

Households in Barnstable County

A significant demographic determinant in housing demand is households—new formations and household size. Looking back at the past three decades, household changes have mainly reflected the maturing of the “baby boom” population. Baby boomers are generally defined as those persons who were born between 1946 and 1964—a period of time when the nation experienced strong population growth rates following the end of World War II. The oldest “baby boomers” are today in their late-sixties to mid-seventies, and the youngest nearing their mid-fifties. Therefore, the majority of this population group has already formed independent households—a factor that is very important to housing markets.

The post-“baby boom” population—which is significantly smaller than the “baby boom” population—is now in the prime age categories for forming new households. An overall slowdown in the rate of new household formations because of the aging of the “baby boomer” segment of the population is an overall demographic trend that is expected to continue to dominate over the next decade. This well-known demographic dynamic will therefore affect the level and nature of housing demand over the next decade as well.

Off-setting declining housing demand caused by the aging “baby boom” population is the trend towards declining household size—the trend toward fewer persons per household. The most obvious implication for housing demand from this trend is that more housing units will be required to house each increment of population growth in the region over the next decade than was the case over the last twenty to thirty years.

The decline in average household size reflects long-standing social changes that have resulted in smaller families and the increasing share of total households by non-family households. For years,

smaller household size is increasingly responsible for greater housing unit need as the population grows with these new household characteristics. The result is potentially greater demand for smaller units, characteristic of households headed by persons aged 50 years and older.

literature on societies has been filled with studies about the decline of the traditional married-couple family, the increase in single-parent families and the growth of single-person households. The implication of smaller household size is increasingly responsible for greater housing unit need as the population grows with these new household characteristics. The result is potentially greater demand for smaller units, characteristic of households headed by persons aged 50 years and older.

Figure 3.5 Households in Barnstable County, 1990-2015

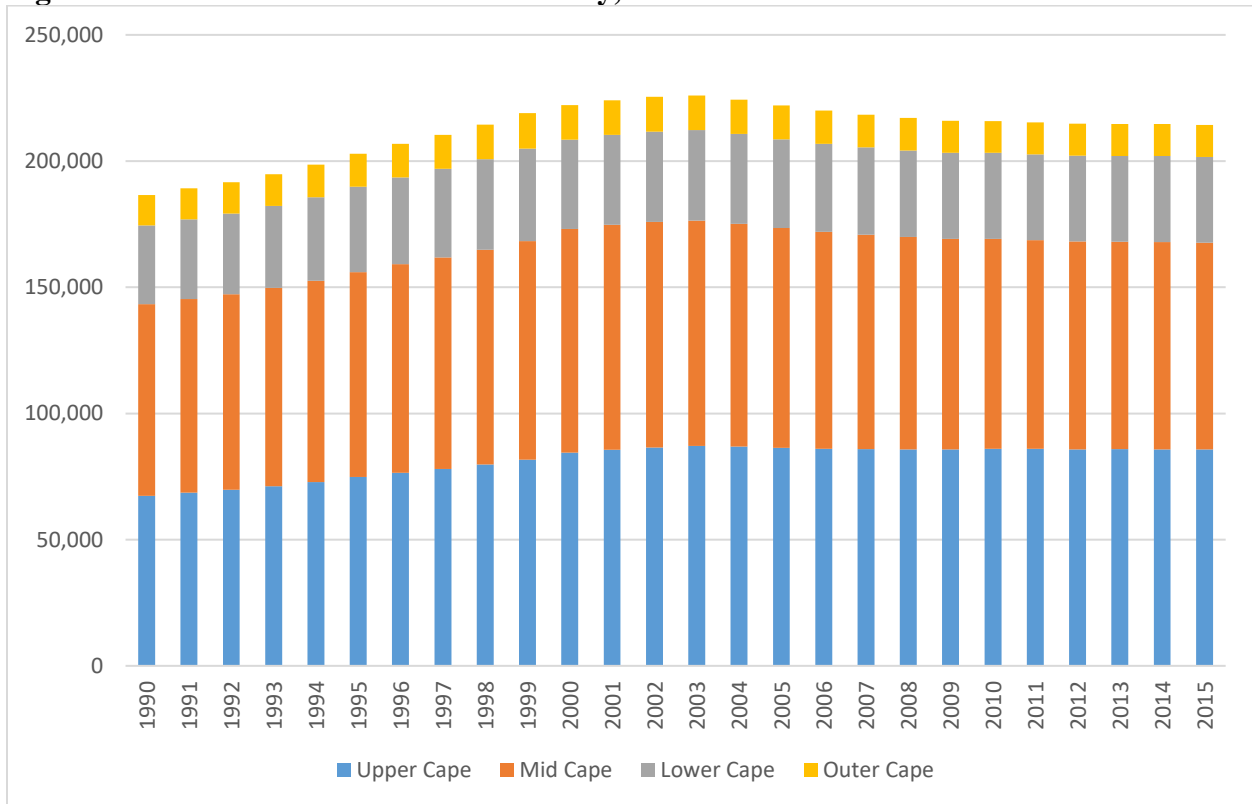


Table 3.4 Households by Town in Barnstable County, 1990-2015 (Selected Years)

Region/Municipality	1990	1995	2000	2005	2010	2015
Upper Cape	25,995	29,385	33,894	35,370	35,829	35,390
Town of Bourne	5,895	6,688	7,422	7,733	7,866	8,292
Town of Falmouth	11,364	12,666	13,876	14,175	14,069	13,638
Town of Mashpee	3,178	3,622	5,250	5,775	6,118	5,907
Town of Sandwich	5,558	6,409	7,346	7,688	7,776	7,553
Mid Cape	32,422	34,919	38,674	38,606	37,382	37,187
Town of Barnstable	16,593	17,984	19,647	19,729	19,225	19,503
Town of Dennis	6,218	6,646	7,511	7,326	6,928	6,809
Town of Yarmouth	9,611	10,289	11,516	11,551	11,229	10,875
Lower Cape	13,548	14,870	15,842	16,156	16,041	15,399
Town of Brewster	3,345	3,694	4,127	4,303	4,383	4,272
Town of Chatham	2,977	3,235	3,157	3,164	3,085	2,816
Town of Harwich	4,501	4,995	5,470	5,625	5,623	5,430
Town of Orleans	2,725	2,947	3,088	3,063	2,950	2,881
Outer Cape	5,710	6,151	6,435	6,553	6,503	6,441
Town of Eastham	1,930	2,116	2,383	2,421	2,388	2,291
Town of Provincetown	1,951	2,018	1,842	1,820	1,765	1,782
Town of Truro	666	749	923	964	984	820
Town of Wellfleet	1,163	1,269	1,287	1,349	1,366	1,548
Barnstable County	77,675	85,325	94,845	96,686	95,755	94,417

Seasonal Population

the Cape Cod Commission, using survey data on second homes indicate that the seasonal population in the county, when averaged over a full calendar year, is equivalent to 68,856 full-time residents.

The prior discussion on population and population change in the county is focused on “resident” population, as reported by the U.S. Census Bureau. However, during significant portions of any given year, Cape Cod is also the home to a large number of “seasonal” residents not counted by the Census Bureau. Estimates produced by the Cape Cod Commission³, using survey data on second homes indicate that the seasonal population in the county, when averaged over a full calendar year, is equivalent to 68,856 full-time residents. Seasonal population obviously varies across the year, with peak seasonal population occurring during the summer months of July and August. Although this was based on a survey conducted in calendar year 2008 and did not include lodging

³ These reported findings are based on the report: *2008 Survey of Cape Cod Second-Home Owners: Technical Report of Findings*. November 2008. UMass Donahue Institute, Research and Evaluation Group.

data, it is likely still representative of the overall seasonal pattern of temporary residents in the county.

Figure 3.6 Second Home Population Estimate, Barnstable County

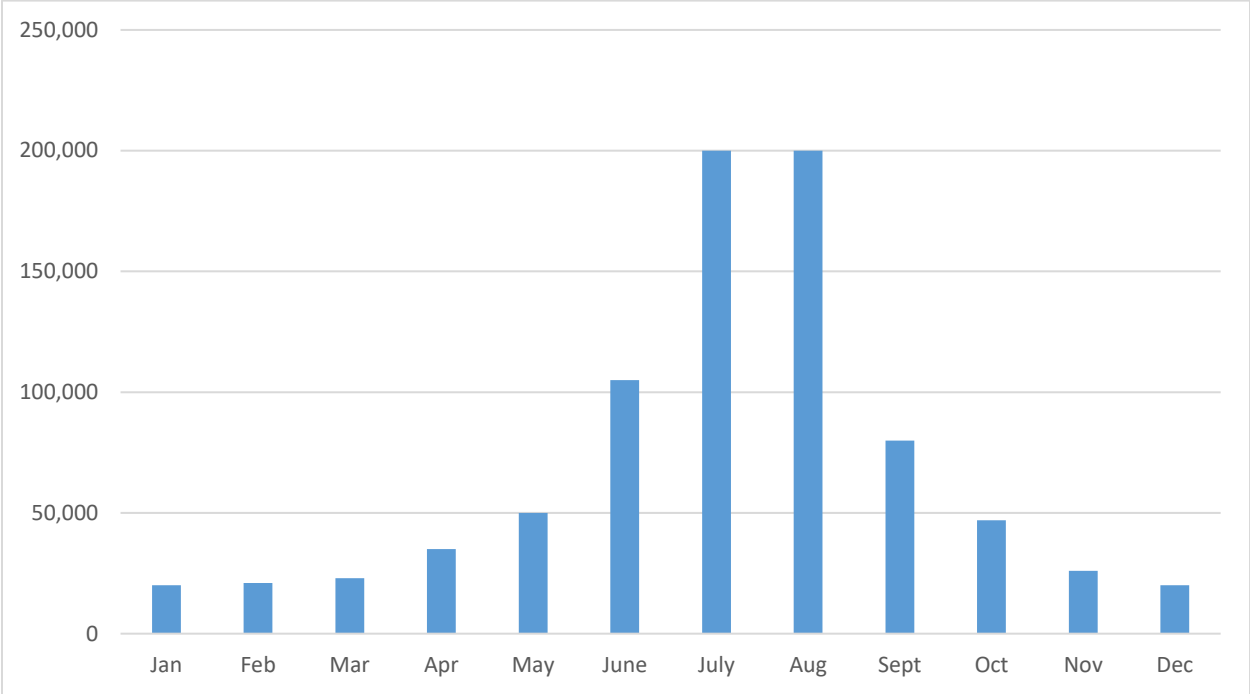
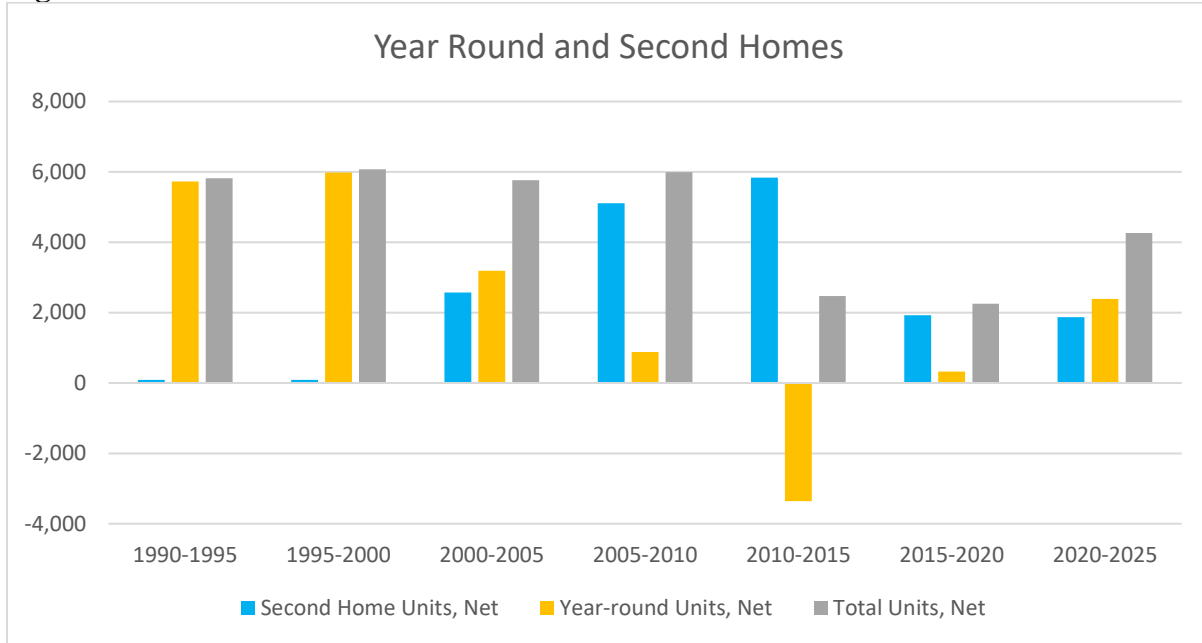


Figure 3.7 Year- Round and Second Home Net Units Added 1990-2025



Several macro-economic factors significantly impacted the Cape’s housing market, especially, the Great Recession, and subsequent recovery by households in the Boston and New York metropolitan areas, which resulted in a historically large number of seasonal unit demand

Over the next ten years seasonal housing units are expected to increase at more than twice the rate of year-round units... This continued growth in seasonal units will likely make it more difficult for year-round resident households to find year-round units at affordable prices

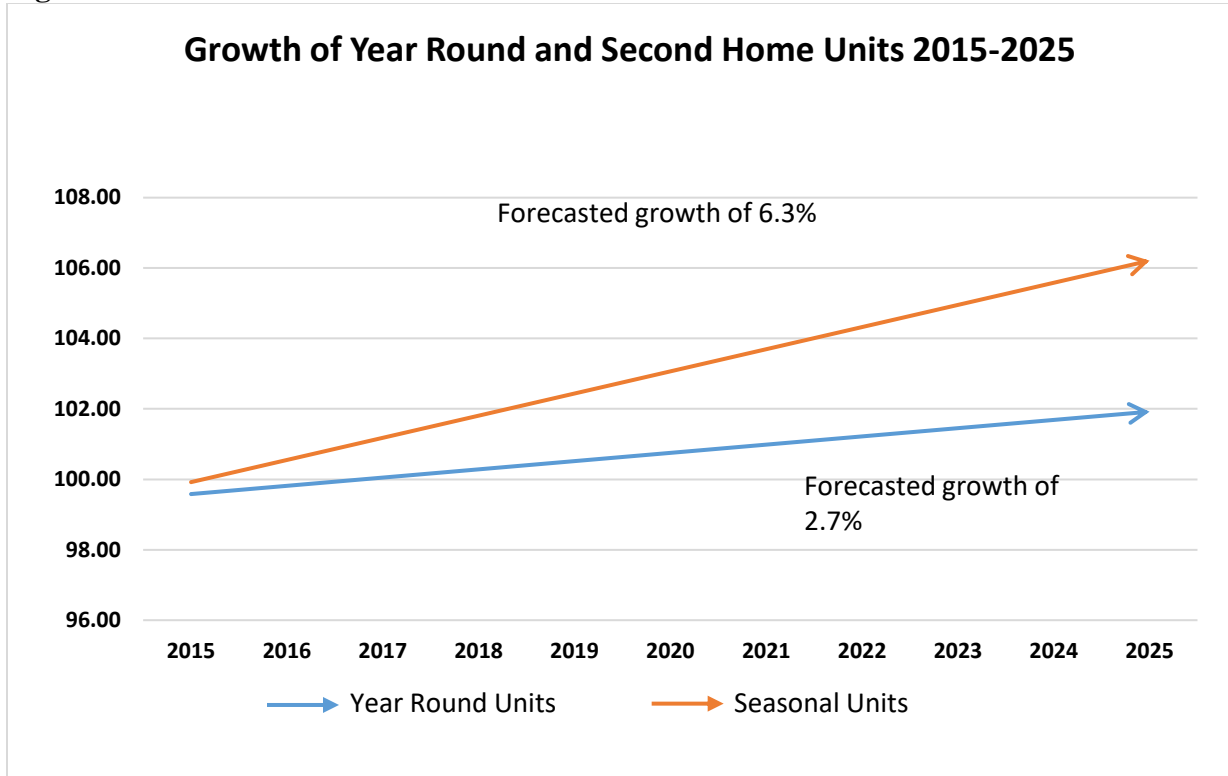
(including new additions and conversions from year-round units to seasonal units—particularly during the 2010 to 2015-time period on Cape Cod. This shift has and will continue to have a long-lasting effect on Cape Cod’s housing market. Figure 3.7 shows how dramatically the housing supply has shifted toward second or seasonal housing units over the 15-year period between 2000 to 2015, and especially during the 2005 to 2015 period. The shift in unit additions away from year-round units to second or seasonal units is illustrated by the over 3,000-unit decline in year-round units the county experienced over the 2010 to 2015 period. Focus groups also reported anecdotally that a large portion of this shift in unit demand was due to conversion of year-round units to second or seasonal

brought about by the improving economic performance of candidate households in the greater Boston metro area.

Over the next ten years seasonal housing units are expected to increase at more than twice the rate of year-round units. Figure 3.8 shows the linear trend lines for the expected increase of year-round and second or seasonal units for the 2015-2025 period. This continued growth in seasonal units will likely make it more difficult for year-round resident households to find year-round units at

affordable prices as increasing seasonal or second unit demand tends to put upward pressure on housing prices but constricting the supply of available units suitable for year-round residents as the year-round unit supply experiences year-round unit to seasonal unit conversions.

Figure 3.8 Growth of Year-Round and Second Home Units 2015-2025



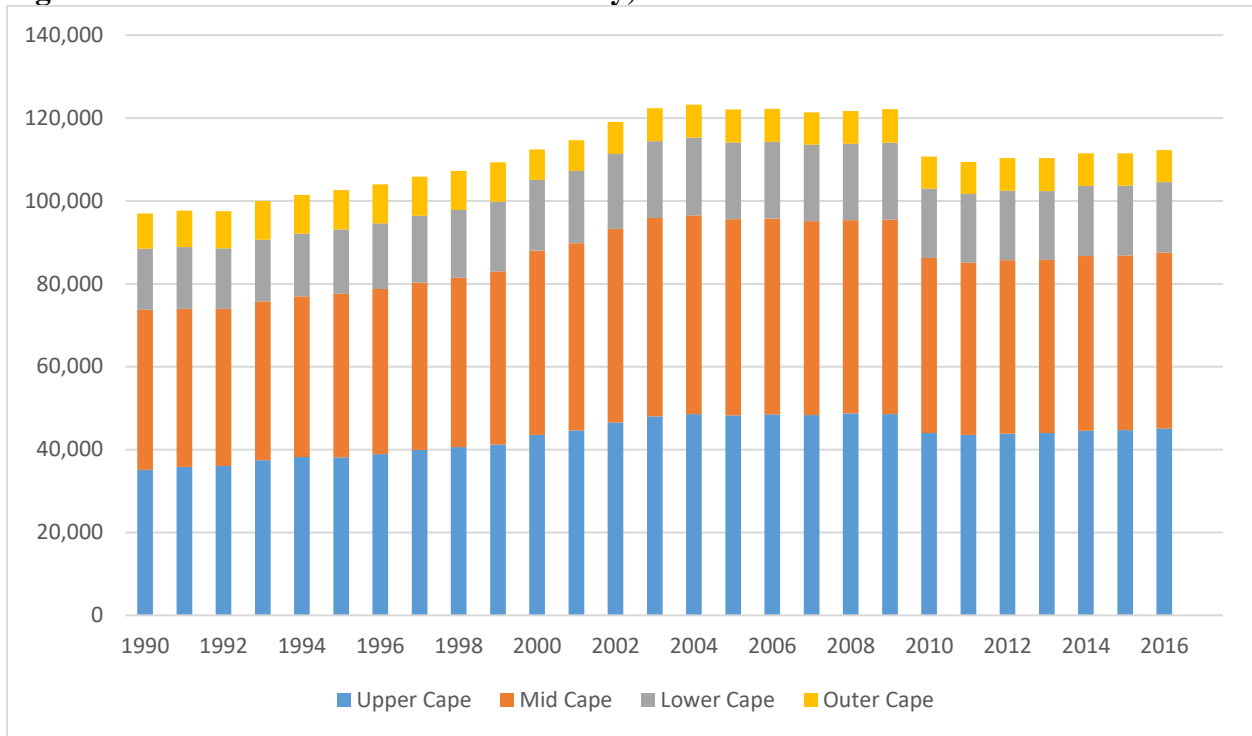
Labor Market and Employment Trends in Barnstable County

Labor Force Trends:

The county's labor market continues to change in fundamental ways. During the 1990s, the county's civilian labor force grew substantially, consistent with employment gains and overall regional economic growth. The county's labor force expanded by 16 percent over this period. In the first half of the 2000s, labor force growth continued apace reaching its zenith at 123,200 in 2004. Between 2004 and 2011, the labor force contracted steadily due to the depth of the "Great Recession" and the region's subsequent sluggish recovery. The year 2010 marked an abrupt drop in the labor force; over 11,000 people left the labor market—an overall reduction of 9 percent. When an upward path for the regional economy had finally resumed in 2012, the size of the regional labor force had been reduced by about ten percent. By 2016, the labor force in the county had returned to 112,200—a level earlier reached back in the year 2000.

The year 2010 marked an abrupt drop in the labor force; over 11,000 people left the labor market—an overall reduction of 9 percent. When an upward path for the regional economy had finally resumed in 2012, the size of the regional labor force had been reduced by about ten percent. By 2016, the labor force in the county had returned to 112,200—a level earlier reached back in the year 2000.

Figure 3.9 Labor Force in Barnstable County, 1990-2016



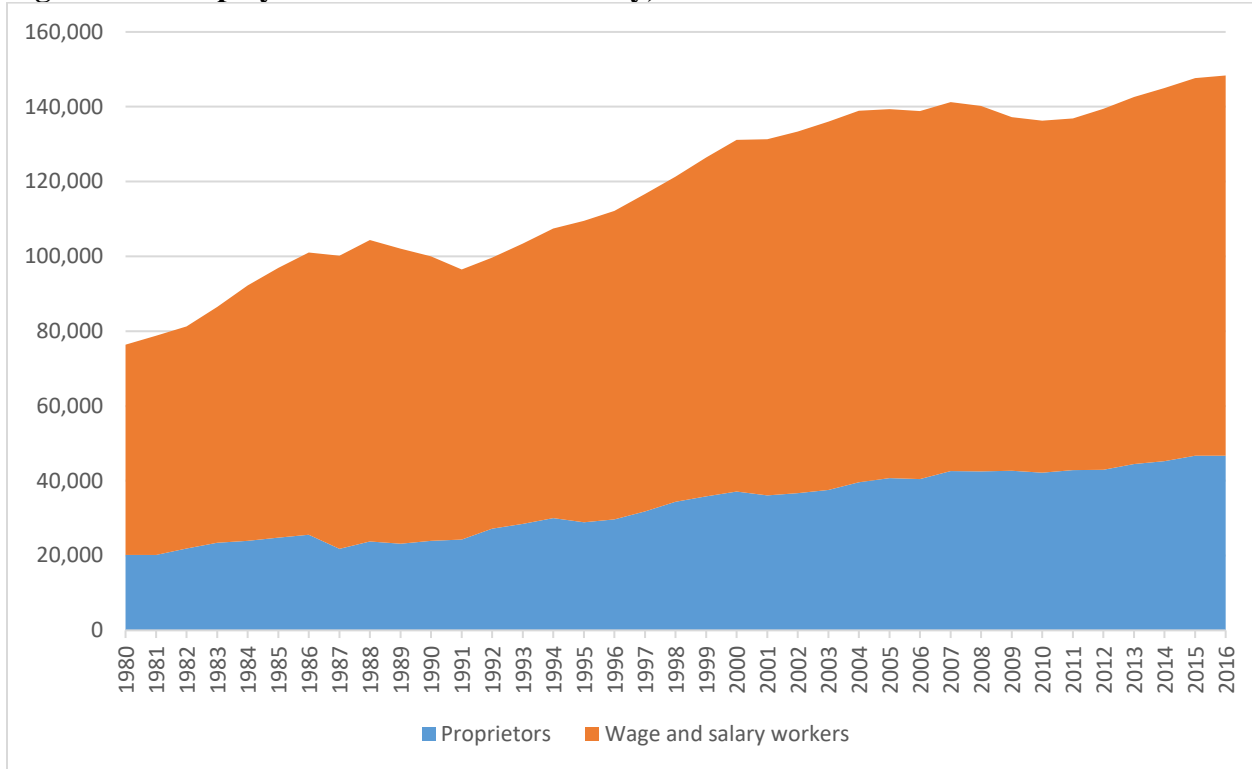
Employment Trends:

Between 1980 and 2016, total employment⁴ in the county nearly doubled, increasing from 76,400 to 148,200. Much of the region’s employment growth occurred during the 1980s and 1990s, when employment grew at an average annual rate of 2.8 percent. Employment growth was tepid during the 2000s, increasing on average by only 0.7 percent annually. The latter half of the decade signaled actual losses in employment as the region was in the throes of the Great Recession. Thus far during the 2010s, employment growth has resumed in the region, with an average annual rate of 1.1 percent.

This growth was not spread evenly among all sectors of the regional economy; with most goods-producing sectors outperforming services-providing sectors. Construction and manufacturing rebounded in recent years following the prolonged recession. A number of services-providing sectors resumed growth, particularly arts, entertainment, and recreation; administration and support and waste management and remediation services; transportation and warehousing; and wholesale trade.

⁴ Total employment used in this report is consistent with the U.S. Bureau of Economic Analysis (BEA) series of full- and part-time employment. In addition to wage and salary employment—consistent with the U.S. Bureau of Labor Statistics (BLS) ES-202 (covered employment), BEA compiles employment of proprietors as well as “uncovered” sectors such as farm workers and military.

Figure 3.10 Employment in Barnstable County, 1980-2016

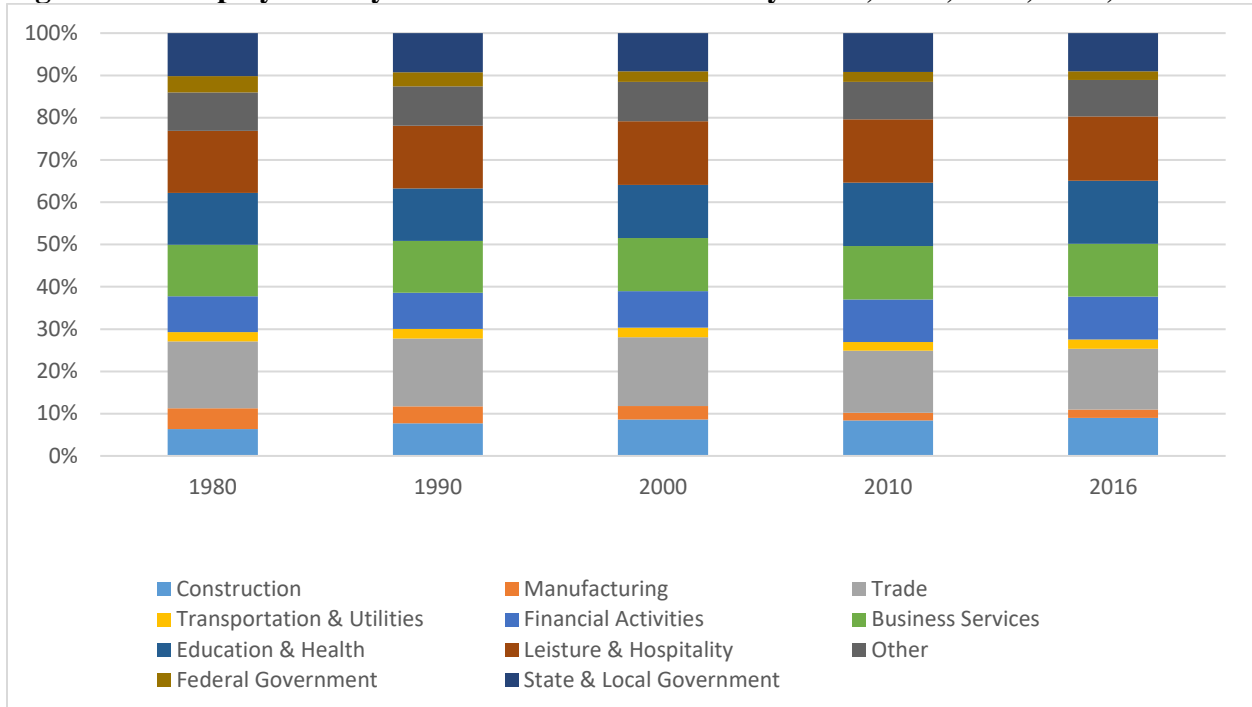


The county’s economy is predominantly services-oriented. Four out of every five workers in the region are employed in trade, transportation, financial and real estate, professional and business services, leisure and hospitality, and other services. While there has been widespread attention given to the shift from goods production to services; employment in goods-producing sectors—

The county’s economy is predominantly services-oriented. Four out of every five workers in the region are employed in trade, transportation, financial and real estate, professional and business services, leisure and hospitality, and other services.

agriculture, fishing, mining, construction, and manufacturing—has remained at about 8 percent since 1980. Construction, though cyclical, has increased its employment share; while manufacturing continues to downsize, with productivity gains and plant closures. In 1980, trade was the leading employment sector in the county; one in every five workers were employed in wholesale and retail establishments. In the intervening decades, structural change has occurred with robust growth occurring in professional and business services and education and health services.

Figure 3.11 Employment by Sector in Barnstable County: 1980, 1990, 2000, 2010, and 2016

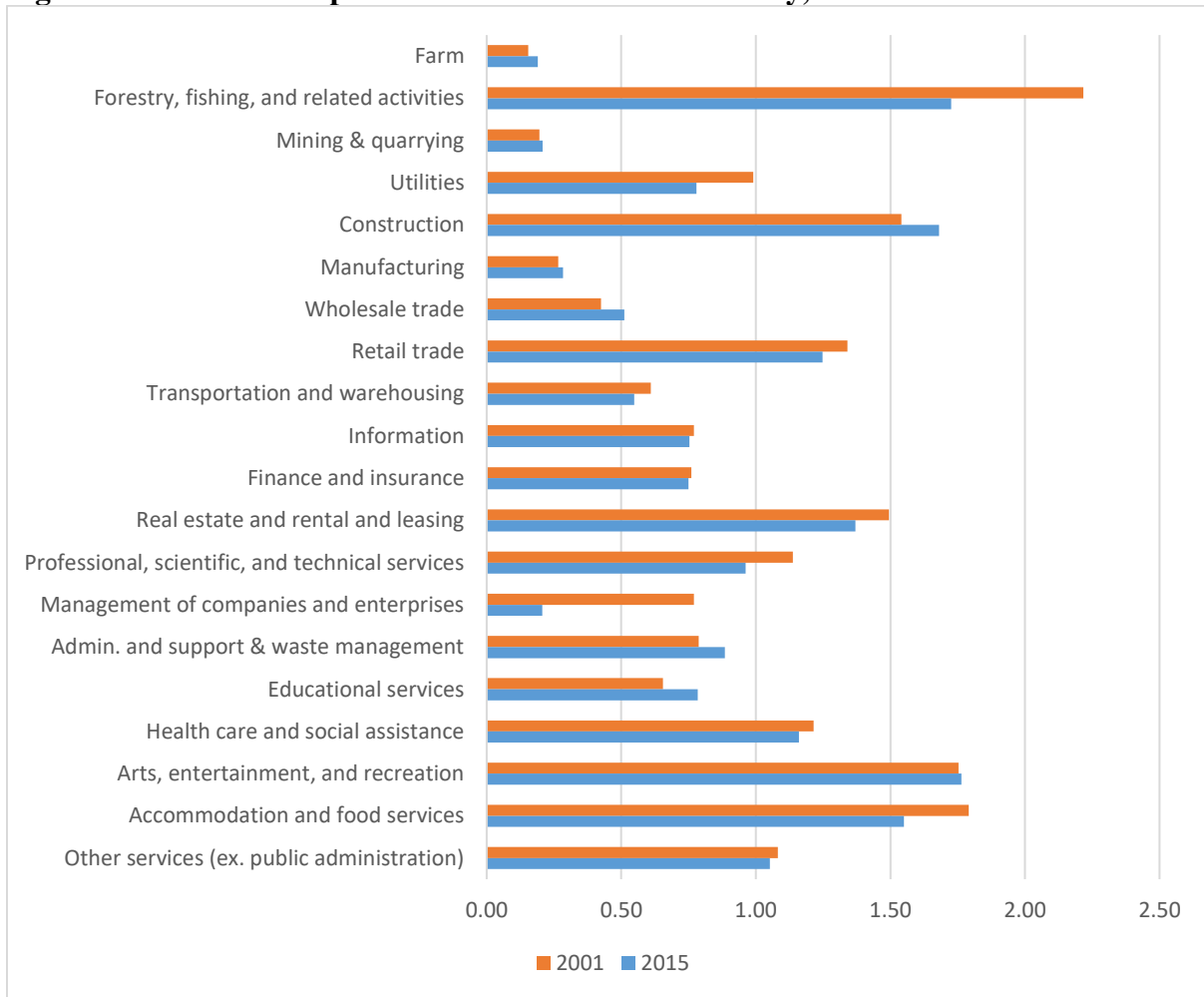


Employment Structure of Barnstable County:

In economic terms, the county’s employment base is defined as that employment among firms whose products or services are sold to markets outside of the region, thereby capturing new income for the area. Those customers may be in other parts of the state, in other states, or in foreign countries. Regional economic theory holds that selling to a non-local customer brings income into a county, and qualifies that firm as part of the local economic base. Businesses that sell to local customers, such as other businesses or households, are called non-basic businesses. Services provided to markets outside the region and services provided to visitors coming in from outside the region also qualify as basic industries in capturing streams of new revenue. Other sources of new money are construction activity, non-local government activity, and retirees.

Basic employment is that share of a regional industry’s employment that corresponds to the industry’s output sold outside the county. Estimates of basic employment among the county regional industries was based on an indirect measure of specialization called location quotient analysis. Location quotients are simply measures of economic specialization; here comparing the share of total employment in a particular industrial grouping in the county with the share it represents in the nation. The quotient for any industry or sector is determined by dividing its share of the county employment by its share of national employment. The idea behind this measure is that a region that is highly specialized in a given sector is exporting a portion of that good or service. In contrast, a less developed industry sector implies that the region is importing goods and services to meet local demand in that sector.

Figure 3.12 Economic Specialization of Barnstable County, 2001 and 2015



A location quotient is formally computed in the following manner:

$$LQ_i = \frac{E_{ic} / E_c}{E_{is} / E_s}$$

where:

LQ_i is the location quotient for sector i ;

E_{ic} / E_c is the percent of regional employment in sector i ; and

E_{is} / E_s is the percent of national employment in sector I .

Essentially, location quotients indicate an industry sector's self-sufficiency and export orientation. Three important location quotient values derive from this self-sufficiency and export orientation notion. A quotient of 1.0 means that the region has the same proportion of its employment in sector i as the nation. In other words, the region just meets local consumption requirements through local production of the specified good or service. If the location quotient is less than 1.0, the region is not producing enough to meet local needs, meaning that local residents and businesses need to import some goods or services to meet production or consumption requirements. This analysis can become a key indicator for an import substitution strategy for local economic developers. If the location quotient is greater than 1.0, the county has a larger proportion of its employment in sector i than does the nation. This excess proportion is assumed to be for export purposes.

The location quotient is often used as a proxy for the extent to which an area's production is being consumed locally or sold to non-local markets. Such an approach helps to identify a region's export sectors. Implicitly, this notion contends that a regional economy depends upon the vigor of its export industries. Other economic sectors in the region in turn support these export-oriented industries by providing needed supplies and services. As these export industries grow, then linked local sectors will in turn expand.

More recently, this technique has been utilized to help identify local industry clusters. Any exporting industry, identified through location quotient analysis, might be a strong candidate for further development and can serve as the core of an industry cluster for the region.

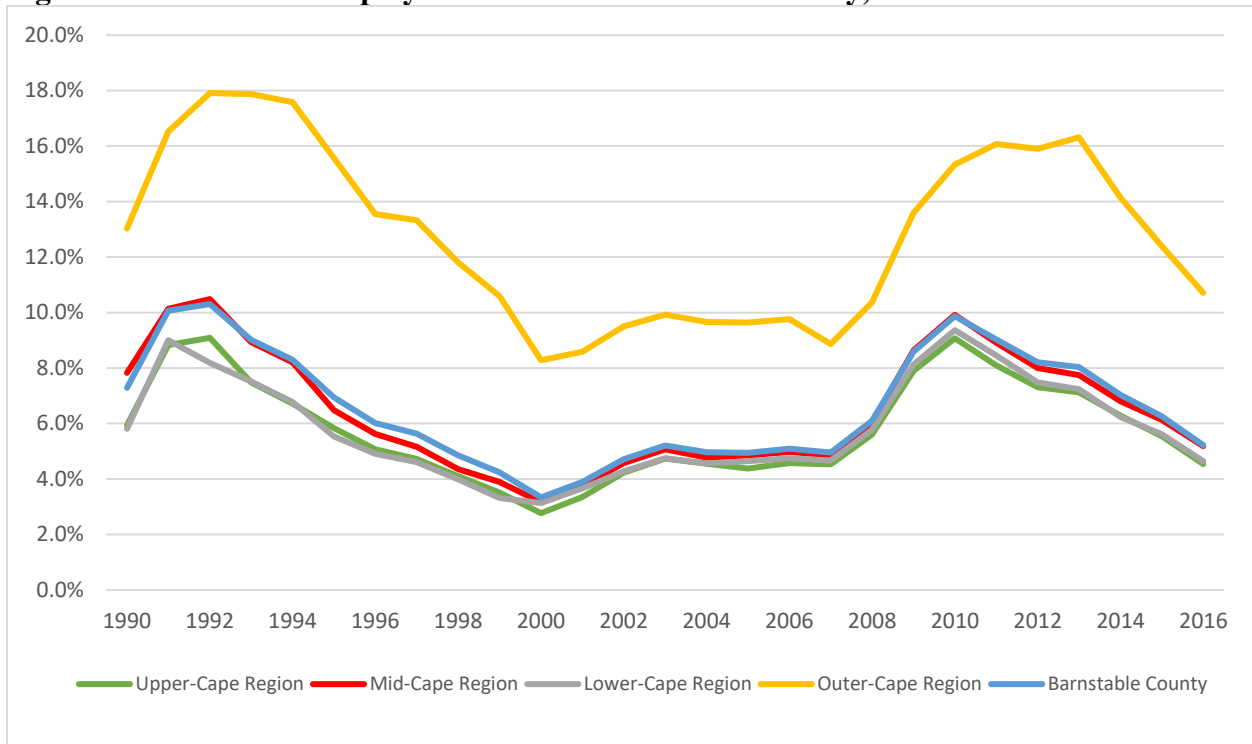
Two economic snapshots of Barnstable County are provided in 2001 and 2015. Regional industries of importance include tourism-related (retail trade; arts, entertainment, and recreation; accommodations & food services; real estate and renting and leasing); health and social assistance; construction; and forestry, fishing & related. Each of these industries have location quotients exceeding 1.2; underscoring economic specialization.

Unemployment:

Unemployment is a significant indicator of the vitality of a county's economy. As noted earlier, the labor force consists of two groups: those who are working; and those who are seeking work. Those who are not working but are actively looking for work constitute the unemployed.⁵

⁵ Discouraged workers, defined as those no longer active in looking for work, are not included in the official labor force numbers

Figure 3.13 Annual Unemployment Rate in Barnstable County, 1990-2016

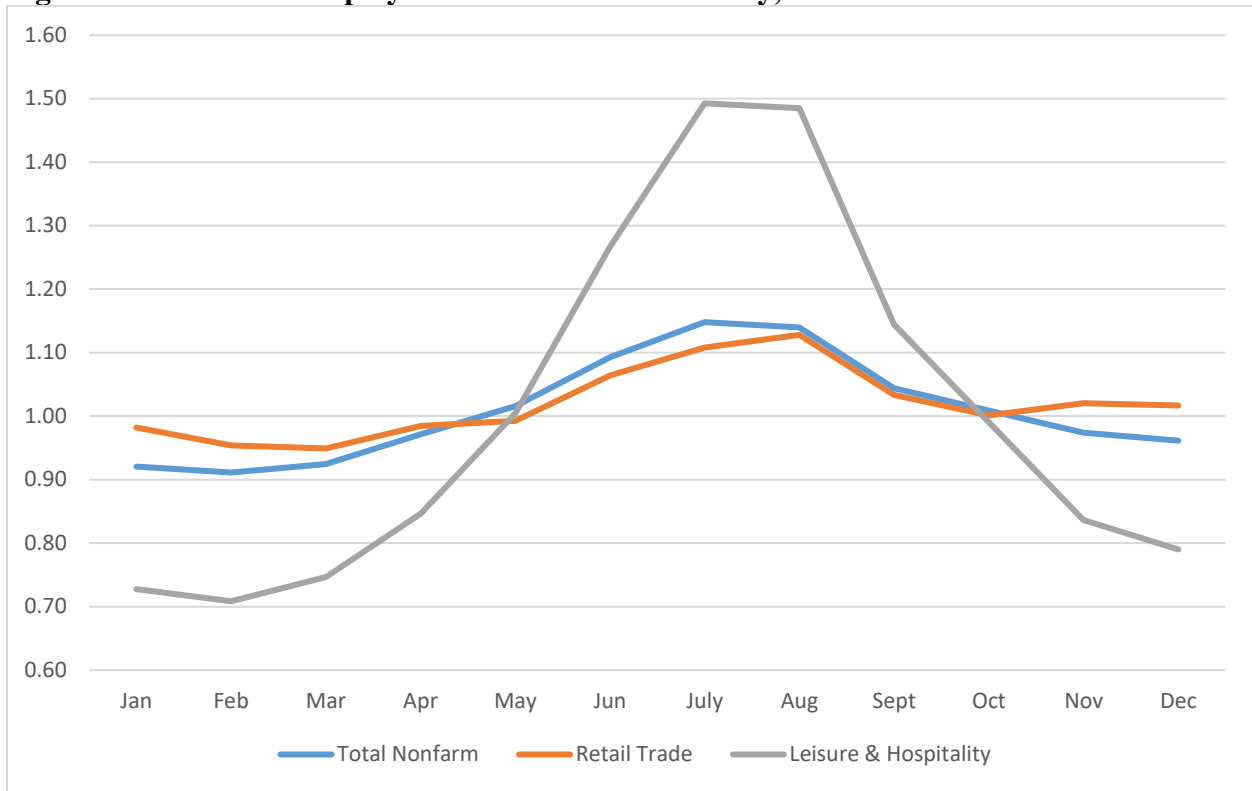


The unemployment rate in the county has been consistently higher—between 0.5 to 2.0 percentage points--than the statewide average over the last couple of decades. Only during the 2002-2004 calendar years was the region’s unemployment rate lower than the statewide average. Though the county has gradually recovered from the “Great Recession,” unemployment persists by 1.5 percentage points above the statewide average. Unemployment levels vary across the region with towns in the Outer Cape region having unemployment rates roughly double the county’s average.

Seasonal Employment:

As in population, seasonality of employment is significant within the county. Businesses, employers and local government entities hire additional workers during the summer season, typically beginning in May and ending in September. The seasonal surge in workers is most pronounced in trade and leisure and hospitality sectors, which are the leading tourism-related industries on the Cape.

Figure 3.14 Seasonal Employment in Barnstable County, 2016



Trends in Personal and Household Income in Barnstable County

Personal Income.

Employment measures only tell part of the economic story of a region. Personal income in the county, the most broad-based measure of general purchasing power available at the local level, amounted to nearly \$14.14 billion in 2016. When measured in current dollars, the county's total personal income increased more than seven-fold between 1980 and 2016. However, when measured in constant 2009 dollars to adjust for inflation, the entire increase over the 36-year period amounted to 239 percent.⁶

Personal income consists of three major components: net earnings for labor services, property incomes, and transfer payments. Net earnings (\$7.33 billion), which accounted for 51.8 percent of the county's total personal income in 2016, can be considered payment for current labor services. Net earnings include wage and salary disbursements, proprietors' income, and other labor income which are mostly employer contributions to private pension and welfare funds. The contributions

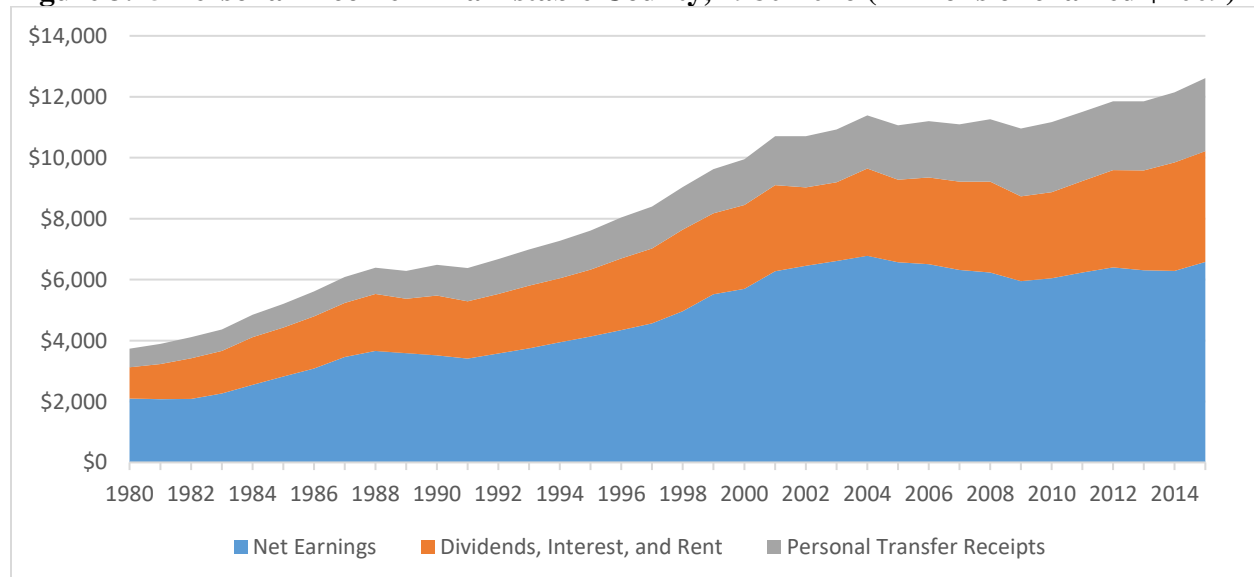
⁶ The U.S. Bureau of Economic Analysis reports personal income data in current dollars--the basis of the value or purchasing power of the dollar during the year in which the incomes are received. To remove the effects of inflation and allow for direct comparison of personal income in terms of an approximation of real purchasing power over time, constant dollar or real estimates of personal income are computed using the Implicit Price Deflator for personal consumption expenditures (2009 = 1.00).

that individuals make to social insurance programs (e.g., Social Security taxes) are excluded from net earnings.

The remaining non-labor portion (\$6.82 billion or 48.2 percent) of the county's personal income was split between dividends, interest, and rent (which is also called property income) and transfer receipts. While wages and proprietor income are the return to productive labor, dividends, interest and rent are the return to fixed assets like stocks, bonds, and rental property. Property incomes (\$4.07 billion) account for 29.8 percent of regional income; substantially above the Massachusetts average. Transfer receipts, the other portion of non-labor income, accounts for 19.4 percent of the county's personal income (\$2.74 billion); compared to the state's share of 15 percent. Transfer receipts are commonly referred to as "unearned income," receipts from the government to people (and non-profit institutions) for reasons other than labor services. Some people might think "welfare payments" when hearing transfer receipts. However, the below table shows that "welfare" only accounts for about 5 percent of transfer receipts in 2016, with unemployment insurance benefits adding another 2 percent. Transfers receipts include retirement benefits, medical benefits, veterans benefit payments, federal assistance for education and training programs for individuals, but also include government payments to nonprofit institutions as well as business payments to individuals.

Retirement benefits and medical payments amount to nearly three-quarters of all transfer payments for the County. Together with the about 30 percent of personal income coming from dividends, rent and interest, non-labor income comes to 43 percent of the regional economy; and this is mostly controlled by the region's senior citizens. Put another way, if one focused only on jobs and the money they bring in, over two-fifths of the economy would be ignored.

Figure 3.15 Personal Income in Barnstable County, 1980-2016 (Millions of chained \$2009)



Median Household Income.

Ranging from nearly \$37,000 in Provincetown to over \$83,000 in Sandwich, median household income for 2015 represents a study of contrasts in the county. These contrasts include a relatively wide range of median household income levels across the fifteen towns in the county. In general, median household incomes in Upper Cape and Lower Cape towns are well above the county median level; whereas Mid-Cape and Outer Cape towns are below the county median. Growth in median household incomes since 2000 for these towns have also mirrored this distinction.

Table 3.5 Median Household Income of Barnstable County Municipalities, 2000, 2010 and 2015

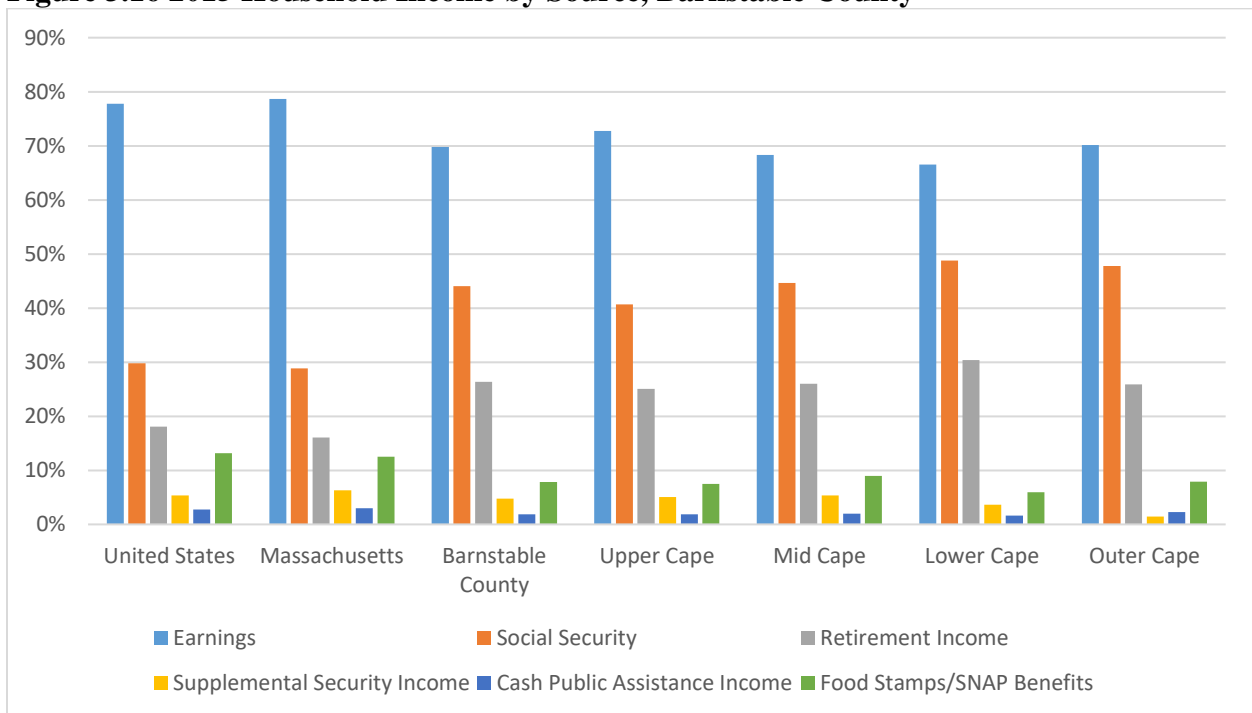
	2000	2010	2015
Upper Cape			
Town of Bourne	\$45,063	\$61,418	\$69,157
Town of Falmouth	\$48,376	\$62,392	\$66,670
Town of Mashpee	\$51,019	\$62,645	\$70,313
Town of Sandwich	\$61,752	\$83,325	\$83,305
Mid Cape			
Town of Barnstable	\$46,781	\$62,264	\$59,711
Town of Dennis	\$41,571	\$50,642	\$53,381
Town of Yarmouth	\$39,677	\$48,653	\$57,569
Lower Cape			
Town of Brewster	\$50,110	\$58,374	\$66,220
Town of Chatham	\$45,435	\$65,990	\$67,587
Town of Harwich	\$41,717	\$54,958	\$68,267
Town of Orleans	\$42,393	\$56,313	\$64,861
Outer Cape			
Town of Eastham	\$42,063	\$58,750	\$60,760
Town of Provincetown	\$32,843	\$44,646	\$36,958
Town of Truro	\$42,200	\$80,425	\$60,432
Town of Wellfleet	\$44,375	\$66,109	\$45,735
Barnstable County	\$45,977	\$60,317	\$63,251
Massachusetts	\$50,284	\$64,509	\$68,563
United States	\$41,851	\$51,914	\$53,889
<i>Source: US Census</i>			

About 70 percent of all households in the county have labor earnings; much lower than the state and national average.

There is a symmetry in the sources of income for households in the county. Compared with the state and the nation, two particular sources of income are conspicuous, namely Social Security and Retirement Income. Over two-fifths of all households in the county rely on Social Security and over a quarter of households are on retirement pensions as sources of income. Nearly half of all households in the Lower Cape towns of Brewster, Chatham, Harwich and Orleans are on Social Security; and three out of every ten households are on retirement income. About 70 percent of all households in the county have labor earnings; much lower than the

state and national average.

Figure 3.16 2015 Household Income by Source, Barnstable County



Poverty in Barnstable County.

A similar picture of poverty levels—for families and individuals--can be seen in the county. As in medium household income, poverty levels for families range from a low of 1.5 percent in Eastham to a high of 10.6 percent in the neighboring town of Truro; well above the county average of 5.2 percent. For individuals, Mid Cape and Outer Cape towns have a higher portion of individuals living below the poverty level than the county average.

Table 3.6 Percentage of Families and People Below Poverty Level

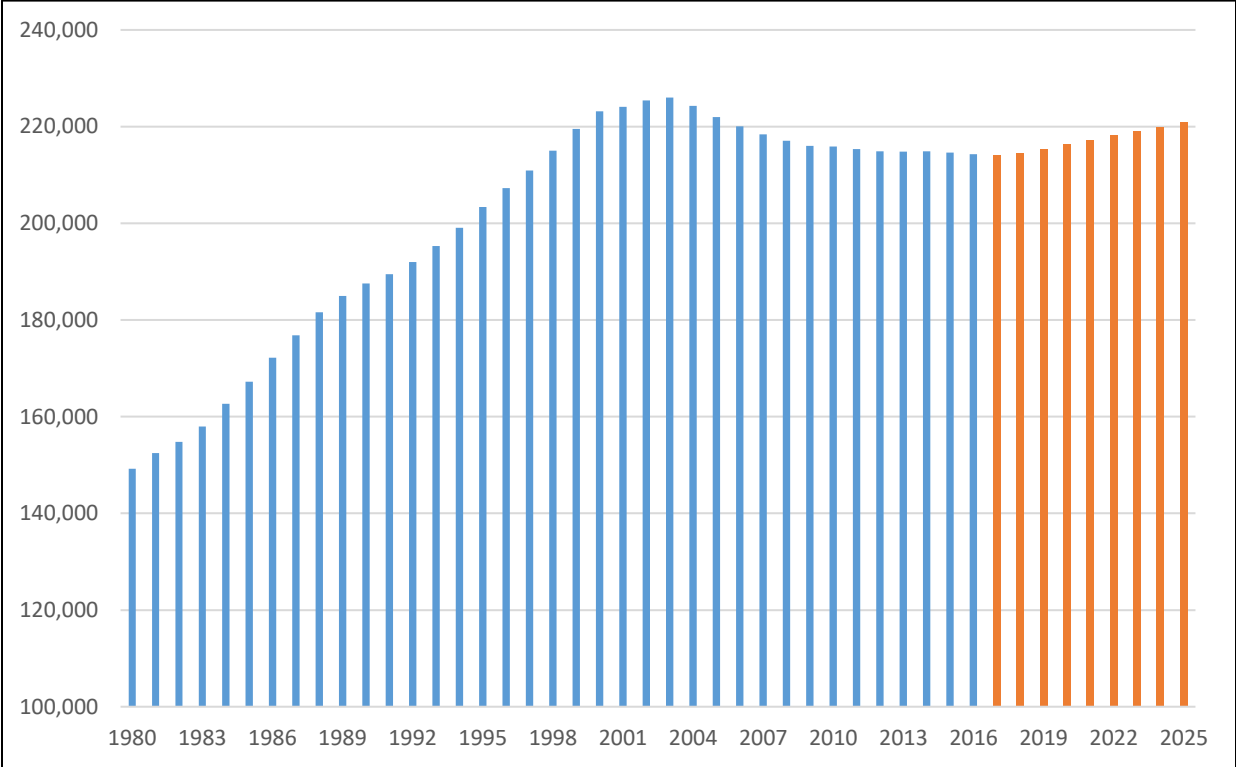
	Families Below Poverty (%)	Individuals Below Poverty (%)
Upper Cape		
Town of Bourne	7.2%	9.1%
Town of Falmouth	5.7%	7.9%
Town of Mashpee	5.3%	7.0%
Town of Sandwich	4.7%	6.5%
Mid Cape		
Town of Barnstable	5.9%	11.7%
Town of Dennis	6.8%	11.2%
Town of Yarmouth	3.3%	7.5%
Lower Cape		
Town of Brewster	2.8%	5.4%
Town of Chatham	5.7%	9.1%
Town of Harwich	3.0%	7.0%
Town of Orleans	2.9%	5.5%
Outer Cape		
Town of Eastham	1.5%	5.6%
Town of Provincetown	8.1%	14.2%
Town of Truro	10.6%	10.7%
Town of Wellfleet	7.7%	11.7%
Barnstable County	5.2%	8.7%
Massachusetts	8.2%	11.6%
United States	11.3%	15.5%
<i>Source: US Census</i>		

Regional Economic-Demographic Forecast

Population Forecast in Barnstable County – 2017-2025

The county was forecasted to experience a similar trend in population decline in 2017 that the county has seen since 2003. From 2016 to 2017, the population is forecasted to decline by 168 residents. The turning point is forecasted to occur in 2018 – the Crane Associates Team forecasted that the population will increase by 343 people from calendar year 2017 to 2018 and then continue to grow by an additional 859 people from calendar year 2018 to 2019. This level of population increase was anticipated to be sustained through to 2025, with an annual average increase of 910 residents from calendar years 2019 to 2025. In 2025, the county was forecasted to have approximately 6,199 more residents than were recorded in 2015.

Figure 3.17 Population in Barnstable County 1980-2016 and Forecasted Population 2017-2025



The following table shows how the forecasted population from 2017 through 2025 was distributed across the towns and regions in the county. In 2017, the loss in population was forecasted to occur mostly in the Upper-Cape (minus 154 people) and Lower-Cape (minus 69 people), with the Mid-Cape actually increasing its population by 54 people and the Outer-Cape essentially experiencing zero change. Entering into the period of forecasted population growth from 2018 through 2025, the Mid-Cape is forecasted to experience the most growth in population, with an average increase of 421 people per year (annual average growth of 0.53%). That growth is mostly driven by the forecasted growth in Barnstable town, which was predicted to increase its population by an average of 215 residents per year (0.51%) during the same period. Dennis town (0.76% annual average growth from 2018 to 2025) and Yarmouth town (0.45% annual average growth from 2018 to 2025) were also forecasted to increase their populations by an average of approximately 100 residents per year from 2018 to 2025.

Table 3.7 Forecasted Population in Barnstable County, 2016-2025

Region/Town	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Upper-Cape	85,703	85,549	85,601	85,861	86,176	86,475	86,743	87,002	87,260	87,517
Bourne	19,647	19,599	19,598	19,645	19,705	19,760	19,806	19,849	19,891	19,932
Falmouth	31,479	31,419	31,439	31,536	31,655	31,771	31,880	31,989	32,099	32,210
Mashpee	14,164	14,162	14,193	14,255	14,326	14,392	14,451	14,507	14,561	14,614
Sandwich	20,414	20,368	20,372	20,424	20,490	20,552	20,606	20,657	20,709	20,761
Mid-Cape	81,904	81,957	82,197	82,626	83,094	83,548	83,996	84,441	84,883	85,325
Barnstable	44,369	44,381	44,496	44,715	44,955	45,188	45,418	45,646	45,872	46,099
Dennis	14,064	14,114	14,193	14,302	14,415	14,525	14,636	14,747	14,857	14,967
Yarmouth	23,471	23,462	23,508	23,610	23,724	23,835	23,942	24,048	24,153	24,259
Lower-Cape	34,023	33,954	33,976	34,084	34,217	34,347	34,471	34,593	34,717	34,841
Brewster	9,861	9,812	9,795	9,809	9,833	9,857	9,880	9,902	9,926	9,950
Chatham	6,152	6,157	6,176	6,209	6,245	6,279	6,314	6,348	6,381	6,415
Harwich	12,156	12,125	12,125	12,155	12,193	12,230	12,264	12,297	12,330	12,363
Orleans	5,855	5,861	5,879	5,912	5,947	5,980	6,014	6,047	6,080	6,113
Outer-Cape	12,646	12,647	12,678	12,739	12,807	12,874	12,939	13,005	13,071	13,137
Eastham	4,929	4,940	4,962	4,995	5,029	5,063	5,096	5,130	5,163	5,196
Provincetown	2,970	2,972	2,981	2,998	3,016	3,034	3,052	3,071	3,090	3,109
Truro	2,004	2,000	2,001	2,007	2,015	2,022	2,029	2,036	2,042	2,049
Wellfleet	2,743	2,735	2,734	2,740	2,748	2,755	2,762	2,769	2,776	2,782
Barnstable County	214,276	214,108	214,451	215,310	216,295	217,244	218,148	219,041	219,930	220,820

Source: U.S. Census Bureau; Moody's Analytics; EPR

The following table shows how the population forecast was distributed across the selected age cohorts. Quite clearly, the population increase is expected to be driven by the Age 65 and older cohort.

Quite clearly, the population increase is expected to be driven by the Age 65 and older cohort. From 2017 to 2025, the Age 65+ cohort is forecasted to increase by an average of approximately 1,667 residents per year (2.57%)

From 2017 to 2025, the Age 65+ cohort is forecasted to increase by an average of approximately 1,667 residents per year (2.57%). The only other age cohort that experiences an increase in population during the forecasted period is the Ages 20-44 cohort, which experiences a positive turning point in 2019 after having forecasted a loss in population in 2017

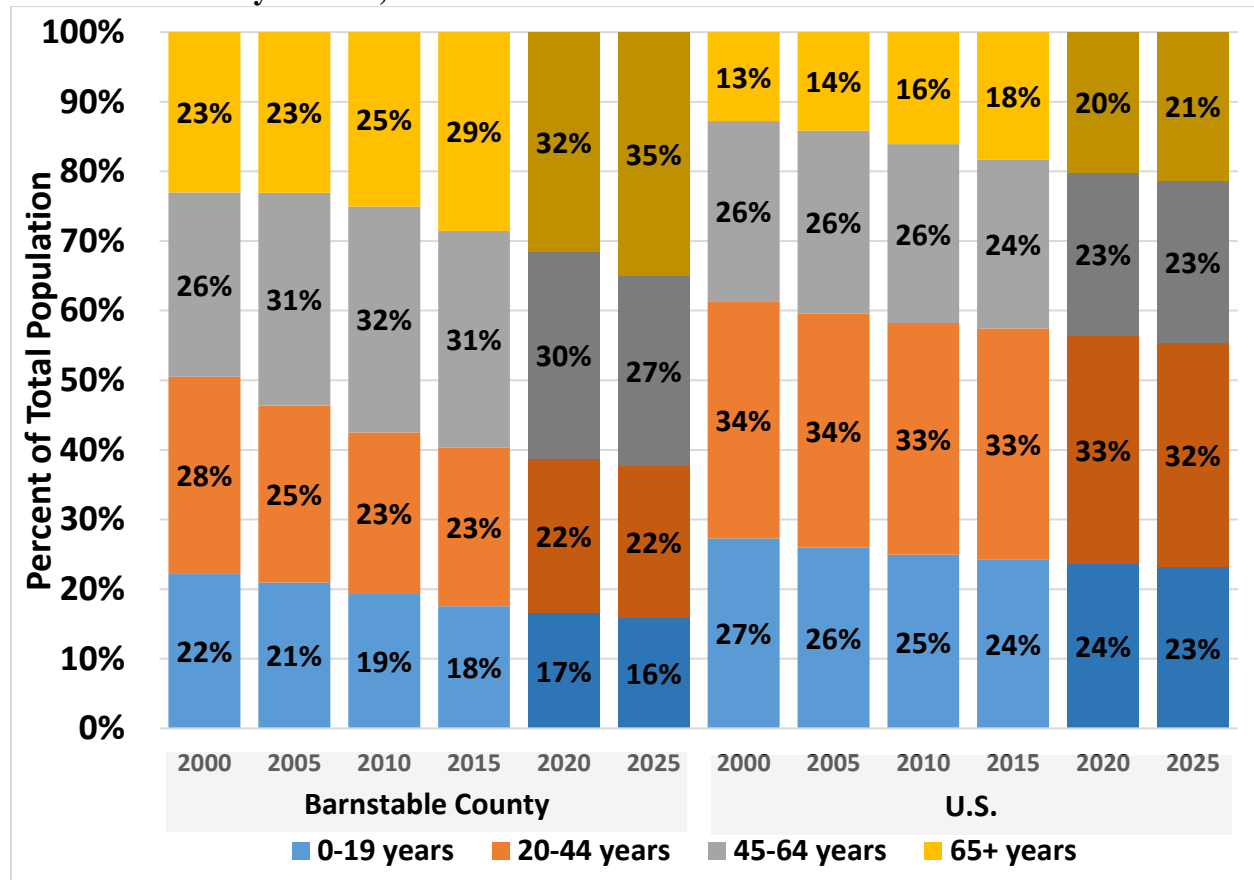
and 2018. The 45-64 age cohort was the selected cohort which was expected to experience the greatest loss during this period, at an average annual decline of approximately 698 residents from 2017 to 2025 (-1.14%).

Table 3.8 Forecasted Population in Barnstable County by Age Cohort, 2016-2025

Age Cohort	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Ages 0-19	37,104	36,603	36,219	35,957	35,709	35,513	35,374	35,249	35,137	35,044
Ages 20-44	48,385	48,068	47,982	48,062	48,138	48,283	48,363	48,418	48,425	48,273
Ages 45-64	66,489	65,984	65,405	64,835	64,239	63,504	62,640	61,767	60,944	60,207
Ages 65+	62,298	63,453	64,845	66,457	68,209	69,944	71,772	73,608	75,424	77,296
Total	214,276	214,108	214,451	215,310	216,295	217,244	218,148	219,041	219,930	220,820

Source: U.S. Census Bureau; Moody's Analytics; EPR

Figure 3.18 Historical and Forecasted Share of Total Population by Age Cohort for Barnstable County vs. U.S., 2000-2025



Compared to the United States as a whole, the county had a significantly higher proportion of people 65 years and older in 2015. This difference is only expected to widen with the county having about 35% of their total population in this age cohort by 2025 compared to 21% for the U.S., a 14 percentage point difference. By 2015, the 45-64 years cohort in the Cape is forecasted to have a 4 percentage point greater share of population relative to the U.S.. For the 20-44 years cohort, the Cape is forecasted to have a share that is 10 percentage points less than the U.S. as a whole, while for those 0-19 years cohort the Cape will have 7 percentage points less of a share

than the U.S. as a whole. By 2015, three of every five people on the Cape will be over the age of 45 years; compared to two out of every five people in the U.S. The aging population on Cape Cod has enormous socio-economic implications for the region; and going forward, presents unique challenges in the housing market.

Household Forecast in Barnstable County, 2016-2025

The total households in the county are forecasted to decrease in 2016 from 2015 by approximately 25 households although were estimated to begin growing again ramping up in 2017 and 2018 until eventually evening out at an approximate average increase of 383 households per year from 2019 to 2025. The forecasted absolute increase was attributed mostly to the Upper-Cape and Mid-Cape, which accounted for approximately 77% of total households in the county in 2016. From 2016 to 2025, the average annual increase in households in the county is forecasted to be approximately 0.34%. By the end of 2025 it was forecasted that the county would have approximately 2,867 more households than it had in 2015.

Figure 3.19 Households in Barnstable County, 1990-2015 and Forecasted Households 2016-2025

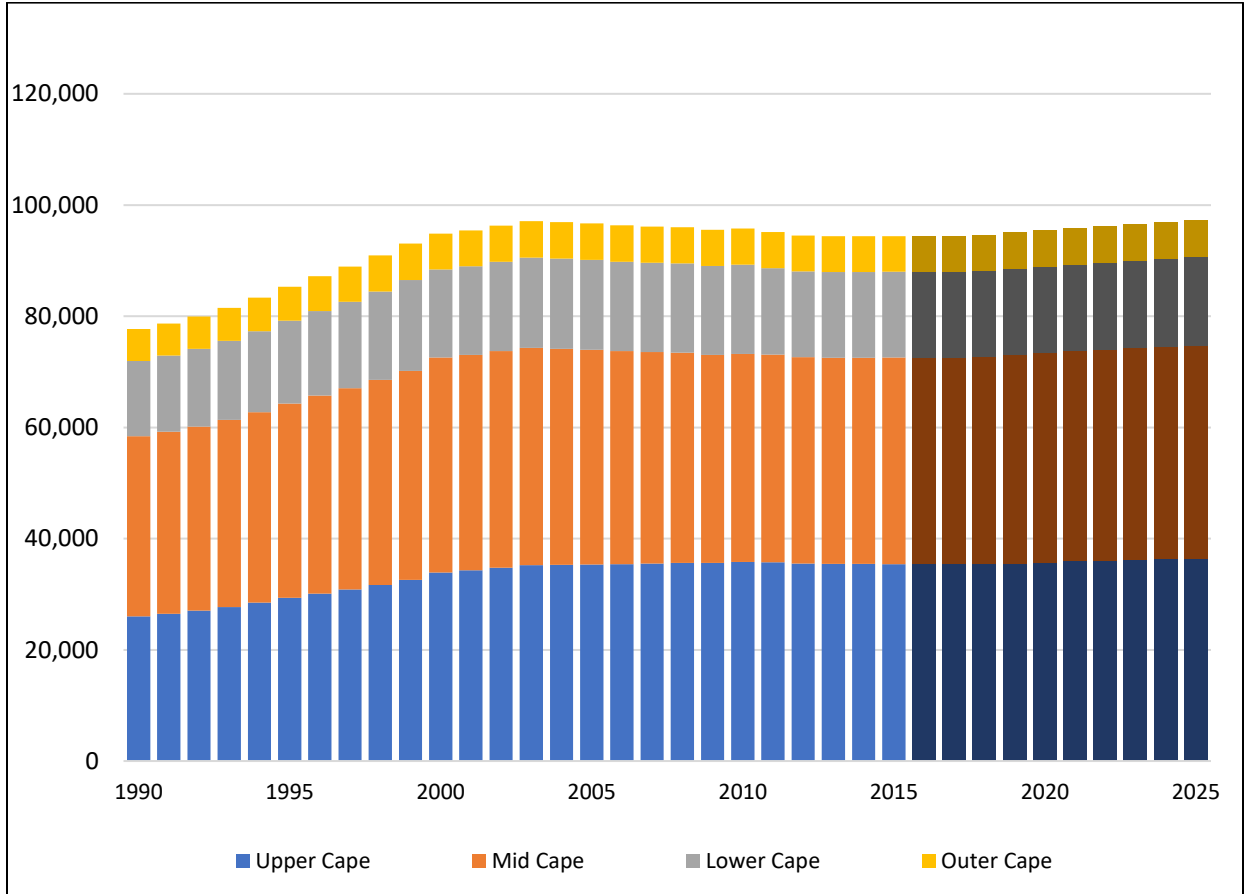


Table 3.9 Households by Town in Barnstable County, 1990-2015 Forecasted Households 2016-2025

Region/Town	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Upper-Cape	35,381	35,388	35,459	35,608	35,778	35,924	36,067	36,207	36,343	36,465
Bourne	8,290	8,292	8,308	8,343	8,383	8,417	8,451	8,483	8,515	8,544
Falmouth	13,634	13,637	13,665	13,722	13,788	13,844	13,899	13,953	14,005	14,052
Mashpee	5,905	5,907	5,919	5,943	5,972	5,996	6,020	6,043	6,066	6,086
Sandwich	7,551	7,553	7,568	7,600	7,636	7,667	7,697	7,727	7,756	7,782
Mid-Cape	37,177	37,185	37,260	37,416	37,595	37,749	37,898	38,045	38,189	38,316
Barnstable	19,498	19,502	19,541	19,623	19,717	19,798	19,876	19,953	20,028	20,095
Dennis	6,807	6,809	6,822	6,851	6,884	6,912	6,939	6,966	6,992	7,016
Yarmouth	10,872	10,874	10,896	10,942	10,994	11,039	11,083	11,126	11,168	11,205
Lower-Cape	15,395	15,398	15,429	15,494	15,568	15,632	15,693	15,754	15,814	15,867
Brewster	4,271	4,272	4,280	4,298	4,319	4,337	4,354	4,371	4,387	4,402
Chatham	2,815	2,816	2,821	2,833	2,847	2,859	2,870	2,881	2,892	2,902
Harwich	5,429	5,430	5,441	5,463	5,490	5,512	5,534	5,555	5,576	5,595
Orleans	2,880	2,881	2,887	2,899	2,913	2,925	2,936	2,947	2,959	2,968
Outer-Cape	6,439	6,441	6,454	6,481	6,512	6,538	6,564	6,590	6,614	6,637
Eastham	2,290	2,291	2,295	2,305	2,316	2,326	2,335	2,344	2,353	2,361
Provincetown	1,782	1,782	1,785	1,793	1,802	1,809	1,816	1,823	1,830	1,836
Truro	820	820	822	825	829	832	836	839	842	845
Wellfleet	1,548	1,548	1,551	1,558	1,565	1,571	1,578	1,584	1,590	1,595
Barnstable County	94,392	94,412	94,601	94,999	95,453	95,843	96,223	96,596	96,960	97,284

Source: U.S. Census Bureau; Moody's Analytics; EPR

Employment (Jobs) Forecast in Barnstable County, 2016-2025

The county was forecasted to continue its steady increase in jobs from 2011 through 2015 into the future period. From 2016 to 2021 employment was forecasted to grow at an annual average rate of approximately 1,096 jobs. In 2022 there is forecasted to be an economic slowdown in employment, with job growth estimated to remain flat with only 20 total jobs forecasted to be added in 2022 from 2021. In 2023, the job growth was forecasted to pick up again with 256 jobs estimated to be added in that year, followed by an additional 571 jobs in 2024 and 619 jobs in 2025. At the end of 2025 it was estimated that there will be approximately 8,043 more jobs in the county than there were recorded in 2015 (annual average growth rate of 0.55%).

In 2016, it was forecasted that in the Lower-Cape and Outer-Cape there would be a decline of approximately 395 jobs. This was offset at the county level by the strong predicted growth of jobs in the Mid-Cape (plus 753 jobs) and the Upper-Cape (plus 207 jobs). The Upper-Cape and Mid-Cape regions were expected to continue to be the relatively stronger areas for job increases throughout the period. From 2015 through 2025, the Upper-Cape was forecasted to add approximately 2,900 jobs (annual average growth rate of 0.53%), the Mid-Cape was estimated to add approximately 3,790 jobs (annual average growth rate of 0.59%), the Lower-Cape was forecasted to add approximately 1,015 jobs (annual average growth rate of 0.45%), and the Outer-Cape was estimated to add approximately 338 jobs (annual average growth rate of 0.37%).

Figure 3.20 Employment (Jobs) in Barnstable County, 1980-2015 and Forecasted Employment 2016-2025

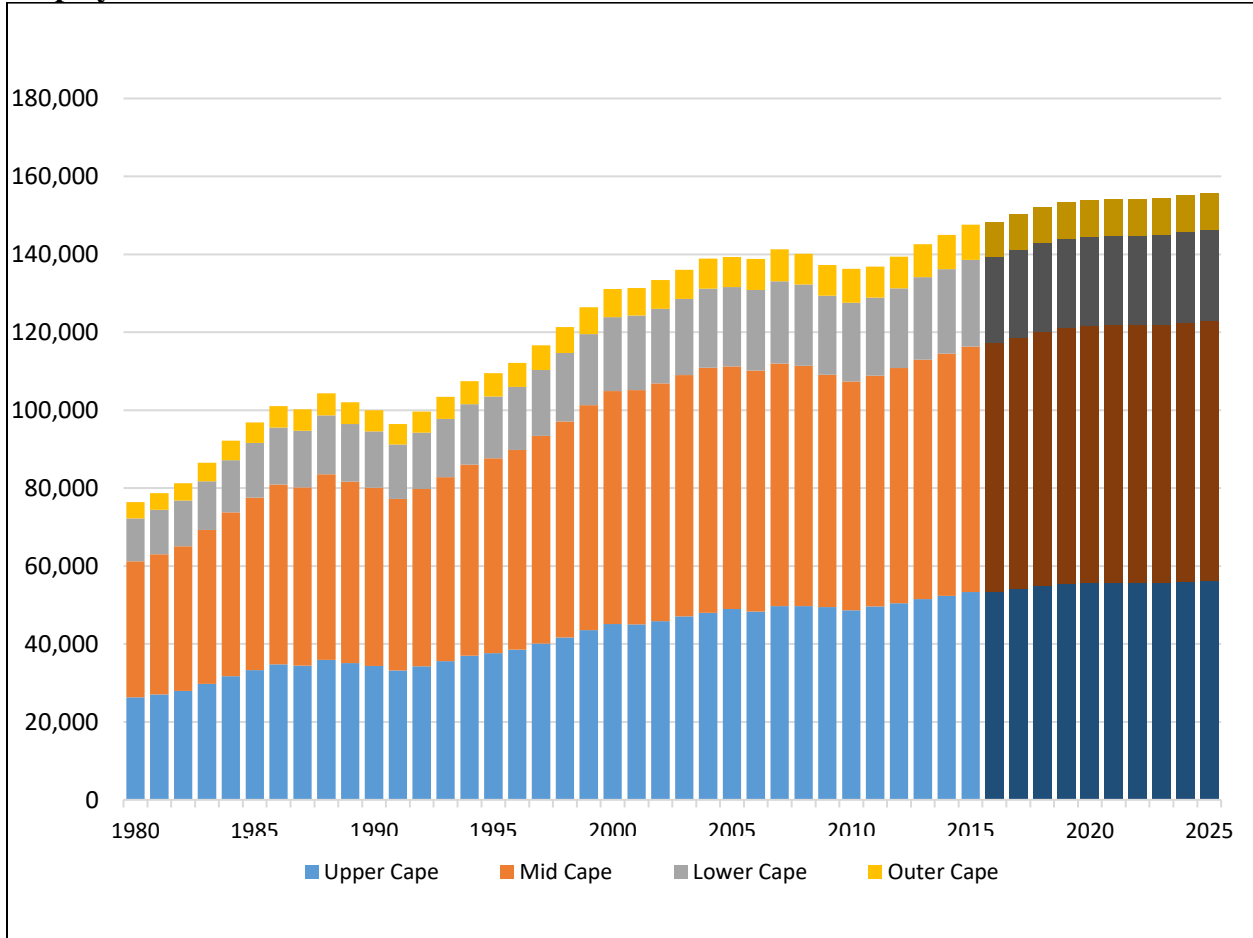


Table 3.10 Employment (Jobs) in Barnstable County, 1990-2015 and Forecasted Employment 2016-2025

Region/Town	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Upper-Cape	53,561	54,241	54,946	55,379	55,631	55,724	55,732	55,825	56,031	56,255
Bourne	13,685	13,875	14,065	14,185	14,234	14,262	14,266	14,290	14,341	14,399
Falmouth	22,761	22,965	23,215	23,367	23,543	23,558	23,553	23,593	23,690	23,779
Mashpee	7,679	7,831	7,964	8,032	8,035	8,063	8,069	8,080	8,105	8,141
Sandwich	9,436	9,570	9,702	9,795	9,820	9,841	9,845	9,862	9,895	9,936
Mid-Cape	63,717	64,412	65,172	65,671	66,049	66,127	66,125	66,240	66,495	66,753
Barnstable	42,928	43,377	43,859	44,195	44,469	44,514	44,508	44,588	44,762	44,934
Dennis	7,566	7,665	7,760	7,812	7,856	7,868	7,868	7,881	7,911	7,942
Yarmouth	13,223	13,370	13,553	13,664	13,724	13,744	13,748	13,772	13,822	13,877
Lower-Cape	22,062	22,434	22,766	22,945	23,006	23,067	23,075	23,109	23,190	23,287
Brewster	4,197	4,236	4,285	4,312	4,344	4,347	4,346	4,354	4,371	4,388
Chatham	5,142	5,309	5,488	5,492	5,465	5,505	5,518	5,516	5,531	5,560
Harwich	6,102	6,146	6,154	6,251	6,288	6,286	6,280	6,300	6,323	6,345
Orleans	6,620	6,743	6,839	6,889	6,909	6,929	6,930	6,940	6,965	6,994
Outer-Cape	8,867	9,036	9,181	9,260	9,269	9,299	9,304	9,318	9,348	9,388
Eastham	1,947	1,991	2,022	2,037	2,039	2,047	2,048	2,050	2,057	2,066
Provincetown	4,200	4,269	4,344	4,386	4,386	4,399	4,403	4,410	4,424	4,443
Truro	879	895	908	916	918	920	921	922	925	929
Wellfleet	1,840	1,881	1,908	1,922	1,926	1,932	1,933	1,935	1,942	1,950
Barnstable County	148,205	150,122	152,065	153,254	153,955	154,216	154,236	154,492	155,063	155,682

Source: U.S. Census Bureau and Bureau of Economic Analysis; Moody's Analytics; EPR

CHAPTER 4: HOUSING UNIT SUPPLY AND DEMAND

Introduction

A housing market is typically sub-divided into rental-occupied and owner-occupied housing markets. The key demographic utilized in assessing trends within these housing markets is households, specifically year-round resident households. A household represents the basic demographic unit and is defined (according to US Census) as including all the people who occupy a housing unit (such as a house or apartment) as their usual place of residence. A household includes related family members and all unrelated people, if any (such as lodgers, foster children) who share the housing unit. A person living alone in a housing unit, or a group of unrelated persons sharing a housing unit such as partners or roomers, also qualifies as a household. Households are subdivided into two categories: family and non-family. Household counts exclude group quarters.

Housing Unit Supply and Demand Methodology

According to the U.S. Census Bureau, a housing unit is a house, an apartment, a mobile home or trailer, a group of rooms, or a single room occupied as separate living quarters; or if vacant, intended for occupancy as separate living quarters. Separate living quarters are those in which occupants live separately from any other individuals in the building and which have direct access from outside the building or through a common hall. For vacant units, the criteria of separateness and direct access are applied to the intended occupants whenever possible. A housing unit is owner-occupied if the owner or co-owner lives in the unit even if it is mortgaged and not fully paid for. A renter-occupied housing unit is one that is rented for cash rent or occupied without payment of cash rent; such as a unit that is not owner-occupied.

A housing unit is considered vacant if no one is living in it at the time of enumeration, unless its occupants are temporarily absent. Units temporarily occupied at the time of enumeration by people who have a usual residence elsewhere are also classified as vacant. Unoccupied housing units are considered vacant; and vacancy status is determined by the terms which the unit may be occupied; whether for rent, or for sale, or for seasonal use only. A vacancy rate is that portion of the inventory (either rental or owner) which is vacant for rent or for sale.

Housing Unit Baseline Supply:

The housing unit supply forecast methodology followed the theory that the number of future housing units in the county would be correlated and predicted by the number of forecasted housing completions in the county as set forth in the long-term December 2016 Moody's Forecast for the county as adjusted by study team—within the context of the broader Long-term economic forecast for the U.S. economy as a whole. For each category of housing unit (total, single-family, and multi-family), the calendar year 1980 through calendar year 2015 number of housing units in the county was regressed against the calendar year 1980 through calendar year 2025 number of completions for each respective category. The results of these regressions were then used to forecast the calendar year 2016 through calendar year 2025 housing units in the county. The forecast was revised and put through a series of reconciliations in order to address housing start and housing permit data forecasted by the Moody's December 2016 Macro Forecast for the county (as adjusted), and then was used as a baseline to regress against and to forecast the municipal

housing data to develop forecast for each individual municipality—consistent with the bottom-up methodology generally employed in this study.

Forecasting seasonal housing units was a particular challenge for the county since the primary drivers for seasonal or second home unit demand appear to be driven by economic performance and wealth generation factors that were and are transpiring outside of the county geography (e.g. seasonal or second home unit demand within the county appears dependent on income and wealth creation for demanding householders residing in the greater Boston metro area). For this study, the calendar year 1980 through calendar year 2015 second home units at the county level (total, single-family, and multi-family) were also regressed and forecasted against the forecasted county housing totals as adjusted in the Moody’s Long-Term Forecast for the county. This followed the theory that second homes were likely captured in the total housing units and any trend that is forecasted in the total housing unit supply would also likely capture the change in the supply of second or seasonal housing units into the future. After completing a county seasonal or second housing unit forecast for calendar year 2016 through calendar year 2025, the individual municipalities were then regressed and forecasted as well using the county-level seasonal or second housing unit forecast. The same process that was used for the seasonal or second housing unit was also used to develop a county-wide and individual municipal forecast of “other” housing units (including but not limited to mobile homes).

To further distill the data into the appropriate housing unit supply delineations, the year-round housing units (including single-family housing units and multi-family housing units) were factored by taking the difference between the total number of housing units in a particular geographic area (county-wide, for one of the four Cape regions, and/or for an individual municipality) and the seasonal second housing unit for that identified geographic area.

Summary of Additional Unit Adjustments:

In addition to the above, three significant adjustments were also made to the data-driven baseline housing unit supply numbers in the study. First, a top-level adjustment was made to the aggregate unit supply forecast to “un-constrain” estimated future housing unit supply so that it was equaled to estimated unit demand going forward from calendar year 2015. The theory behind that adjustment was that housing unit demand should also equal housing unit supply in aggregate over the long-term assuming housing unit supply was and is not otherwise constrained by economic performance or policy, financing, and/or by either infrastructure constraints or natural resource constraints. That assumption was reasonable, given the results of the Cape Cod Commission’s long-term build-out analysis which indicated that the county has the “land capacity” to provide for the addition of roughly six times the indicated un-constrained baseline housing unit increases called for by this study through calendar year 2025.

The second adjustment was made to ensure that the forecasted regional distribution of the housing supply accurately reflected what has been occurring in the most recent time period prior to the forward-looking calendar year 2016 through calendar year 2025 forecast time frame. While there certainly was several “statistically-based” advantages to using a series of forecasting models that covered a longer time series going back to the early 1980s, the initial results of those longer term forecasting models did not produce a supply forecast that appeared to accurately reflect what had recently been occurring in the county and among the 15 municipalities over the most recent five

year to ten year time period—particularly for seasonal or second home unit additions. As a result, and after multiple attempts to identify an historical time frame that appeared to most reflect many of the recent changes-developments in and among the several micro-housing markets within the county, the second adjustment settled upon a heavy weighting in the regression analyses for the most recent five year period covering calendar years 2011 through 2015 (thereby emphasizing housing unit developments over the most five year period for this study). This approach was used to complete a series of redistributive statistical techniques that resulted in what was thought to be a more properly allocated housing unit distribution of future unit additions originally projected for the Lower or Outer Cape into the Upper Cape region.

A third adjustment was also made with the intent of more accurately aligning the forecasted future housing unit change numbers among the county’s municipalities. This involved ensuring that no individual municipality over the forecasted time horizon from calendar year 2016 through calendar year 2025 had an absolute housing unit decline in any given forecasted year—or, in other words, had any single year going forward where total housing unit destruction exceeded the addition of new units. While the historical data for some municipalities indicated that a small decline in a municipality’s housing unit inventory was plausible from time to time, such a scenario was unlikely unless accompanied by an atypical or unusual event. As such, since the baseline, unconstrained forecast included in this study was not likely to include an atypical or unusual event, the housing unit supply forecast for this study essentially forced all future housing supply additions for all municipalities to include “net positive” unit addition for all years over the calendar year 2016 through calendar year 2025 time period. Adjustments to impacted municipalities included housing unit additions in the “other” category being reallocated to either year round or seasonal or second housing unit additions. That adjustment approach made intuitive sense from the standpoint that an assumption of positive growth in permanent housing units in a particular municipality would likely be accompanied by a reduction in more temporary (e.g. mobile housing unit) housing. These adjustments together produced the final housing unit supply forecast that was then utilized in the study’s various gap analyses.

Housing Unit Demand:

Housing unit demand is closely associated with the number of households headed by a year-round resident residing in a particular locale (In this case, a year-round resident of one of the fifteen municipalities that make up the county). These households reside in housing units that are either owner-occupied or rental-occupied. Historical housing unit demand—households and owner-occupied/rental-occupied/vacant units are reported by town in decennial years by the U.S. Census Bureau and in-between the decennial census years by the American Community Survey (or “ACS”). As stated in the definitions described above, housing unit demand is generally synonymous with the number of households. Housing unit demand using variables such as households, owner-occupied units, rental-occupied units—for each municipality were forecasted from calendar year 2015 through calendar year 2025 for this study using an econometric statistical technique known as the “Ordinary Least Squares” (or “OLS”)—based on historical population-demographic data obtained through the December 2016 forecast from Moody’s Analytics.

Estimates of housing unit demand were forecasted by using historical trends by age group as set forth in the long-term population and demographic forecast since research is well established that

households headed by residents of certain ages have housing preferences (e.g. owner or renter) and household formation rates that can be quantitatively estimated going forward based on the historical relationships of a locale’s resident population and its age and household characteristics (such as the income level and number of dependents in their household unit). Long-term historical relationships between the past population and past demographic characteristics of the county’s resident population and the actual or past housing unit inventory estimates for the county as a whole and for each municipality were estimated. The forward-looking forecast of the future housing unit demand for both owner housing units and renter housing units was then developed based on those quantified historical relationships and the forward-looking population and demographic forecast for the county. The economic and population-demographic forecast used the long-term housing unit projections came from the Moody’s December 2016 forecast for the county which was specifically commissioned by Crane Associates for this study.

Focus Groups

To improve upon the statistical data that was collected and analyzed, a series of focus groups were held to provide qualitative richness to the quantitative data. Focus groups help the research understand interpret data finding. They add real-life meaning to data and allow the research to hear first-hand stories about the challenges of finding affordable housing on the Cape. Four focus groups were held in March of 2017 at four different locations across the Cape. The four focus groups and the key takeaways from the 90 minute discussions are shown below.

RETIREES



Key Takeaways

Two groups of >65
The increase in >65 are new in-migrants.
Locals are leaving
Downsizing isn’t easy

EMPLOYERS



Key Takeaways

Very difficult to run a business
95% employees live on Cape
Plenty of jobs
Supply is too low
Gov’t intervention

YOUNG PROFESSIONALS



Key Takeaways

All were paying <30% income
Easier and cheaper to purchase than rent
Those who stay are locals. In-migrants leave.

RENTERS



Key Takeaways

Large barriers to entry
Personal finances prevent ownership

Findings

The housing unit projections resulted in a lower rate of housing unit demand growth than was the case during the 1980s, 1990s through to the mid-2000s when the housing market peaked in the county and for the state as a whole. The housing projections also included a shift slightly away from the housing market dynamics associated with the absolute declines in the population of the county over the 2005 through 2015 period—which likely contributed to a very sharp rise in the conversion of year-round units to seasonal units across the county over the 2010-2015 time period. The housing unit demand projections indicate there will be a slight turnaround in owner unit demand during the 2015 to 2020 time frame (but owner unit demand is expected to increase by less than 0.1 percent per year over the period), as the resident population ends its roughly decade-long decline and begins a slow rebound. Unit demand for renter units is also expected to experience a modest turnaround during the 2015 to 2020 period (but unit demand also is expected to increase at less than 0.1 percent per year), with both owner and renter unit demand strengthening over the 2020 to 2025 period to increase at an average annual rate of just under 0.5 percent per year.

Overall, demand in the county is expected to increase by 2,712 year-round units by 2025 (or at an average annual rate of 271 year-round units per year). Demand for owner units is expected to increase by 2,137 units by 2025 (or at an annual rate of 214 units per year). Renter unit demand is expected to increase by 575 units (corresponding to an annual increase of 58 units per year).

The housing unit demand projections indicate that the largest increase in housing unit demand in the county will be in the oldest age group, 65 years and over, which are expected to exhibit stronger than average rates of growth—reflecting the aging population. Demand for units in the youngest age group, aged 15 to 24 years, is expected to experience a housing unit

demand decline over the forecast period as this part of the population struggles to cope with increasing costs relative to expected household income growth. Overall, demand in the county is expected to increase by 2,712 year-round units by 2025 (or at an average annual rate of 271 year-round units per year). Demand for owner units is expected to increase by 2,137 units by 2025 (or at an annual rate of 214 units per year). Renter unit demand is expected to increase by 575 units (corresponding to an annual increase of 58 units per year). These estimates correspond to an overall annual housing unit growth rate of 0.3% per year. The increase in year-round housing unit demand is expected to be constrained by a somewhat stronger 0.6% annual growth rate in seasonal housing unit demand expected over the same time frame.

Table 4.1: Housing Unit Demand in Barnstable County, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	161,311	163,561	167,825	2,250	4,264	6,514	0.28%	0.52%	0.40%
Year-round Units	100,780	101,102	103,492	322	2,390	2,712	0.06%	0.47%	0.27%
Single-family	87,451	86,955	89,027	-496	2,072	1,576	-0.11%	0.47%	0.18%
Multi-family	13,329	14,148	14,465	818	318	1,136	1.20%	0.45%	0.82%
Tenure, owner	79,415	79,668	81,552	254	1,884	2,137	0.06%	0.47%	0.27%
Tenure, renter	21,365	21,434	21,940	68	507	575	0.06%	0.47%	0.27%
Second home units	60,531	62,459	64,333	1,928	1,874	3,802	0.63%	0.59%	0.61%
Other-mobile	882	789	724	-93	-65	-158	-2.20%	-1.70%	-1.95%
Households	94,417	95,405	97,236	988	1,831	2,819	0.21%	0.38%	0.29%

Table 4.2 Housing Unit Demand in Outer Cape, Barnstable County, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015 - 2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	18,176	18,444	18,976	268	532	800	0.29%	0.57%	0.43%
Year-round Units	6,904	6,989	7,241	85	252	337	0.24%	0.71%	0.48%
Single-family	4,834	4,914	5,138	79	224	303	0.33%	0.90%	0.61%
Multi-family	2,070	2,069	2,133	-1	64	64	-0.01%	0.62%	0.30%
Tenure, owner	5,384	5,458	5,669	73	212	285	0.27%	0.76%	0.52%
Tenure, renter	1,520	1,531	1,572	11	41	52	0.15%	0.52%	0.34%
Second home units	11,272	11,455	11,734	183	279	462	0.32%	0.48%	0.40%
Other-mobile	297	274	289	-23	14	-8	-1.58%	1.02%	-0.29%
Households	6,441	6,508	6,633	67	125	192	0.21%	0.38%	0.29%

Table 4.3 Housing Unit Demand in Lower Cape, Barnstable County, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	30,232	30,611	31,554	379	943	1,322	0.25%	0.61%	0.43%
Year-round Units	16,515	16,504	16,951	-11	447	436	-0.01%	0.54%	0.26%
Single-family	14,021	14,053	14,517	31	465	496	0.04%	0.65%	0.35%
Multi-family	2,494	2,451	2,423	-42	-28	-70	-0.34%	-0.23%	-0.29%
Tenure, owner	13,477	13,468	13,833	-9	365	355	-0.01%	0.54%	0.26%
Tenure, renter	3,038	3,036	3,118	-2	82	80	-0.01%	0.53%	0.26%
Second home units	13,717	14,107	14,604	390	497	887	0.56%	0.69%	0.63%
Other-mobile	81	78	68	-3	-10	-13	-0.81%	-2.77%	-1.79%
Households	15,399	15,560	15,859	161	299	460	0.21%	0.38%	0.29%

Table 4.4 Housing Unit Demand in Mid Cape, Barnstable County, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	60,236	60,778	62,406	542	1,627	2,170	0.18%	0.53%	0.35%
Year-round Units	39,923	40,024	40,872	101	848	949	0.05%	0.42%	0.24%
Single-family	33,829	33,965	34,540	135	575	711	0.08%	0.34%	0.21%
Multi-family	6,094	6,075	6,321	-19	246	227	-0.06%	0.80%	0.37%
Tenure, owner	30,559	30,631	31,274	72	642	714	0.05%	0.42%	0.23%
Tenure, renter	9,364	9,393	9,598	29	206	235	0.06%	0.43%	0.25%
Second home units	20,313	20,754	21,534	441	779	1,221	0.43%	0.74%	0.59%
Other-mobile	335	295	281	-40	-14	-54	-2.49%	-0.98%	-1.74%
Households	37,187	37,576	38,297	389	721	1,110	0.21%	0.38%	0.29%

Table 4.5 Housing Unit Demand in Upper Cape, Barnstable County, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	52,667	53,727	54,889	1,060	1,162	2,222	0.40%	0.43%	0.41%
Year-round Units	37,438	37,585	38,429	147	843	991	0.08%	0.44%	0.26%
Single-family	33,906	34,013	34,795	107	783	890	0.06%	0.46%	0.26%
Multi-family	3,532	3,573	3,618	40	45	86	0.23%	0.25%	0.24%
Tenure, owner	29,954	30,071	30,756	117	685	802	0.08%	0.45%	0.26%
Tenure, renter	7,484	7,514	7,673	31	158	189	0.08%	0.42%	0.25%
Second home units	15,229	16,142	16,461	913	319	1,232	1.17%	0.39%	0.78%
Other-mobile	169	142	87	-27	-55	-82	-3.45%	-9.29%	-6.42%
Households	35,390	35,760	36,446	370	686	1,056	0.21%	0.38%	0.29%

Table 4.6 Housing Unit Demand in Town of Barnstable, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	27,039	27,283	28,084	244	801	1,045	0.18%	0.58%	0.38%
Year-round Units	20,856	21,041	21,648	185	608	792	0.18%	0.57%	0.37%
Single-family	17,530	17,743	18,129	213	386	599	0.24%	0.43%	0.34%
Multi-family	3,326	3,314	3,508	-13	195	182	-0.08%	1.15%	0.53%
Tenure, owner	15,517	15,654	16,106	137	452	589	0.18%	0.57%	0.37%
Tenure, renter	5,339	5,386	5,542	47	156	203	0.18%	0.57%	0.37%
Second home units	6,183	6,243	6,436	60	193	253	0.19%	0.61%	0.40%
Other-mobile	112	112	145	0	33	33	-0.01%	5.27%	2.60%
Households	19,503	19,707	20,085	204	378	582	0.21%	0.38%	0.29%

	2015	2020	2025	Change in Units/Households			Average Annual Growth		
				2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	11,469	11,605	11,796	136	191	327	0.24%	0.33%	0.28%
Year-round Units	8,847	8,864	9,014	17	150	167	0.04%	0.34%	0.19%
Single-family	7,646	7,672	7,801	25	129	155	0.07%	0.33%	0.20%
Multi-family	1,201	1,192	1,203	-9	11	2	-0.14%	0.18%	0.02%
Tenure, owner	6,786	6,799	6,914	13	115	128	0.04%	0.34%	0.19%
Tenure, renter	2,061	2,065	2,100	4	35	39	0.04%	0.34%	0.19%
Second home units	2,622	2,741	2,782	119	41	160	0.89%	0.30%	0.59%
Other-mobile	92	58	30	-34	-28	-62	-8.72%	-12.42%	-10.59%
Households	8,292	8,379	8,540	87	161	248	0.21%	0.38%	0.29%

Table 4.8 Housing Unit Demand in Brewster Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	7,761	7,876	8,174	115	298	413	0.30%	0.75%	0.52%
Year-round Units	4,457	4,445	4,588	-12	143	131	-0.05%	0.64%	0.29%
Single-family	3,239	3,266	3,430	27	164	191	0.16%	0.99%	0.58%
Multi-family	1,218	1,180	1,153	-39	-26	-65	-0.64%	-0.45%	-0.54%
Tenure, owner	3,637	3,627	3,744	-10	117	107	-0.05%	0.64%	0.29%
Tenure, renter	820	818	844	-2	26	24	-0.05%	0.64%	0.29%
Second home units	3,304	3,431	3,586	127	155	282	0.76%	0.89%	0.82%
Other-mobile	21	32	25	11	-7	4	8.82%	-4.51%	1.94%
Households	4,272	4,317	4,400	45	83	128	0.21%	0.38%	0.29%

Table 4.9 Housing Unit Demand in Chatham Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	7,119	7,242	7,455	123	213	336	0.34%	0.58%	0.46%
Year-round Units	3,117	3,172	3,283	55	111	166	0.35%	0.69%	0.52%
Single-family	2,815	2,879	2,976	64	97	161	0.45%	0.67%	0.56%
Multi-family	302	294	302	-8	8	0	-0.54%	0.57%	0.01%
Tenure, owner	2,547	2,592	2,682	45	90	136	0.35%	0.69%	0.52%
Tenure, renter	570	581	601	10	20	30	0.35%	0.69%	0.52%
Second home units	4,002	4,069	4,171	67	102	169	0.33%	0.50%	0.42%
Other-mobile	9	0	0	-9	0	-9	-100.00%	NA	-100.00%
Households	2,816	2,845	2,900	29	55	84	0.21%	0.38%	0.29%

Table 4.10 Housing Unit Demand in Dennis Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	16,039	16,259	16,745	220	486	706	0.27%	0.59%	0.43%
Year-round Units	7,346	7,341	7,460	-5	119	114	-0.01%	0.32%	0.15%
Single-family	6,467	6,474	6,596	8	121	129	0.02%	0.37%	0.20%
Multi-family	879	867	865	-13	-2	-15	-0.29%	-0.05%	-0.17%
Tenure, owner	5,877	5,873	5,968	-4	95	91	-0.01%	0.32%	0.15%
Tenure, renter	1,469	1,468	1,492	-1	24	23	-0.01%	0.32%	0.15%
Second home units	8,693	8,918	9,285	225	367	592	0.51%	0.81%	0.66%
Other-mobile	205	183	136	-22	-47	-69	-2.20%	-5.74%	-3.99%
Households	6,809	6,880	7,012	71	132	203	0.21%	0.38%	0.29%

Table 4.11 Housing Unit Demand in Eastham Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	5,906	6,030	6,272	124	242	366	0.42%	0.79%	0.60%
Year-round Units	2,369	2,430	2,570	61	140	201	0.51%	1.12%	0.82%
Single-family	2,274	2,320	2,430	46	110	156	0.41%	0.93%	0.67%
Multi-family	95	101	102	5	2	7	1.08%	0.34%	0.71%
Tenure, owner	1,985	2,036	2,153	51	117	168	0.51%	1.12%	0.82%
Tenure, renter	384	394	416	10	23	32	0.51%	1.12%	0.82%
Second home units	3,537	3,600	3,702	63	102	165	0.35%	0.56%	0.46%
Other-mobile	0	2	0	2	-2	0	#DIV/0!	-100.00%	#DIV/0!
Households	2,291	2,315	2,359	24	44	68	0.21%	0.38%	0.29%

Table 4.12 Housing Unit Demand in Falmouth Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	21,843	22,363	22,780	520	417	937	0.47%	0.37%	0.42%
Year-round Units	14,549	14,621	14,894	72	273	345	0.10%	0.37%	0.23%
Single-family	13,355	13,439	13,754	84	316	400	0.12%	0.47%	0.30%
Multi-family	1,194	1,183	1,140	-11	-43	-55	-0.19%	-0.74%	-0.47%
Tenure, owner	11,130	11,185	11,394	55	209	264	0.10%	0.37%	0.23%
Tenure, renter	3,419	3,436	3,500	17	64	81	0.10%	0.37%	0.23%
Second home units	7,294	7,742	7,886	448	144	592	1.20%	0.37%	0.78%
Other-mobile	0	33	14	33	-19	14	#DIV/0!	-15.94%	#DIV/0!
Households	13,638	13,781	14,045	143	264	407	0.21%	0.38%	0.29%

Table 4.13 Housing Unit Demand in Harwich Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	10,054	10,141	10,431	87	290	377	0.17%	0.57%	0.37%
Year-round Units	5,796	5,750	5,879	-46	129	83	-0.16%	0.44%	0.14%
Single-family	5,461	5,400	5,533	-61	132	72	-0.22%	0.48%	0.13%
Multi-family	335	350	347	15	-3	12	0.87%	-0.17%	0.34%
Tenure, owner	4,828	4,790	4,897	-38	107	69	-0.16%	0.44%	0.14%
Tenure, renter	968	960	982	-8	22	14	-0.16%	0.44%	0.14%
Second home units	4,258	4,390	4,551	132	161	293	0.61%	0.72%	0.67%
Other-mobile	0	12	12	12	-1	12	#DIV/0!	-1.56%	#DIV/0!
Households	5,430	5,487	5,592	57	105	162	0.21%	0.38%	0.29%

Table 4.14 Housing Unit Demand in Mashpee Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	9,807	10,073	10,408	266	335	601	0.54%	0.66%	0.60%
Year-round Units	6,242	6,206	6,423	-36	218	181	-0.12%	0.69%	0.29%
Single-family	5,432	5,362	5,507	-70	144	74	-0.26%	0.53%	0.14%
Multi-family	810	843	917	34	73	107	0.82%	1.68%	1.25%
Tenure, owner	5,424	5,393	5,582	-32	189	158	-0.12%	0.69%	0.29%
Tenure, renter	818	813	841	-5	29	24	-0.12%	0.69%	0.29%
Second home units	3,565	3,867	3,985	302	118	420	1.64%	0.60%	1.12%
Other-mobile	77	42	42	-35	0	-35	-11.56%	0.08%	-5.92%
Households	5,907	5,969	6,083	62	115	176	0.21%	0.38%	0.29%

	2015	2020	2025	Change in Units/Households			Average Annual Growth		
				2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	5,298	5,352	5,495	54	143	197	0.20%	0.53%	0.37%
Year-round Units	3,145	3,136	3,200	-9	64	55	-0.06%	0.40%	0.17%
Single-family	2,506	2,508	2,578	2	71	72	0.01%	0.56%	0.29%
Multi-family	639	628	621	-10	-7	-18	-0.33%	-0.23%	-0.28%
Tenure, owner	2,466	2,459	2,509	-7	50	43	-0.06%	0.40%	0.17%
Tenure, renter	679	677	691	-2	14	12	-0.06%	0.40%	0.17%
Second home units	2,153	2,216	2,295	63	79	142	0.58%	0.70%	0.64%
Other-mobile	51	33	31	-18	-3	-20	-8.19%	-1.65%	-4.97%
Households	2,881	2,911	2,967	30	56	86	0.21%	0.38%	0.29%

Table 4.16 Housing Unit Demand in Provincetown, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	4,517	4,522	4,541	5	19	24	0.02%	0.08%	0.05%
Year-round Units	2,006	1,991	1,980	-15	-10	-26	-0.15%	-0.10%	-0.13%
Single-family	279	274	279	-5	5	0	-0.35%	0.36%	0.00%
Multi-family	1,727	1,720	1,774	-7	54	47	-0.08%	0.62%	0.27%
Tenure, owner	1,312	1,302	1,295	-10	-7	-17	-0.15%	-0.10%	-0.13%
Tenure, renter	694	689	685	-5	-4	-9	-0.15%	-0.10%	-0.13%
Second home units	2,511	2,532	2,561	21	29	50	0.16%	0.23%	0.20%
Other-mobile	23	0	0	-23	0	-23	-100.00%	#DIV/0!	-100.00%
Households	1,782	1,801	1,835	19	35	53	0.21%	0.38%	0.29%

Table 4.17 Housing Unit Demand in Sandwich Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	9,548	9,686	9,905	138	218	357	0.29%	0.45%	0.37%
Year-round Units	7,800	7,895	8,098	95	203	298	0.24%	0.51%	0.38%
Single-family	7,472	7,540	7,734	68	193	261	0.18%	0.51%	0.34%
Multi-family	328	354	359	27	4	31	1.57%	0.25%	0.91%
Tenure, owner	6,614	6,695	6,867	80	172	252	0.24%	0.51%	0.38%
Tenure, renter	1,186	1,200	1,231	14	31	45	0.24%	0.51%	0.38%
Second home units	1,748	1,792	1,807	44	16	59	0.50%	0.17%	0.33%
Other-mobile	0	9	1	9	-8	1	#DIV/0!	-30.73%	#DIV/0!
Households	7,553	7,632	7,778	79	146	225	0.21%	0.38%	0.29%

Table 4.18 Housing Unit Demand in Truro Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	3,277	3,314	3,407	37	93	130	0.22%	0.55%	0.39%
Year-round Units	877	893	941	16	48	64	0.35%	1.05%	0.70%
Single-family	806	818	857	13	39	52	0.32%	0.93%	0.62%
Multi-family	71	74	78	3	4	7	0.76%	1.10%	0.93%
Tenure, owner	723	736	775	13	39	52	0.35%	1.05%	0.70%
Tenure, renter	154	157	166	3	8	11	0.35%	1.05%	0.70%
Second home units	2,400	2,421	2,466	21	45	66	0.18%	0.37%	0.27%
Other-mobile	40	48	57	8	9	17	3.58%	3.54%	3.56%
Households	820	829	844	9	16	24	0.21%	0.38%	0.29%

Table 4.19 Housing Unit Demand in Wellfleet Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	4,476	4,578	4,756	102	178	280	0.45%	0.77%	0.61%
Year-round Units	1,652	1,675	1,751	23	75	99	0.28%	0.88%	0.58%
Single-family	1,476	1,501	1,572	25	71	96	0.34%	0.92%	0.63%
Multi-family	176	174	179	-2	5	3	-0.19%	0.54%	0.17%
Tenure, owner	1,365	1,384	1,446	19	62	82	0.28%	0.88%	0.58%
Tenure, renter	287	292	305	4	13	17	0.28%	0.88%	0.58%
Second home units	2,824	2,902	3,005	78	103	181	0.55%	0.70%	0.62%
Other-mobile	234	225	232	-9	7	-2	-0.78%	0.60%	-0.09%
Households	1,548	1,564	1,594	16	30	46	0.21%	0.38%	0.29%

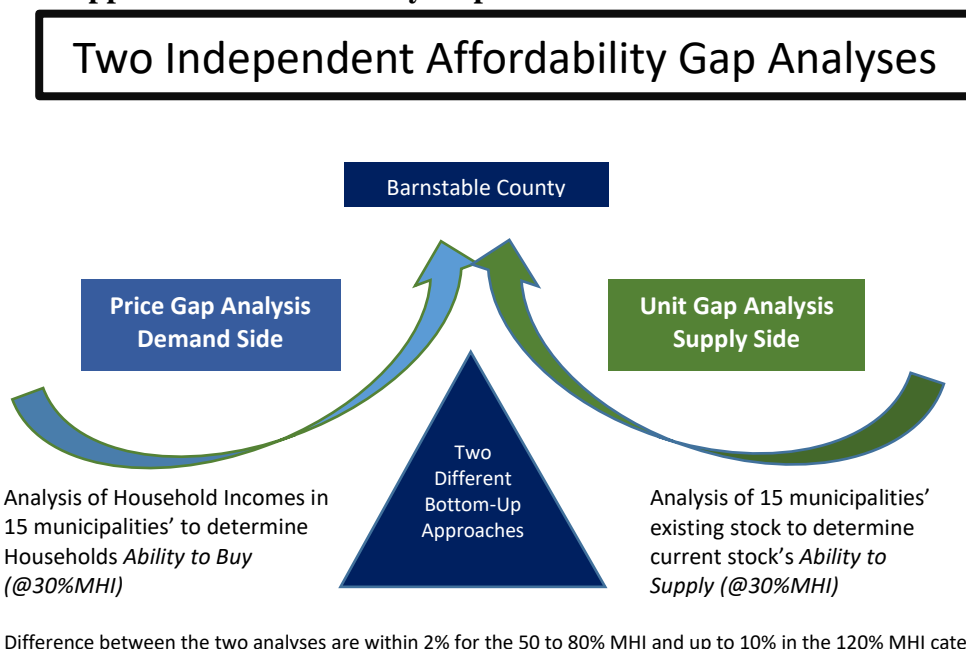
Table 4.20 Housing Unit Demand in Yarmouth Town, Projected									
				Change in Units/Households			Average Annual Growth		
	2015	2020	2025	2015-2020	2020-2025	2015-2025	2015-2020	2020-2025	2015-2025
Total Housing Units	17,158	17,236	17,576	78	340	418	0.09%	0.39%	0.24%
Year-round Units	11,721	11,643	11,764	-78	121	43	-0.13%	0.21%	0.04%
Single-family	9,833	9,748	9,816	-85	68	-18	-0.17%	0.14%	-0.02%
Multi-family	1,888	1,895	1,948	7	53	60	0.07%	0.56%	0.31%
Tenure, owner	9,166	9,104	9,199	-61	95	33	-0.13%	0.21%	0.04%
Tenure, renter	2,555	2,538	2,564	-17	26	9	-0.13%	0.21%	0.04%
Second home units	5,437	5,593	5,812	156	219	375	0.57%	0.77%	0.67%
Other-mobile	18	0	0	-18	0	-18	-100.00%	#DIV/0!	-100.00%
Households	10,875	10,989	11,200	114	211	325	0.21%	0.38%	0.29%

CHAPTER 5: ANALYSIS OF THE AFFORDABILITY GAP

The affordability gap analysis provides the estimated difference between the number of housing units demanded and the number of housing units available in the housing supply by income category and tenure status (owner and renter). The affordability gap analysis was completed for each of the municipalities within the county and for the county total. The affordability gap analysis for calendar year 2015 is presented below for the county and for the Town of Barnstable as the example municipality. The same calculation is performed for each municipality and provided in appendix. The projected affordability gap is also presented for calendar year 2025 for the county, and again with the Town of Barnstable used as the example municipality in the report. For 2015, the study estimated housing unit supply for the county using a bottom-up municipality by municipality approach utilizing the 2011-15 American Community Survey unit data, current parcel data from the assessor databases of each municipality in the county received from the municipalities, municipality building permit data, and county level unit completions from the Moody's December 2016 Long-Term Economic Forecast for the county and other data from our economic and demographic forecast presented in Chapter 3. Calendar year 2015 were estimated actual values, and therefore were not adjusted as was done for forecasted values covering the 2016 through 2025 time frame.

Data was compiled and analyzed two different ways—namely demand and supply—for each of the 15 municipalities. Each calculation and escalation to forecast supply and demand was also done individually for all 15 municipalities and the results of each set of calculations for each individual municipality was then summed to obtain the county total. This approach was employed because of the diversity of housing and economic situations between the Cape's municipalities, making a “top-down” county average approach problematic for this housing demand and supply analysis study if the study was to be sensitive to the varying circumstances between the various towns and Cape sub-regions. This bottom up approach is summarized by the figure below:

Figure 5.1 Approach to Affordability Gap



Unit demand by household income level and tenure status was estimated based on the long-term demographic forecast for the county and was apportioned to each of the municipalities according to the technical approach described previously. The unit demand and unit supply concepts were then compared within each municipality. This comparison then revealed whether or not unit demand exceeded unit supply within the municipality or vice versa. If there was an observed difference between unit demand and unit supply, the extent of that difference at each household income level for both tenure types was analyzed and reported. For example, if it was determined that demand exceeded supply, this was an indication that the number of units available to be purchased (or rented) at an affordable price (or rent) was not sufficient, and households occupying those units in the year indicated would likely have been paying more than the HUD threshold of 30% of household income toward housing costs.⁷

For the county overall, this analysis confirmed what was heard at the focus groups regarding current housing market conditions around the county (see Table 5.1 below). In calendar year 2015, the study estimated that the county had a total affordable housing unit gap of 26,364 units (including an estimated gap of 21,924 owner units and 4,441 renter units) for household income levels at or below 80% of median household income. For owner and renter units at and below 120% but above 80% of median household income, unit demand and unit supply were better balanced in the county in calendar year 2015, with a total of 7504 more units supplied than demanded at the above 80% to 120% of median income category. This includes 6,743 units

⁷ Owner-occupied units that spend 30% of their household income or less on housing costs, including mortgage payments, utilities, insurance, and taxes, are considered to not be experiencing “housing cost stress” and are therefore spending within the threshold of housing affordability for owners in the identified geographic area. Renter-occupied units that spend 30% of their household income or less on housing costs, including rent and utilities, are considered not to be experiencing “housing cost stress” and are therefore spending within the threshold of housing affordability for renters in the identified geographic area.

cumulatively for those two household income categories for owners and 761 rental units for those at 120% of MHI. (Table 5.1) at those affordable rent levels (at 591 units cumulatively for two household income categories for renters⁸) in 2015.

However, the reader should be aware that at least a portion of the 7,300 units in 2015 that were affordable to the 100% and 120% of median household income households were occupied by households paying less than 30% of their household income on housing. This likely contributed to a housing bottleneck at 100%-120% of median household income as households—many of whom have many housing choices versus the lower income households—were occupying units affordable at that level. This bottleneck was particularly evident in the seniors (and “empty nesters”) in the area, where seniors were still living in larger family units despite no longer needing them. If seniors were given the option of downsizing into appropriate sized units, this option could potentially fill about one-third of the current housing gap. However, this was viewed as a challenge because there was a lack of diversity in housing units on the Cape in 2015—which may mean even those seniors that want to downsize were unable to find a more appropriate unit at an affordable price.

Housing affordability, or housing stress, is not evenly distributed across Barnstable County. Looking at the four sub-county regions delineated in this study, the results of the gap analysis indicated a better housing affordability situation for both owner and renter units in the Upper Cape and Mid-Cape regions than in the Outer and Lower regions. (See Table 5.2 through Table 5.5 below).

Understanding the Gap Analysis Tables

To understand the gap analysis tables, a few terms, concepts, and assumptions need to be explained. First, calculating gaps between supply and demand relies on the assumption that each household will spend 30% of their household income on housing expenses⁹. We know in reality that this isn't exactly true but by using 30% of household income as a threshold we can observe the number of households who are spending more or less than 30% of their income on housing. We use 30% as the threshold because HUD guidelines label those spending more than 30% as “housing cost-stressed” and are therefore living in unaffordable housing. This analytical procedure allows us to consistently determine an affordable price or rent. Supply at a particular income level means the number of units (either owned or rented) that are affordable at that price point if all units within that geographic area were to be available for sale (or rent). Demand at a particular income level is the number of households at or below that level of income which is currently owned or rented. The difference between the number of units available, (supply) and the number of households that could afford them (demand) results in a unit gap at each income level. This creates a “theoretical gap” which assumes that households would not occupy units within other income levels. This

⁸ Although for renters, the unit supply for this affordable supply unit count were all found in the 100% to 120% of household income level (with an estimated total of 761 surplus units that were affordable in 2015 to renter households at the 120% median household income category). For the 80% to 100% of median household income category, the supply of affordable renter units versus demand was virtually in balance at 171 units more units demanded than were estimated to have been available in the supply at that rent level in 2015.

⁹ For owners: housing costs are mortgage, taxes, insurance, utilities; for renters: rent and utilities

means that if a household was occupying a unit that costs either more or less than 30% of their income than the household does not appear in the demand for the housing unit they are occupying (supply side analysis). However, based on their household incomes they will appear in demand for housing units that are affordable at 30% of their incomes (demand side analysis). Due to the large quantity of expensive seasonal units, the demand side gap will be greater than the supply side gap.

Using the 30% of MHI assumption was necessary to do meaningful and orderly analysis of the data. If many households are spending less than 30% of their income on housing, then they are not demanding units affordable to their income level. This occurs in the Cape's housing market due to the large number of senior households who paid off their mortgage and have low housing expenses. These are moderately valued homes between \$200,000 and \$400,000. As a result our analysis will show a theoretical oversupply of housing units at this price range. The reality is that there was not an oversupply of units anywhere on the Cape, regardless of household income; in towns with theoretical oversupply at particular income levels there are a great number of households at lower income levels competing for those units because there are not enough units within their affordable range.

Estimated unit demand was the number of units demanded by households that make between one income category and the next. For example, in Barnstable County, the 12,908 units demanded at 80% of median income was the number of households between 50% and 80% that own. Estimated unit supply is similar to demand but is the number of units available at the affordable price for each income level. So for 80% of median income the affordable price was \$212,438, there was a supply of 5,322 units above \$125,043 and below the 80% affordable price of \$212,438. The affordability gap is the number of units demanded minus the number of units at each income category. All of the measures in the top part of the chart are for the above income level only. They do not include any values to the left or right. For example, the 5,322 units supplied at 80% of median income does not include the 3,041 units supplied at 50% of median income.

Cumulative demand is the estimated unit demand at that income level plus the estimated unit demand for each lower income level. Therefore, the cumulative demand for 80% of median income was 30,287, or 12,908 (the estimated demand at 80%) plus 17,379 (the estimated demand at 50%). Cumulative Supply is similar to cumulative demand. It is the estimated unit supply for each income level plus all of the unit supply for each lower income level. At 80% of median income, there was a cumulative supply of 8,363 units at affordable prices, or 5,322 (the estimated unit supply at 80%) plus 3,041 (the estimated supply at 50%). The cumulative gap is calculated by subtracting cumulative supply from cumulative demand. So the cumulative gap was 21,924, or 30,827 (cumulative demand) minus 8,363 (cumulative supply). Alternatively, it can be calculated by summing the affordability gap at a particular income level and the gap from each lower income level. So the cumulative gap at 80% was 21,924, or 7,586 (affordability gap at 80%) plus 14,338 (affordability gap at 50%).

It's important to note that cumulative numbers are generally a better measure of the real state of the market as someone who is making 100% of median income would be able to purchase a house that is affordable to someone at 80% or even 50% of median income if the opportunity arose. Also, if there are not enough units available at an affordable price, those households will still need to

live somewhere and so will likely purchase a unit at a price outside of their affordable range. This means that even though there was a theoretical oversupply of units at 100% and 120% of median income, the full picture of the market was shown more clearly by the cumulative gap values which show those “surplus” units likely being purchased by people in the lower income categories because they have few other options. This leaves a still substantial cumulative gap at high income levels.

Table 5.1 County-Wide Gap Analysis by Tenure, 2015

Barnstable County-Estimated Affordable Gap for Owner Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income (County Average)	\$36,125	\$57,799	\$72,249	\$86,699	
Affordable Price (County Average)	\$125,043	\$212,438	\$271,473	\$330,618	
Estimated Unit Demand	17,379	12,908	8,477	7,858	32,753
Estimated Unit Supply	3,041	5,322	10,557	12,521	47,934
Affordability Gap in Units (demand minus supply)	14,338	7,586	-2,080	-4,663	
Cumulative Demand	17,379	30,287	38,764	46,622	79,375
Cumulative Supply	3,041	8,363	18,920	31,441	79,375
Cumulative Gap	14,338	21,924	19,844	15,181	
Barnstable County-Estimated Affordable Gap for Renter Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income (County Average)	\$16,530	\$26,447	\$33,059	\$39,671	
Affordable Rent (County Average)	\$413	\$661	\$826	\$992	
Estimated Unit Demand	5,232	3,540	1,978	1,646	9,009
Estimated Unit Supply	2,363	1,969	1,807	2,407	12,858
Affordability Gap in Units (demand minus supply)	2,869	1,572	171	-761	
Cumulative Demand	5,232	8,772	10,750	12,396	21,405
Cumulative Supply	2,363	4,332	6,139	8,546	21,405
Cumulative Gap	2,869	4,441	4,611	3,850	

Table 5.2 Upper Cape Gap Analysis, 2015

Upper Cape-Estimated Affordable Gap for Owner Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income					
Affordable Price					
Estimated Unit Demand	6,804	4,590	2,906	2,960	12,695
Estimated Unit Supply	1,393	2,557	5,715	5,366	14,923
Affordability Gap in Units (demand minus supply)	5,410	2,033	-2,809	-2,406	
Cumulative Demand	6,804	11,394	14,299	17,260	29,954
Cumulative Supply	1,393	3,951	9,666	15,031	29,954
Cumulative Gap	5,410	7,443	4,634	2,228	
Upper Cape-Estimated Affordable Gap for Renter Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income					
Affordable Rent					
Estimated Unit Demand	1,935	1,274	584	466	3,225
Estimated Unit Supply	1,019	667	922	954	3,922
Affordability Gap in Units (demand minus supply)	916	607	-338	-488	
Cumulative Demand	1,935	3,209	3,792	4,259	7,484
Cumulative Supply	1,019	1,686	2,608	3,562	7,484
Cumulative Gap	916	1,523	1,185	696	

Table 5.3 Mid Cape Gap Analysis, 2015

Mid Cape-Estimated Affordable Gap for Owner Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income					
Affordable Price					
Estimated Unit Demand	6,406	5,208	3,472	3,007	12,466
Estimated Unit Supply	1,124	2,009	3,458	5,158	18,811
Affordability Gap in Units (demand minus supply)	5,282	3,199	14	-2,150	
Cumulative Demand	6,406	11,614	15,087	18,094	30,559
Cumulative Supply	1,124	3,133	6,591	11,748	30,559
Cumulative Gap	5,282	8,481	8,496	6,345	
Mid Cape-Estimated Affordable Gap for Renter Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income					
Affordable Rent					
Estimated Unit Demand	2,424	1,259	970	815	3,896
Estimated Unit Supply	987	830	557	1,001	5,990
Affordability Gap in Units (demand minus supply)	1,437	430	413	-186	
Cumulative Demand	2,424	3,683	4,653	5,468	9,364
Cumulative Supply	987	1,817	2,373	3,374	9,364
Cumulative Gap	1,437	1,866	2,279	2,094	

Table 5.4 Lower Cape Gap Analysis, 2015

Lower Cape-Estimated Affordable Gap for Owner Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income					
Affordable Price					
Estimated Unit Demand	2,919	2,254	1,540	1,376	5,388
Estimated Unit Supply	318	598	1,214	1,807	9,541
Affordability Gap in Units (demand minus supply)	2,602	1,656	326	-431	
Cumulative Demand	2,919	5,173	6,713	8,090	13,477
Cumulative Supply	318	915	2,129	3,936	13,477
Cumulative Gap	2,602	4,258	4,584	4,154	
Lower Cape-Estimated Affordable Gap for Renter Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income					
Affordable Rent					
Estimated Unit Demand	625	710	266	171	1,267
Estimated Unit Supply	320	315	218	304	1,881
Affordability Gap in Units (demand minus supply)	304	395	48	-133	
Cumulative Demand	625	1,335	1,600	1,771	3,038
Cumulative Supply	320	635	853	1,157	3,038
Cumulative Gap	304	699	747	614	

Table 5.5 Outer Cape Gap Analysis, 2015

Outer Cape-Estimated Affordable Gap for Owner Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income					
Affordable Price					
Estimated Unit Demand	1,250	856	560	514	2,205
Estimated Unit Supply	206	159	170	190	4,659
Affordability Gap in Units (demand minus supply)	1,044	697	389	324	
Cumulative Demand	1,250	2,106	2,665	3,179	5,384
Cumulative Supply	206	364	535	725	5,384
Cumulative Gap	1,044	1,741	2,130	2,454	
Outer Cape-Estimated Affordable Gap for Renter Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income					
Affordable Rent					
Estimated Unit Demand	249	297	159	194	621
Estimated Unit Supply	37	157	111	148	1,067
Affordability Gap in Units (demand minus supply)	212	140	48	46	
Cumulative Demand	249	546	705	899	1,520
Cumulative Supply	37	194	305	453	1,520
Cumulative Gap	212	352	400	446	

Prospective County-Wide Affordability Gap—Calendar Year 2025

Looking forward at calendar years 2015 to 2025, the estimated gap in units that would be affordable at or below the 80% of median household income level is expected to increase. The forecast indicates that housing cost pressures relative to forecasted increases in household income within the county will worsen. This prospective deterioration of affordability is expected to be more significant in the owner tenure category, while increasing affordability pressures would be significantly lower—although still resulting in a negative gap—in the renter tenure category. Looking forward to calendar year 2025, it is considered unlikely that many of the 2,712 net year-round unit additions between calendar year 2016 and 2025 enter the county’s future housing supply (or inventory) at either affordable price points (for owner units) or affordable rent levels (for renter units), outside of a known list of housing development projects being developed in the Upper-Cape and/or Mid-Cape regions that are expected to have at least some of the units at affordable price points or rent levels. These projects looked to be significant for the renter category, and appeared to be making a positive contribution to lessening the pace of erosion in affordability in the renter tenure category over the calendar year 2015 to calendar year 2025 period.

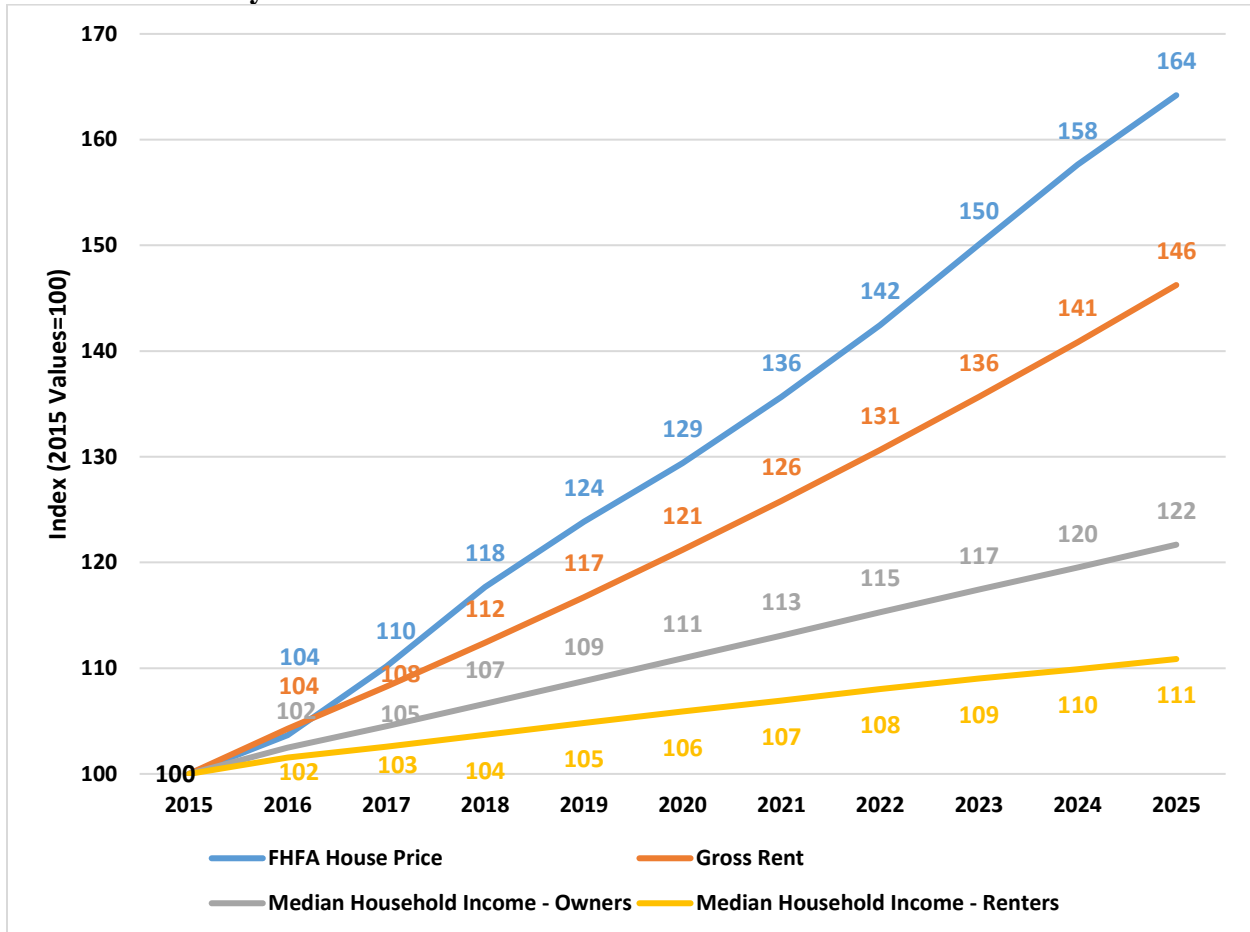
the study forecasted that the trajectory of owner unit housing price points was likely to increase by an average of 5.1% per year over the calendar year 2015 to calendar year 2025 period, and affordable gross rent levels for renter units across the county estimated to increase at the rate of 3.9% per year over the same time frame, with the utilities portion increasing at a rate one-half of that at 1.5% per year. In contrast, county-wide median household income growth was forecasted to increase at a more modest 2.0% per year (on average) for owner households over the calendar year 2015 to calendar year 2025 period, and median household income for renter households was forecasted to increase at the average annual rate of 1.0% per year in the county (on average) over the same period. As a result, this forecasted housing cost-household income disparity made it clear that housing affordability in the county was expected to erode further going forward

However, for the most part it was expected that these unit additions would likely be overshadowed by the forecasted increases in overall housing prices, including increasing owner housing costs for owner units and rising rents/renter housing costs for renter units over the calendar year 2015 to calendar year 2025 time frame. More specifically, the study forecasted that the trajectory of owner unit housing price points was likely to increase by an average of 5.1% per year over the calendar year 2015 to calendar year 2025 period, and affordable gross rent levels for renter units across the county estimated to increase at the rate of 3.9% per year over the same time frame, with the utilities portion increasing at a rate one-half of that at 1.5% per year. In contrast, county-wide median household income growth was forecasted to increase at a more modest 2.0% per year (on average) for owner households over the calendar year 2015 to calendar year 2025 period,

and median household income for renter households was forecasted to increase at the average

annual rate of 1.0% per year in the county (on average) over the same period. As a result, this forecasted housing cost-household income disparity made it clear that housing affordability in the county was expected to erode further going forward.

Figure 5.2 Forecasted Change in Federal Housing Finance Agency (FHFA) House Prices, Gross Rent, and Median Household Income for Owners and Renters, 2015-2025, Barnstable County



This forecasted erosion in housing affordability across the county is highlighted after completing our bottom-up, municipal-level analysis of unit demand and unit supply for calendar year 2025—using the forward-looking housing cost increases and median household income estimates for each municipality by tenure as discussed above. This approach forecasts long-term changes in the affordability of the county’s owner unit and renter unit housing stock by incorporating both: (1) the new owner and renter unit additions as forecasted by the county’s housing unit inventory over the study’s calendar year 2015 to 2025 timeframe, and (2) the expected further erosion of the affordability (from the 2015 affordability estimates by tenure) of the existing 2015 housing inventory over the calendar years 2015 to 2025 as housing prices and rent increases were forecasted to outpace household income growth over the period.

Table 5.6 shows the results of this approach for estimating future housing costs and household income by tenure category. The study shows that the current trajectory of trends in housing costs

and income growth are likely to result in a significant increase in the total affordable housing unit gap for the county. By calendar year 2025, the study forecasted that the county would likely have a total housing unit gap of 33,597 units (including an estimated gap of 28,494 owner units and 5,103 renter units) for households at or below the 80% of median household income level—a net increase of 6,571 owner units from calendar year 2015 and a net increase of 663 renter units from calendar year 2015.

Table 5.6: County-Wide Gap Analysis by Tenure, 2025

Barnstable County-Estimated Affordable Gap for Owner Units, 2025					
% of Median Household Income	50%	80%	100%	120%	>120%
Income					
Affordable Price					
Estimated Unit Demand	18,191	13,479	8,823	8,202	32,836
Estimated Unit Supply	2,077	1,099	1,889	3,385	73,082
Affordability Gap in Units (demand minus supply)	16,114	12,380	6,934	4,817	
Cumulative Demand	18,191	31,670	40,493	48,695	81,532
Cumulative Supply	2,077	3,176	5,065	8,450	81,532
Cumulative Gap	16,114	28,494	35,428	40,245	
Barnstable County-Estimated Affordable Gap for Renter Units, 2025					
% of Median Household Income	50%	80%	100%	120%	>120%
Income					
Affordable Rent					
Estimated Unit Demand	5,261	3,591	2,054	1,772	9,283
Estimated Unit Supply	1,976	1,772	1,664	1,822	14,727
Affordability Gap in Units (demand minus supply)	3,285	1,818	391	-49	
Cumulative Demand	5,261	8,852	10,906	12,678	21,961
Cumulative Supply	1,976	3,748	5,412	7,234	21,961
Cumulative Gap	3,285	5,103	5,494	5,444	

For owner units between 80% and 120% of median household income, unit demand versus unit supply is forecasted to tip into the negative¹⁰ category over the calendar year 2015 to calendar year 2025 period in the owner category, since housing prices are expected to increase at nearly twice the average annual rate of increase in median household income for owner households. More specifically, the calendar year 2025 unit gap for these two household income categories for owner units is expected to deteriorate by a total net change of 18,494 units, totaling an estimated 25,064 units—up from a 6,743 owner surplus of units affordable between the 80% and 120% of median household income categories in calendar year 2015. For renters, the increase in the unit gap between calendar year 2015 and calendar year 2025 was estimated to remain negative, but not as significantly negative as the unit gap erosion in the owner tenure category. For renters, the study estimated this tenure category would experience an erosion in the affordable unit gap of 1,594 additional units by calendar year 2025 (versus calendar year 2015) for households in the 80% and 120% of median household income range. These unit numbers correspond to a combined owner

¹⁰ An increasing gap is “negative”, as demand is outpacing supply, while a decreasing gap is “positive.”

and renter unit gap across all household income categories at or below 120% of median of 45,690 units in calendar year 2025—a net increase over next ten years of just over double the cumulative unit gap that was estimated to have existed in calendar year 2015 (Table 5.7).

By calendar year 2025, the study forecasted that the county would likely have a total housing unit gap of 33,597 units (including an estimated gap of 28,494 owner units and 5,103 renter units) for households at or below the 80% of median household income level—a net increase of 6,571 owner units from calendar year 2015 and a net increase of 663 renter units from calendar year 2015.

Table 5.7 Cumulative Gap Change from 2015 to 2025

	50%	80%	100%	120%
Cumulative Gap Owners - 2015	14,338	21,924	19,844	15,181
Cumulative Gap Owners - 2025	16,114	28,494	35,428	40,245
Change 2015 to 2025	1,776	6,570	15,584	25,064
Cumulative Gap Renters- 2015	2,869	4,441	4,611	3,850
Cumulative Gap Renters - 2025	3,285	5,103	5,494	5,444
Change 2015 to 2025	416	662	883	1,594

Representative Municipal Affordability Calculations/Gap Analysis—Town of Barnstable

The following section provides a description of the affordability calculations performed for each municipality. The Town of Barnstable is presented here as an example. The reader should keep in mind that the municipal-level affordability calculations were performed first, and the County and Sub-Regions were calculated after based on the sum of the results of each municipality. The county was further analyzed using separate ACS county-level data for a cross-check. Unit demand for owners and renters in each municipality was estimated for calendar year 2015 using “Tenure by Household Income” data from the 2015 Five-Year American Community Survey (“ACS”). The household totals were used to estimate housing unit demand by tenure¹¹ so that the total could be compared to available supply at each income level in the municipality in order to calculate any difference (or gap) across all levels of household income versus the median. The unit demand totals include units that were occupied, and those that were unoccupied units. Unoccupied (or vacant) units were those available for sale or rent, units that have been sold but were unoccupied at that point in time, units that were being held for settlement of an estate, and units that were undergoing repair or renovation. For example, in the Town of Barnstable in calendar year 2015, there were 14,511 owner-occupied households (which resulted in a total unit demand of 15,517 owner units) and 4,992 renter-occupied households (which resulted in a total unit demand of 5,339

¹¹ Housing unit demand in theory also includes the number of unoccupied units which is typically comprised of vacant units available for sale or rent and vacant units for a variety of reasons which are needed for a properly functioning housing market.

renter units). Table 5.8 shows the total number of owner and renter housing unit supply by household income level for the Town of Barnstable for calendar year 2015.

Table 5.8 Total Households and Housing Unit Demand by Household Income Category and Tenure, Town of Barnstable, 2015

	Owner-Occupied Households	Renter-Occupied Households	Owner + Renter Households	Owner Units	Renter Units	Owner + Renter Units
Total:	14,511	4,992	19,503	15,517	5,339	20,856
Less than \$49,999	4,841	3,360	8,201	5,177	3,594	8,770
\$50,000 to \$99,999	5,007	1,167	6,174	5,354	1,248	6,602
\$100,000 to \$149,999	2,674	263	2,937	2,859	281	3,141
\$150,000 or More	1,989	202	2,191	2,127	216	2,343

The second step in the affordability unit gap analysis was to determine the demand and supply of owner units in the Town of Barnstable. This process began with developing an estimate of the number of owner occupied units by unit value and the number of unoccupied units (including vacant units) by unit value for calendar year 2015. These data were obtained from the 2015 Five-Year Estimates data from the ACS (taken from the dataset “Value: Owner-Occupied Housing Units” and “*Vacant Housing Units*”). Unoccupied owner units for 2015 were added to the housing supply estimate according to the value distribution of the occupied units in the Town to arrive at the total housing supply by estimated value. Values for occupied units were based on ACS respondent’s estimate of their housing unit value (including land) if the property were offered for sale at the time of the survey in the Town of Barnstable.¹² Therefore, the estimate of units by value were dependent on the accuracy of ACS respondent estimates of their own housing value at the time of survey.¹³

The reader should be aware that there were a number of owner units in the Town of Barnstable in 2015 that were reported by ACS respondents to be valued at very low levels—with 258 units in the Town that were valued at less than \$50,000 in calendar year 2015 (see Table 5.9 below). Aside from sampling and nonsampling error described above, it should be noted that such lower-priced units were very small units such as cabins and family flats. There also were likely a number of larger units that may have been priced at lower levels due to some deficiency or deficiencies and may have been units valued at those lower levels because of their poor or sub-standard condition. In addition, it should be remembered that the number of units below \$50,000 in value in 2015 represented just 276 units (or just 1.8%) of an estimated 15,517 owner units overall in 2015. Therefore, this was a very small percentage of the town’s overall housing unit inventory in 2015.

¹² This tabulation also includes only specified owner-occupied housing units—one-family houses on less than 10 acres without a business or medical office on the property.

¹³ All ACS data used in this analysis is therefore subject to sampling and nonsampling error. Sampling error is the uncertainty between an estimate based on a sample and the corresponding value that would be obtained if the estimate were based on the entire population (as from a census). An example of nonsampling error would be an ACS respondent that had an estimate of how much the property (house and lot) would sell for if it were for sale that was either too high or too low versus what the property would actually sell for at the time the respondent completed the ACS survey.

and was a plausible unit count with respect to the town's estimated supply or housing unit inventory.

Table 5.9: Supply of Owner Units by Value of Unit, Town of Barnstable 2015

	Town of Barnstable	
	Owner-Occupied Households Estimate	Owner Units
Total:	14,511	15,517
Less than \$49,999	258	276
\$50,000 to \$99,999	111	119
\$100,000 to \$199,999	1,142	1,221
\$200,000 to \$299,999	3,758	4,019
\$300,000 to \$399,999	4,053	4,334
\$400,000 to \$499,999	1,863	1,992
\$500,000 or more	3,326	3,557

The supply of housing units for the four median income levels (at 50%, 80%, 100%, and 120% of median) was determined by the affordable house prices at each income level (based on the calendar year 2015 affordability calculations completed previously), cross-referenced with the number of owner-occupied households available at or below those price points in the ACS data, and revised to reflect total owner units. For example, at the 100% median household income level for owners in the Town of Barnstable, the potential owners could afford a house priced at or below \$251,591. In the Town of Barnstable, there are approximately 3,360 owner housing units in the supply (see Table 5.10 below).

Table 5.10 Supply of Owner Units at Affordable Price Points

Supply (Owner Units) - Town of Barnstable		
% At or Below The Town Median Household Income	Affordable House Price	Number of Owner Units
50%	\$115,524	570
80%	\$196,730	1,567
100%	\$251,591	3,360
120%	\$306,575	5,919

Based on the number of owner housing units at or below the 100% median household income level, there was demand for approximately 7,788 housing units in 2015. There was therefore a cumulative gap of 4,428 units needed to meet the demand in the market of the Town of Barnstable for housing units in calendar year 2015 (Table 5.11). This difference was calculated by the number of units demanded less the estimated supply of year-round housing units. The affordability gap in units for owners between 100% of median household income and 120% of median income reflected a situation where unit supply at affordable price points exceeded unit demand by 1,145 units. This indicated that there were more units available in the housing unit supply that were affordable in 2015 at those price points versus the number of units that were demanded in the corresponding household income category in 2015. However, it should be noted there still remains a significant cumulative gap in affordable units at or below the 120% of median income of 3,283 owner units because of the significant gap at and below the 100% of median household income

level. These results indicated the potential owners at or below the 100% median household income level in the Town of Barnstable have had a difficult time finding affordable single-family units that they could afford without becoming “housing cost stressed,” for example paying more than 30% of their monthly household income on housing costs (mortgage payments, utilities, insurance, and taxes).

Table 5.11 Town of Barnstable-Estimated Affordability Unit Gap, Calendar Year 2015

Town of Barnstable-Estimated Affordable Gap for Owner Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income	\$34,647	\$55,435	\$69,294	\$83,153	
Affordable Price	\$115,524	\$196,730	\$251,591	\$306,575	
Estimated Unit Demand	3,356	2,556	1,876	1,415	6,314
Estimated Unit Supply	570	997	1,792	2,560	9,598
Affordability Gap in Units (demand minus supply)	2,787	1,558	83	-1,145	
Cumulative Demand	3,356	5,912	7,788	9,203	15,517
Cumulative Supply	570	1,567	3,360	5,919	15,517
Cumulative Gap	2,787	4,345	4,428	3,283	
Town of Barnstable-Estimated Affordable Gap for Renter Units, 2015					
% of Median Household Income	50%	80%	100%	120%	>120%
Income	\$15,080	\$24,128	\$30,160	\$36,192	
Affordable Rent	\$377	\$603	\$754	\$905	
Estimated Unit Demand	1,466	797	395	342	2,338
Estimated Unit Supply	483	441	192	487	3,736
Affordability Gap in Units (demand minus supply)	983	357	203	-145	
Cumulative Demand	1,466	2,264	2,659	3,001	5,339
Cumulative Supply	483	924	1,116	1,603	5,339
Cumulative Gap	983	1,340	1,543	1,398	

Similarly, the estimated calendar year 2015 renter-unit gap is calculated using the number of rental units demanded at each income level (based on the number of renter-occupied households) less the supply of year-round renter units (provided by the 2015 Five-Year ACS). The affordable price points for the renter income levels were determined previously in the renter affordability calculations for calendar year 2015. The renter supply data is sourced from the 2015 Five-Year ACS “Rental Units Available by Bedroom” data for renter-households within each municipality and the county as a whole, revised to reflect the total rental units.

For example, for renters at 100% of median renter-occupied household income in the Town of Barnstable, the affordable gross rent (including rent and utilities) was determined to be \$754 per month. The rental unit demand at and below the 100% median household income level is 2,659 rental units, compared to 1,116 rental units in the year-round (non-seasonal) supply in the Town of Barnstable, resulting in the cumulative gap of 1,543 units. For renters, these results indicate the renters at or below the 100% median renter-occupied household income level will have a challenging time finding affordable rental units due to the large cumulative affordability gap (1,543 units).

These calculations for renter and owner supply, demand, and the estimated gap between supply and demand, were repeated for each municipality in the county. The gap analysis for the county was calculated first as a sum of all the municipalities and then a separate analysis of the ACS data for the county. The estimated gap for calendar year 2015 was also calculated for each region of the Cape by summing the data for the municipalities that comprise the Upper Cape, Mid Cape, Lower Cape, and Outer Cape.

Town of Barnstable Affordability Gap – Calendar Year 2025

The owner supply for calendar year 2025 in each municipality and the county as a whole was estimated using 2015 ACS data for value of owner-occupied housing units, and then escalated using the FHFA All-Transactions Home Price Index forecast from Moody's December 2016 Forecast for the county, with the assumption of an even distribution among each bracket of unit value. The totals were then revised to reflect the owner forecast.

Renter supply for calendar year 2025 is estimated using 2015 ACS data for "Gross Rent" for renter-occupied units (exclude units with no cash rent) and was increased through calendar year 2025 using the most recent the five-year average of CPI-All Urban "Rent of Primary Residences") plus one-half of one percent to more closely reflect the forecasted tighter rental and owner housing market conditions for the county overall—versus the U.S. economy as a whole. The totals were then revised to reflect the renter forecast.

The owner and renter demand for calendar year 2025 in each municipality and the county as a whole was estimated using 2015 ACS data for "Income by Tenure" and escalated using differing rates based off the median income forecast for each municipality and tenure type. These numbers were again revised to reflect the total forecasted owner/renter units.

Table 5.12 Town of Barnstable-Estimated Affordability Unit Gap, Calendar Year 2025

Town of Barnstable-Estimated Affordable Gap for Owner Units, 2025					
% of Median Household Income	50%	80%	100%	120%	>120%
Income	\$38,708	\$61,932	\$77,416	\$92,899	
Affordable House Price	\$102,296	\$176,579	\$226,028	\$275,594	
Estimated Unit Demand	3,483	2,653	1,947	1,470	6,554
Estimated Unit Supply	293	204	262	396	14,951
Affordability Gap in Units (demand minus supply)	3,190	2,449	1,685	1,073	
Cumulative Demand	3,483	6,136	8,083	9,552	16,106
Cumulative Supply	293	497	759	1,155	16,106
Cumulative Gap	3,190	5,638	7,323	8,397	
Town of Barnstable-Estimated Affordable Gap for Renter Units, 2025					
% of Median Household Income	50%	80%	100%	120%	>120%
Income	\$15,403	\$24,645	\$30,806	\$36,967	
Affordable Gross Rent	\$385	\$616	\$770	\$924	
Estimated Unit Demand	1,521	828	410	355	2,428
Estimated Unit Supply	312	333	217	181	4,499
Affordability Gap in Units (demand minus supply)	1,209	495	193	174	
Cumulative Demand	1,521	2,349	2,759	3,114	5,542
Cumulative Supply	312	645	862	1,043	5,542
Cumulative Gap	1,209	1,704	1,897	2,071	

Table 5.12 shows the calendar year 2025 gap analysis for renters and owners at each income category for the Town of Barnstable (as the example municipality). Based on the number of owner households at or below the 100% median household income level, the analysis estimated that there will be cumulative demand on the market for approximately 8,083 owner housing units in calendar year 2025 and only a cumulative supply of 759 housing units. There was therefore an estimated cumulative gap of 7,323 units needed to meet the demand in the market of the Town of Barnstable for owner housing units in calendar year 2025 at or below the 100% of median household income for owner-occupied units. This difference was calculated by the number of units demanded less the estimated supply of year-round owner units.

The cumulative renter unit demand at the 100% median household income level for a renter-occupied household is 2,759 renter units, compared to 862 cumulative renter units in the year-round supply in the Town of Barnstable. The resulting gap of 1,897 year-round rental units was estimated to be the total needed to meet the demand in calendar year 2025 at the 100% of the median renter household income.

CHAPTER 6: INTERPRETATION OF FINDINGS

Assessment of the Housing Wage for Barnstable County, Town of Barnstable, Falmouth, Orleans, and Provincetown

This supplemental analysis is provided to help connect the abstract concept of housing affordability to the region’s labor market. In order to accomplish this, earnings in selected job sectors (known as sectors as delineated in the North American Industry Classification System or “NAICS”) in the county were compared to the earnings necessary to affordably own an average-priced owner housing unit or to be able to affordably pay rent on a renter unit available in the local-regional housing market. This was accomplished using wage data from the Bureau of Labor Statistics’ Quarterly Census of Employment and Wages (QCEW). This data set allows comparison between average wages and salaries in a number of the economy’s economic sectors in the regional labor market and to the household income levels necessary to live in the region or locale without experiencing a more than 30% housing cost burden for the household.

The Massachusetts Department of Labor and Workforce Development, in cooperation with the U.S. Bureau of Labor Statistics, conducts the QCEW census every quarter for employers “covered” under the state’s unemployment insurance program (“UI”). The QCEW is part of the quarterly UI filing by employers and requires employers report the number of employees and the total wages paid during the preceding quarter. The data used in assessment includes the average wage-salary paid in each major economic sector for the county and each municipality where data is available for calendar year 2015. The wage-salary is an average, which in this case refers to the “arithmetic mean” salary-wage paid to workers in each sector in each geographic region. This means very high and very low wages-salaries paid can have a significant impact on the “average” wage or salary. Although the median wage-salary by sector by geographic region may be preferred by some, this statistic is not available or routinely published by the U.S. Department of Labor, and this analysis had to employ the arithmetic mean.

Relating Earnings to Housing Affordability:

Housing affordability, or evidence of housing cost stress, is typically measured by the proportion of income used to pay for the cost of housing in an area. If more than 30% of a household’s income goes to renter housing costs (including rent and utilities) or owner housing costs (including mortgage payments, utilities, taxes, and insurance), then a household is determined to be “housing cost stressed” or “housing cost burdened” using widely accepted guidelines from the U.S. Department of Housing and Urban Development (known as HUD). For owners, the gap between income and home prices is typically measured by comparing household income needed to afford a median priced home without exceeding the 30% housing cost stress threshold. This study relates QCEW wage estimates to typical owner housing costs (including mortgage payments) in the county and for four major representative municipalities (where the most complete QCEW data

exists), for each of the four study regions.¹⁴ For renters, this analysis focuses on average wages-salaries paid to workers by major sector in comparison to the median renter housing costs for the county as a whole and for each representative town in the four study regions.

The housing wage concept is useful for assessing the potential for a single-earner household to be housing cost burdened. Because today's economy typically includes many households with more than one earner (e.g. households where both parents are working and therefore are participating in the regional labor force), a straight-forward housing wage comparison is in many ways a worst-case housing affordability scenario. This study uses earnings multiples for sector-by-sector comparison purposes for both one- wage-earner and two-wage earner households.

Defining the Housing Wage:

The housing wage figure used in the analysis for owners is the amount of household income per year required to afford a median priced house including the mortgage amount (assuming 5% down), property tax, private mortgage insurance, and housing insurance in the county and each of the four selected towns divided by 2,080 work hours per year (40-hour work week times 52 weeks per year).

For renters, the housing wage is the amount of household income per year required to afford a median gross rent priced apartment in the county and each of the four towns. Workers earning above the housing wage are considered able to affordably rent. While income includes payments from sources other than wages such as capital gains and dividends from equities and other securities, the households of interest in this study (those at 120% or less of median income) receive most of their income from wages.

County Housing Wage Analysis

County Average Renter Housing Wage

Figure 6.1 and 6.2 indicate that workers at three of the top seven sectors in the county earn average wages which would leave a single earner household potentially house cost burdened. It should be emphasized that these are average figures; many workers in the sectors where the average is only barely above the housing wage likely earn wages below the housing wage. The gap between wages in the administration & waste services, retail trade, and accommodation & food services sectors suggests single-earner households in these industries would likely be house cost burdened.

¹⁴ For this analysis, the four study regions are the Upper Cape region (comprised of the towns of Bourne, Falmouth, Mashpee, and Sandwich—where Town of Falmouth was the representative municipality), the Mid-Cape region (comprised of the towns of Barnstable, Yarmouth, and Dennis—where the Town of Barnstable was the representative municipality), the Lower Cape region (comprised of the towns of Brewster, Harwich, Chatham, and Orleans-- where Orleans was the representative municipality), and the Outer Cape region (comprised of the towns of Eastham, Wellfleet, Truro, and Provincetown—where Provincetown was the representative municipality).

Additionally, it is possible that wages from tipping in the accommodation sector are under reported, exaggerating the magnitude of the gap.

Figure 6.1 Average Wages by Sector and Renter Housing Wage

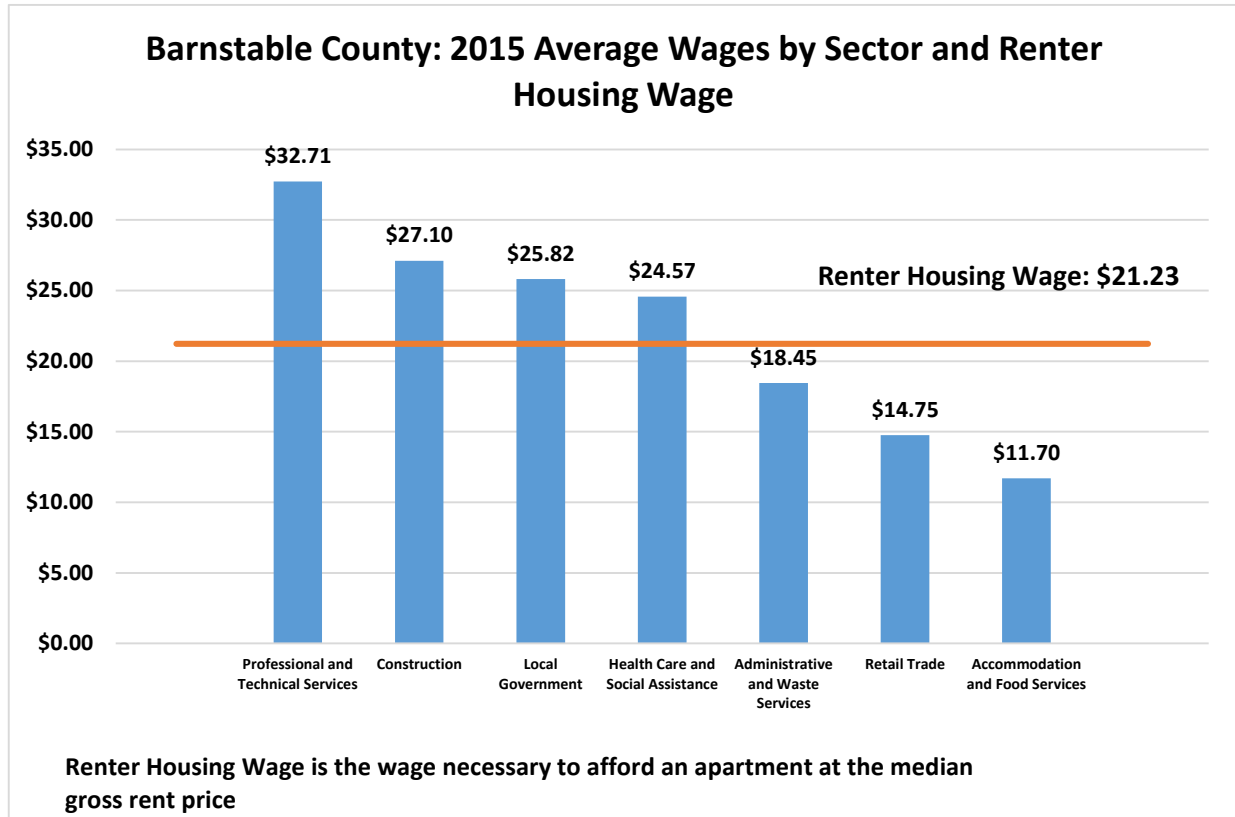
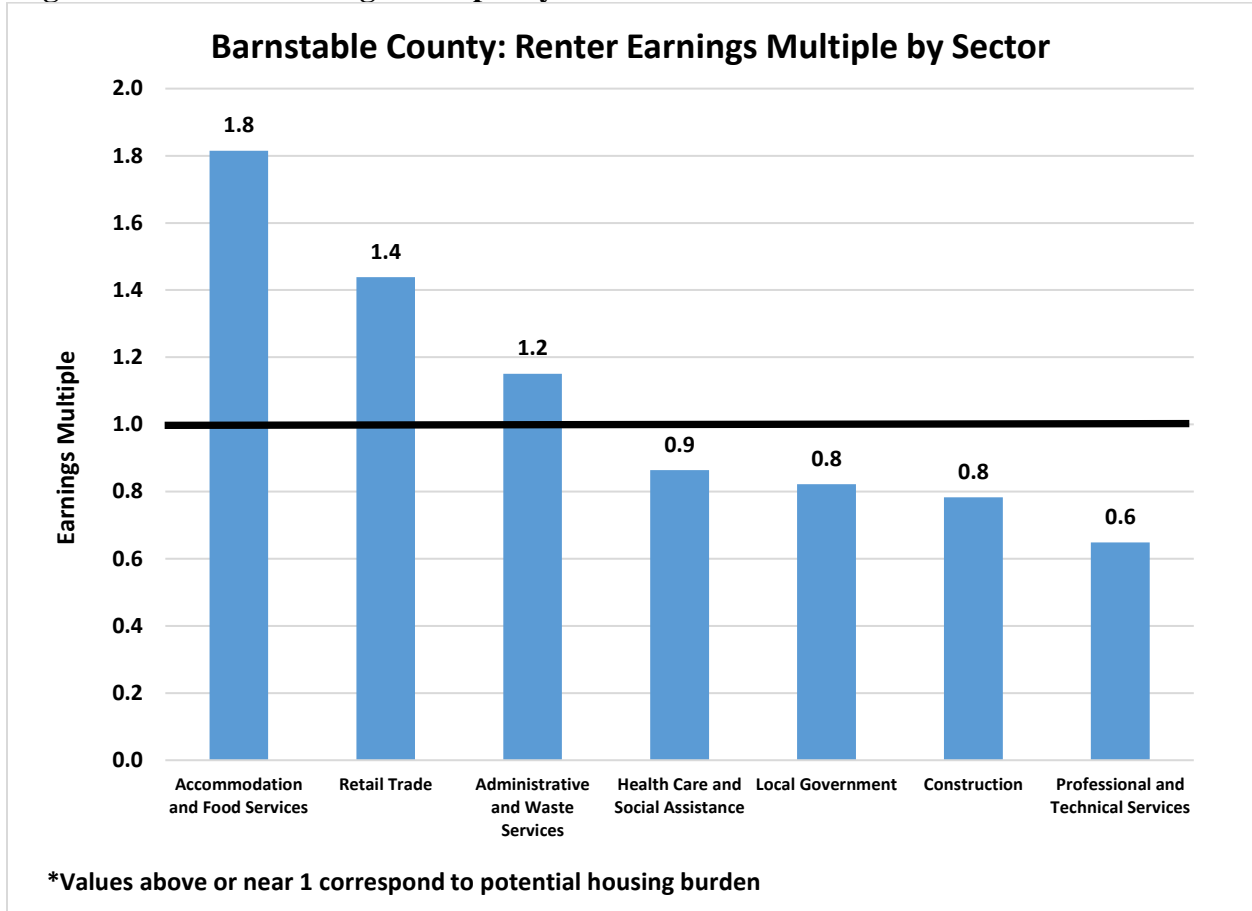


Figure 6.2 Renter Earnings Multiple by Sector



When the data are analyzed from the earnings multiple perspective, it is clear that in calendar year 2015 the average worker in the highest-paying major employment sectors in the town (such as Professional and Technical Services, Construction, Local Government, and Healthcare and Social Assistance) appeared likely able to affordably rent a housing unit without being housing cost stressed in calendar year 2015. However, with earnings multiples at 0.8 to 0.9 three of those industries (the exception being Professional and Technical Services) likely have many workers who earn less than the average wage who are unable to affordably rent. Those in the lower-paying employment sectors would require two or more household members with average earnings in those sectors to exceed the minimum housing wage affordability threshold—and therefore have sufficient household income to be able to afford the housing costs of such units without experiencing housing cost stress.

County Average Owner Housing Wage

The gap between the owner housing wage and average wage level of many sectors in the county indicates that owning a home in calendar year 2015 in many cases is beyond the means of the single earner, and indeed for many households with two wage earners. Average wages in all of the top seven NAICS sectors is insufficient to meet the requirements of the owner housing wage; and it appears that only the highest paid employees within the county’s major employment categories would be able to afford to own a house in calendar year 2015.

Figure 6.3 Average Wages by Sector and Owner Housing Wage

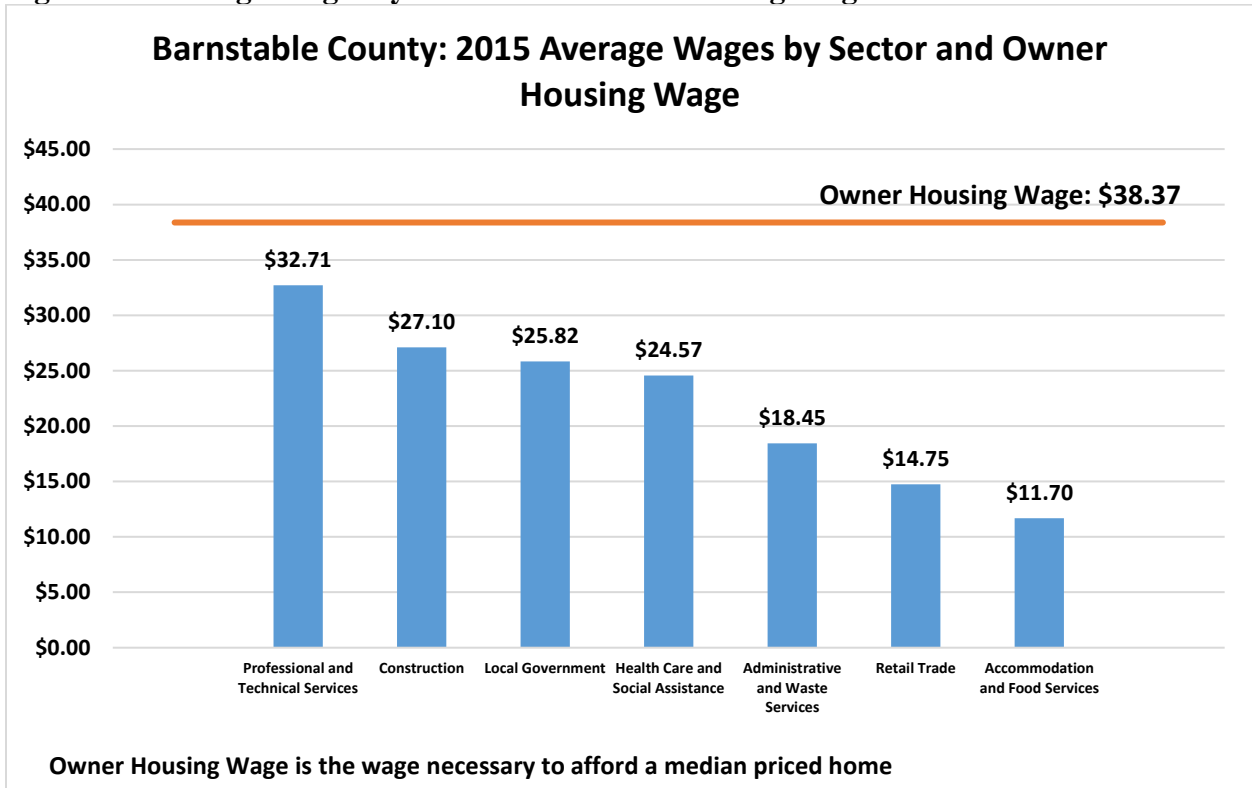
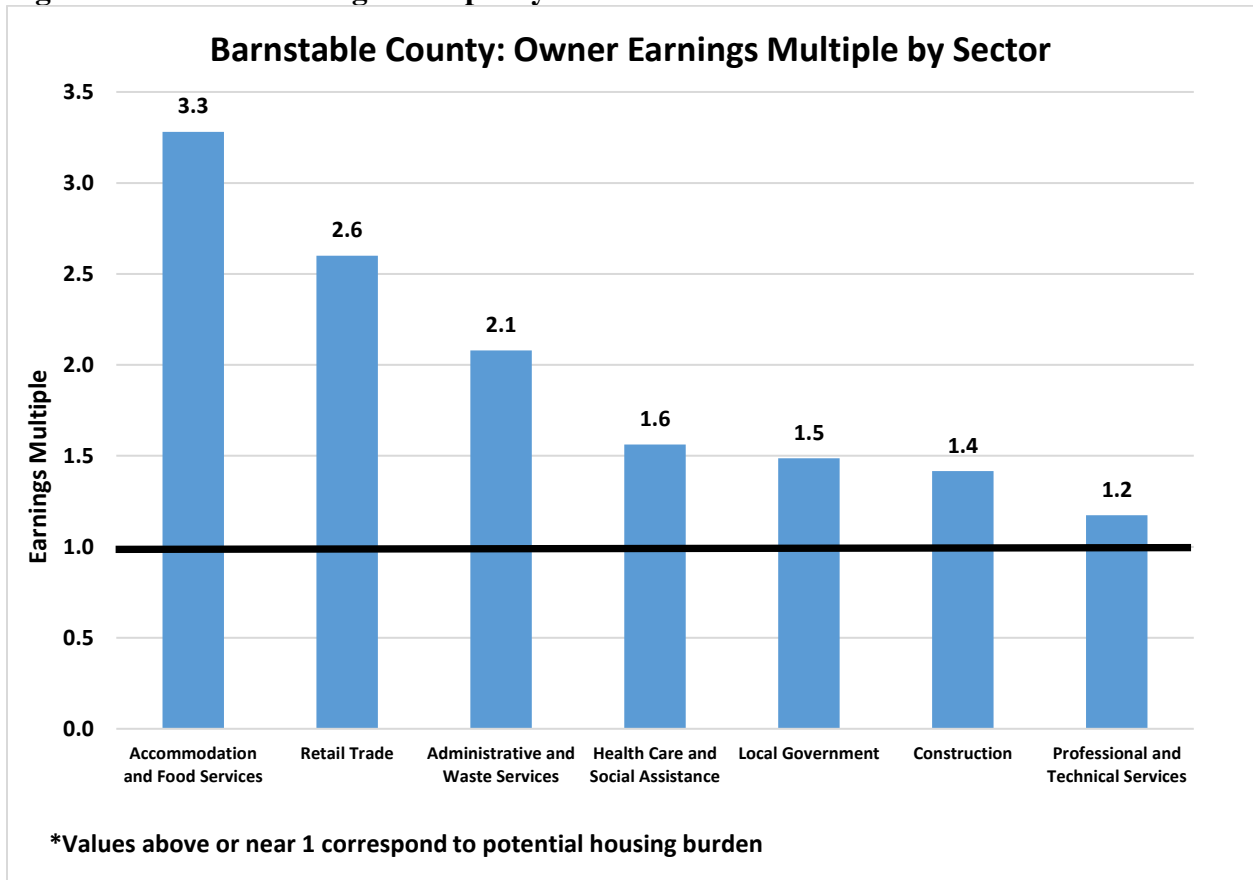


Figure 6.3 Owner Earnings Multiple by Sector



The multiple-earner analysis suggests that average wages in the lowest-paying sectors also fail to provide adequate income for even a two-earner household to afford the housing cost burdens of a median-priced house. With an earnings multiple of 3.3, wages from Accommodation and Food Services would require more than three full-time workers per household to be able to afford to live in a median priced house “stress free.” The analysis also indicates that average wages in the county are not high enough to provide single-earner households even in the highest-paying industries with the household income necessary to be able to afford the housing costs of owning a housing unit without experiencing housing cost stress at the 30% level of household income. In fact, in the highest-paying sector (Professional and Technical Services), with an earnings multiple of 1.2, a single-earner household would have to earn at least 20% more than the average to afford a median-priced home.

Town of Barnstable—Representative Municipality of the Mid-Cape Region

Town Renter Housing Wage

Average wages paid at the Town of Barnstable’s employers by major NAICS sector were all near or well below the renter housing wage for the town on average in calendar year 2015. While it is again likely that wages in the hospitality sector (in this case Accommodation and Food Services) from tipping and other cash sources are undercounted, the average wage in this NAICS sector category was still less than half that needed to affordably rent a housing unit in the Town of Barnstable, suggesting these workers are highly cost burdened for renter units. From these results, most workers in the Town of Barnstable’s largest employment sector categories are therefore not earning a sufficient wage for households to be able to pay the estimated costs of living in such units without significant levels of housing cost stress—assuming that households primarily rely on earnings to pay their housing costs, especially if they earn less than the average wage in their industry sector.

Figure 6.5 Average Wages by Sector and Renter Housing Wage

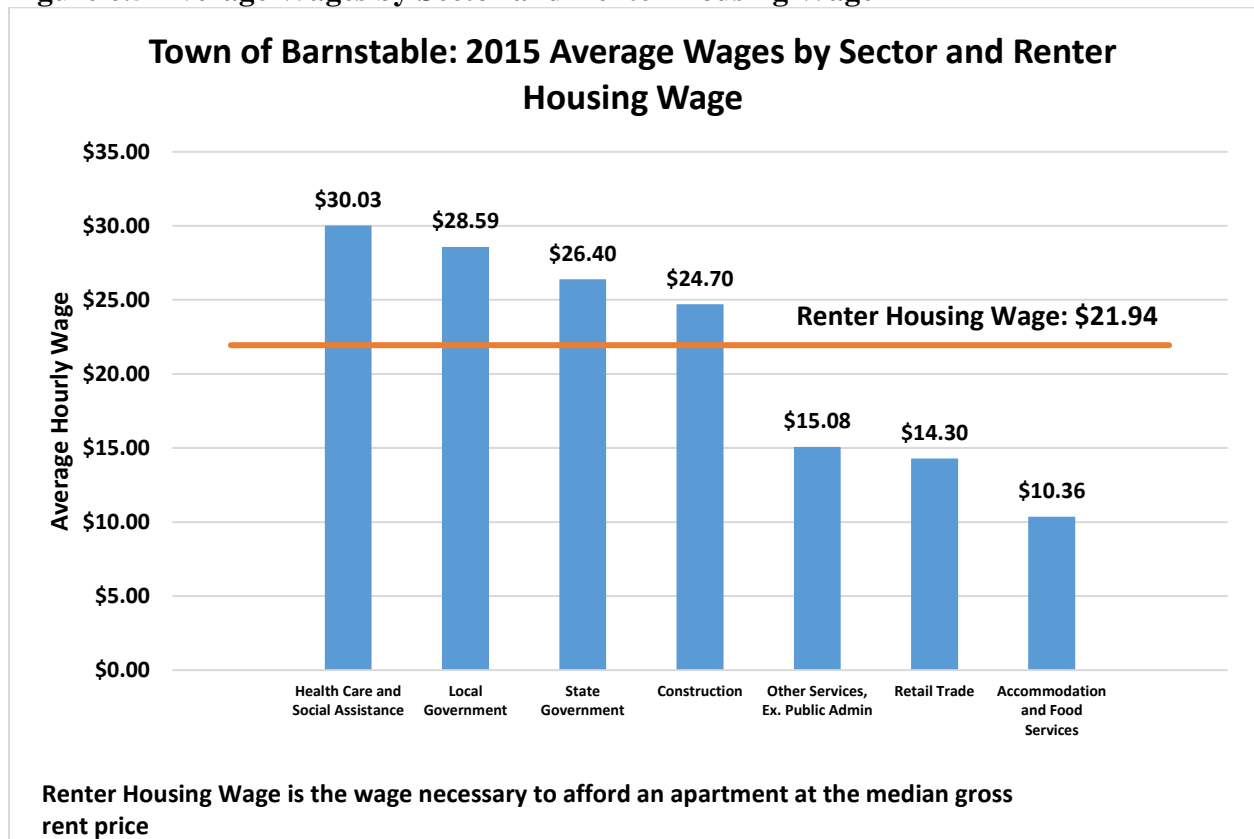
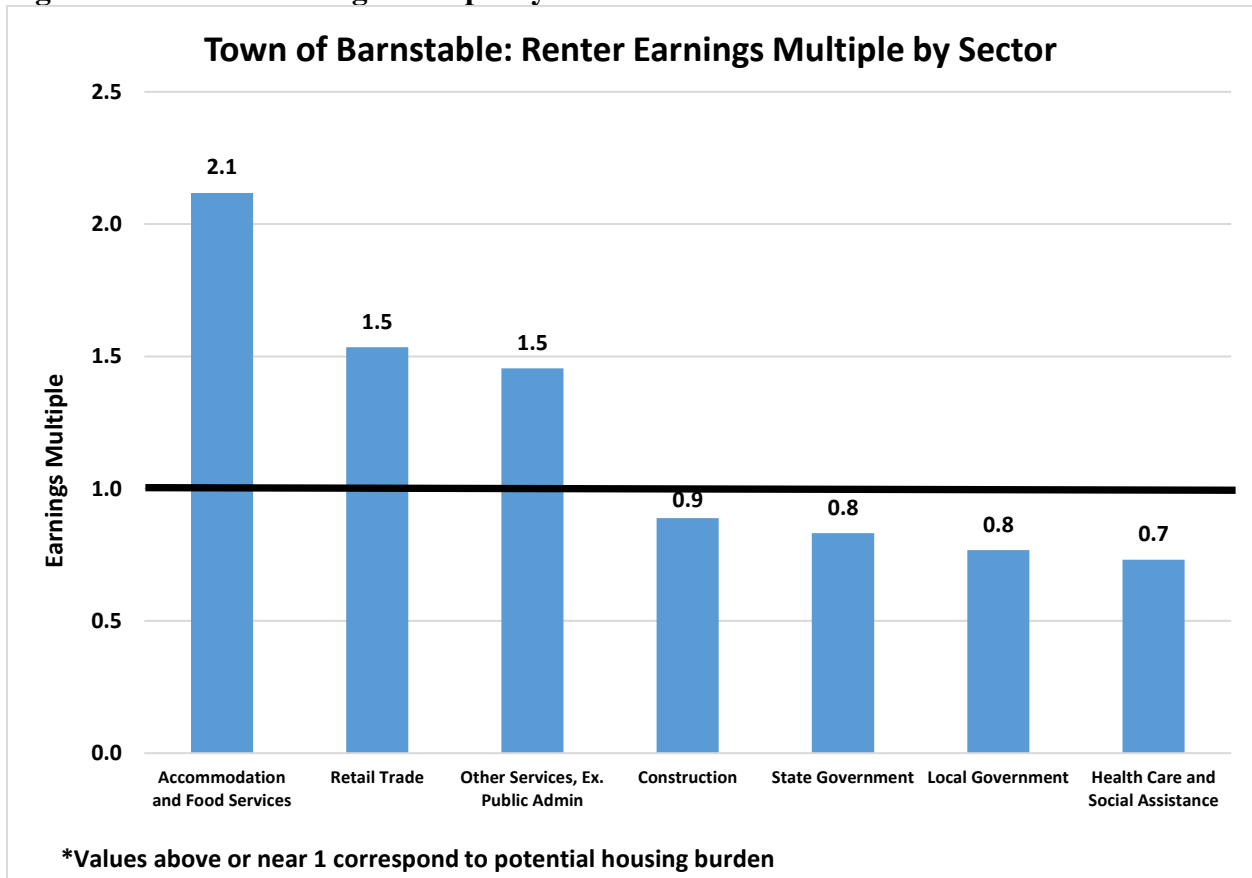


Figure 6.4 Renter Earnings Multiple by Sector



When the data are analyzed from the earnings multiple perspective, it is clear that in calendar year 2015 the average worker in the highest-paying major employment sectors in the town (such as Accommodation and Food Services, Retail Trade, and Other Services, Ex. Public Admin) appeared likely able to affordably rent a housing unit without being housing cost stressed. However, with earnings multiples at 0.8 to 0.9, three of those industries (the exception being Accommodation and Food Services) are likely to have many workers who earn less than the average wage who are unable to affordably rent because of how close they are to the earnings multiple threshold of 1.0. Those in the lower-paying employment sectors would require two or more household members with average earnings in those sectors to exceed the minimum housing wage affordability threshold—and therefore have sufficient household income to be able to afford the housing costs of such units without experiencing housing cost stress.

Town Owner Housing Wage

Typical wages paid in Town of Barnstable across all major employment sectors in the town were well below the affordable owner housing wage level; indicating that most single-earner households in the town would not be able to afford the owner housing costs associated with a median priced owner unit in the town in calendar year 2015. Average wages paid to covered workers in the bottom three industry categories earned less than half of the owner housing wage level in calendar year 2015, indicating that even dual-earner households in these economic sectors would still be unable to afford a median-priced home without experiencing housing cost stress.

Figure 6.5 Average Wages by Sector and Owner Housing Wage

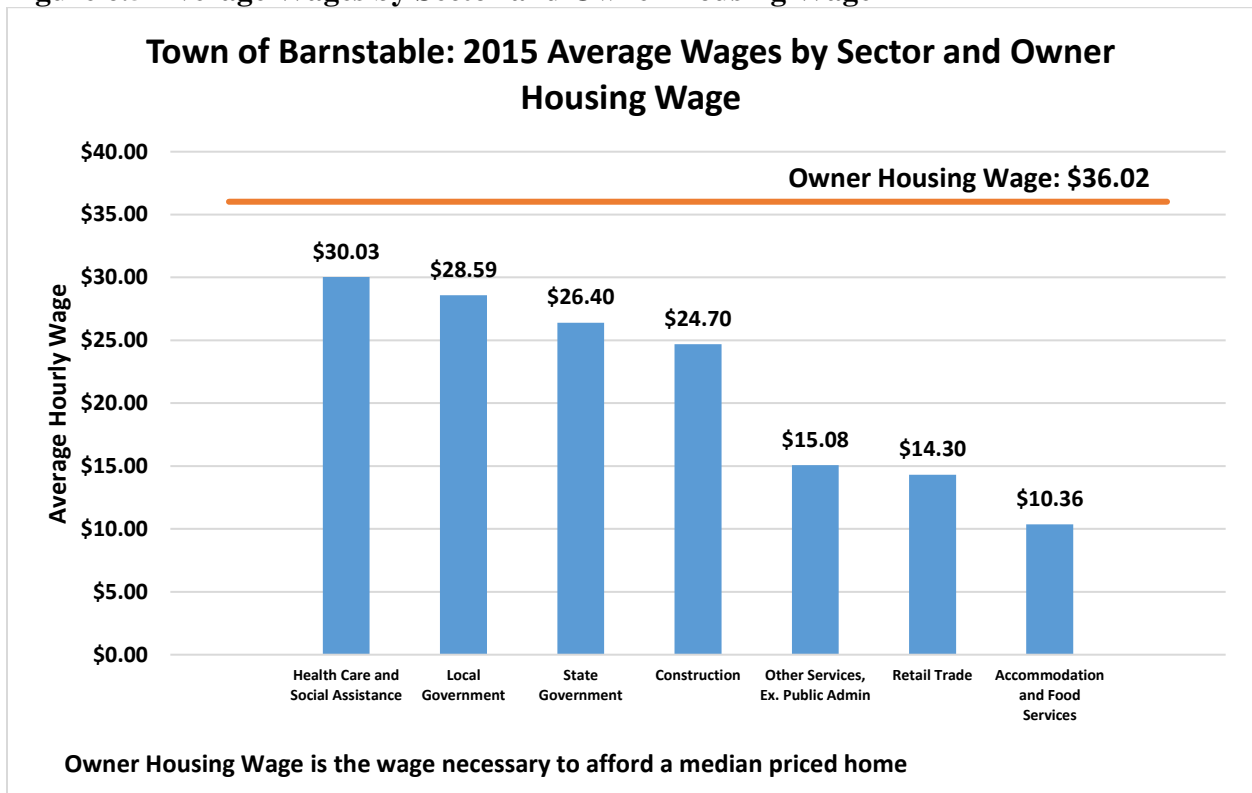
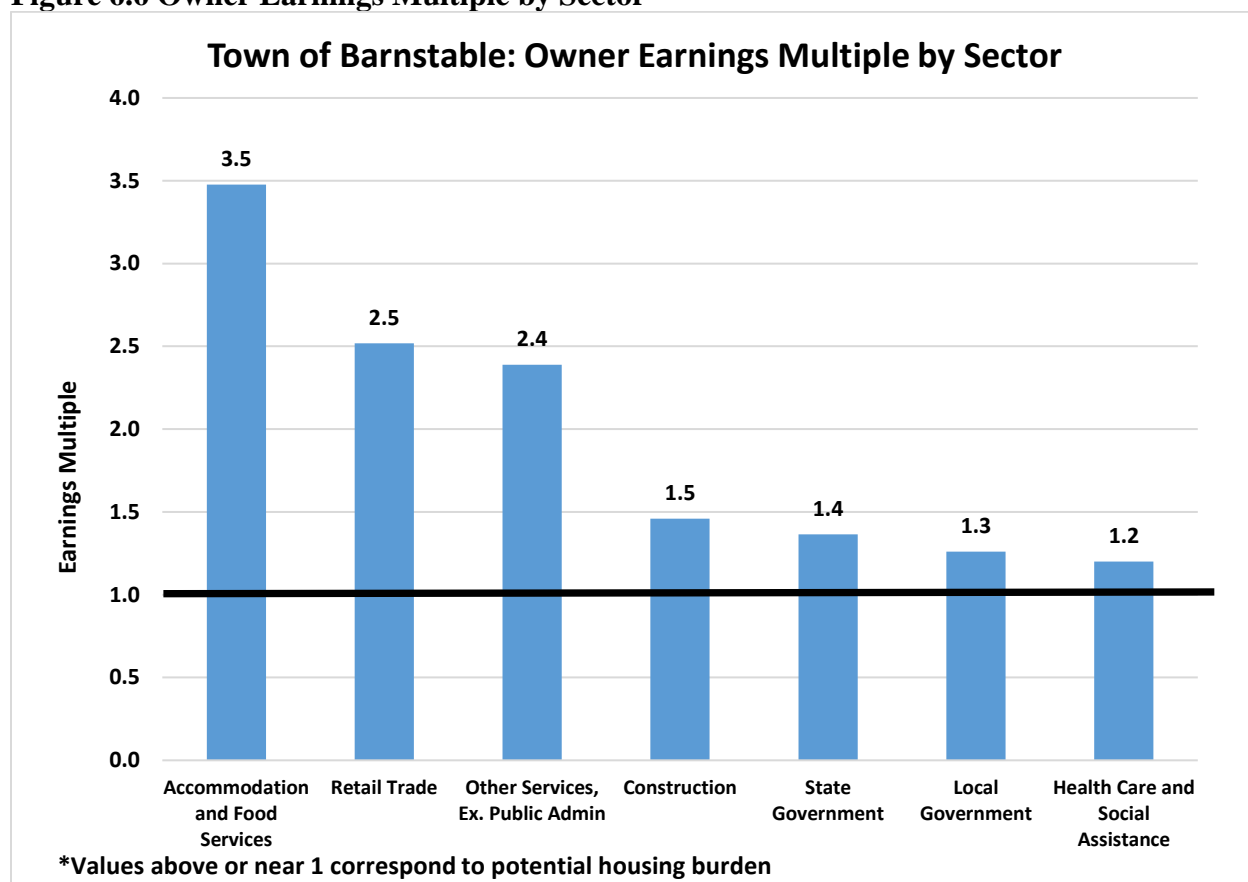


Figure 6.6 Owner Earnings Multiple by Sector

The multiple wage earner household analysis also showed that all of the top seven employment sectors paid average wages that were below the level that was needed for a single-earner household to afford an owner unit in the town without being housing cost burdened in calendar year 2015. Similarly, the analysis indicates that the lowest-paying of these NAICS employment sectors (Accommodation and Food Services), with an earnings multiple of 3.5, would have required more than three earners in the household in order to afford a median-priced home without experiencing housing cost stress in calendar year 2015.

Town of Falmouth—Representative Municipality of the Upper Cape Region

Town Renter Housing Wage

Average wages at Falmouth's largest NAICS employment categories overall looked to be slightly higher than the average wages paid in those sectors for the county as a whole. While the housing wage level for the town was similar to that in profile for many other towns, average income in two of the top seven employment sectors in calendar year 2015 fell below the level needed to meet or exceed the average housing wage needed to avoid being housing cost stressed in calendar year 2015. Three of the other significant employment categories (including the Local Government,

State Government, and Health Care and Social Assistance NAICS sectors) paid wages at a level that was just barely above the town’s estimated housing wage level, suggesting that those who make less than average wages in those industries may also be housing burdened even if the average wage was somewhat above the average housing wage in calendar year 2015.

Figure 6.7 Average Wages by Sector and Renter Housing Wage

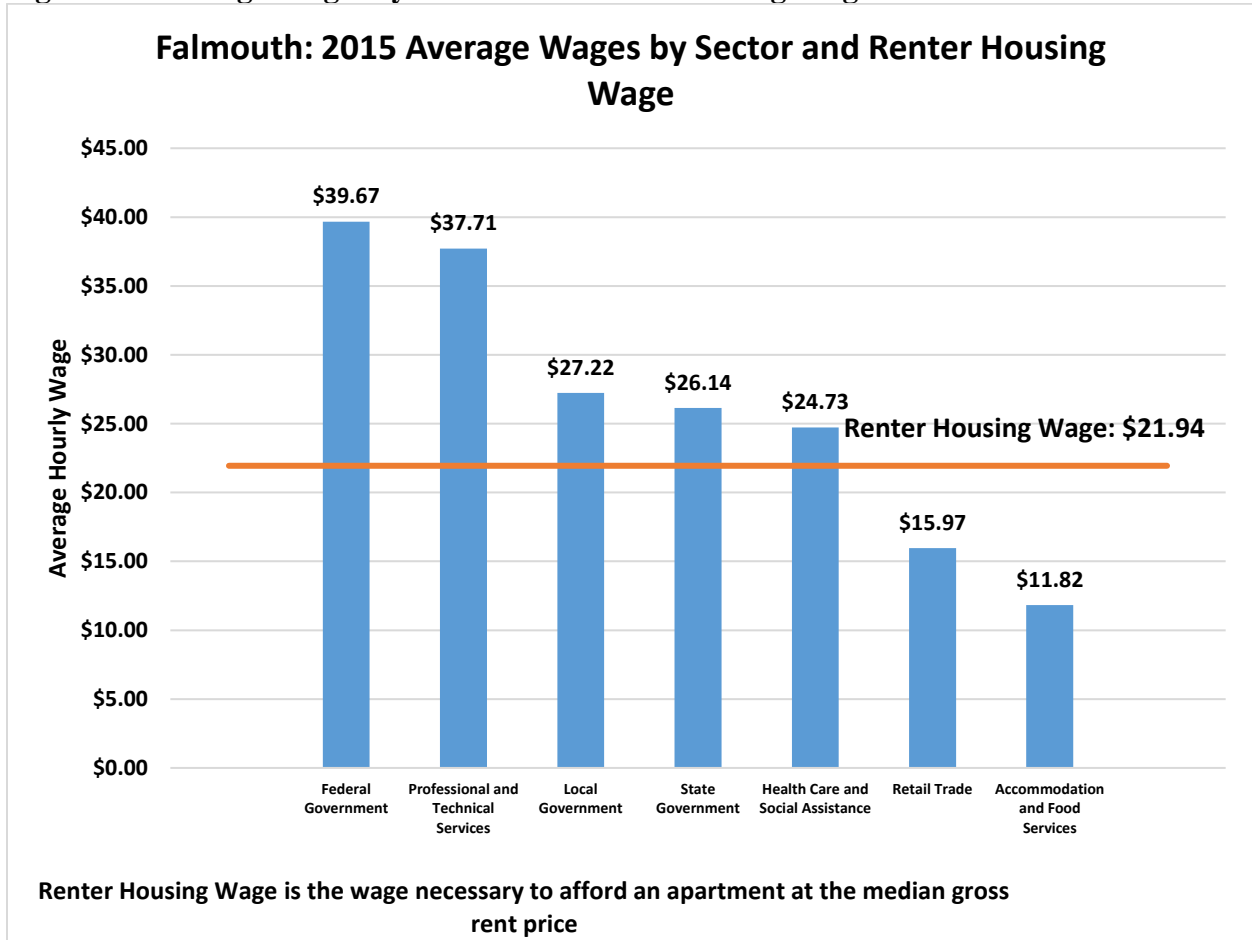
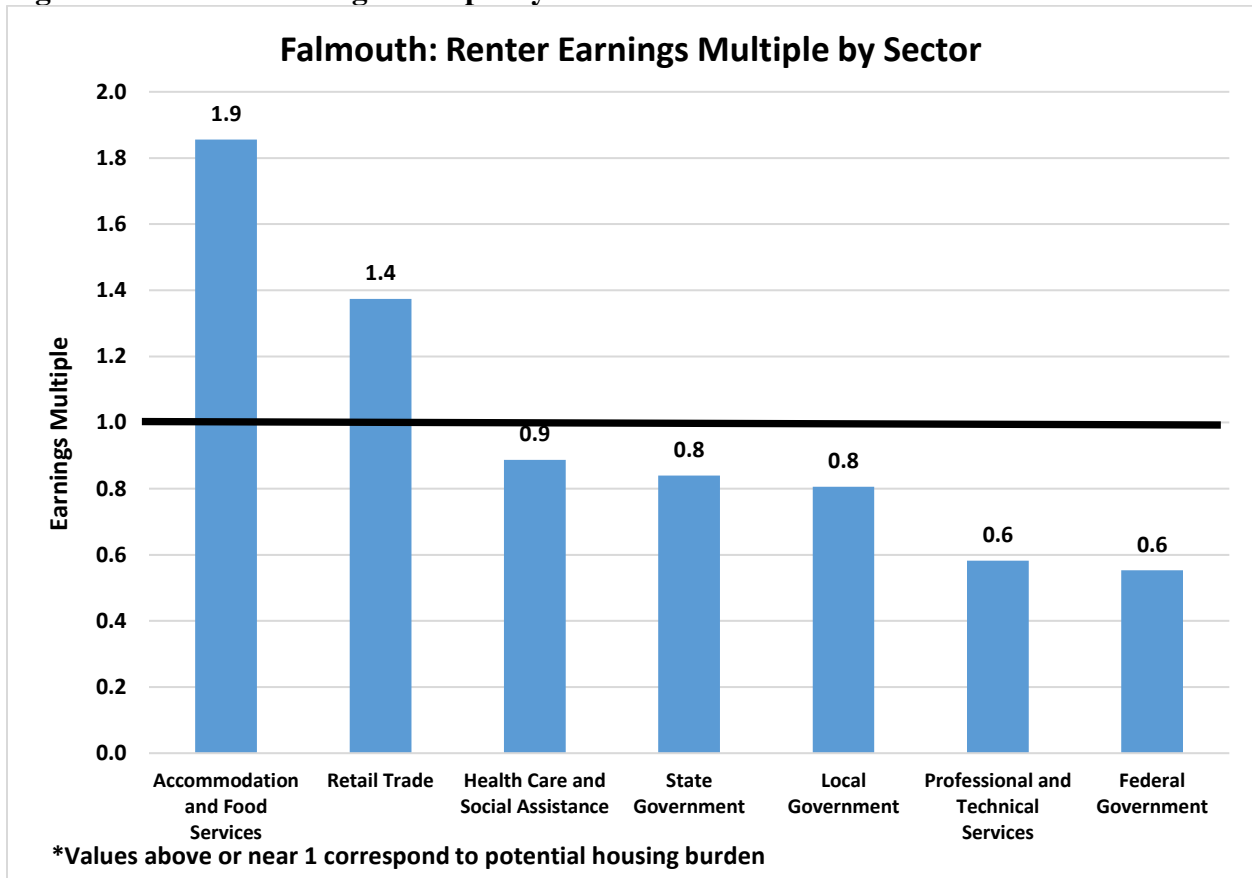


Figure 6.8 Renter Earnings Multiple by Sector



Multiple earner analysis indicates results that were similar to those for the county as a whole, where most of the major NAICS employment sectors appeared to have paid average wages at a level that would have enabled households in either one or two earner households to pay renter housing costs without becoming housing cost burdened. However, the margin is not wide, and even though many households would not be cost burdened, there still were likely many households within those NAICS employment categories that were house cost burdened because they received wages that were less than average in 2015. The data showed that clearly most workers in the five lowest paying industries are very likely housing burdened with earnings multiples of 0.8 or above.

Town Owner Housing Wage

Housing costs for ownership units in the town showed that it is unlikely that the job base in the town in calendar year 2015 was paid a sufficient wage to support “stress free” house ownership for typical single-earner households in the town—although the average wage paid in the Federal Government NAICS category was close to meeting the average housing wage for owners in the town. The owner housing wage was slightly higher than the housing wage county-wide on average in calendar year 2015. Despite these higher wages, affordable home ownership appeared out of reach for most owner households without being housing cost burdened in all seven of the biggest employment sector categories in the town. Two sectors paid average wages in 2015 that were

close to the town’s owner housing wage level, therefore it is likely that there will be a number of households with above average wages in 2015, making it likely that there were a number of households in those sectors receiving wages that were sufficient to pay the costs of homeownership without experiencing housing cost stress in calendar year 2015.

Figure 6.9 Average Wages by Sector and Owner Housing Wage

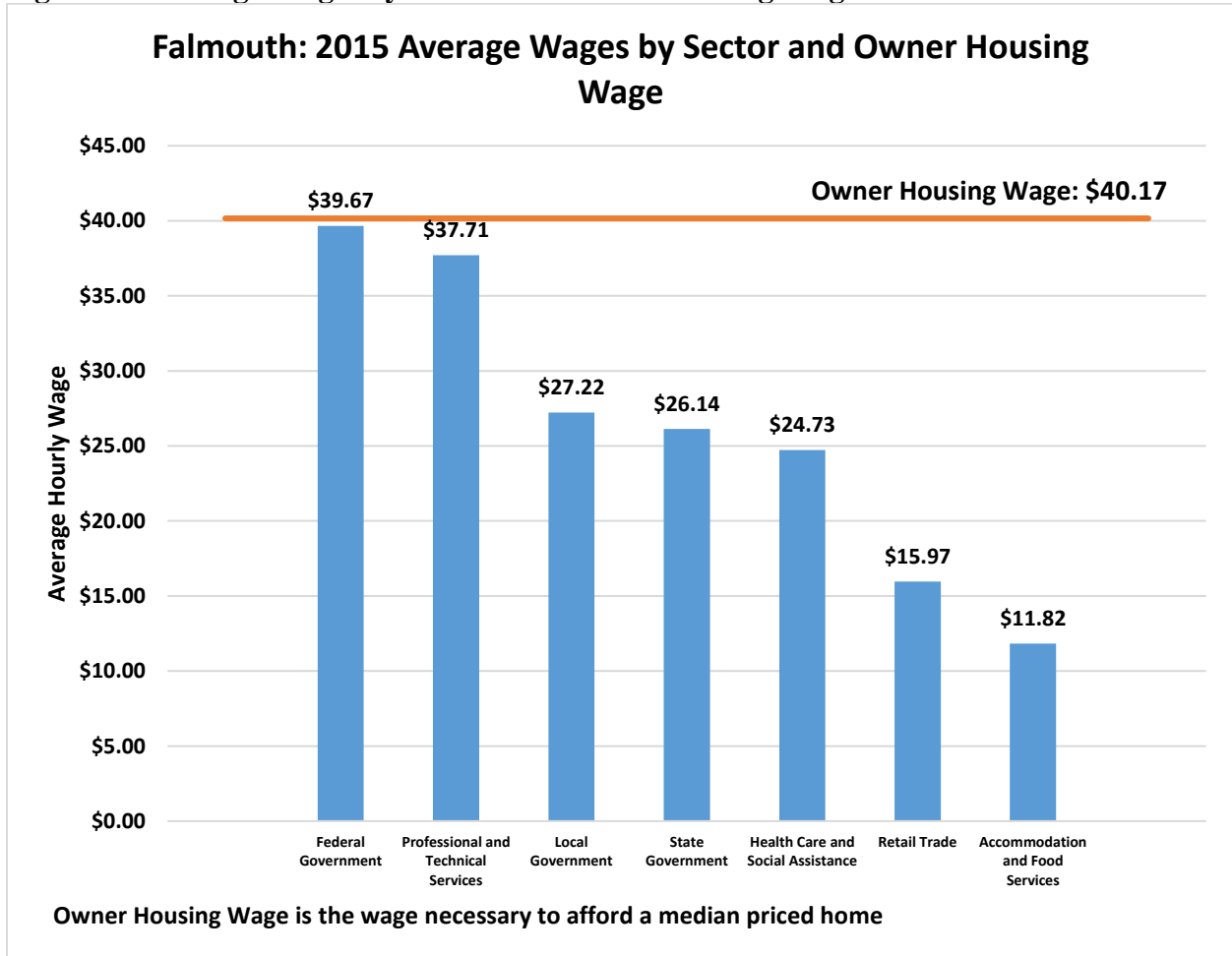
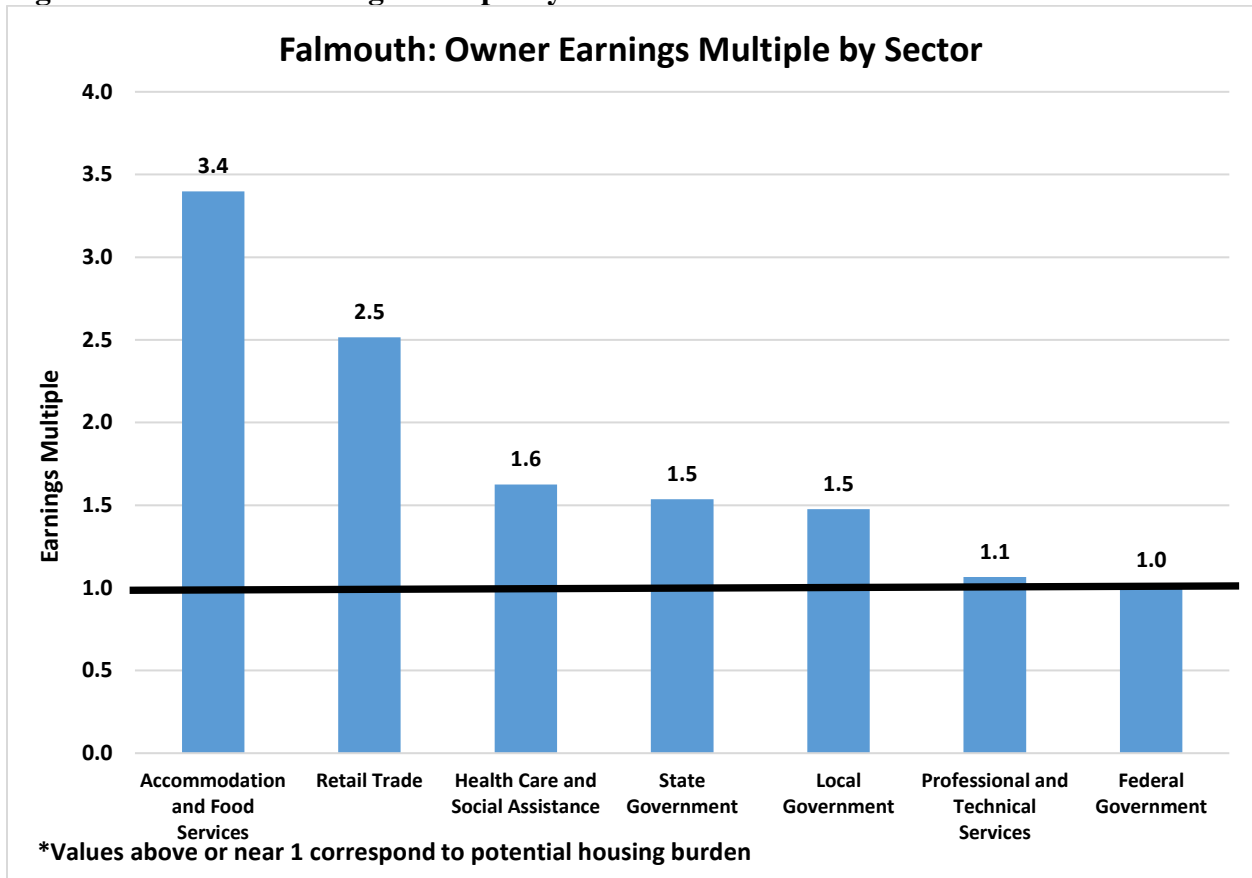


Figure 6.10 Owner Earnings Multiple by Sector



Multiple earner analysis shows that five of the seven sectors in Falmouth are paid average wages at a level that would allow a two-earner household to afford an owner unit without housing cost stress. However, those that make less than the average in any of the top seven industries in the town may be housing cost stressed even with two earners. As in the other areas in this study, the lowest paying of the major employment sectors (again, Accommodation and Food Services), with an earnings multiple of 3.4, paid wages in calendar year 2015 that were below the level needed for even a triple-earner household in that sector to be able to afford the housing costs associated with an owner unit without being housing cost stressed.

Town of Orleans—Representative Municipality of the Lower Cape Region

Town Renter Housing Wage

Average wages paid at Orleans’ major employers in calendar year 2015 were significantly higher than the average for the county as a whole while the renter housing wage in the town for that year was significantly lower. This situation resulted in workers in the Town who earned the average wage or higher in four of the seven largest employment sectors in 2015 were able to afford the housing costs associated with the median housing costs associated with renting in the town. Retail

Trade and the Accommodation and Food Services sectors were the key exceptions to that statement in 2015. As was the case in some of the other representative municipalities evaluated for the housing wage, the apparent gap for the Accommodation and Food Services was likely exaggerated as tips and other cash income likely experienced some underreporting in the town in those employment sectors.

Figure 6.13 Average Wages by Sector and Renter Housing Wage

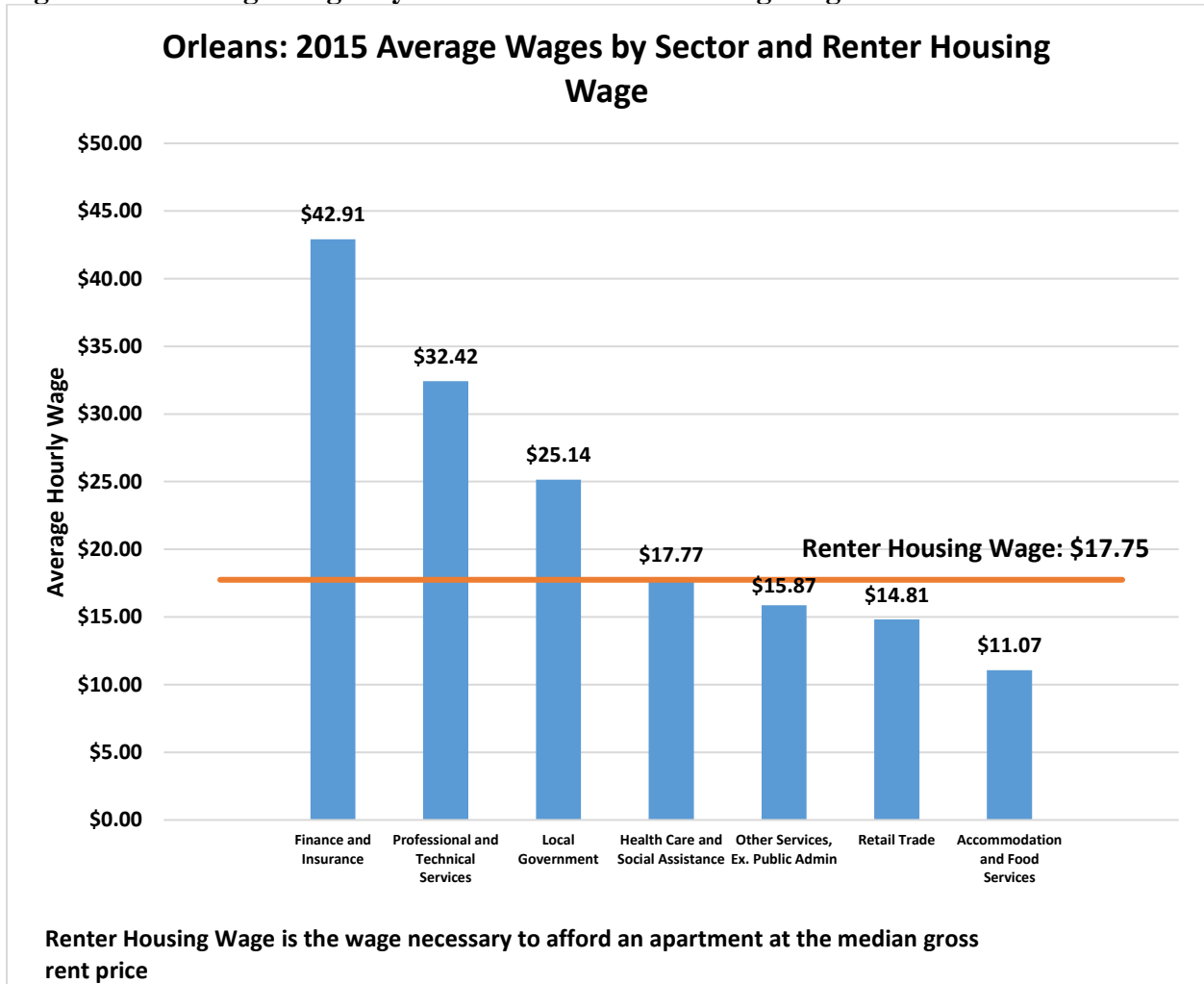
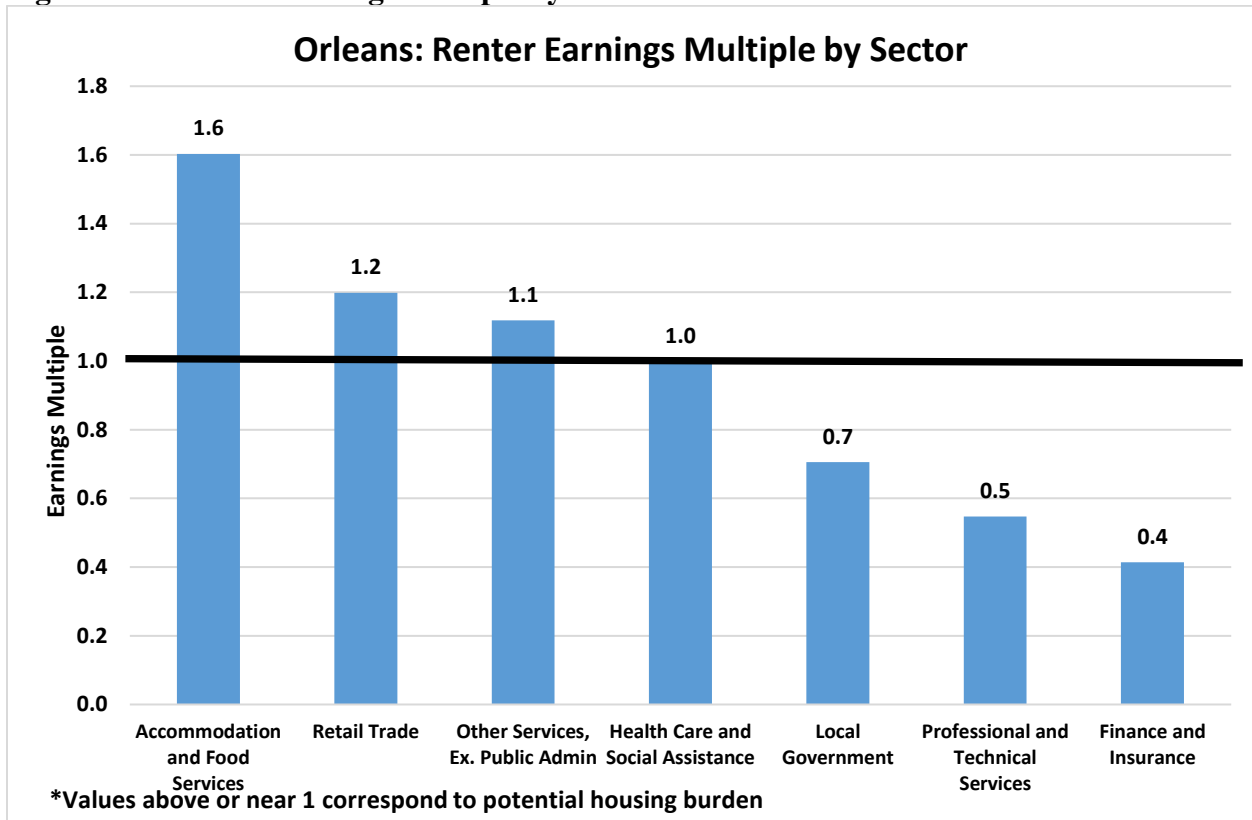


Figure 6.14 Renter Earnings Multiple by Sector



When the data are analyzed from the earnings perspective of multiple earner households, the data indicated that the average worker in the higher paying major employment sectors (such as Finance and Insurance, Professional and Technical Services, Local Government, and Healthcare and Social Assistance) were in many cases likely to afford the costs associated with renting in the town in 2015. The households with workers in the lower paying sectors would have required at least two earning household members to have been able to afford to pay the costs of renting in the town in 2015 without experiencing housing cost stress.

Owner Housing Wage

Average wages paid in the town in 2015 were well below the level needed to meet the owner housing costs for households in the town without experiencing housing cost stress despite the high wages in the town compared to the county. The data for the town indicated that most single-earner households in 2015 would have been unable to afford the housing costs associated with an owner unit in the town without being housing cost burdened. Average wages paid in 2015 in the lowest five NAICS industry employment categories were less than half of the owner housing wage in 2015. That indicated that that even two earner households would still have been unable to afford a median priced house without pushing through the threshold of housing cost stress.

Figure 6.15 Average Wages by Sector and Owner Housing Wage

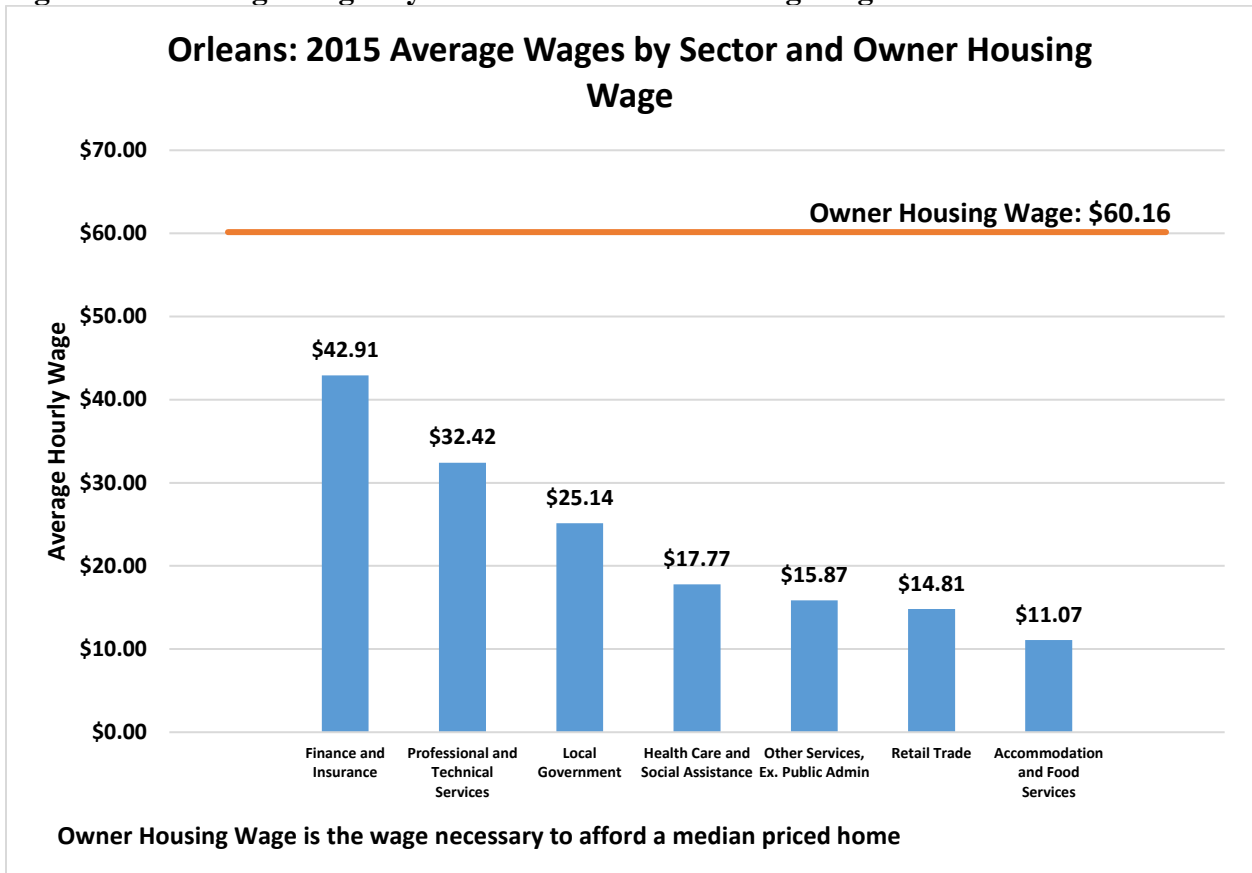
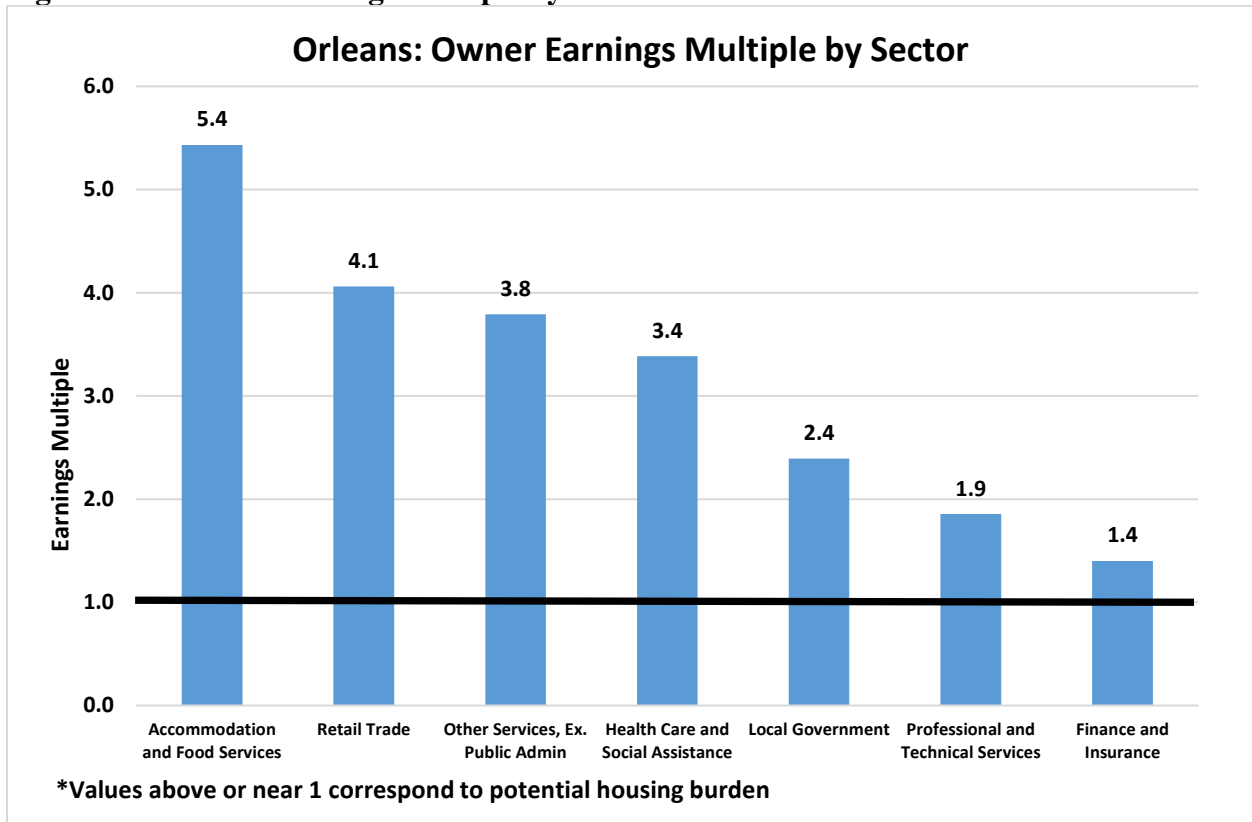


Figure 6.16 Owner Earnings Multiple by Sector



The analysis for multiple earner households in calendar year 2015 showed that all of the top seven NAICS employment sectors paid average wages that were below the level needed for a single-earner household in any of the largest employment sectors to meet the income required (as indicated by the owner housing wage) to own a unit in the town without housing cost stress. The data indicated that in 2015 the lowest paying of these NAICS sectors (Accommodation and Food Services), with an earnings multiple of 5.4, would have required more than five earners in the household to have been able to afford a median priced home without experiencing housing cost stress. In the highest paying of these NAICS sectors (Finance and Insurance), with an earnings multiple of 1.4, a single-earner household would still have to earn 40% more than the average wage to own a median priced unit in the town without housing cost stress-free.

Provincetown—Representative Municipality in the Outer Cape Region

Town Renter Housing Wage

The average wages paid by Provincetown’s major employers in 2015 were all near or below the minimum renter housing wage level. Overall, the QCEW data indicated that there was not much difference in average wage levels paid across the primary NAICS industry employment sectors in the town in 2015—with a difference of about \$7.00 to \$8.00 per hour between the lowest-paying

and highest-paying sectors. The relatively high number of relatively low wage jobs in the town in calendar year 2015 indicated that many employment categories' average wage levels in calendar year 2015 would be insufficient to enable most households in the town to avoid being housing cost stressed for renter units.

Figure 6.17 Average Wages by Sector and Renter Housing Wage

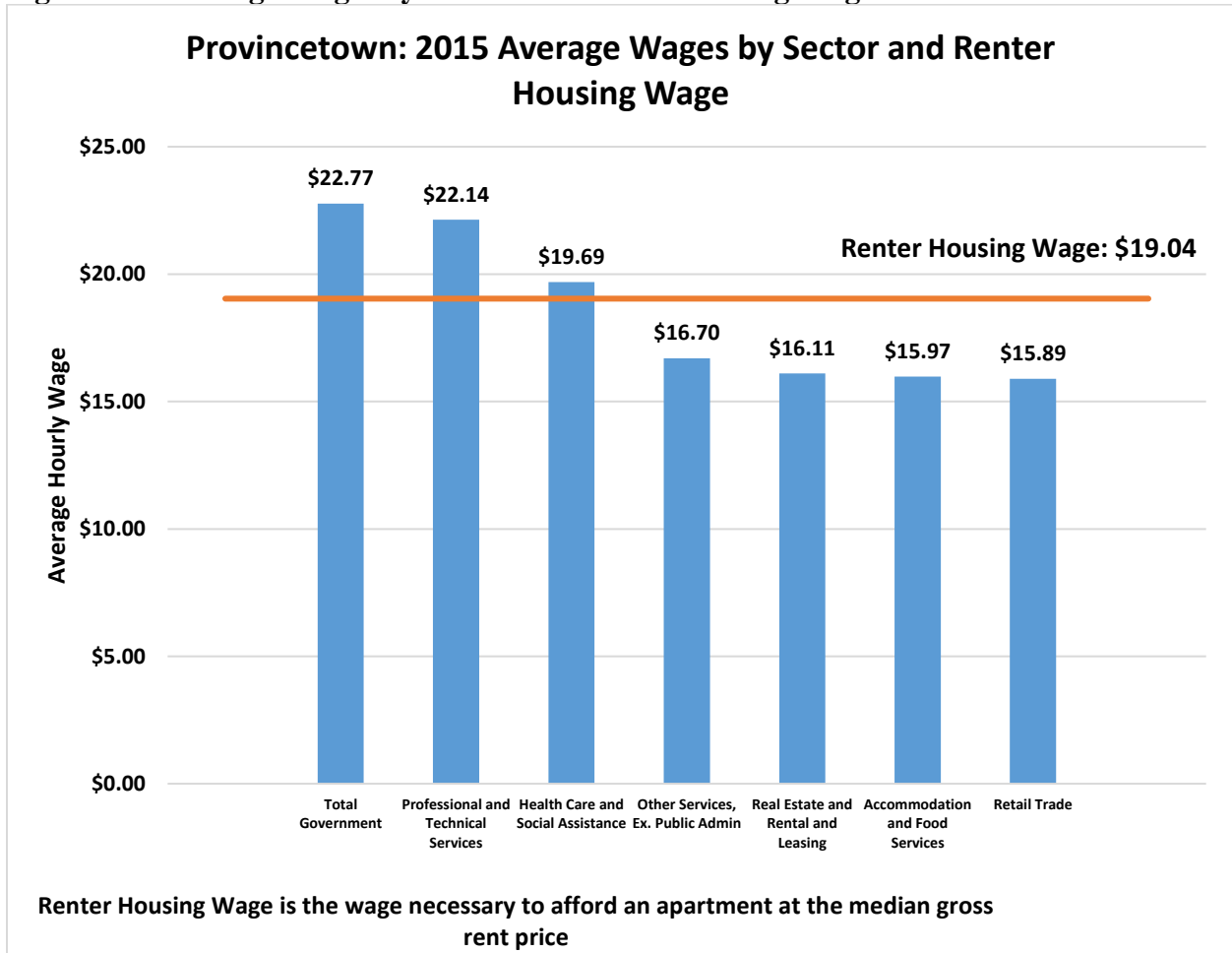
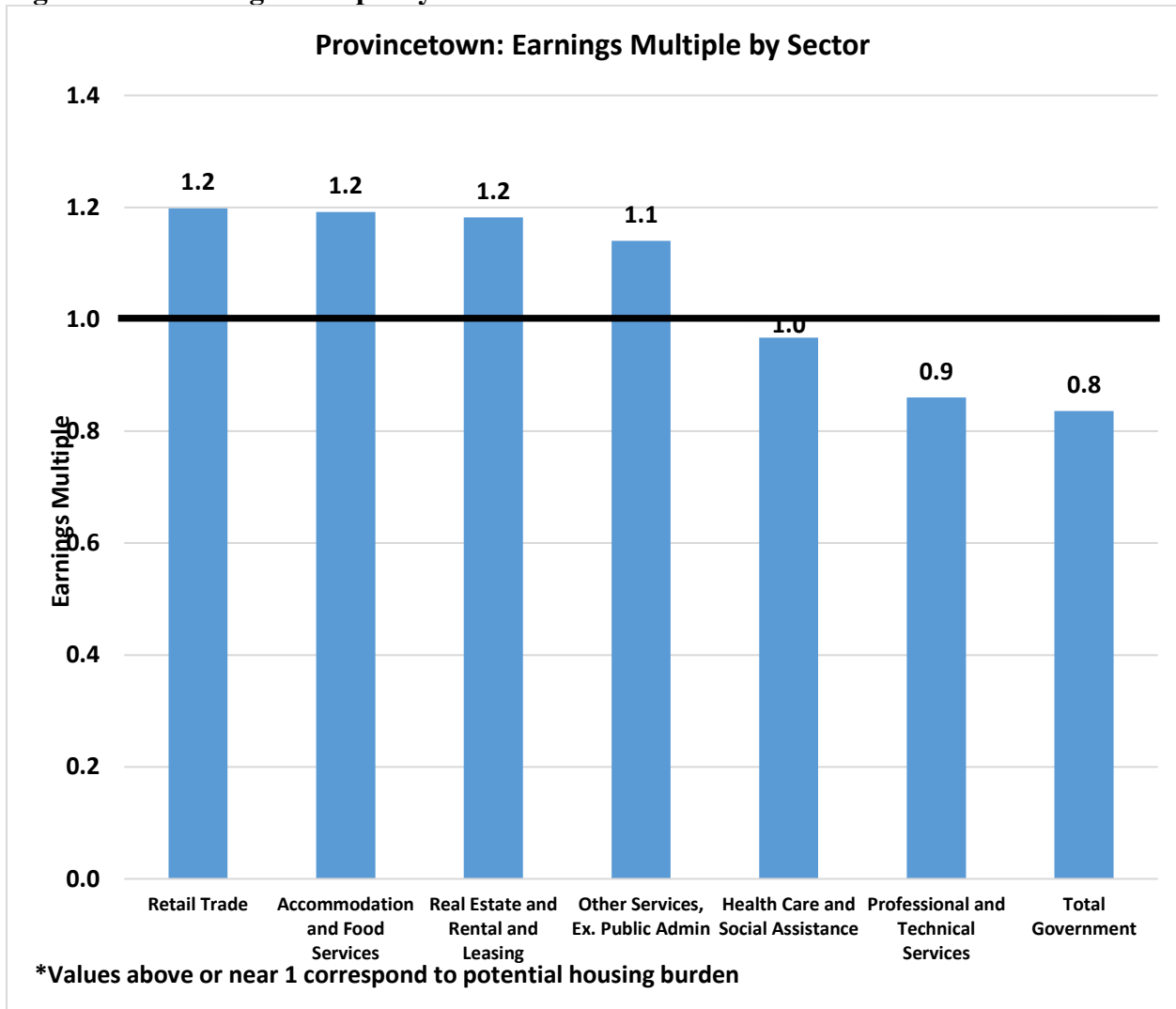


Figure 6.18 Earnings Multiple by Sector



When the data were also analyzed from the perspective of multiple wage earner households, the data indicated that the average worker in the higher-paying major employment sectors (including the Government, Professional and Technical Services, and Healthcare and Social Assistance job categories) was likely able to pay the housing costs associated with renting in the town in calendar year 2015. Those households with earners in the lower paying employment sectors (Retail Trade, Accommodation and Food Services, and Real Estate and Rental and Leasing), with earnings multiples of 1.2, would have required at least two earners earning average wages in those sectors, or one making 20% more than the average, in order to push higher than the housing wage threshold for renters in calendar year 2015. Given how close even the comparatively high wages are to the housing wage threshold, it was apparent in calendar year 2015 that those households with earners receiving wages that were below average for those sectors were housing cost burdened as well.

Town Owner Housing Wage

Typical wages in the town in calendar year 2015 also fell well below the owner housing wage level. This indicated that all single-earner households would have been unable to pay the costs of a median-priced owner unit in calendar year 2015 without being housing cost stressed. Average wages paid in all of the top seven NAICS employment categories in calendar year 2015 were less than half of the owner housing wage needed to avoid being housing cost stressed in 2015 in a median-priced owner unit. That indicated that even dual-earner households would have still also been unable to afford a median priced owner unit in calendar year 2015.

Figure 6.19 Average Wages by Sector and Owner Housing Wage

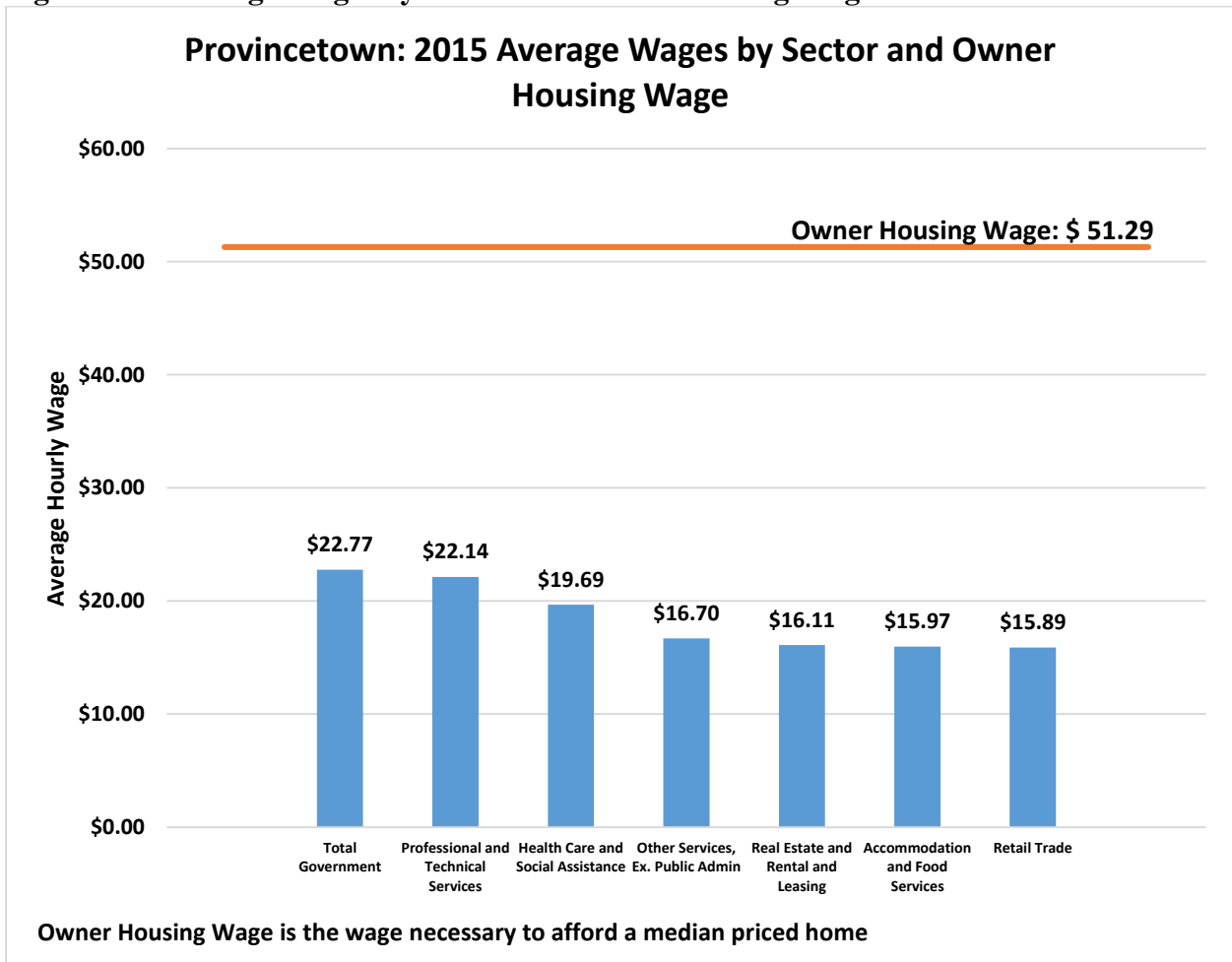
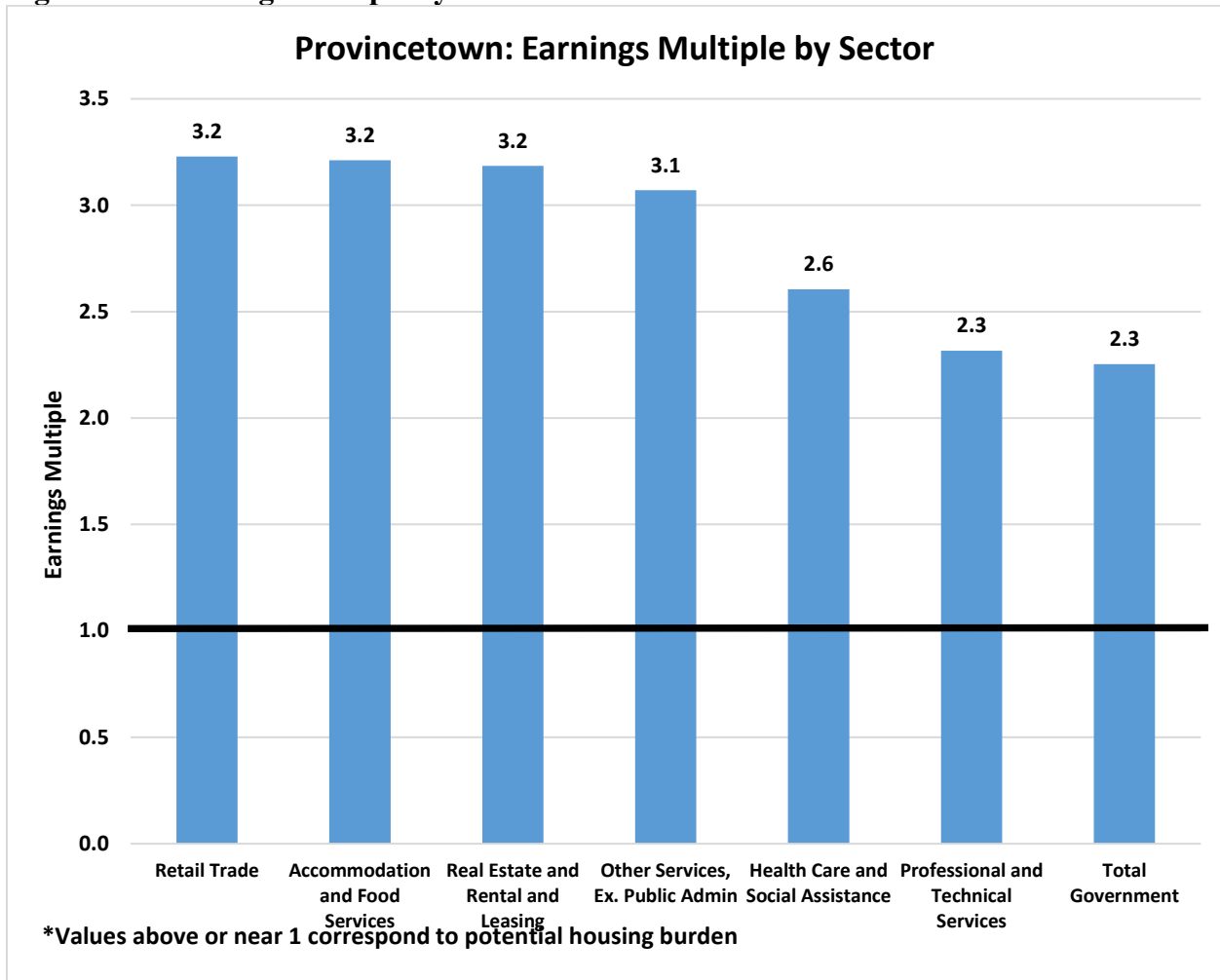


Figure 6.20 Earnings Multiple by Sector



The multiple earner analysis for the town showed that all of the top seven NAICS employment sectors paid average wages in calendar year 2015 that were below the level needed for a two-earner household employed in those sectors to be able to afford the costs of a median-priced owner unit in calendar year 2015 without being housing cost stressed. On the other side of the average wage spectrum, the four lowest-paying NAICS employment categories (Retail Trade, Accommodation and Food Services, Real Estate and Rental and Leasing, and Other Services) with earnings multiples of 3.1 or above, in the town in calendar year 2015 would have required more than three earners in the household at the average wage paid in each category in order to have been able to afford a median-priced owner unit in the town in calendar year 2015 without experiencing housing cost stress.

Conclusion

This analysis of typical average wages paid in key NAICS employment sectors in the county and in four of the major municipalities in each Cape region suggested that average pay levels in many of the largest NACIS employment sectors in the county are not sufficient to cover the costs of

either renting or owning a housing unit in the county or municipality—even if there are multiple earners in the household. Many of the largest employment categories in the county and among the key municipalities in the county would have required as many as three average earners per household in order to afford the renter and owner costs associated with median-priced owner and renter units without being put in a position of experiencing housing cost stress. Even the municipalities with the largest workforces in each of the four regions of the county were likewise experiencing significant levels of housing cost stress for both owners and renters in calendar year 2015. While the lack of the availability of comparable wage data for many NAICS employment sectors in towns such as Chatham and Truro made it difficult to compare the average wages in those towns to the estimated costs of owning a median priced house or renting a median rent level unit in 2015, the relatively higher priced owner units and in some case higher level of rents in 2015 indicated that housing cost stress in those and other municipalities may be higher than the county average or municipalities examined in this housing wage analysis for 2015.

Below are additional tables that offer detailed data on employment sectors in the selected towns. Each sector’s share of total employment, the average wage, and the renter and owner housing wage multiples for calendar year 2015 are shown for the county as a whole and for the selected towns in each of the four Cape regions.

Table 6.1 Barnstable County Employment Share by Sector

Sector	Share of Employment	Average Hourly Wage	Owner Earnings Multiple	Renter Earnings Multiple
Health Care and Social Assistance	17.4%	\$24.57	1.6	0.9
Accommodation and Food Services	16.6%	\$11.70	3.3	1.8
Retail Trade	16.2%	\$14.75	2.6	1.4
Local Government	10.8%	\$25.82	1.5	0.8
Construction	5.7%	\$27.10	1.4	0.8
Professional and Technical Services	4.3%	\$32.71	1.2	0.6
Administrative and Waste Services	4.1%	\$18.45	2.1	1.2
Other Services, Ex. Public Admin	3.9%	\$16.50	2.3	1.3
Arts, Entertainment, and Recreation	2.9%	\$14.68	2.6	1.4
State Government	2.9%	\$28.87	1.3	0.7
Finance and Insurance	2.3%	\$40.20	1.0	0.5
Transportation and Warehousing	2.1%	\$19.80	1.9	1.1
Wholesale Trade	1.8%	\$28.97	1.3	0.7
Federal Government	1.8%	\$33.04	1.2	0.6
Information	1.5%	\$24.97	1.5	0.9
Durable-Goods Manufacturing	1.4%	\$35.48	1.1	0.6
Real Estate and Rental and Leasing	1.4%	\$19.05	2.0	1.1
Educational Services	1.1%	\$15.81	2.4	1.3
Nondurable-Goods Manufacturing	0.9%	\$20.52	1.9	1.0
Management of Companies and Enterprises	0.4%	\$27.27	1.4	0.8
Utilities	0.3%	\$47.56	0.8	0.4
Agriculture, Forestry, Fishing & Hunting	0.2%	\$19.52	2.0	1.1
Mining	0.1%	\$31.74	1.2	0.7

Table 6.2 Town of Barnstable Employment Share by Sector

Sector	Share of Employment	Average Hourly Wage	Owner Earnings Multiple	Renter Earnings Multiple
Health Care and Social Assistance	23.7%	\$30.03	1.2	0.7
Retail Trade	18.3%	\$14.30	2.5	1.5
Accommodation and Food Services	12.3%	\$10.36	3.5	2.1
Local Government	8.7%	\$28.59	1.3	0.8
Other Services, Ex. Public Admin	5.0%	\$15.08	2.4	1.5
Construction	3.8%	\$24.70	1.5	0.9
State Government	3.5%	\$26.40	1.4	0.8
Administrative and Waste Services	3.4%	\$18.49	1.9	1.2
Transportation and Warehousing	3.3%	\$20.84	1.7	1.1
Arts, Entertainment, and Recreation	2.8%	\$16.71	2.2	1.3
Finance and Insurance	2.7%	\$48.96	0.7	0.4
Professional and Technical Services	2.3%	\$28.40	1.3	0.8
Wholesale Trade	2.2%	\$31.55	1.1	0.7
Information	1.8%	\$22.69	1.6	1.0
Durable-Goods Manufacturing	1.4%	\$36.45	1.0	0.6
Nondurable-Goods Manufacturing	1.3%	\$19.40	1.9	1.1
Real Estate and Rental and Leasing	1.2%	\$21.96	1.6	1.0
Educational Services	0.9%	\$15.29	2.4	1.4
Federal Government	0.7%	\$32.79	1.1	0.7
Management of Companies and Enterprises	0.4%	\$36.94	1.0	0.6
Mining	0.2%	\$34.51	1.0	0.6
Agriculture, Forestry, Fishing & Hunting	0.2%	\$17.27	2.1	1.3
Utilities	0.0%	\$30.17	1.2	0.7

Table 6.3 Town of Falmouth Employment Share by Sector

Sector	Share of Employment	Average Hourly Wage	Owner Earnings Multiple	Renter Earnings Multiple
Health Care and Social Assistance	21.7%	\$24.73	1.6	0.9
Accommodation and Food Services	14.5%	\$11.82	3.4	1.9
Retail Trade	12.5%	\$15.97	2.5	1.4
Professional and Technical Services	11.6%	\$37.71	1.1	0.6
Local Government	7.7%	\$27.22	1.5	0.8
Federal Government	5.5%	\$39.67	1.0	0.6
State Government	4.3%	\$26.14	1.5	0.8
Construction	4.2%	\$32.15	1.2	0.7
Administrative and Waste Services	3.1%	\$19.45	2.1	1.1
Other Services, Ex. Public Admin	2.8%	\$17.13	2.3	1.3
Arts, Entertainment, and Recreation	2.5%	\$15.76	2.5	1.4
Durable-Goods Manufacturing	1.7%	\$42.23	1.0	0.5
Finance and Insurance	1.6%	\$32.83	1.2	0.7
Nondurable-Goods Manufacturing	1.5%	\$29.77	1.3	0.7
Educational Services	1.5%	\$18.18	2.2	1.2
Information	1.2%	\$19.98	2.0	1.1
Transportation and Warehousing	0.9%	\$14.46	2.8	1.5
Real Estate and Rental and Leasing	0.5%	\$17.79	2.3	1.2
Wholesale Trade	0.5%	\$25.74	1.6	0.9
Agriculture, Forestry, Fishing & Hunting	0.2%	\$17.99	2.2	1.2
Management of Companies and Enterprises	0.0%	\$29.79	1.3	0.7
Mining	0.0%	\$33.90	1.2	0.6
Utilities	0.0%	\$0.00	N/A	N/A

Table 6.4 Town of Orleans Employment Share by Sector

Industry	Share of Employment	Average Hourly Wage	Owner Earnings Multiple	Renter Earnings Multiple
Retail Trade	26.7%	\$14.81	4.1	1.2
Accommodation and Food Services	16.7%	\$11.07	5.4	1.6
Local Government	16.0%	\$25.14	2.4	0.7
Health Care and Social Assistance	7.0%	\$17.77	3.4	1.0
Finance and Insurance	6.9%	\$42.91	1.4	0.4
Other Services, Ex. Public Admin	4.5%	\$15.87	3.8	1.1
Professional and Technical Services	4.1%	\$32.42	1.9	0.5
Construction	3.9%	\$22.87	2.6	0.8
Arts, Entertainment, and Recreation	3.5%	\$7.86	7.7	2.3
Administrative and Waste Services	2.4%	\$18.36	3.3	1.0
Real Estate and Rental and Leasing	1.6%	\$20.85	2.9	0.9
Information	1.5%	\$31.12	1.9	0.6
Wholesale Trade	1.4%	\$23.25	2.6	0.8
Durable-Goods Manufacturing	1.4%	\$26.17	2.3	0.7
Nondurable-Goods Manufacturing	0.7%	\$12.76	4.7	1.4
State Government	0.6%	\$37.13	1.6	0.5
Educational Services	0.6%	\$11.40	5.3	1.6
Federal Government	0.3%	\$28.66	2.1	0.6
Management of Companies and Enterprises	0.0%	\$14.85	4.1	1.2
Natural Resources and Mining	0.0%	\$91.55	0.7	0.2
Transportation and Warehousing	N/A	N/A	N/A	N/A
Utilities	N/A	N/A	N/A	N/A

Table 6.5 Provincetown Employment Share by Sector

Industry	Share of Employment	Average Hourly Wage	Owner Earnings Multiple	Renter Earnings Multiple
Accommodation and Food Services	41.7%	\$15.97	3.2	1.2
Retail Trade	22.2%	\$15.89	3.2	1.2
Total Government	9.7%	\$22.77	2.3	0.8
Health Care and Social Assistance	8.0%	\$19.69	2.6	1.0
Professional and Technical Services	3.1%	\$22.14	2.3	0.9
Other Services, Ex. Public Admin	2.3%	\$16.70	3.1	1.1
Real Estate and Rental and Leasing	1.8%	\$16.11	3.2	1.2
Arts, Entertainment, and Recreation	1.7%	\$15.46	3.3	1.2
Administrative and Waste Services	1.5%	\$18.41	2.8	1.0
Management of Companies and Enterprises	1.5%	\$25.04	2.0	0.8
Finance and Insurance	1.0%	\$69.22	0.7	0.3
Construction	0.9%	\$23.06	2.2	0.8
Educational Services	0.7%	\$21.39	2.4	0.9
Manufacturing	0.7%	\$13.78	3.7	1.4
Information	0.7%	\$20.22	2.5	0.9
Natural resources and mining	0.4%	\$20.62	2.5	0.9
Transportation and Warehousing	N/A	N/A	N/A	N/A
Utilities	N/A	N/A	N/A	N/A
Wholesale Trade	N/A	N/A	N/A	N/A

CHAPTER 7: STRATEGIES AND RECOMMENDATIONS

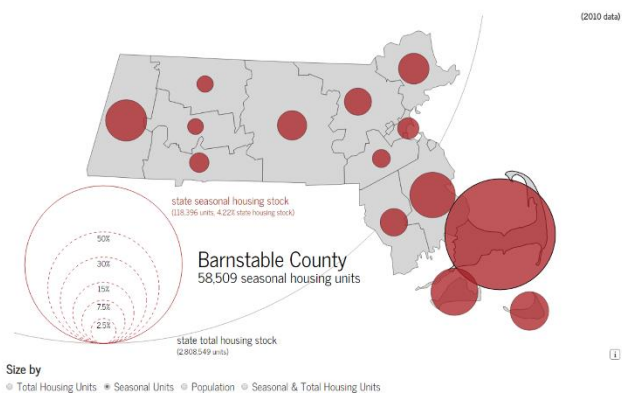
The Bigger Picture

During this study's research and analysis, we discovered that Cape Cod has an unusual and complex housing challenge. The Cape's demographic composition, housing stock monoculture, seasonal lifestyle, job homogeneity, geographic isolation, fresh water limitations, and lack of public infrastructure have converged to form a highly unique housing market. To address these housing challenges, it is most important to remember two messages. First, it is the convergence of four major societal elements, demographic, economic, natural, and physical, not any one alone, which makes the challenge so difficult. Second, Barnstable County is currently short about 22,000 housing units obtainable to all income categories below \$90,000. The County is forecasted to be short only another 2700 over the next ten years. Therefore, the real estate situation that the Cape is facing today didn't occur in the last 5 or 10 years but is a result of "deferred maintenance" from a long series of decisions made over the last two or three decades by 15 independent municipalities. These two overarching messages call for an integrated approach that relies on intermunicipal cooperation and that addresses all four elements of the problem concurrently.

Seasonal homeowners choose to buy property on the Cape because it is beautiful. It is the protected natural areas, fresh air, amazing beaches, numerous recreational opportunities, and relaxed lifestyle that attracts seasonal buyers, weekly vacationers, and retired couples. The long history of decisions by municipalities to limit growth and to protect their natural resources should be commended because it created the Cape Cod that most people know and love. There are two sides to every coin however, and we must also recognize that these decisions created a seasonal economy. Year-round housing requires a year-round economy. When most of Cape Cod's wages are earned in 4 or 5 months of the year, that's when most of the people will live here, and when most businesses are open. As workers search for their needed remaining annual earnings, they will migrate off Cape, which vacates housing that still needs to be serviced by annual property tax payments. Since seasonal workers have no incentive (or ability) to pay annual property taxes, housing units are owned by two groups of people: those who live and work elsewhere but can afford a second home on the Cape; and the limited population that stays on the Cape year-round. As the number of second home owners increases, the seasonal economy becomes stronger, more businesses close in the off season, which further increases seasonal migration, decreases municipal tax revenue from year-round residents, and increases the town's incentive to attract more seasonal homeowners. Over the past decades, a combination of municipal-level decisions has created a cycle of dependency on a seasonal economy. They are not at fault; cash-strapped towns with limited control of state and federal policies made rational choices in the best interest of their residents.

The composition of housing stock reflects the region's economy. High concentrations of historic ship captains' homes in Provincetown and Hyannis tells us about the once strong maritime economy. Today's Cape Cod has 50% of all the second homes in the Commonwealth. Our research indicates that the people on the Cape who are struggling to find year-round housing are

the same people struggling to find year-round employment. Perhaps the economy is too heavily



weighted into too few economic sectors. There is almost no diversity in the housing stock; 87% of all housing in the county are single family detached units. While this study was not dedicated toward a detailed analysis of the economy, we do know that 49% of all employment on the Cape is in the 5 sectors that primarily serve tourists and second home owners: Arts & Entertainment, Accommodations & Food Services,

Retail (32%); and Real Estate & Construction (17%). Health care sector includes another 15.5%, which when combined with the others amounts to 65% of the entire employment base on the Cape. The Health Care sector may be the only one that typically supports 12-month employment. The growing retiree demographic will keep this sector strong for the next ten years and likely beyond.

A diversified housing stock is created by a diversified economy (and vice versa). The county needs to diversify its housing stock in order to make more housing affordable to more households. A diversified economy will increase the demand for year-round employees and in-turn increase the demand for year-round housing. The wider the range of job types, the wider the demand for housing product types. Housing and employment are part and parcel of each other. Therefore, our strategies are intended to increase the demand for a wider range of housing types by expanding the economic base of the county. Our strategies are intended to address the demand and supply sides of the equations. A demand-side problem means that the buyer does not have enough income to pay for the housing units available, and therefore doesn't "demand" one. Supply side housing problems mean that there is not enough stock in the supply to meet the current demand. Demand side strategies are intended to increase household revenue while supply side strategies are intended to increase the stock of housing.

Strategies that simply increase the supply side of the equation will not address the underlying causes of the housing challenges on the Cape today. Increases in the supply and types of units for all households, at all income levels, is indeed an immediate need in the county. Addressing supply is also a short-term approach that will serve about 1/3 of the Cape's residents. Longer-term strategies are found on the demand side and will serve 50% of the population. Strategies on both sides are needed. If housing unit supply increases without addressing the demand side issues, there will be a strong economic incentive for the new construction to be converted to seasonal units. Our current short-term forecast shows that seasonal units will continue to compete for year-round units. Newly built condominiums, rental units or even year-round single-family units will continue to be attractive to seasonal buyers. Deed restrictions, zoning and usage regulations may help lean the market toward year-round buyers, but even these techniques are only as good as their enforcement.

Housing strategies on the Cape must be addressed from all four major societal elements: demographics, economics, physical infrastructure, and natural resources. Each element carries

both a solution and a challenge and they all must be addressed in a comprehensive and integrated approach. The care and conservation to protect Cape Cod's natural resources created an attractive place for second home owners and retirees. This success must be leveraged to now attract year-round employers. However, year-round employers need something more than homeowners, they need physical infrastructure. Sewer, water, public transportation, advanced telecommunications, and energy infrastructure are needed to diversify the economy and make housing more obtainable to a wider range of households and families. This may sound threatening to the Cape's conservation efforts but it is actually an ally. Conservation through land preservation and growth control policies, such as low-density housing, works well but only up to the point where groundwater and private septic systems become too close to each other, when roads become clogged, and habitat on privately held land becomes developed. At that point, land becomes scarce and therefore more expensive, and the cycle of dependency on a seasonal economy becomes reinforced. The Cape's past conservation efforts worked well but are now at a crossroads, where new approaches are needed that depend on the concentration of infrastructure, housing, and employment. Likewise, the diversification of the economy and housing types also depends on the concentration of infrastructure, which then attracts new businesses and employees looking for both urban conveniences and conserved recreation lands for a well-balanced life of work and play.

In addition to addressing these four societal elements comprehensively, a governance structure must be employed to integrate all existing housing policies and players, including local, regional, state, and federal governments, non-profit organizations, and private sector developers. The review panel that was created for this project is just the beginning. A new governance structure may not be necessary if existing structures can be refocused to address housing in a comprehensive manner. Since most of the critical policy decisions are made at the local government level, all 15 municipalities should be represented. The existing town managers association is a possible structure that can be used to focus on housing. The Cape Cod Commission is also another choice to direct the conversation. In fact, at a recent policy strategy session held on May 30th 2017 many participants requested to increase the housing conversation, hold regular meetings, conduct follow-up policy sessions, and maintain a continuous stream of dialogue through public awareness campaigns, local government hearings, and intergovernmental coordination.

Specific Recommendations

Recommendation 1: Adopt the following Housing Targets and create an Economic Efficient distribution to increase supply:

Municipalities on the Cape should recognize the regional nature of housing market and collectively adopt the following housing targets. Then, on an individual basis, they can start to work on their percentage share.

The following housing targets are provided to start the regional discussion. They should be used as a guide not policy. Additional discussions may create new target market categories and adjust the totals. In the end, 22,000 ownership units should be divided among different market segments. Each municipality will have a unique set of circumstances: political, economic, demographic, and physical that will help facilitate or prevent construction of these different housing markets. For example, some municipalities are more attractive to seniors while others will attract households without children; some municipalities will have the infrastructure and land to accommodate compact housing while others are more appropriate for families with children. The County, as a collective accumulation of 15 municipalities, should divvy up these totals to each municipality based on logic and economic efficiency, not based on equal or proportional shares. The most appropriate development should occur in the most appropriate places and therefore increase the efficiency of housing and land markets. This may mean that some municipalities do not take on any new development of a certain market segment while others take a disproportionately larger percentage. As long as all target market segments are distributed across the County the net effect will be an improved housing market in the County and further progress toward a year-round economy.

Table 7.1 Targets for Total Ownership Units Demanded	22000	
Year-Round Ownership Market	% of Market	Unit Demand
>65 aged at 100% + MHI	28%	6160
>65 aged at 80-100% MHI	7%	1540
>65 aged at < 80% MHI	5%	1100
Family Households at 50% to 80% MHI	8%	1760
Family Households at 80% to 120% MHI	30%	6600
Households w/out children at 50% to 80% MHI	7%	1540
Households w/out children at 80% to 120% MHI	15%	3300
Total Ownership Units Demanded	100%	22000

Creating an economic efficient distribution across the Cape is more difficult and complicated than a simple percentage share, however, it is the distribution method that would return the most economic benefits to the county and each municipality. This approach also taps into and leverages private market forces by using “more carrots than sticks” to accomplish the development. The general approach would require creating a decision support model that used objective

economic and housing market criteria such as data on land, infrastructure, and market preferences to distribute the housing targets. The CCC’s build out analysis will be very helpful in this regard. Some updating may be necessary but most of the information is still relevant and valuable. Data

from the market preference study will be critical for this distribution. This preference study has not been completed and therefore is recommended here.

Table 7.2 Targets for Total Rental Units Demanded		4800
Year Round Rental Market	% of Market	Unit Demand
>65 aged at 100% + MHI	28%	1344
>65 aged at 80-100% MHI	17%	816
>65 aged at < 80% MHI	15%	720
Family Households at 50% to 80% MHI	10%	480
Family Households at 80% to 120% MHI	2%	96
Households w/out children at 50% to 80% MHI	22%	1056
Households w/out children at 80% to 120% MHI	6%	288
Total Ownership Units Demanded	100%	4800

Recommendation 2: Conduct a Detailed Housing Market Preference Study

A market preference study will provide critical information on how to distribute countywide demand for housing by different market segments. It will also provide a level of housing market details that has not been generated previously for Barnstable County. While this study provided detailed analysis of future housing market demand by tenure and affordability, there are many micro-market details that are unknown. The next steps of this analysis would be to determine product preferences by the market segments shown above. Why are seniors still living in oversized 4 bedroom homes that are falling in disrepair and are expensive to maintain? This study has shown that there is a backlog of supply created by those over 65 years of age living in their homes. A typical housing lifecycle has 5 stages: first, it starts with young renters who after a few years start to earn more income and enter into their second phase by either renting single family attached units like condos or townhouses with one or two bedrooms, or buying the same. Third, they create families and their demand for space increases, and they move again to a larger home. Fourth, when their children leave, and become young renters themselves, these couples start to downsize into retirement communities or neighborhoods with smaller units similar to those they were in as young unmarried professional. Fifth, after this phase they move again, either by choice or necessity, to independent living facilities or assisted living facilities. On the Cape, these last two phases, mostly the fourth, are being missed. Healthy seniors are not downsizing. This puts a greater strain on the existing stock to serve the current population. Increasing stock to serve the largest demographic group on the Cape is essential to releasing some of the housing pressures. This study discovered some of the reasons but didn't delve into the details to determine what would

free up this backlog of stock. A housing preference study is needed to know how to entice this demographic to downsize.

A housing preference study would also determine the preferences of all other major market segments including young renters, households without children, and families by all age groups, tenures, and household incomes. The results will provide details product preferences that various market segments are demanding including:

Unit types: Condominiums; townhouses; single family attached and detached, mobile homes;

Degree of Compactness: Number of units per building; yard sizes, density of neighborhoods;

Location: Proximity to village or central downtown; proximity to services and entertainment;

Municipality: preferred municipality and why;

Public Infrastructure: importance of public transit, road conditions, traffic, preferences for public sewer, private vs. public water;

Interior design: number of bedrooms and baths; bathroom amenities; kitchen amenities; storage; entertainment rooms; laundry; entrance way; garages

Exterior Design: Patios, porches, decks, driveways

The study must include a statistically robust market sampling method including questionnaire pretests. The Cape's building professionals and real estate agents should play a lead role in designing the questions. The study should include seasonal homeowners as well as year-round residents.

Recommendation 3: Supply the Demand for Compact Urban Forms

Single and two person households over 65 years of age is the demographic group that will dominate the Cape in the next 20 years. The demographic that the Cape's economy needs to attract now but doesn't have is young professionals between 25 and 35 years of age working in non-tourist sectors such as finance, technology, science and engineering. There is one common element that these two groups share: they are both demanding compact urban forms. Yet, the Cape in general (with some exceptions) is not meeting these demands. A concerted effort between 15 municipalities is needed to provide the new urban forms, complete with the public infrastructure amenities that these groups are seeking. It would behoove all 15 municipalities to combine efforts and create a regional growth plan. Their task would be to create regional growth centers that are designed and planned to absorb 70%- 80% of all future growth on the Cape. That growth includes 22,000 year-round ownership units; 4,800 year-round rental units; and 8,000 new jobs¹⁵. This concentration of homes and businesses makes public infrastructure more economically feasible. To adopt a regional growth center policy that is approved by all 15 municipalities is a challenging task. However, the benefits of a diversified and more sustainable economy supporting more year-round residents certainly outweighs the cost of the status quo.

Recommendation 4: Increase the Diversity of Senior Housing

As previously mentioned, this research revealed that many senior households are staying in their homes even though they are poorly maintained, inefficient, substandard and possibly dangerous simply because there is no place for them to go. It also revealed that there is a theoretical

¹⁵ The amount of commercial square footage needed to support these jobs was not calculated as part of this study.

oversupply of units at > 100% MHI however they are not available. The senior household population on the Cape can absorb 11,000 units divided over 5 major housing types: independent ownership, independent rentals, continuing care retirement communities, assisted living facilities and skilled nursing homes. We recommend creating detailed strategies for dividing these 11,000 units into specific market segments for seniors. A special Senior Housing Committee (SHC) of developers, real estate professionals, non-profit advocacy groups, and other specialist should be formed to determine the appropriate allocation. The SHC should be coordinated and facilitated by the Cape Cod Commission.

Fair Housing laws allow developments to be age restricted down to 55 years and over. The SHC should meet to discuss the range of options for developing retirement communities that will attract seniors out of their current, oversized homes and into appropriately designed units. Seniors are a difficult market to satisfy because they have many options and strong opinions on what they find acceptable. The recommendation to create a market preference survey will help inform and support this committee. Senior only communities must be innovative and designed specifically for seniors that include features such as larger bathrooms, easy operating doors and windows, community programs, unique spaces for hobbies and pastimes, storage, outdoor recreation, gardening, and health care services. This report is not the place to make the final determination for what will sell to seniors. Rather, the SHC should contribute to the Preference Survey and use the results to help guide decisions on the developments location, product types, financing and target markets. This, and all recommendations for new year-round developments, must be created to discourage seasonal occupancy and the SHC should work to ensure correct policies are engaged that preference year-round ownership.

Recommendation 5: Increase the Diversity of Multi-Family Housing

The diversity of the County's total housing stock is too homogenous. The County has three times less rental units than the national average. An increase in multifamily development projects for renters and owners at all price ranges is sorely needed today. The county should plan on distributing 4,800 new multi-family rental units across the 15 municipalities. These 4800 units should be divided into 7 market segments: 3 for seniors at 3 price ranges between 50% and 120 % of the median household income; 2 for families between 50% and 100% of the median; and two for households w/out children between 50% and 100% of the median. Similar to the senior housing approach, specific strategies on location, product types, and funding are needed to diversify the stock. The housing preference study will help guide these decisions.

Recommendation 6: Create targeted strategies to diversify the economy

The most important long-term strategy to address the demand side of the Cape's housing challenges is to diversify the economy. This doesn't happen automatically. A long-term concerted effort by all 15 municipalities, the County, and State governments, guided by a strategic road map, is needed. An economic diversification strategy would entail identifying the growing sectors of the Massachusetts economy that are not present on the Cape and create targeted strategies to recruit them. The County's existing CEDS is an import documents that lays the groundwork for this diversification strategy. Throughout the document, the need to diversify the economy on the Cape is clearly articulated and it conducts analysis on which sectors might be most successful. The CEDS Action Plan includes many priority projects, which were developed after extensive public

involvement. While the CEDS clearly spells out a need to diversify the economy, the priority projects are primarily infrastructure projects in sewer, water roads, and telecommunications. WE agree that these projects are highly important in not only diversifying the economy but also providing the necessary foundation for creating compact urban forms and efficiently built neighborhoods, villages and downtowns. Nonetheless, there is a leap of faith that these projects will directly result in meeting the Plans goals of economic diversification, import substitution, and export growth. The next step for this Plan would be to make a direct connection by actively recruiting private companies, designing product specific import substitution projects with private companies, creating public/private partnerships to help build infrastructure, and targeting existing businesses for output expansion. The Chatham Shellfish Upwelling Facility is the only such example in this document that would expand an existing business. Targeted strategic plan to diversify Cape's economy will include many more of these types of projects plus other recruitment and business retention strategies.

Recommendation 7: Create a County-Level Housing Advisory Team

The County is missing an intergovernmental institution that is focused specifically on housing issues. At a recent policy strategy session held on May 30th 2017 many participants requested to increase the housing conversation, hold regular meetings, conduct follow-up policy sessions, and maintain a continuous stream of dialogue through public awareness campaigns, local government hearings, and intergovernmental coordination. While there are many independent private and non-profit entities on the Cape with separate missions to build housing, there is no organization that forces the integration of these efforts for a common purpose. A county level housing advisory team should be created that is appointed by County government with a mission of integrating all existing housing policies and players, including local, regional, state, and federal governments, non-profit organizations, and private sector developers. This body would not have regulatory or decision-making authority, rather they are a coordinating entity that this is focused on the technical aspect of housing policies, developing innovative funding strategies, removing impediments to housing, providing technical assistance to municipalities, creating locally specific development solutions and helping move forward the recommendations of this report. A new entity is not necessary if existing structures can be refocused to address housing in a comprehensive manner. This should be decided during the formation of this entity. The most impactful policy decisions are made at the local government level; therefore, it is recommended that all 15 municipalities are represented. The existing town managers association is a possible structure that can be used to focus on housing, but they are missing the private and non-profit sectors so some modifications would be necessary. The Cape Cod Commission is in the position of providing coordination assistance to this entity.

Recommendation 8: Expand on this report

This report is not finished. The data collection and analysis is completed. However, due to timing constraints, a thorough understanding of the findings was not possible. There are many interrelated development issues, policies, and history that brought the County to its current housing status. The recommendations in here are based on the consultant's best interpretation of the findings combined with profession experience. We believe the County would benefit from more time interpreting the findings and developing policies. This report needs to be read thoroughly; the data analyses and findings need to be understood. Then a more comprehensive program of

public involvement and stakeholder dialogue should be engaged for the purposes of development implementation policies. During this project, only one 3-hour session with 25 stakeholders was conducted. The session had a high level of interest but the county needs to hold several more at a regional basis plus at least one in each municipality. One of the most prominent outcomes of the policy session was the need to continue this dialogue. Knowing the data and findings of this report is key to ensuring that the policy discussions are based on facts.

Appendix 1: Forecast Methodology

Introduction:

This Appendix provides a detailed methodology used to create the demographic forecast for Barnstable County that was used to develop the housing demand part of the housing study. The county demographic forecast began with the use of a national (or U.S.) macroeconomic forecast, which was used to define the larger and external macroeconomic and demographic forces at play for the county. This national forecast was obtained from Moody’s Analytics—a globally-recognized economic-demographic forecasting and data service. Economic & Policy Resources, Inc. (“EPR”) of the Crane Associates Team has been a regular subscriber to Moody’s Analytics economic analysis and forecasting services for over thirty years through its various associations (such as with the New England Economic Partnership (known throughout the New England region as “NEEP”),¹⁶ and through its more than 35 years of experience in applied economics throughout the U.S. and in three U.S. territories. In addition, EPR has used U.S. macro and regional forecasting economic and demographic services from Moody’s Analytics (or its forerunner companies) through the years for specific research projects—including several housing and demand studies in throughout the northeastern United States.

The undertaking of this housing study for the county comes at a time of considerable global and U.S. economic uncertainty following the somewhat surprising results of the November 2016 elections. The new administration, with its pledges to change the current trajectory of the nation’s economic and foreign policies, represents a significant departure from the trajectory of U.S. policies in that regard of the past eight years. Economically, there are new fiscal, tax, and trade policy uncertainties in the outlook that were not evident prior to the results of the November 2016 elections. Because the underlying, long-term economic and demographic forecast for the county is a foundational part of this housing study, the Crane Associates Team devoted a considerable amount of extra attention to the long-term economic and demographic forecast to help ensure that the results of this study will be reasonable and useful for the county’s stakeholders out into the future.

Our consulting team undertook considerable effort to understand the important changes in the economic and demographic climate *before* we were retained for this assignment. As we were assembling our proposal, members of the team thought it was important to understand the ramifications of the November 2016 elections economically—if our team were to be selected to conduct this study. During the months of November 2016 and December 2016, EPR participated in two webinar presentations conducted by Moody’s Analytics regarding the changing U.S. macroeconomic environment in the aftermath of the results of the November 2016 national elections. In those presentations, more than 100 economists from around the world (including three economists at EPR) were able to review the higher level data associated with the Moody’s November 2016 and December 2016 short-term and long-term macroeconomic forecasts for the

¹⁶ NEEP is a non-profit New England regional economic and demographic forecasting group made up of economists from the private sector and from many prominent New England higher education institutions.

U.S. economy and ask detailed questions about the way Moody’s Analytics “most likely” forecast and its alternate five scenario forecasts for the U.S. economy considered the likely impacts of the policy and other uncertainties that followed the November 2016 U.S. elections. During this formative period, Moody’s Analytics was very responsive to the dialogue that emerged during these presentations, with Moody’s providing sound and reasonable answers to all legitimate contextual and technical questions posed by the webinar participants. Although this review and analysis was conducted prior to the beginning of this assignment, this work was foundational—since our team had proposed in our approach to utilize an integrated, national-regional economic-demographic forecast approach as the initial starting point for this study. The initial starting point required the review and development of a cogent, comprehensive, and reasonable long-term U.S. economic forecast to provide the basis for the regional economic-demographic forecast for the county through calendar year 2025 that was to be used in this assignment.¹⁷

Following this detailed review and analysis by EPR, the Crane Associates Team made the decision to utilize the Moody’s Analytics December 2016 macroeconomic forecast as the basis for the county’s short-term and longer-term demographic economic forecast through calendar year 2025. This U.S. forecast laid the ground work, along with estimates of county’s annual, mid-year population and net migration from the U.S. Census Bureau, for the short-term and long-term forecast of county economic activity and the resulting county demographic forecast. This approach was determined by the Crane Associates Team to be the most credible approach employed in light of the advanced age of the current national, state and regional economic upturn, and the significant level of new uncertainty that has been introduced into the economic background created by the November 2016 elections.

In addition, Moody’s Analytics also had a sound approach for incorporating recent global events into the U.S. economic outlook. For example, Moody’s Analytics thoroughly researched and had a sound strategy for incorporating the recent vote in the U.K. which has resulted in Britain to start moving on an expected two year effort to exit from the European Union. The Moody’s Analytics U.S. forecast also fully considers and incorporates the expected U.S. economic impacts related to the economic instability among many of the countries in the developing world, and the growing economic imbalances apparent in mainland China—as the second largest economy in the world—and economic and political developments in key regions such as the Middle East (e.g. their impacts on U.S. energy prices) and the fast evolving economies in Asia (in addition to developments in China). All of these extremely complex and evolving external factors and forces require a sound and integrated forward-looking macroeconomic and demographic basis or structure in the economic outlook if the county’s long-term economic and demographic forecast is to remain relevant over the next ten years—or through calendar year 2025. Based on the Crane Associates Team’s research and review, it was decided to use the December 2016 Moody’s Analytics U.S. Macroeconomic forecast as the starting point basis of the county economic and demographic

¹⁷ This critical review-analysis of the November 2016 and December 2016 Moody’s Analytics macroeconomic forecasts was actually completed in conjunction with other on-going long-term consulting assignments of the Crane Associates team members. For example, EPR uses Moody’s Analytics for its on-going engagement for the Vermont Agency of Administration for the state’s economic and revenue forecasting/fiscal management function. EPR has provided those services on a contract basis for more than twenty five years, and that state revenue forecasting and analysis function for the Agency requires a valid and reasonable long-term (five year) national and state macroeconomic forecast with appropriate detail for use in more than one hundred revenue forecasting equations as maintained by EPR.

forecast. Part of this selection process included the knowledge that the December 2016 macroeconomic forecast was the first forecast that attempted to fully incorporate the expected policy changes from the incoming administration (despite the lack of specific policy details). Another important consideration in the selection of this was also the roughly thirty years of macroeconomic forecasting expertise of the Moody's Analytics team of economists, including the experience of its forerunner companies—including Regional Financial Associates, and Economy.com.

The Moody's Analytics forecasts used in this study also were selected given the Crane Associates consulting team past successful experience in utilizing the Moody's Analytics national and regional economic forecast as a starting point for analysis and customization in several past, successful housing supply and demand studies which have completed throughout the northeastern U.S. region. Each time the Moody's Analytics macroeconomic forecast was used, it was found that the long-term economic and demographic forecasts were proven to critically important initial analytical building blocks for the regional economic and demographic forecast used in each study. One such assignment was completed during the very uncertain economic times just after the turn of the century and just as the 2005-07 housing market bubble was forming-deflating. We expect that the selection of the December 2016 Moody's Analytics U.S. macroeconomic forecast and the associated regional macroeconomic forecast for the county will again prove to be a sound research and analysis decision that will continue to build upon the successful past track record for Moody's Analytics for developing reasonable, long-term national and regional economic forecasts in housing demand and supply studies of this type.

Overview of the Moody's December 2016 Forecast for the U.S. Economy:

This next section of this chapter presents an overview of the Moody's Analytics December 2016 macro forecast (hereafter the "Moody's Forecast"), which served as the basis for the regional baseline economic and demographic forecast for the county that was commissioned in December 2016 from Moody's Analytics as the starting point for this county housing study. The Moody's regional economic and demographic forecast for the county is a separate forecast for the Barnstable Town Metropolitan Statistical Area (or "MSA") which covers the entirety of Barnstable County). The regional economic and demographic forecast utilizes the national forecast as a basis for the forecasted variables. Because the Moody's Analytics U.S. Macro Model is a closed system, the independently forecasted variables for the county are part of a system where all regional forecasts are forced to the national total as determined by the U.S. Macro Model. As such, although the county forecast is developed independently based on its identified quantitative relationships to the U.S. economy, the sum of all of the independent regional forecasts are also influenced by the results of the U.S. forecast and the sum of all of the regions do not exceed the forecasted variables of the U.S. as a whole.

As mentioned above, the Moody's Forecast was the first post-November 2016 U.S. election macro forecast provided by Moody's Analytics which included the major, but still relatively broad, policy proposals of the new, in-coming presidential administration. While the administration's ambitious proposals to: (1) reform the Affordable Care Act (or "ACA"), (2) undertake an effort to reform the U.S. tax code, and (3) undertake a significant potentially \$1.0 trillion development program to upgrade U.S. infrastructure lacked the normal level of detail required to accurately develop the

series of detailed assumptions to be applied to the U.S. macro forecast, the Moody's Forecast employed a series of assumptions related to those broad policies which essentially re-distributed the already expected level of economic national economic growth (as contained in earlier monthly U.S. macroeconomic forecasts leading up to the November elections) somewhat differently between the years of the short-term U.S. macro forecast timeframe. However, the December 2016 Moody's Forecast did not significantly alter the overall level of economic growth over the short-term forecast timeframe overall.

In other words, the Moody's Forecast essentially reallocated growth somewhat differently between the first four (4) years of the short-term, forecast time horizon (initially increasing the expected level of U.S. economic growth over the first two to three years of the forecast as these proposals are fully developed, passed and implemented and the "stimulus from these proposals takes hold), but also expecting weaker overall economic growth towards the end of the new president's initial four years in office as the stimulative effect of these policies is expected to fade. In addition, Moody's expects that the size of the expected tax cuts (including significant reductions in Personal Income and Corporate Income taxes) from the expected tax reform proposal will be sizeable (at an expected \$1.0 trillion over the next decade), but they will not be as large as the administration portrayed during the campaign debate. Because of the upcoming infrastructure development program, Moody's expects government spending to increase by "at least \$500 million" over the next ten years. Spending is expected to be significantly higher for Veterans benefit programs, the military, and for infrastructure programs—although the infrastructure spending program is almost certain to have opposition among at least some Republicans (likely to be based on concerns about increasing the federal budget deficit for the federal funds likely needed to finance such spending), even though the new administration appears fully-committed to developing, passing, and implementing such a program before the end of the new administration's initial four year term. The Moody's Forecast also expects U.S. growth to peak by the middle of calendar year 2018, when the fiscal stimulus from the spending increases and the possible federal tax cuts will be having their greatest effect—both actually and expectation-ally.¹⁸

The Moody's Forecast also included the caution that the near full-employment status of the U.S. economy currently would limit the positive macroeconomic effects of the administration's policy-induced economic stimulus during the forecast period. This was because tax- and expenditure multipliers, that is the input-output coefficients-matrix measuring the resulting output, jobs and income effects from those policies, tend to be smaller when economic conditions-activity are/is near or at the economy's full capacity (and therefore the economy has unused capacity to take

¹⁸ It is noteworthy that at the time of the publication of the Moody's Forecast in mid-December 2016, U.S. stock prices were up by more than five percent over the five or so week period between the election in early November and mid-December—with the biggest shares price gains in the financial sector, and in the energy and industrial industry category. Long-term Treasury yields had risen sharply (from early November), with ten-year yields up nearly eighty basis points to almost 2.6%, pushing fixed mortgage rates back up to well over four percent. Corporate credit spreads also narrowed over the roughly six week period, so borrowing costs for businesses did not rise significantly during the period. The U.S. dollar appreciated particularly between U.S. Election Day and mid-December, particularly against the yen and the euro. On a trade-weighted basis, U.S. the dollar at that time was as strong as it had been since calendar year 2000. Oil and metals commodity prices also were up significantly over the period following the U.S. elections, without even a single new policy being implemented by the President-elect and his team—since they had not been sworn into office. As such, these gains were entirely based on "expectations" concerning what the new administration was expected to accomplish during the initial time period of its term of office.

advantage of those stimuli versus when the economy is operating a higher capacity levels). For example, the stimulative impact on the economy associated with the administration’s proposals would likely lead to higher levels of activity if the U.S. economy were now struggling with high levels of unemployment and large amounts of unused industrial and business capacity as it was coming out of the “Great Recession” back in calendar year 2009. However, currently, the performance of the U.S. economy is markedly different than was the case when the 2009 economic recovery legislation passed—as the U.S. and regional economies were emerging from the “Great Recession.” Instead, it is noteworthy that expansionary, or deficit spending, fiscal policy is often crowded out by off-setting actions associated with a less accommodative Federal Reserve and the actions of global investors, who have a demonstrated tendency to act to push up long-term interest rates in anticipation of higher inflation rates and larger federal budget deficits when the economy is operating close to “full capacity.”

In the Moody’s Forecast, higher inflation rates and higher interest rates are built into the forecast—including core¹⁹ consumer price inflation pushing through the three percent level on a sustained basis. A persistent three percent rate of core inflation would be well above the Federal Reserve’s rumored inflation target. During periods when the inflation rate exceeds the target of the Federal Reserve, the Federal Reserve often responds by increasing the short-term interest rates—the federal funds rate. The Moody’s Forecast expects the federal funds rate to increase to nearly four percent by early 2020, and the long-term, 10-year Treasury yield to reach as high as four and one-half percent. Moody’s Analytics notes in its December 2016 macroeconomic forecast that this is a “classic symptom” of an overheating U.S. economy, which has historically ended in an economic recession or downturn.

Beyond the initial four years to five years of the forecast time frame, the Moody’s Forecast are not expected to materially alter the long-run growth potential of the U.S. or Barnstable County regional economy. Moody’s Analytics expects the post-election, long-run growth potential of the U.S. economy as measured by real U.S. GDP²⁰—the output growth potential that is consistent with stable unemployment—to remain the same as it was before the election. In effect, Moody’s Analytics expects that the policy proposals of the new administration will not alter the two percent per annum growth potential of the U.S. economy. Moody’s Analytics notes in the December 2016 forecast that the long overdue corporate tax reform should provide a meaningful boost to the economy’s growth potential. The proposed lower marginal rates and the adoption of a territorial tax system will likely lower the cost of capital for many U.S. businesses and, as a result, encourage increased capital investment activity. Moody’s Analytics also notes that more investment and a larger capital stock, in turn, will act to lift labor productivity growth and the U.S. economy’s growth potential.

However, the Moody’s Forecast also includes the expectation that the positive effect on the U.S. and regional economy’s growth potential will require time to develop, and this “development” time frame is assumed under the Moody’s Forecast to be longer than the initial four years of the new administration. While the new administration’s expected policy initiatives, should they pass in all or in part, could meaningfully add to the U.S. economy’s growth potential during the initial four years of the Moody’s Forecast, these initiatives are not expected to be “game changers.”

¹⁹ That is the inflation rate excluding volatile food and energy prices.

²⁰ GDP means Gross Domestic Product.

Moody's Analytics has assumed that these measures on balance would add only marginally to the U.S. economy's growth potential and expected future performance. As a result, the Moody's Forecast does not expect the future growth of the U.S. economy to change significantly for the pre- versus post-implementation of the new administration's policies—especially considering the expected monetary policies to be implemented by the Federal Reserve in response. For example, annual GDP growth over the forecast period may rise roughly a quarter of one percentage point on an average annual basis over the forecast time frame versus the long-term forecast's pre-new administration economic-monetary policy assumptions.

The Moody's Forecast does not expect that the net effect of the new administration's policy changes when implemented and integrated into the U.S. economy's supply side, will come anywhere near producing the new administration's objective of having four percent annual growth rates for the U.S. economy per year over the long term. This is because any stimulative effect by the proposed tax reform agenda or the proposed infrastructure program may to a large degree be off-set by the new administration's anti-globalization positions. Those anti-globalization positions may hamper the U.S. economy's future performance by leading to a smaller workforce as some undocumented workers leave the country and fewer legal immigrants come to the U.S. to participate in the economy. In addition, the Moody's Forecast also expects that global trade will also be adversely impacted as the U.S. pulls away from trade deals and skepticism around our trading relationships increases. Such policy changes can be expected to impede competition and productivity growth over the longer term in the U.S. economy. As such, the net effect of the expected negatives and positives is for the U.S. economy to be little changed over the longer term by these expected cross-cutting policy changes—although the economy may become somewhat more “cyclical” as the Federal Reserve is expected to “steadily normalize” interest rates over the short-term time horizon (e.g. the next three to four years) of the Moody's Forecast.

Forecast Model Details:

Since the Moody's Analytics U.S. Macroeconomic Model is a foundational part of this study, this section is intended to describe this sophisticated tool and to provide the reader with a road map to the model's construction. The Moody's Analytics U.S. Macroeconomic Model (hereafter the “Moody's U.S. Macro Model”) is a large scale, multi-equation structural econometric model of the U.S. economy that is designed to produce a conjoined short-term and long-term forecast of the U.S. economy. The model includes more than 1,800 published and unpublished intermediate variables that splits the difference between these theoretical boundaries defined by a family of quantitative models-tools which employ pure time series methods (which place the analytical priority on obtaining the purest “statistical fit” for the time series data and using few, if any, assumptions about empirical or theoretical underpinning of how the economy operates), and a family of quantitative models or tools which are used to forecast the economy which rely heavily on theoretical applications of microeconomic theory to forecast the economy based on a carefully crafted set theory-based assumptions (versus attempting to “best fit” the data which is characteristic of the first type of models-tools). The U.S. macroeconomic and accompanying regional forecasting models maintained by Moody's Analytics reflects a blending of the two types of model theory presented above. The Moody's U.S. Macro Model relies on the approach of “specifying, estimating, and then solving simultaneously” a large set of empirically-based equations that are intended to “mirror the structural workings” and inter-relationships of the U.S. economy.

The theory behind the Moody's U.S. Macro Model can be summarized as an intersection of the U.S. economy's aggregate demand and aggregate supply. Over the shorter term time horizon, the Moody's U.S. Macro Model assumes that "ups and downs" in economic activity are a function of changes in aggregate demand. This assumes that aggregate supply—or the growth potential of the U.S. economy—remains "unchanged." As such, the level of resources and technology that are available for output growth do not change. Over the longer term, Moody's U.S. Macro Model does incorporate changes in supply into the economy's growth potential. By incorporating the supply side changes, such as expansions in labor and capital and changes in technology which allow the economy's inputs to be transformed into higher levels of output at higher levels of efficiency, the longer-term Moody's Analytics macroeconomic forecast therefore reflects the Moody's U.S. Macro Model interaction between aggregate supply and aggregate demand. According to Moody's Analytics, this interaction is captured mathematically in the relationship between three key macroeconomic variables for the U.S. economy. These include:

GDP depends on aggregate spending, which in turn depends on the expected real rate of interest, or the nominal rate less future inflation;

Nominal interest rates are determined both by monetary policy and by private demand for credit, both of which are influenced by GDP;

Inflation is determined by firm price-setting choices, which depend on the level of real activity and inflation expectations.

In its technical documentation of the Moody's U.S. Macro Model,²¹ Moody's Analytics points out that the above mathematically describes a system of three equations that can be solved for the three unknowns—real or inflation-adjusted GDP, nominal-dollar interest rates, and inflation—conditional on given expectations of future income and inflation for the U.S. economy. Dr. Zandi and Dr. Hoyt further elaborate that the classical long-run equilibrium for the economy is achieved at the point where expectations are consistent with reality. When this occurs in the economy, the level of real output, interest rates and inflation remain stable at equilibrium values governed entirely by the supply side of the economy. However, they note that in the short run, a shock to any part of this system can cause spending and inflation to depart from expectations. If that occurs; it causes departures in current growth, interest and inflation rates from their long-run equilibrium values, giving rise to business cycles—the recurring ups and downs in economic activity that have characterized the U.S. economy that have been documented by the National Bureau of Economic Research or NBER since the middle of the 1800s.

Within the context of the above, the Moody's U.S. Macro Model includes system of equations covering all aspects of the U.S. economy as typically are expected in classical macroeconomic theory. Aggregate demand in the Moody's U.S. Macro Model is disaggregated into consumption, business investment, international trade, and government expenditures. The key categories of macro activity included in the model include: (1) consumer spending, (2) gross private domestic

²¹ See U.S. Macro Model Methodology, April 2015; Dr. Mark Zandi and Dr. Scott Hoyt, Moody's Analytics; Economic & Consumer Credit Analytics, pp. 1-15. The description herein draws heavily from the above model documentation which was published as part of Moody's Analytics' work regarding "stress-testing" analyses for U.S. financial institutions. The technical information regarding the Moody's U.S. Macro Model's theoretical construction is also useful for understanding why and how this tool was employed in this housing study for the county.

investment, (3) international trade, (4) government spending and fiscal policy, (5) aggregate supply, (6) inflation, (8) monetary policy and financial markets, (9) personal income and corporate profits, (10) labor markets, and (11) housing. The Moody's U.S. Macro Model also includes break outs of key variables in the consumer sector, components of personal income, and output-jobs by industry. The detail for each of the eleven activity areas is summarized below.

Consumer Spending:

Consumer spending is a key part of the economy and is disaggregated into spending on motor vehicles and parts, durable goods excluding motor vehicles, nondurable goods, and services as the key components of spending. Within the Moody's U.S. Macro Model, each of these consumption components is modeled on a per capita basis to account for population growth. These categories are modeled as a function of real or inflation-adjusted income and real or inflation-adjusted household net worth. Energy prices, as they impact the consumption of vehicles, nondurable goods and services are also factored in to the consumer spending's system of equations. The Moody's U.S. Macro Model treats vehicle spending has an intermediate step—since it is a key part of consumer spending as a durable or “big-ticket” goods. Factors particular to the automobile market also have a significant influence on automobile purchases, so Moody's treats them separately within the broader framework of consumer durable purchases. The components of durable goods excluding motor vehicles, nondurable goods and services are modeled separately but forced to sum to the appropriate aggregate expenditure category. Other variables including unemployment, consumer sentiment, demographic trends, home sales, and the price of the particular good or service relative to the prices of all consumer goods and services are included in the models that support this macro activity area of the Moody's U.S. Macro Model.

Gross Private Domestic Investment:

Gross private domestic investment is divided in the Moody's U.S. Macro Model into three different categories: residential construction, fixed business investment, and inventory investment. Each category of investment is determined by different factors which reflect their differing cyclical patterns and macroeconomic basis. Estimates of residential construction activity are impacted by household formation growth and housing affordability. Housing affordability, in turn, is determined by mortgage rates, house prices, and income growth; tax law changes; consumer sentiment; and lending standards established by mortgage lenders. Measures of residential construction activity included in the Moody's U.S. Macro Model include single- and multifamily housing starts, existing-home sales, and several measures of house prices—including the FHFA-HPI²². The FHFA HPI is thought to be a good proxy for housing prices because it includes all sale and re-financing transactions within a geographic area where an appraisal is used to establish housing value or price. The FHFA HPI excludes house transactions involving “jumbo” mortgages.²³

Fixed business investment in the Moody's U.S. Macro Model is divided into four categories of equipment and software, three categories of intellectual property, and five categories of

²² FHFA refers to Federal Housing Finance Agency Housing Price Index.

²³ A jumbo mortgage is a house loan for an amount that exceeds conforming loan limits established by regulation. The jumbo loan limit is \$417,000 in most regions of the United States. The limit on jumbo loans is \$625,500 in the nation's highest-priced areas.

nonresidential structures. Moody's Analytics explains that business investment plays an important role in both the demand and supply sides of the economy. On the demand side, investment is a critical determinant of the business cycle because it responds to, and therefore amplifies, shifts in output. In the traditional accelerator/multiplier theory, the level of investment depends on the change in expected output; investment changes will in turn stimulate further movements in output through the multiplier effects. Investment influences the supply side of the economy since it is the principal determinant of potential output and labor productivity. Investment spending, under the Moody's U.S. Macro Model construct, adds to both the stock of capital available per worker, and also determines the extent to which the capital stock embodies the latest and most efficient technology. The Moody's U.S. Macro Model specification of the investment equations is based on the neoclassical investment theory of individual firms. Following this approach, net investment is modeled as a function of changes in expected output and the cost of capital. The cost of capital is equal to the implicit cost of leasing a capital asset—per economic theory.

Although most theoretical analyses assume that businesses do not face constraints on investment funds, in practice there are limits to the availability of credit. Corporate cash flow and debt levels are therefore also important determinants in the investment equations in the Moody's U.S. Macro Model. Investment in intellectual property is dependent on technology spending and profits. Investment in different types of nonresidential structures is driven in the Moody's U.S. Macro Model by construction put in place, which is in turn determined by measures that proxy for absorption of space, vacancy rates, and government spending. Investment in mining structures is closely linked to changes in oil prices. Inventory investment is divided into farm and nonfarm inventories. Nonfarm inventory change is further divided into construction and mining, manufacturing, and wholesale and retail inventories. Inventory investment is dependent on final sales and production which is "proxied" by capacity utilization—a commonly reported level of asset utilization by industry category.

International Trade:

World trade has been growing rapidly and has become more important to the U.S. economy in recent decades. This trend is expected to continue, despite the campaign rhetoric attributable to representatives of the new administration. The Moody's U.S. Macro Model includes an international trade sector that captures the interactions between foreign and domestic prices, interest rates, exchange rates, and estimated product flows. Within the model, export prices and volumes are determined by what are called stochastic equations, while nominal trade flows are calculated as identities. Merchandise trade flows are disaggregated between goods and services with imports of automobiles and parts also modeled separately within the Moody's U.S. Macro Model.

The key determinants of export volumes are global GDP growth and both the real and nominal trade-weighted value of the U.S. dollar. The structural equations in the Moody's U.S. Macro Model for imports allow a richer specification than do the corresponding export equations. Real imports are determined by specific domestic spending categories and relative prices. Projections of international economic activity are determined using the Moody's Analytics international

economic model system and are provided exogenously²⁴ to the Moody's U.S. Macro Model and regional economic model system.

Government Spending and Fiscal Policy:

Federal government spending and fiscal policies are treated in the Moody's U.S. Macro Model as partially exogenous to the U.S. economy, since legislative and administrative decisions are not tied with enough predictability to changes in macroeconomic conditions. At its most basic macroeconomic level, federal government spending is the sum of federal consumption and investment expenditures. These two expenditure categories are, in turn, divided into defense and nondefense categories. Federal defense and nondefense expenditures are each the sum of compensation and non-compensation federal purchases. Total federal government outlays in the Moody's U.S. Macro Model include the sum of defense and nondefense consumption expenditures plus transfer payments, net interest payments, subsidies less current surplus of government enterprises, federal grants-in-aid to state and local governments, less wage accruals net of disbursements. All outlays are exogenous except for transfer payments, which are a function of unemployment insurance payments, net interest payments (which are a function of interest rates and the publicly held Treasury debt), and government consumption (which is included in the Moody's U.S. Macro Model as a component of GDP and assumed to grow in a trend-like manner). Total federal government receipts are the sum of personal tax receipts, social insurance contributions, corporate profits tax receipts, and indirect tax receipts. Personal taxes account for the bulk of federal tax collections—accounting for nearly one-half of total receipts. Personal tax receipts are equal to the product of the average effective income tax rate times the tax base. The tax base is defined as personal income less nontaxable components of income (which include other labor income and government transfers). Most average effective tax rates are exogenous and actually comprise key policy levers in the model. The personal income tax rate is modeled based on high, low and middle marginal tax rate and changes in real stock and home prices. This allows for more policy levers in the Moody's U.S. Macro Model and account for capital gains tax receipts.

The federal budget deficit is measured both on a National Income and Product Accounts (or "NIPA") basis and on a unified basis. Differences between the two measures depend on accounting methods, coverage, and timing. For example, the unified budget counts receipts on a cash collections basis; the NIPA records corporate profit receipts on a liability basis (as is done in the so-called GDP accounts), and personal income taxes and Social Security payments on a "when paid" basis. Thus, unified outlays are counted when funds are disbursed. In contrast, NIPA outlays are recorded at the time of delivery. The state and local government sector of the Moody's U.S. Macro Model is modeled similarly to the federal sector. Revenues are a function of exogenous average effective tax rates and their corresponding national income categories, plus federal grants-in-aid. Expenditures for all but net interest costs are exogenously determined. Government spending in the NIPA calculations of GDP includes government consumption and adds government investment spending. Other components are considered transfers rather than economic output. One unique feature of the government sector of the NIPA accounts is that, unlike

²⁴ The term "exogenous" means that this variable is estimated using other quantitative tools other than the U.S. Macro Model. Separate values are inputted into the Moody's U.S. Macro Model that have been determined elsewhere (e.g. through other models) that are not run jointly with the Moody's U.S. Macro Model and are therefore outside or "exogenous" to the model.

most modeling of expenditures, government spending is forecast in nominal terms, with price deflators for each category of expenditures forecasted as well. Real values are then derived as identities within the Moody's U.S. Macro Model.

Aggregate Supply:

The supply side of the Moody's U.S. Macro Model describes the U.S. economy's capabilities for producing output. By extension, the Barnstable County regional economic model, which provided the baseline economic and demographic forecast for this study, describes the same capacity for producing output for the county. In the Moody's U.S. Macro model, aggregate supply or potential GDP is estimated by a Cobb-Douglas production function that combines factor input growth and improvements in productivity (e.g. through advances in technology that improve output efficiency). Factor inputs include labor and business fixed capital, and are defined by an estimate of the full-employment labor force and by the existing capital stock of private nonresidential equipment and structures. Population is estimated based on Census Bureau birth and death rates and immigration rates that are determined by the economic performance of the United States relative to the rest of the world. The baseline population forecast for the county was determined in a similar way, except the relative performance is for the county relative to the closed system for the U.S. economy—with the county's forecast part of an algorithm where the totals for the parts (e.g. all regional forecasts) are relationally forced to sum to the national total. Total factor productivity is calculated as the residual from the Cobb-Douglas production function estimated at full employment. A key unknown in estimating aggregate supply is what the full employment level of labor actually is. This level is derived from a measure of potential labor supply and a measure of the long-run equilibrium unemployment rate for the U.S. economy. This rate, often referred to as NAIRU or the **Non-Accelerating Inflation Rate of Unemployment**, is the unemployment rate consistent with steady price (and wage) inflation. It is also the unemployment rate at which actual GDP equals potential GDP.

Estimation of the NAIRU proceeds with the estimation of an expectations augmented Phillips curve relationship between inflation and unemployment. The inflation measure used is the chain price index for personal consumption expenditures excluding food and energy. The NAIRU estimated in this Phillips curve is the "married male" NAIRU. This group is chosen for the Moody's U.S. Macro Model because "married males" are expected to have the greatest attachment to the labor market, and thus be less susceptible to changes in labor force participation than other groups that may be affected more by changing demographic composition, changed work habits, or reduced discrimination (which are typical possible factors that drive labor force participation). This stability allows the Moody's U.S. Macro Model to more accurately estimate a married male (MM) NAIRU that is constant over time. Married female and unmarried NAIRUs are derived via statistical techniques such as regression from the married male NAIRU. These individual NAIRUs are demographically weighted to arrive at an overall NAIRU.

The growth of aggregate supply in the Moody's U.S. macro Model is the fundamental constraint on the long-term growth of aggregate demand. When actual GDP is above below-potential GDP, there is an output gap. Given currently high unemployment relative to NAIRU, the current output gap is large. Inflation created by demand that approaches or surpasses potential GDP (a positive output gap) raises credit costs and weakens consumer confidence, thus constraining aggregate demand when the economy is overheating. Conversely, lower inflation and easier credit stimulate

demand when economic conditions are slack. Thus, output and employment gaps form the key determinants of prices in the Moody's U.S. Macro Model, as price movements become the mechanism for restoring the full-employment level of output. An increase in government spending, for example, narrows the output gap, driving up output prices and lowering the unemployment rate. Higher prices and a tighter labor market, in turn, tend to force up wage rates, further putting upward pressures on prices— inflation, although this effect is partially offset by an increase in labor productivity. Higher inflation and a stronger real economy drive up interest rates and reduce real income gains. The net effect is a dampening of aggregate demand to bring it back in line with aggregate supply over the long-term.

Inflation:

Decisions about prices are made by individual firms. Firms adjust their prices in response to conditions in their markets. If demand has been strong and they are producing more than they think is appropriate given their current prices, they will raise their prices. If demand has been weak and the firms are producing less than appropriate, they will lower their prices. When the Moody's U.S. Macro Model handles this process in terms of aggregate variables—GDP and the price level—prices will tend to rise whenever GDP has been above potential and will tend to fall when it has been below potential. Firms make their price decisions with the prices of their inputs in mind. The most important input is labor. Therefore, the behavior of the wage rate is a major determinant of the price adjustment process. Wages and demand pressures on prices determine a relationship between the deviation of GDP from potential and inflation. This is embodied in the wage equations of the Moody's U.S. Macro Model through an expectations augmented Phillips curve, where wages react to expected inflation and unemployment. The fundamental wage equation in the model is the wage component of the Bureau of Labor Statistics' quarterly "Productivity & Costs" release. The explanatory variables include the difference between the actual unemployment rate and the NAIRU, private nonfarm labor productivity growth, and consumer prices. Within the Moody's U.S. Macro Model, the impact of prices takes three years to fully play out in the model. In addition to labor, energy is another important determinant of business costs.

In the specification of the Moody's U.S. Macro Model, firms are expected to be quicker to pass through energy price increases to consumers on goods that are especially sensitive to oil prices such as gasoline and agricultural commodities. Firms also pass through price increases on services such as airfare, train fare and wholesale trade after material and persistent rises in their energy costs. Electricity and natural gas consumer prices are slower to rise, since utilities must seek the permission of policymakers in order to raise prices in the regulated utilities industry. Energy is an input cost to virtually every firm in every industry. As such, rising energy prices boost the prices for all goods and services to the extent that firms pass through price increases.

More than 60 producer price index components are included and forecasted in the Moody's U.S. Macro Model. Most are forecast based on historical performance relative to demand and other relevant drivers. More aggregate producer price indexes are determined by a weighted average of other producer prices and labor costs. The weights reflect the composition of each producer price's factor inputs. The consumer price indexes in the Moody's U.S. Macro Model are driven by producer prices, labor costs, and import prices. Import price deflators, for example, are direct

determinants of many of the indexes for consumption goods. The core components of consumer prices are determined by the appropriate price deflators. Oil and food prices are determined exogenously. Consumer expenditure deflators are primarily determined by related consumer price indexes, although in some cases more fundamental drivers are utilized. The aggregate PCE deflator is determined stochastically and component deflators are constrained to be consistent.

Monetary Policy and Financial Markets:

The conduct of U.S. monetary policy by the Federal Open Market Committee (or “FOMC”) of the Federal Reserve is a very important part of the financial environment surrounding U.S. and regional housing markets. The key, benchmark short-term rate in the Moody’s U.S. Macro Model is the federal funds rate. The federal funds rate²⁵ is determined within the model over the period including when former Fed Chair Paul Volker became chair of the Federal Reserve Board in 1979 through the end of the forecast period. This period includes a number of very different approaches to the conduct of monetary policy by the Federal Reserve, including former Chair Volker’s implementation of monetarist theories, former Chair Alan Greenspan’s policy of opportunistic disinflation, and former Chair Ben Bernanke’s use of unconventional monetary policy tools to combat the “Great Recession” and financial crisis, and subsequent slower than desired recovery.

Despite the differences in approach, monetary policy as represented by the federal funds rate is included in the Moody’s U.S. Macro Model with a so-called “Taylor Rule” specification—reflecting the Federal Reserve’s dual objectives of fostering economic growth and maintaining long-term price stability. Developed by Stanford economist John Taylor, the Taylor Rule has been used as an important reference point for policymakers as they craft monetary policy as the economy has changed over time. The Taylor Rule is a central bank reaction function that computes an optimal federal funds rate from the equilibrium funds rate—that rate consistent with an economy operating at full-employment, growing at its potential with inflation at the Federal Reserve’s target. Stock market volatility is also included in the reaction function to proxy for the impact of financial market stress on policymakers’ views of the appropriate funds rate target. When the economy is operating at full employment and inflation is at the rate consistent with the Federal Reserve’s definition of price stability, the federal funds rate should be equal to its equilibrium rate.

In addition, the Taylor Rule prescribes the central bank to lower interest rates when either inflation or the economy is operating below its respective target, and vice versa. The Taylor Rule has done a reasonable job in tracking actions by the FOMC since the late 1970s. As the Taylor Rule was vetted by accurately predicting Federal Reserve’s actions, it provided financial markets a good metric to ascertain the path of monetary policy. For much of the period after the “Great Recession,” the Taylor Rule called for a negative federal funds rate. Since a negative interest rate of any kind, much less a benchmark interest rate like the federal funds rate, is extremely unlikely in reality (not to mention a negative interest rate would also create major issues in the specification of any U.S. macro model), at a certain point close to “zero,” a minimum, positive federal funds rate is imposed within the model.

²⁵ The federal funds rate is the interest rate at which depository institutions (banks and credit unions) lend reserve balances to other depository institutions overnight, on an uncollateralized basis. It is a benchmark rate that lays the groundwork for other consumer rates (like mortgage interest rates) that are charged in retail banking and other non-bank retail lending markets.

For the remainder of the financial sector, money demand equations are derived from portfolio theory; the demand for cash depends on the level of income, the expected level of transactions, and the opportunity cost of holding liquid assets as opposed to other interest-earning instruments. Money in the Moody's U.S. Macro Model is not a single asset, but rather a group of asset categories with varying degrees of liquidity. At one end of the spectrum is currency, which can be exchanged directly for assets; money also includes savings and time accounts, and, at the other end of the spectrum, certificates of deposit. Required reserves—determined by the components of money demand and the monetary policy lever specifying the required ratio—define the demand for reserves in the banking system. Free reserves, defined as non-borrowed reserves less required reserves, are a measure of disequilibrium in the Moody's U.S. Macro Model. Total, borrowed, and excess reserves are included for completeness of U.S. financial markets within the Moody's U.S. Macro Model.

Personal Income and Corporate Profits:

While the income side of the NIPA accounts is not as carefully followed as the demand side of the accounts, it is the income sector that makes macroeconomic models truly general equilibrium models. One household's spending is income to another household, while income generated by production is a constraint on final demand. Moreover, the distribution of income among households, businesses, and government has significant effects on the composition of output and on the dynamics of the business cycle. National income is defined as the sum of the payments to the factors of production. The Moody's U.S. Macro Model has behavioral equations for all nonprofit income flows including compensation of employees (wages and benefits), other labor income, employer contributions for social insurance, farm and nonfarm proprietors' income, and net interest paid by business.

Corporate profits with inventory valuation adjustment and capital consumption adjustment are estimated by quantitative methods such as regression on output, labor costs and prices. Corporate cash flow is determined by subtracting dividends and corporate taxes from corporate profits and adding depreciation allowances. A key stock price variable in the U.S. Macro Model has been the S&P 500 Composite Stock Price Index. This is modeled as a function of after-tax profits, stock price volatility, and a distributed lag on the 10- year government bond rate. In 2015, a new variable, the Dow Jones total stock market index, has been added to the model in order to meet Comprehensive Capital Analysis and Review reporting requirements. Over history, the two series have shown very similar behavior. Consequently, the S&P variable is the primary driver for the Dow Jones Index.

Labor Markets:

The labor market sector in the Moody's U.S. Macro Model reports employment concepts of two major types: (1) payroll jobs (which is a full-time and part-time position count by place of work), and (2) household employment-unemployment (which is a count of job holding residents or unemployed residents based on where they live—and each individual is counted as one employed or unemployed if they meet the required criteria for “participating in the labor force,” even if an

employed resident holds more than one position or job).²⁶ Within the household data set, the labor force, the number of unemployed, and the rate of unemployment are all calculated for the household data series. Private payroll jobs is modeled within the Moody's U.S. Macro Model from both a top-down and bottom-up approach. Total private jobs is derived as a function of labor hours demanded, which in turn is a function of output. Labor hours are modeled based on lagged growth in output and labor productivity. Total payroll jobs are also modeled separately at the one-digit and two-digit NAICS level.

To properly examine industry specific employment impacts attributed to changes in consumer spending, business investment, trade and federal and state government spending, the Moody's U.S. Macro Model has incorporated data from the 1997 benchmark of the Bureau of Economic Analysis' U.S. Input-Output Accounts. In the Moody's Analytics U.S. Macro Model technical specifications, Moody's indicates that these data are used to generate quarterly estimates of gross product originating by industry as follows:

GPO by industry *equals* the industry's share of total consumption *times* Real personal consumption expenditures; *plus* the industry's share of investment *times* Real investment *plus* the industry's share of exports *times* Real exports *plus* the industry's share of imports *times* Real imports *plus* the industry's share of federal spending *times* Real federal gross investment and consumption *plus* the industry's share of state and local spending *times* Real state and local gross investment and consumption.

Industry payroll jobs depend on the industry specific gross product originating and productivity terms in some cases for construction jobs. This intermediate value of construction payroll jobs then divided by the sum of all the intermediate estimates of job categories. This share is then applied to total private jobs estimated separately. Thus, relative industry payroll job shifts occur, even though the actual industry payroll job levels are "forced" to equal the change in top-line, total private payroll jobs.

Household employment (which again is the count of employed residents by where they live) is modeled as a function of total payroll jobs by place of work. The two measures of jobs-employment can vary over the business cycle given changes in the number of people holding multiple jobs and the number of self-employed. These differences should be captured in the national level variable. The labor force is determined by the working age population, real hourly compensation and the share of the population of prime working age. The rate of labor force participation is determined through an identity. The number of unemployed and the

²⁶ It should be noted that this housing study uses these two employment concepts for forecast development guidance only. This housing study uses a broader job concept as estimated by the Bureau of Economic Analysis as part of its personal income estimating program. The BEA definition of jobs is a broader employment-job concept than either of the series discussed above and was used because it is a more complete employment-jobs that would include all of the types of employment-job opportunities that can affect housing demand—including jobs in the agricultural sector, proprietors, and military jobs which are not a part of the Current Employment Survey (or CES) series that counts nonfarm payroll jobs. Neither the nonfarm payroll job concept (which includes only non-agricultural jobs and does not include proprietors' jobs) nor household employment (e.g. employed residents by where they live), is on-point for the housing demand forecast. However, they are important because both Moody's job-employment series are both important macro variables that provide important information on the health-performance of the economy. As such, they remain key macro variables in the Moody's U.S. Macro Model and regional forecast model employed in this study.

unemployment rate are determined as identities from the household employment and labor force projections.

The Personal Income sector of the Moody's U.S. Macro Model is further broken down into eight different components. Wages and salaries, the largest income category, are divided into manufacturing, private service producing, and construction and mining categories. In the same spirit as jobs-employment, wages and salaries are modeled from a top-down and bottom-up approach. Total wages and salaries are modeled as a function of average weekly earnings. Individual wage and salary categories are modeled as a function of industry employment, industry average hourly earnings, and a broad measure of hours worked. Outside of the wages and salaries category, the other non-wages and salaries income categories including supplements to wages and salaries, basically benefits, are estimated as a function of wages and salaries. The sizable constant term for this category of Personal Income in the Moody's U.S. Macro Model reflects the rapid growth in this category of income over the past two decades due to rising medical costs and nonwage benefits. Contributions for social insurance are also a function of wages and salaries and tax rates.

Interest income in the Moody's U.S. Macro Model is estimated from a regression on a weighted average of short- and long-term interest rates. Dividend income is a function of corporate dividend payments. Rental income is exogenous, and proprietors' income is derived from output and profits. Transfer payments in the Moody's U.S. Macro Model are a function primarily of the share of the population over 65 since Social Security benefits are the largest component. The unemployment rate and the rate of consumer price inflation also play a role in the Moody's U.S. Macro Model for this component.

Housing:

The housing sector determines the number of single-family and multifamily housing permits, starts, completions, new- and existing-home sales, house prices, mortgage originations for purchase and refinancing, and mortgage delinquency and foreclosure rates. Over the long run, demographic factors such as household formation and income growth drive growth of the housing market. Business cycles and construction cycles, as represented by the jobless rate and the availability and cost of labor and building materials, will create disequilibrium between housing demand and supply in the short run. The Moody's U.S. Macro Model of housing measures includes both these long-term and short-term forces, and provides important background for the county housing unit demand and unit supply estimates.

In the Moody's U.S. Macro Model, the demand for homes as expressed by new- and existing-home sales is related to household formation over the long term. Real, or inflation-adjusted, per household income growth is also an important determinant of housing demand as higher incomes make it possible for more households to buy a housing unit. The user cost of housing, or the after tax interest cost of owning a home less the expected return to buying a home, is a short-term driver of housing sales. The higher the user cost, the lower the housing unit sales. The expected return to buying a house is expected house price appreciation. The housing sales equations also include a measure of credit availability: with looser lending standards help drive sales over the near term.

Similarly, the level of housing permits issued is largely determined by the number of household formations over the long term. Over time, the level of housing permits issued will closely follow the number of new household formations, after considering demolitions. However, permits and household formations are not equal in each period, given changes in the business cycle and building activity. Within the Moody's U.S. Macro Model, also affecting starts and sales are the general economic conditions as represented by employment or income growth, the user cost of housing, and the availability of credit. Credit availability has become a particularly important factor influencing the level of housing unit construction given recent changes in bank capital standards and the emphasis of bank regulators on credit quality. In the Moody's U.S. Macro Model, single-family housing permits are modeled based on relationships of the 30-year fixed mortgage rates to a four-quarter moving average of single family housing prices, the loan to housing price ratio, the ratio of fixed 30-year mortgage rates to 30-year adjustable mortgage rates, and real disposable income growth per household in the economy over time.

House prices within the Moody's U.S. Macro Model are specified as a function of factors that influence both the demand and supply of housing. The demand for housing depends on income per household, the jobless rate, after-tax borrowing costs, credit availability, and the distress sale share of total existing-housing sales. Income per household measures both the ability and willingness of households to purchase a home. Rising income levels in the Moody's U.S. Macro Model will result in increased house buying activity. The jobless rate also impacts consumers' willingness to buy. If consumer confidence is low, house purchases will remain lackluster even if income levels are growing. Finally, the distress sale share of total existing-house sales has had a significant impact on house prices during the recent housing boom-bust cycle, representing discounted excess supply of housing. House price appreciation and changes in the distress share are inversely correlated. As such, the Moody's U.S. Macro Model treat distress share as an explanatory variable in the house price model.

Purchase mortgage originations are modeled as a function of the value of new- and existing-home sales and the loan-to-value ratio. To account for the changing share of home sales that are for cash, the Moody's U.S. Macro Model includes the mortgage foreclosure rate. The cash share of home sales tends to be greater when there are more distress sales that are purchased by investors with cash. Refinance originations as a share of mortgage debt outstanding are determined by the difference between the current 30-year fixed mortgage interest rate and the average rate over the last five years (the average duration of a mortgage loan). The spread between interest rates on fixed and adjustable rate mortgages is also included in the model to capture the desire of ARM borrowers to refinance and lock in fixed rates when those rates are low.

Mortgage delinquency rates are determined by employment growth, house price changes, household financial obligations, and loan-to-value ratios. Job-employment growth reflects the ability of homeowners to meet their mortgage payments, while the change in house prices captures changes in the level of homeowners' equity. Significant declines in equity values are necessary before homeowners will stop making their mortgage payments altogether. Mortgage foreclosures are also included in the Moody's U.S. Macro Model as a function of lagged mortgage delinquencies, real house price movements, household financial obligations, and employment growth. The housing sector has been expanded substantially since the housing boom and bust cycle of the mid-2000s. Some notable additions to the Moody's U.S. Macro Model in the housing

activity sector include the CoreLogic Case-Shiller® 20-City Single-Family House Price Index, single-family months of supply at current sales rate, and new single-family houses for sale.

Overview of the County Forecasting Process

According to the above technical description of the Moody’s U.S. Macro Model, the model specifies, estimates, and then solves simultaneously, a large set of equations that “mirror the structural workings” of the U.S. economy. The model is maintained on a monthly basis by Moody’s Analytics, and produces a short-term and long-term economic and demographic forecast for the U.S. economy. The structural model uses historical data from the various federal agencies which develop, publish and periodically revise these data on a regulator basis. For this study, the U.S. macroeconomic forecast through calendar year 2025 that comes from the Moody’s U.S. Macro Model forms the basis for the external macroeconomic drivers that help determine the short-term and long-term economic and demographic forecast for the county’s economy. Table 2.1 (below) sets for the key macroeconomic variables from the Moody’s Forecast which forms the important U.S. economic and demographic activity background for the county’s short-term and long-term economic and demographic forecast.

As such, the first step in creating the economic and demographic forecast (including the detailed population forecast) for the county and its respective municipalities, is from derived from the Moody’s Forecast, and more geographically-specific economic and demographic data from a special baseline forecast that was commissioned by the Crane Associates Team from Moody’s Analytics for the county’s economy. More specifically, the Crane Associates Team in January of 2017 commissioned a comprehensive regional economic and demographic forecast through calendar year 2025 for the Barnstable Town Metropolitan Statistical Area (“MSA”), which covers the entire geography of Barnstable County using the Moody’s Forecast for the U.S. economy as the basis for that regional forecast.

The Moody’s regional macro model, like the Moody’s U.S. Macro Model, specifies, estimates, and solves simultaneously a large set of equations that mirror the structural workings of the county’s economy in relation to the external drivers that are part of the U.S. economic forecast—in this case the Moody’s Forecast (completed in December of 2016). As mentioned above, by adopting a middle ground, the Moody’s model is able to include a significant number of endogenous indicators to help explain historic changes in economic, financial, and demographic trends and to forecast future trends in GDP, interest rates and inflation and the resulting regional implications of that U.S. forecast for the county.

Over the longer term, the Moody’s model construct allows the numerous and interrelated macroeconomic variables that will impact the short-term and longer-term economic and demographic (including population) to play themselves out in a detailed economic and demographic forecast for the county. The Moody’s regional model for the Barnstable Town MSA incorporates natural population changes, births minus deaths, but also includes in population changes (both population declines or increases) driven by the region’s economics—in that it assumes the economy influences the most important component of population dynamics, the in- and out-migration of resident population. In the next section of this chapter, we turn to a brief explanation on the differences between the official State of Massachusetts Population Forecast for Barnstable County and the results of Moody’s Analytics county economic and demographic forecast as adjusted by

the Crane Associates Team that was used as the economic and demographic background in this county housing study.

Table A.1 Moody's Forecast: U.S. Macro Baseline Forecast (December 2016)

Moody's Forecast: Moody's Analytics: U.S. Macro Baseline Forecast (December 2016)									Annual	Annual	Annual	Annual	Annual	Annual	Annual
Macro-Variable	1980	1990	2000	2005	2010	2015	2020	2025	% Change 1980-00	% Change 2000-05	% Change 2005-10	% Change 2010-15	% Change 2015-20	% Change 2020-25	% Change 2015-25
	History						Forecast		History				Forecast		
Gross Domestic Product: Total, (Bil. Chained 2009 \$, SAAR)	6,450.40	8,955.03	12,559.65	14,234.25	14,783.80	16,397.20	18,280.48	20,320.13	3.4%	2.5%	0.8%	2.1%	2.2%	2.1%	2.2%
Income: Total Personal, (Bil. 2009 \$, SAAR)	5,268.44	7,275.32	10,389.04	11,503.50	12,273.82	14,112.88	15,876.82	17,498.27	3.5%	2.1%	1.3%	2.8%	2.4%	2.0%	2.2%
Income: Wage & Salary Disbursements, (Bil. Nominal \$, SAAR)	1,373.43	2,741.20	4,825.85	5,691.98	6,377.53	7,854.83	10,346.91	12,500.77	6.5%	3.4%	2.3%	4.3%	5.7%	3.9%	4.8%
Median Household Income, (Nominal \$, SA)	18,167	31,102	42,349	46,242	50,046	55,775	65,470	74,583	4.3%	1.8%	1.6%	2.2%	3.3%	2.6%	2.9%
Jobs: Total Non-Agricultural, (Mill.)	90.53	109.53	132.03	134.04	130.35	141.83	151.50	156.76	1.9%	0.3%	-0.6%	1.7%	1.3%	0.7%	1.0%
Employment (Household Survey): Total Employed, (Mil.)	99.30	118.80	136.90	141.71	139.08	148.84	156.61	162.02	1.6%	0.7%	-0.4%	1.4%	1.0%	0.7%	0.9%
Employment (Household Survey): Unemployment Rate (%)	7.2	5.6	4.0	5.1	9.6	5.3	4.7	4.6							
Population: Total, (Mil.)	227.53	250.04	282.51	295.88	309.64	321.72	333.55	345.40	1.1%	0.9%	0.9%	0.8%	0.7%	0.7%	0.7%
Population: Ages 0-4, (Mil.)	16.51	18.90	19.19	19.92	20.18	19.91	20.38	20.77	0.8%	0.7%	0.3%	-0.3%	0.5%	0.4%	0.4%
Population: Ages 5-19, (Mil.)	55.82	53.08	61.42	62.13	62.96	62.21	61.71	61.97	0.5%	0.2%	0.3%	-0.2%	-0.2%	0.1%	0.0%
Population: Ages 19-64, (Mil.)	129.43	146.73	166.80	177.12	185.93	191.64	194.89	196.63	1.3%	1.2%	1.0%	0.6%	0.3%	0.2%	0.3%
Population: Ages 65+, (Mil.)	25.77	31.32	35.10	36.71	40.57	47.96	56.57	66.01	1.6%	0.9%	2.0%	3.4%	3.4%	3.1%	3.2%
Households, (Mil.)--Annual Average	81.10	92.07	106.10	112.71	117.16	123.23	130.26	137.36	1.4%	1.2%	0.8%	1.0%	1.1%	1.1%	1.1%
FHFA All Transactions Home Price Index, (Index 1995Q1 = 100, NSA)	102.70	165.00	234.63	346.77	323.45	358.75	419.67	511.57	4.2%	8.1%	-1.4%	2.1%	3.2%	4.0%	3.6%
Notes: NA Means "Not Available." FHFA means Federal Housing Finance Agency.															

Table A.2 Moody's Analytics: Barnstable County Economic and Demographic Baseline Forecast (December 2016)-Unadjusted

Moody's Analytics: Barnstable County Economic and Demographic Baseline Forecast (December 2016)-Unadjusted									Annual	Annual	Annual	Annual	Annual	Annual	Annual	
Macro-Variable	1980	1990	2000	2005	2010	2015	2020	2025	% Change 1980-00	% Change 2000-05	% Change 2005-10	% Change 2010-15	% Change 2015-20	% Change 2020-25	% Change 2015-25	
	History						Forecast		History				Forecast			
Gross Metro Product: Total, (Bil. Chained 2009 \$, SAAR)	3.79	6.18	9.69	10.72	10.25	10.35	11.39	12.47	4.8%	2.0%	-0.9%	0.2%	1.9%	1.8%	1.9%	
Income: Total Personal, (Mil. 2009 \$, SAAR)	3,770.30	6,418.38	9,820.20	10,736.27	11,307.63	12,488.88	13,735.53	14,996.76	4.9%	1.8%	1.0%	2.0%	1.9%	1.8%	1.8%	
Income: Wage & Salary Disbursements, (Mil. Nominal \$, SAAR)	581.58	1,504.93	2,785.78	3,486.58	3,720.55	4,479.28	5,706.99	6,849.10	8.1%	4.6%	1.3%	3.8%	5.0%	3.7%	4.3%	
Median Household Income, (Nominal \$, SA)	16,613	31,356	47,586	54,899	57,423	66,102	76,318	86,155	5.4%	2.9%	0.9%	2.9%	2.9%	2.5%	2.7%	
Jobs: Total Non-Agricultural, (Ths.)	53.93	72.48	90.98	95.75	91.14	98.05	105.20	107.35	2.6%	1.0%	-1.0%	1.5%	1.4%	0.4%	0.9%	
Employment (Household Survey): Total Employed, (Ths.)	NA	89.92	108.65	116.02	99.80	104.51	109.23	109.75	NA	1.3%	-3.0%	0.9%	0.9%	0.1%	0.5%	
Employment (Household Survey): Unemployment Rate (%)	NA	7.3	3.3	4.9	9.9	6.3	6.0	6.4								
Population: Total, (Ths.)	149.24	187.55	223.14	221.99	215.93	214.33	219.38	223.94	2.0%	-0.1%	-0.6%	-0.1%	0.5%	0.4%	0.4%	
Population: Ages 0-4, (Ths.)	8.12	12.16	10.59	9.51	8.86	8.17	8.39	8.47	1.3%	-2.1%	-1.4%	-1.6%	0.5%	0.2%	0.4%	
Population: Ages 5-19, (Ths.)	30.56	30.83	38.90	37.00	32.77	29.46	27.83	27.07	1.2%	-1.0%	-2.4%	-2.1%	-1.1%	-0.6%	-0.8%	
Population: Ages 19-64, (Ths.)	79.45	103.20	122.28	124.30	120.26	115.57	113.98	110.02	2.2%	0.3%	-0.7%	-0.8%	-0.3%	-0.7%	-0.5%	
Population: Ages 65+, (Ths.)	31.10	41.36	51.37	51.20	54.05	61.14	69.18	78.39	2.5%	-0.1%	1.1%	2.5%	2.5%	2.5%	2.5%	
Households, (Ths.)--Annual Average	59.11	78.00	95.29	96.98	95.88	97.18	101.31	105.64	2.4%	0.4%	-0.2%	0.3%	0.8%	0.8%	0.8%	
FHFA All Transactions Home Price Index, (Index 1995Q1 = 100, NSA)	NA	111.36	155.85	301.23	255.63	272.14	352.09	446.79	NA	14.1%	-3.2%	1.3%	5.3%	4.9%	5.1%	
Notes: NA Means "Not Available"	FHFA means Federal Housing Finance Agency.															
The county forecast from Moody's Analytics presented in the above table is unadjusted for "facts on the ground." The final county population forecast was adjusted for the March 2017 release of county population estimates for July 1, 2016 from the U.S. Census Bureau																

Moody's Model vs. State of Massachusetts Official Projections from the UMass Donahue Institute

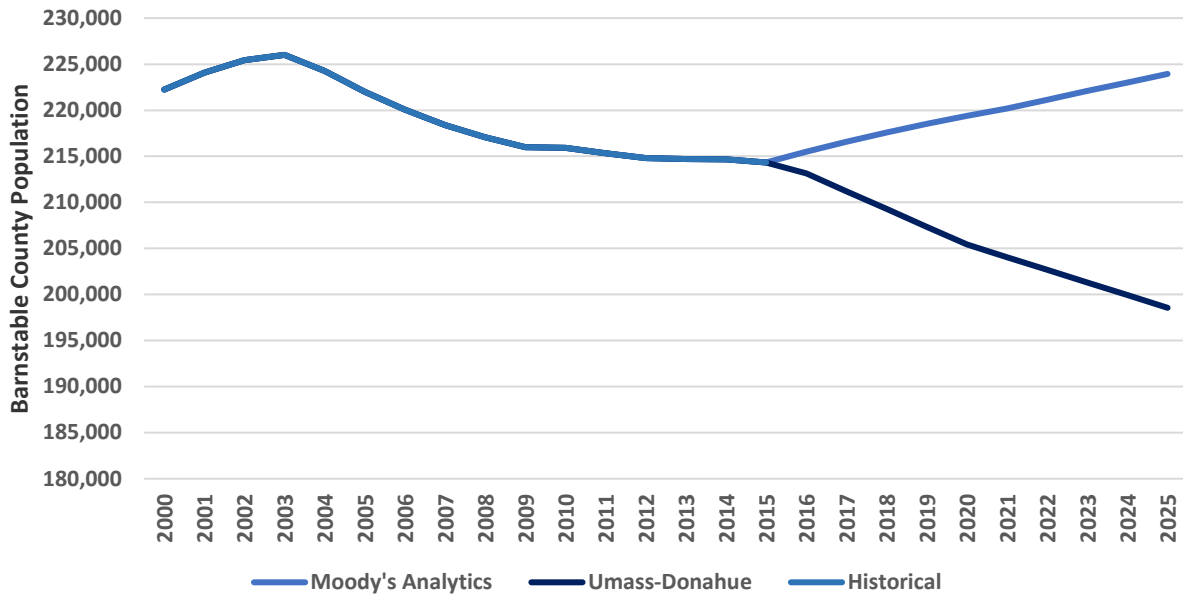
Moody's collects the historical data and their team of economists set up the theory-bound structural equations to explain and forecast economic, financial and demographic trends for 382 Metropolitan Statistical Areas (MSAs) and 50 states. Included in that system is a regional economic and demographic forecasting model for the Barnstable Town MSA—as one of the U.S.' MSAs. This forecast from Moody's Analytics, which was commissioned in January of 2017 based on the December 2016 Moody's Forecast for the U.S. economy, differs from the analysis presented in the *Long-term Population Projections for Massachusetts Regions and Municipalities* study performed by the UMass Donahue Institute in March 2015.

While Moody's is forecasting demographic change, in this case population, as it relates to the structural economy in the county, the Donahue Institute is projecting demographic change based solely on historical, or a retrospective view of past demographic data and trends. Moody's Analytics, therefore, takes a forward-looking more holistic approach to the economics and demographics of the county, forecasting the county's future economic performance and demographic changes within a larger prospective view of the county's economic, financial, and demographic picture. A caveat to the Moody's Analytics method is that all of the various economic, financial and demographic variables are to some degree endogenous to the model and slight changes in one or many indicators could significantly impact the economic and demographic forecast developed for this study. Moody's Analytics updates the U.S. Macro Model every month, including periodic re-specification of underlying equations to help improve model's forecasting accuracy—which necessitates continuous revision and updates. However, the requirements of this study necessitates that an initial, foundational forecast of the economic and demographic determinants of housing demand be agreed to and that this forecast have the longevity to keep the study's long term forecasts and findings relevant for as long a period of time into the future as it can. This seems particularly important given the aging of the U.S. economic cycle, and the recent global economic and political uncertainties that may complicate achieving that longevity objective for this study.

More specifically, the Donahue Institute uses a retrospective or backward-looking approach that considers population change through a strict and direct version of historic population dynamics. This is clearly a less complicated forecasting approach. However, such an approach does have a short-coming in that it does not rely on any background economic theory nor does it consider more than a relative few variables (for example migration, birth, and death rates)—an observation that the Donahue Institute also acknowledges in their technical report describing their approach. While in certain situations (such as a study with a short-term time horizon), it is appropriate to view the demographic future as a mere extension of a region's demographic past, the Crane Associates Team did not believe this was a robust enough approach nor the best, fully-considered methodology on which to base a regional housing demand and supply study that covers a ten year period going forward. After thorough analysis, EPR concluded that a structural macroeconomic model for Barnstable County was necessary to forecast future housing supply and demand because of the symbiotic relationship between the housing market and the overall economy of the region and the economy of the United States as a whole. Looking back to 2009 only reinforces this view.

The chart (below) shows how these two different approaches-methodologies can lead to significantly different forecasts of resident population for the future. These differences can become large, especially as the prospective timeline approaches ten years out into the future.

Figure A.1 Moody’s Analytics Forecast vs. Donahue Institute Projection for the County



Key Economic Variables

The projection performed by the Donahue Institute continues the negative trend in population change actually experienced in the county since 2003. The Donahue Institute projects this trend into the future using estimated data regarding migration (from 2005 to 2011) and birth-death rates data from 2000 to 2010 from the U.S. Census Bureau. The baseline Moody’s regional forecast for the county includes the expectation that the county’s population will actually increase in the future, despite the estimated actual population counts experienced over the period between 2003 and 2016—where there were years of population decline in the county. As mentioned previously, Moody’s Analytics does not only look exclusively at the specific components of the demographic variables in forecasting future population changes. Population is only one variable in Moody’s regional economic and demographic structural model for the Barnstable MSA or the county. It would be prudent then to look at some non-demographic variables in the Barnstable County model that can help explain why population is forecasted to grow.

As shown in Figure 2.2 below, Real Gross Metro Product, Industrial Production and Retail Sales in Barnstable County all experienced a major decline from calendar year 2007 through calendar year 2009, as we would expect with the onset of the “Great Recession.” Since 2010, however, all three economic indicators experienced fairly steady growth and are forecasted to continue to do so in the future. It is intuitive then to expect the population to increase in order to enable or support this expected future economic growth. However, taking into consideration the recent historical trend, the Crane Associates Team would not expect it to be substantial. Thus, the Crane Associates team arrives at how Moody’s regional economic and demographic forecasting model is generally set up: economic theory and expectations would dictate some population growth but the historical trend is warning that likely near-term future population increases will be somewhat tempered from a historical perspective. Taking a look at the wider historical context of population growth coupled with Moody’s forecast in Figure 2.2 (below), the Crane Associates Team believes that this is the more fully-considered, reasonable projection for resident population change through calendar year

2025 when compared to the historical, more narrowly-focused projection technique employed by the Donahue Institute.

Figure A.2 Moody's Analytics Economic Indicators – Barnstable County Historical and Forecasted—Annual Rate of Change (%)

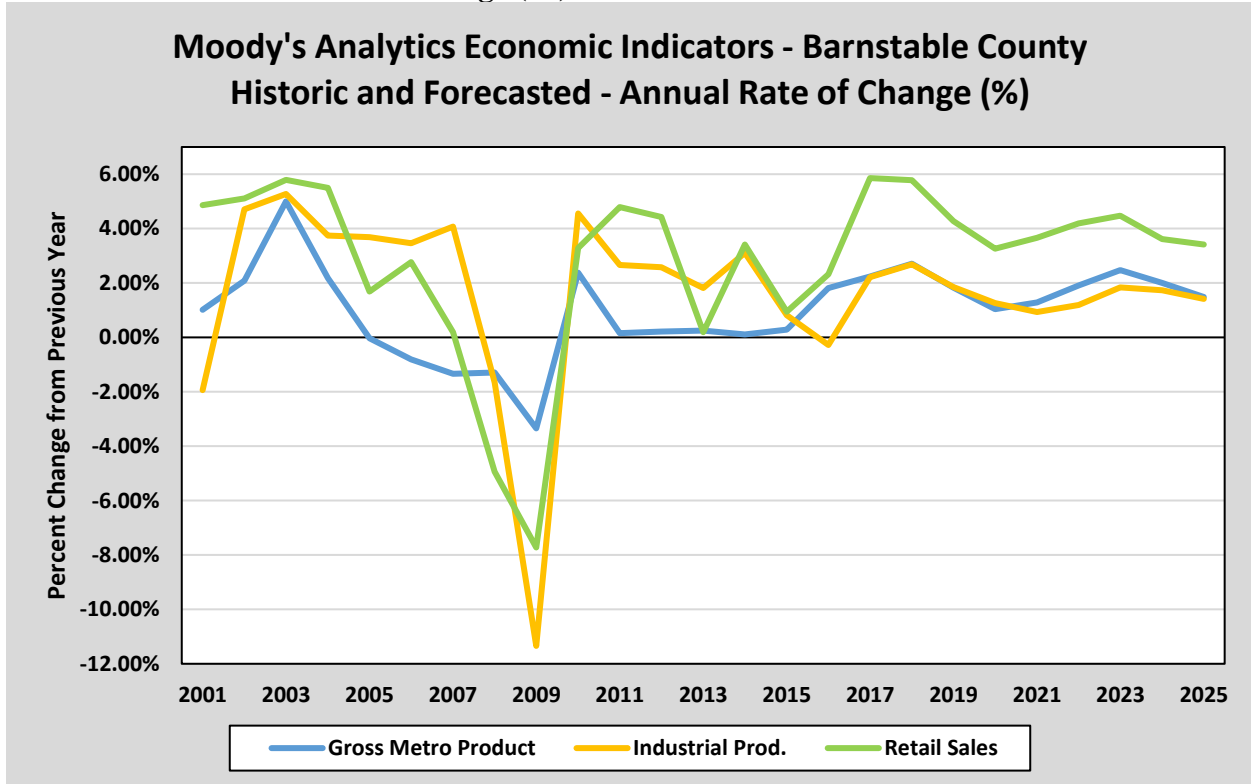
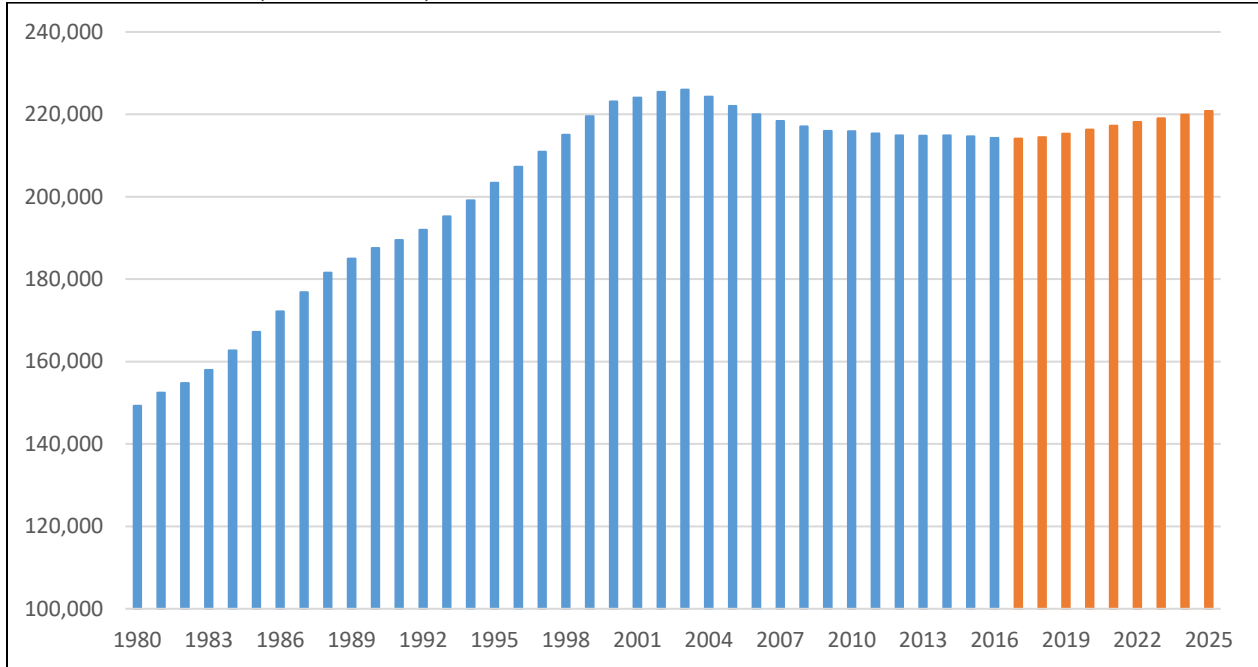


Figure A.3 Barnstable County Population—Historical (1980–2015)/Moody’s Analytics Baseline Forecast (2016 – 2025)



Creating a Unique Forecast Model for Barnstable County

We decided to use the Moody’s Analytics population forecast for the basis of our population forecast to be used in the Cape Cod Commission’s Housing Study. The Donahue Institute study showed Barnstable County as the only county in Massachusetts that was losing population. This anomaly caused enough concern to further investigate our model. First, we ensured that the quarterly historical data provided by Moody’s Analytics aligned with the mid-year estimates provided by the United States Census Bureau. The 2nd Quarter population for each year indeed aligns with the mid-year estimates from the Census so no further adjustments were required to adjust the forecast.²⁷ Second, we incorporated the newly released 2016 data from the US Census, as well as the revised 2010 through 2015 data. This forecast used a Variance Auto Regression (“VAR”) to correlate the Moody’s Analytics baseline forecast for the county with the updated historical data. That VAR process is described below, as the third step is to adjust for the Donahue Institute projections, as discussed below.

While Moody’s baseline population forecast for the county alone would probably have sufficed, the Crane Associates Team believed it was necessary to further revise our correlated forecast to take into special account the migration and birth/death patterns that the Donahue Institute deemed important to consider when trying to predict the underlying drivers of resident population growth for the county. The Crane Associates Team expected consideration of those factors was going to result in downward revisions to the initial baseline forecast. This was in fact the case as the final adjusted forecast was developed. The final forecast significantly lowered (or by about 1/3) the

²⁷ In the previous forecast, we used annual averages for the Moody’s forecast so we ran a VAR to correlate to the US Census mid-year estimates. With revisions to the 2010 through 2015 data and the release of the 2016 mid-year data, we chose to use the mid-year estimates.

population growth forecast that was in the baseline regional economic and demographic forecast for the county that was tied to the Moody's Forecast for the U.S. economy as a whole. Figure 2.4 (below) sets forth graphically the components of population change which were included in the regional economic and demographic forecast baseline for the county.

From the chart, it seems apparent that while net migration has increased since 2009, the natural change in population (births minus deaths) has been steadily decreasing over the entire period. As a reminder, the Donahue Institute focused primarily on the 2005–2011 migration period as period of the county's historical past that would be "*reasonably likely to reflect migration patterns over the next 20 years...*"²⁸ The actual population components data indicate that that assumption by the Donahue Institute may not be entirely accurate and could be cause for forecasting model re-specification. The Moody's Analytics regional baseline forecast expects more of an increase in net migration from 2016 to 2025, although the Moody's Analytics also forecasts the same downward trend for the natural change in population, as shown set forth in Figure 2.5. It should also be noted that Figure 2.5 has been adjusted for the actual mid-year July 2016 estimates of population change that were published by the U.S. Census Bureau in March of 2017.

²⁸ *Long-term Population Projections for Massachusetts Regions and Municipalities*, UMASS Donahue Institute, March 2015, page 29.

Figure A.4 Net Migration and Natural Increase in Population – Barnstable County 2001 – 2016

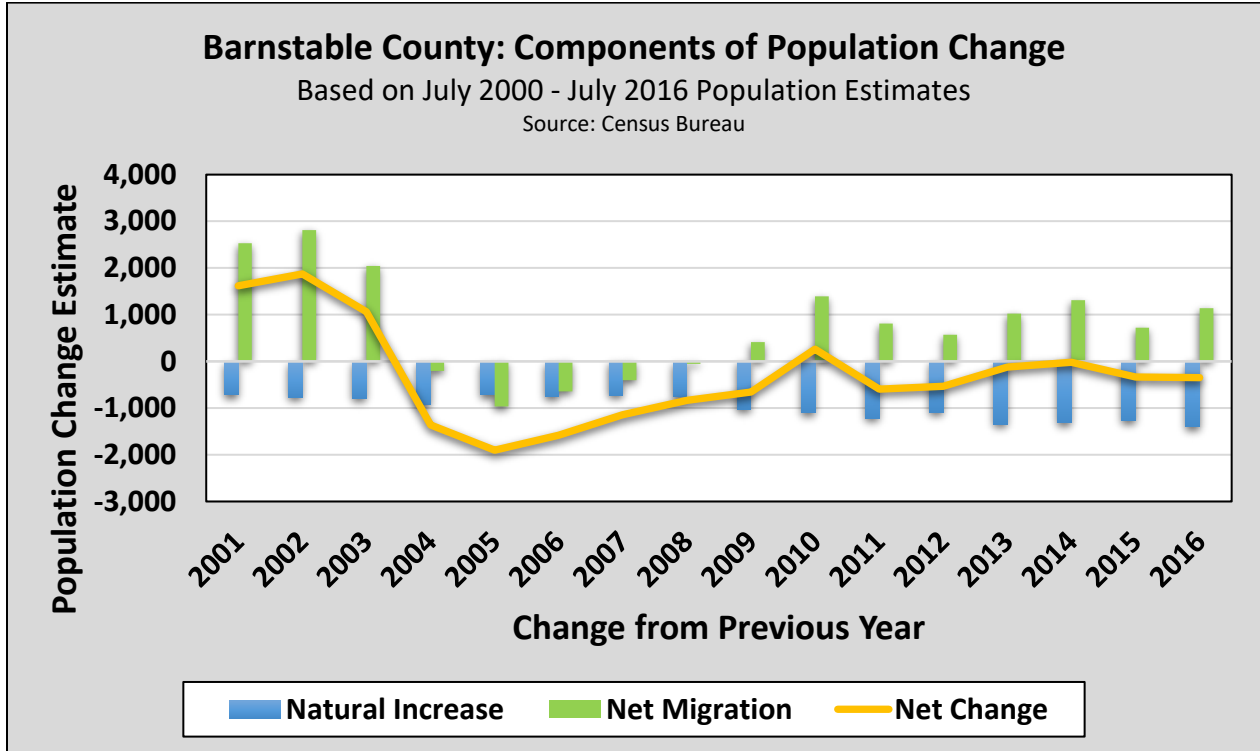
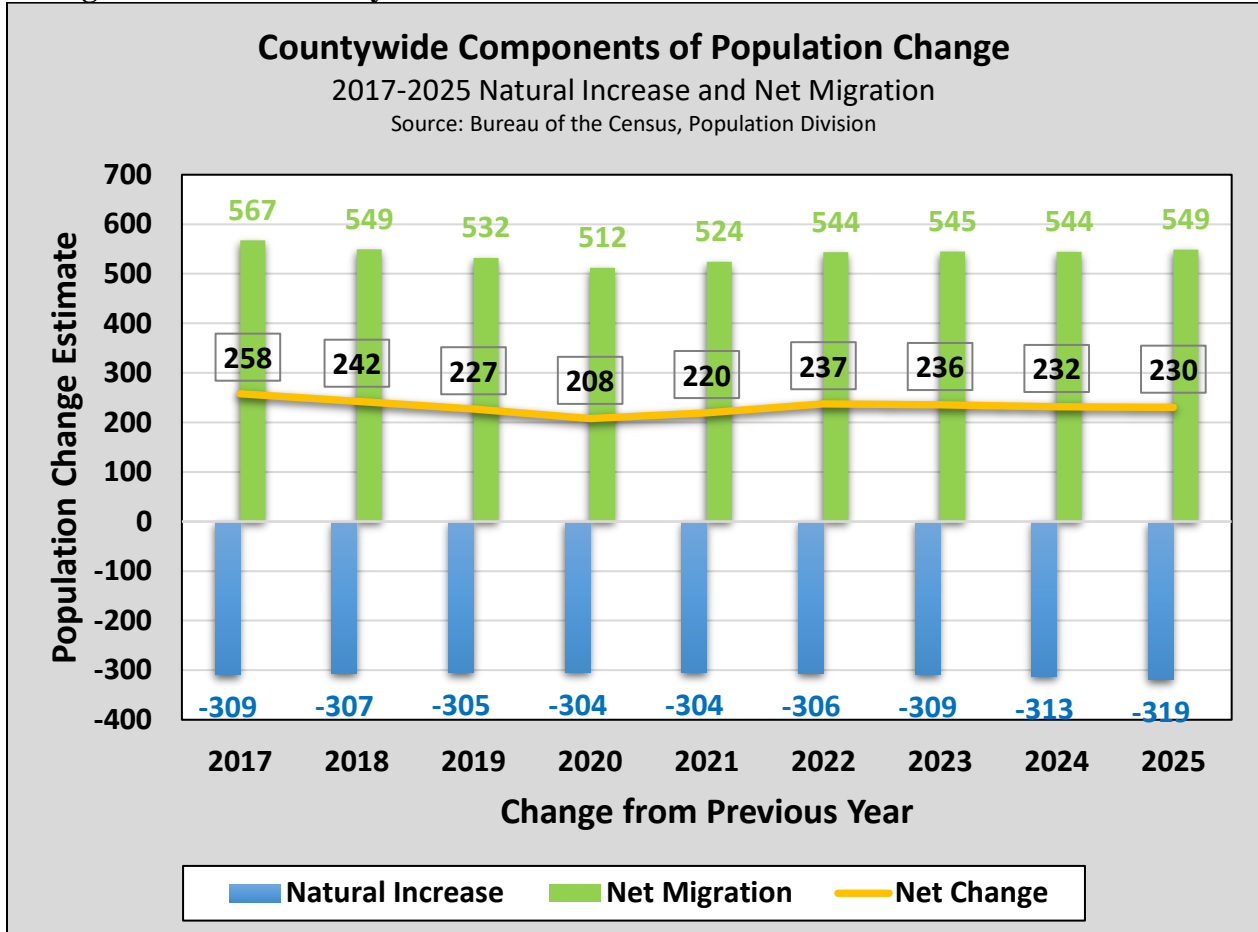


Figure A.5 Moody’s Analytics Baseline Forecast of Net Migration and Natural Population Change–Barnstable County



The initial adjusted forecast had a large increase in population in the first forecasted year. This was likely caused by the Moody’s forecast not incorporating certain important characteristics of the county (it is impossible to know which ones), and it reflected a typical “forecast launching” issue—where historical values are matched to forecasted future values as estimated by the quantitative model. In order to properly address this issue—in terms of the change in population from 2016 (last year of county historical data) to 2017 (first year of forecasted county data²⁹) and to also give extra attention to the Donahue Institute’s study—a statistical adjustment to the Moody’s forecast was made to weight the previous years’ demographic trends a little more heavily. In effect, that gave some quantitative support to the Donahue methodology without using their direct resident population estimates-forecasted outputs.

To accomplish this, a 5-year moving average was applied to the Moody’s Analytics baseline data, where the value in 2017 was the 5-year average of the total population in Barnstable County from 2012 through 2016. Instead of 2017’s population forecasted to be 215,498 in the original Moody’s

²⁹ However, it should be noted that calendar year 2016 was still considered the first forecasted year for the study. No detailed municipal data exists for the individual communities corresponding to the updated county population estimate revisions covering calendar years 2011-2015. The county level estimates were incorporated updated and the individual municipal population totals were re-estimated—but were forced to the county total for all historical years.

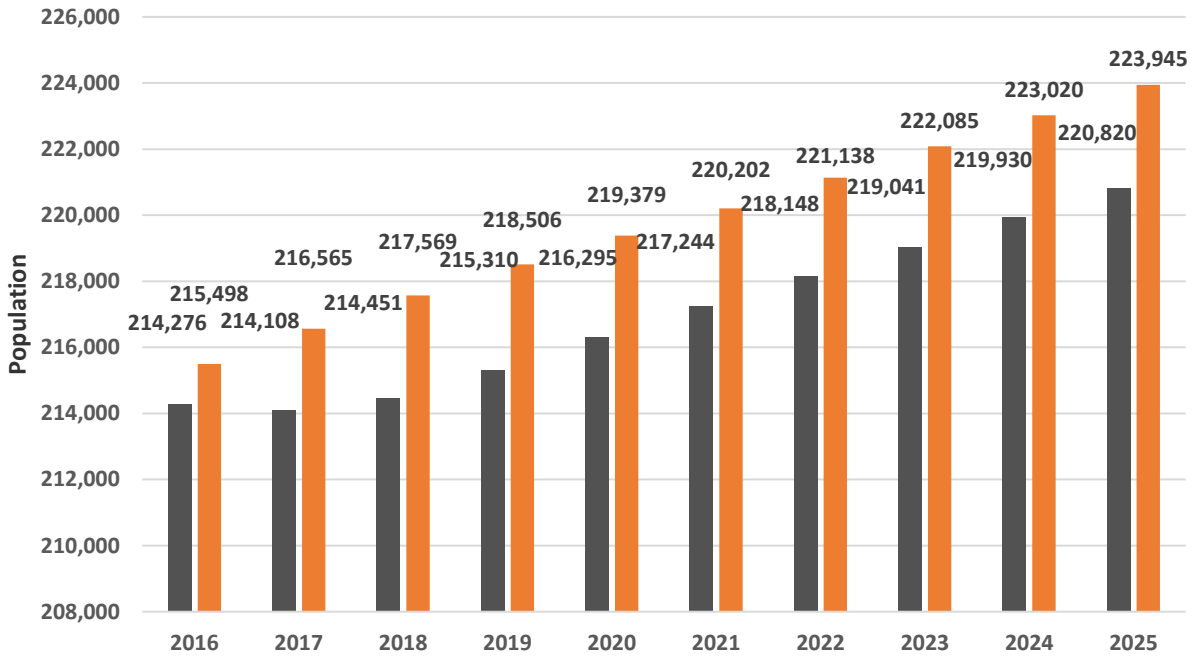
forecast, the adjusted population would now be 214,797. This is near what would have been calculated—if the total change in net migration and the natural change in population forecasted by Moody’s in 2017 (279 residents) was added to the Moody’s Analytics population figure for 2016 (214,333 residents). This approach resolves the forecast’s launching problem and the 5-year moving average application to years 2018 through 2025 in the Moody’s Analytics baseline regional forecast completes the adjusted forecast. After these calculations, a VAR was performed between the U.S. Census historical data (updated for the 2016 estimate and 2010 through 2015 revisions) and the revised forecast. Table 2.3 (below) shows the regression results.

Table A.3 VAR Results

Dependent Variable: BARNSTABLE_COUNTY				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-43.60715	1,886	-0.023117	0.9817
MOODYS_MA	1.000268	0	114.4786	0
AR(1)	-0.339236	0.380863	-0.890704	0.3795
SIGMASQ	11086.49	1872.585	5.920421	0
R-squared	0.99998	Mean dependent var		200017.5
Adjusted R-squared	0.999978	S.D. dependent var		23865.15
S.E. of regression	111.4913	Akaike info criterion		12.37088
Sum squared resid	410200.1	Schwarz criterion		12.54503
Log likelihood	-224.8613	Hannan-Quinn criter.		12.43228
F-statistic	549818.1	Durbin-Watson stat		1.549931
Prob(F-statistic)	0			
Inverted AR Roots	-0.34			

Forecasting based on this VAR produces a lower county population forecast than what Moody's Analytics forecasted in the regional population forecast baseline. To further revise, again based on the inclination to give consideration to demographic trends, we took into account the forecasted natural change of population by Moody's Analytics for years 2017 through 2025. We subtracted the forecasted number of deaths (net of births) in the county during these years from the results obtained from the forecast based on the VAR above. This lowered the EPR forecast for population even further away from the Moody's Analytics forecast. Figure 2.6 below shows the difference between EPR's revised forecast and Moody's regional baseline forecast.

Figure A.6 Barnstable County Population Forecast – EPR Adjusted Forecast (Gray) vs the Moody’s Analytics Baseline Population Forecast (Orange)



Note on Methodology for the Jobs Forecast

An important clarification on the Crane Associates Team’s jobs forecast and how it differs from the Moody’s Analytics jobs forecast. First (and as mentioned above), the job concept used in the county housing study (both historical and forecasted) is based on the Bureau of Economic Analysis (“BEA”) data and definitions. Specifically, the BEA reports all part-time and full-time jobs in an area for both wage and salary jobs (payroll jobs) and proprietor jobs. Moody’s Analytics reports and forecasts the non-agricultural payroll jobs and household employment (which is reported each month by the U.S. Bureau of Labor Statistics of the U.S. Department of Labor as part of the publication of the unemployment rate). In order to forecast the BEA data and to report the part-time and full-time payroll and proprietor jobs for the county, two VAR analyses were conducted—one for the BEA payroll jobs versus the Moody’s Analytics job count data and the other for the BEA proprietor jobs vs the Moody’s Analytics data. The VAR results for both are reported below. Prior to forecasting however, an adjustment was made to reduce the Moody’s employment forecast in a similar way that the study adjustments were made for population: the forecasted results were “smoothed” by taking a three-year moving average of the Moody’s data. In 2016 (the first forecasted year), instead of the Moody’s non-agricultural payroll jobs being forecasted to be 101,172, the adjusted number is 98,726 (the average of 2016 = 101,172; 2015 = 98,050; and 2014 = 96,956). After smoothing the Moody’s baseline forecasted data, VARs were run against the BEA data, as shown below.

Dependent Variable: WAGE ___ SALARY

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2359.429	3728.602	0.632792	0.5387
MOODYS_SMOOTH	1.005876	0.039529	25.44624	0.0000

AR(1)	0.213804	0.454215	0.470711	0.6463
SIGMASQ	33575.62	17108.64	1.962495	0.0733
R-squared	0.992814	Mean dependent var		97199.13
Adjusted R-squared	0.991017	S.D. dependent var		2232.384
S.E. of regression	211.5833	Akaike info criterion		13.76236
Sum squared resid	537210.0	Schwarz criterion		13.95550
Log likelihood	-106.0989	Hannan-Quinn criter.		13.77225
F-statistic	552.6025	Durbin-Watson stat		1.971132
Prob(F-statistic)	0.000000			
Inverted AR Roots	.21			

Dependent Variable: PROPRIETORS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11080.90	19387.83	0.571539	0.5782
MOODYS_SMOOTH	0.324226	0.207408	1.563231	0.1440
AR(1)	0.951868	0.107424	8.860869	0.0000
SIGMASQ	1031626.	471435.5	2.188266	0.0492
R-squared	0.889693	Mean dependent var		41264.44
Adjusted R-squared	0.862117	S.D. dependent var		3158.456
S.E. of regression	1172.818	Akaike info criterion		17.33234
Sum squared resid	16506015	Schwarz criterion		17.52548
Log likelihood	-134.6587	Hannan-Quinn criter.		17.34223
F-statistic	32.26259	Durbin-Watson stat		1.384692
Prob(F-statistic)	0.000005			
Inverted AR Roots	.95			

Forecasting the data based on these VAR results resulted in an adjusted forecast for both payroll jobs as well as proprietor jobs. The sum of those two categories is the total jobs forecast and is consistent with the BEA job count definition—which was thought to be more appropriate for a housing study of this nature.

Conclusion

The Crane Associates Team adjusted the Moody’s Analytics baseline regional economic and demographic county population forecast to a level that we believe takes into account the expertise and economically reliable structural model produced by Moody’s Analytics as well as the statistical demographic analysis paid by the Donahue Institute. Obviously, the Crane Associates team was weighing more heavily the analysis in the Moody’s Analytics baseline, as we believe that it is necessary to take into account not just past demographic trends, but also future economic and financial expectations, as Moody’s Analytics baseline regional economic and demographic forecast had done.

The population for the municipalities for the county were forecasted using VAR analysis. The Crane Associates Team used the annual historical population estimates for each municipality from

the U.S. Bureau of the Census over the 2000 through 2015 period to regress against the adjusted regional population forecast as described above in detail. To completely reconcile to the county forecast, the Crane Associates Team subtracted any additional forecasted population in the municipal forecasts according to their respective share of the county population in that year.

The attached tables show the historical and forecasted population for each municipality, as well as the annual average change and the share of the total county population. The data were also provided to the Cape Cod Commission in Excel format.

Supplemental Tables

Table A.7 Barnstable County Moody’s Population Forecast vs. EPR Population Forecast

Year	Barnstable County (US Census Mid Year Estimates)	Barnstable County Moody’s		Natural Change in Population - Moody’s	Barnstable County - EPR Forecast
		Q2 Data (Back to 2000 - Annual Average 1980 - 2000)	Moody’s 5 YR Moving Average (Starting 2016)		
1980	149,239	149,239	149,239		149,239
1981	152,474	152,474	152,474		152,474
1982	154,762	154,762	154,762		154,762
1983	157,945	157,945	157,945		157,945
1984	162,673	162,673	162,673		162,673
1985	167,232	167,232	167,232		167,232
1986	172,188	172,188	172,188		172,188
1987	176,860	176,860	176,860		176,860
1988	181,578	181,578	181,578		181,578
1989	184,999	184,999	184,999		184,999
1990	187,550	187,550	187,550		187,550
1991	189,453	189,453	189,453		189,453
1992	191,996	191,996	191,996		191,996
1993	195,277	195,277	195,277		195,277
1994	199,084	199,084	199,084		199,084
1995	203,385	203,385	203,385		203,385
1996	207,278	207,278	207,278		207,278
1997	210,891	210,891	210,891		210,891
1998	215,045	215,045	215,045		215,045
1999	219,545	219,545	219,545		219,545
2000	223,142	223,142	223,142		223,142
2001	224,087	224,087	224,087		224,087
2002	225,421	225,421	225,421		225,421
2003	226,011	226,011	226,011		226,011
2004	224,264	224,264	224,264		224,264
2005	221,995	221,995	221,995		221,995
2006	220,037	220,037	220,037		220,037
2007	218,380	218,380	218,380		218,380
2008	217,066	217,066	217,066		217,066
2009	215,994	215,994	215,994		215,994
2010	215,908	215,930	215,930		215,908
2011	215,372	215,339	215,339		215,372
2012	214,915	214,806	214,806		214,915
2013	214,844	214,685	214,685		214,844
2014	214,858	214,665	214,665		214,858
2015	214,621	214,333	214,333		214,621
2016	214,276	215,498	214,797		214,276
2017	215,345	216,565	215,149	(1,237)	214,108
2018	215,679	217,569	215,726	(1,227)	214,451
2019	216,530	218,506	216,494	(1,220)	215,310
2020	217,511	219,379	217,503	(1,216)	216,295
2021	218,462	220,202	218,444	(1,218)	217,244
2022	219,373	221,138	219,359	(1,225)	218,148
2023	220,278	222,085	220,262	(1,236)	219,041
2024	221,180	223,020	221,165	(1,250)	219,930
2025	222,094	223,945	222,078	(1,274)	220,820

[A]
Forecasted vs Moody’s Q2 Forecast (adjusted for 5 Year MA)

[B] [A] - [B] = [C]
Moody’s Annual Sum of Quarterly Births - Deaths

Forecasted

Table A.8 Barnstable County Moody’s Employment Forecast vs. EPR Employment Forecast

Year	BEA Wage & Salary	BEA Proprietors	BEA Total Employment	YoY Change	EPR Total Employment (Based on BEA and Adjusted for Pop Revision)		Moody's Employment	Moody's Smooth
					YoY Change Adjusted for Pop Revisions	Adjusted for Pop Revision		
1980	56,246	20,173	76,419			76,419	53,927	53,927
1981	58,576	20,169	78,745			78,745	56,523	56,523
1982	59,308	21,929	81,237			81,237	56,766	56,766
1983	63,044	23,437	86,481			86,481	60,120	60,120
1984	68,268	23,906	92,174			92,174	65,168	65,168
1985	72,068	24,810	96,878			96,878	69,245	69,245
1986	75,473	25,572	101,045			101,045	72,403	72,403
1987	78,378	21,818	100,196			100,196	75,453	75,453
1988	80,573	23,784	104,357			104,357	77,470	77,470
1989	78,832	23,176	102,008			102,008	75,692	75,692
1990	76,033	23,973	100,006			100,006	72,484	72,484
1991	72,162	24,315	96,477			96,477	68,919	68,919
1992	72,455	27,228	99,683			99,683	69,023	69,023
1993	74,946	28,507	103,453			103,453	71,534	71,534
1994	77,454	29,973	107,427			107,427	74,256	74,256
1995	80,590	28,892	109,482			109,482	77,895	77,895
1996	82,453	29,655	112,108			112,108	79,477	79,477
1997	84,876	31,792	116,668			116,668	82,159	82,159
1998	86,877	34,419	121,296			121,296	84,297	84,297
1999	90,584	35,871	126,455			126,455	87,980	87,980
2000	93,996	37,106	131,102			131,102	90,982	90,982
2001	95,223	36,119	131,342			131,342	92,516	92,516
2002	96,749	36,648	133,397			133,397	93,686	93,686
2003	98,550	37,504	136,054			136,054	95,404	95,404
2004	99,293	39,616	138,909			138,909	96,255	96,255
2005	98,642	40,701	139,343			139,343	95,748	95,748
2006	98,410	40,437	138,847			138,847	95,458	95,458
2007	98,648	42,619	141,267			141,267	95,674	95,674
2008	97,639	42,528	140,167			140,167	94,537	94,537
2009	94,583	42,664	137,247			137,247	91,475	91,475
2010	94,132	42,138	136,270			136,270	91,144	91,144
2011	94,021	42,821	136,842			136,842	91,596	91,596
2012	96,456	42,959	139,415			139,415	93,606	93,606
2013	98,181	44,436	142,617			142,617	95,514	95,514
2014	99,682	45,277	144,959			144,959	96,956	96,956
2015	100,981	46,658	147,639			147,639	98,050	98,050
2016	101,665	46,695	148,359		720	148,205	101,172	98,726
2017	103,642	47,158	150,800		2,441	150,122	102,851	100,691
2018	105,636	47,636	153,273		2,472	152,065	103,999	102,674
2019	106,901	47,886	154,787		1,515	153,254	104,942	103,931
2020	107,688	47,991	155,679		891	153,955	105,199	104,713
2021	108,047	47,964	156,011		332	154,216	105,069	105,070
2022	108,169	47,868	156,037		26	154,236	105,306	105,191
2023	108,513	47,850	156,363		326	154,492	106,226	105,534
2024	109,156	47,934	157,090		727	155,063	106,985	106,172
2025	109,840	48,038	157,878		788	155,682	107,348	106,853

[T] [A]

[A] - ([A] * 21.4%) = [B] [C] = [C]_{Year-1} + [B]

[Reduced by the same amount population was reduced from original forecast]

Table A.9 Population Forecast by Age Cohort (Moody’s)

Year	Total	Population: Ages													
		0-4, (Ths.)	5-9, (Ths.)	10-14, (Ths.)	15-19, (Ths.)	20-24, (Ths.)	25-29, (Ths.)	30-34, (Ths.)	35-39, (Ths.)	40-44, (Ths.)	45-49, (Ths.)	50-54, (Ths.)	55-59, (Ths.)	60-64, (Ths.)	65 and greater, (Ths.)
1980	149239	8122	8,695	10,663	11,204	9,992	10,541	11,316	8,648	6,332	6,408	7,529	8,761	9,923	31,105
1981	152474	8453	8,441	10,625	10,903	10,322	10,914	11,800	9,225	6,826	6,461	7,469	8,762	10,201	32,073
1982	154762	8730	8,350	10,367	10,578	10,421	11,254	11,651	10,124	7,406	6,523	7,295	8,732	10,327	33,005
1983	157945	9078	8,486	10,102	10,385	10,466	11,659	11,832	10,682	8,192	6,724	7,134	8,788	10,428	33,990
1984	162673	9477	8,801	9,867	10,310	10,579	12,171	12,235	11,452	8,940	7,025	7,094	8,845	10,737	35,139
1985	167232	9944	9,174	9,607	10,295	10,592	12,606	12,674	12,250	9,598	7,312	7,085	8,861	10,969	36,265
1986	172188	10456	9,679	9,387	10,340	10,496	13,021	13,132	13,054	10,327	7,711	7,092	8,907	11,071	37,516
1987	176860	10927	10,166	9,411	10,237	10,416	13,192	13,631	13,245	11,489	8,285	7,173	8,869	11,193	38,628
1988	181578	11409	10,639	9,611	10,076	10,415	13,204	14,134	13,724	12,216	9,063	7,379	8,789	11,348	39,573
1989	184999	11888	11,076	9,894	9,765	10,307	12,997	14,454	14,149	12,942	9,620	7,548	8,691	11,279	40,387
1990	187550	12156	11,397	10,141	9,293	10,241	12,705	14,587	14,486	13,603	10,023	7,719	8,656	11,179	41,362
1991	189453	12134	11,723	10,553	8,766	10,088	12,293	14,493	14,587	13,964	10,453	8,020	8,587	11,095	42,698
1992	191996	12063	11,979	10,911	8,539	9,805	11,924	14,445	14,849	13,905	11,511	8,613	8,700	11,018	43,735
1993	195277	11951	12,380	11,366	8,673	9,287	11,582	14,364	15,128	14,161	12,125	9,449	8,947	10,876	44,989
1994	199084	11750	12,825	11,716	8,955	8,723	11,334	14,354	15,465	14,611	12,918	10,250	9,319	10,835	46,029
1995	203385	11506	13,200	12,133	9,385	8,163	11,182	14,264	15,799	15,169	13,837	11,017	9,674	10,918	47,137
1996	207278	11301	13,278	12,566	9,879	7,535	11,006	13,944	16,013	15,667	14,609	11,843	10,135	10,926	48,575
1997	210891	11053	13,220	12,888	10,360	7,273	10,632	13,519	16,125	16,190	14,828	13,252	10,857	11,042	49,653
1998	215045	10901	13,103	13,364	10,881	7,355	10,048	13,140	16,205	16,766	15,392	14,183	11,889	11,363	50,456
1999	219545	10703	12,963	13,879	11,369	7,585	9,428	12,841	16,307	17,375	16,154	15,352	12,872	11,787	50,929
2000	223142	10586	12,744	14,306	11,852	7,819	8,810	12,599	16,173	17,757	16,825	16,460	13,711	12,128	51,371
2001	224087	10431	12,372	14,456	12,250	8,110	8,128	12,304	15,728	17,728	17,069	17,183	14,341	12,623	51,414
2002	225421	10279	11,928	14,326	12,691	8,592	7,820	11,855	15,165	17,687	17,353	17,084	15,750	13,433	51,458
2003	226011	10047	11,635	14,042	12,940	9,180	7,892	11,187	14,564	17,325	17,497	17,176	16,422	14,410	51,694
2004	224264	9764	11,228	13,449	13,204	9,474	7,837	10,358	13,824	16,932	17,566	17,235	17,066	14,990	51,337
2005	221995	9508	10,842	12,856	13,297	9,600	7,958	9,527	13,172	16,135	17,731	17,259	17,520	15,395	51,195
2006	220037	9336	10,590	12,338	13,351	9,618	8,027	8,821	12,775	15,312	17,746	17,317	17,995	15,619	51,192
2007	218380	9245	10,318	11,893	13,105	9,619	8,283	8,482	12,003	14,572	17,432	17,528	17,495	16,685	51,720
2008	217066	9327	10,093	11,586	12,769	9,554	8,663	8,338	11,213	13,926	17,071	17,632	17,404	16,988	52,502
2009	215994	9155	9,821	11,336	12,302	9,557	8,844	8,370	10,520	13,268	16,745	17,689	17,473	17,604	53,310
2010	215930	8856	9,832	10,973	11,962	9,676	9,188	8,696	9,770	12,870	16,302	17,931	17,673	18,153	54,048
2011	215339	8757	9,600	10,752	11,738	10,167	9,328	9,041	8,961	12,489	15,573	17,815	17,729	18,814	54,575
2012	214806	8668	9,370	10,477	11,377	10,550	9,151	9,316	8,714	11,893	14,833	17,552	17,933	18,323	56,649
2013	214685	8430	9,316	10,198	11,138	11,003	9,023	9,420	8,760	11,271	14,134	17,468	17,982	18,314	58,228
2014	214665	8305	9,163	9,992	10,859	11,206	9,185	9,438	8,897	10,608	13,419	17,028	18,337	18,480	59,748
2015	214333	8167	9,001	9,838	10,621	11,222	9,217	9,479	9,029	9,889	12,888	16,481	18,586	18,778	61,137
2016	215498	8187	8,888	9,704	10,537	10,999	9,470	9,514	9,192	9,487	12,732	16,215	18,763	19,159	62,653
2017	216565	8231	8,765	9,616	10,412	10,806	9,651	9,613	9,295	9,255	12,468	15,907	18,777	19,590	64,182
2018	217569	8288	8,660	9,508	10,288	10,634	9,728	9,852	9,301	9,164	12,117	15,532	18,765	19,941	65,788
2019	218506	8344	8,631	9,345	10,170	10,474	9,711	10,140	9,277	9,173	11,712	15,115	18,760	20,211	67,443
2020	219379	8390	8,618	9,201	10,010	10,351	9,558	10,415	9,237	9,264	11,246	14,862	18,613	20,434	69,182
2021	220202	8429	8,622	9,075	9,871	10,248	9,356	10,670	9,246	9,420	10,780	14,679	18,303	20,607	70,896
2022	221138	8461	8,660	8,949	9,789	10,119	9,188	10,860	9,337	9,522	10,519	14,387	17,968	20,624	72,755
2023	222085	8482	8,717	8,848	9,692	9,997	9,042	10,945	9,579	9,527	10,424	14,007	17,570	20,625	74,630
2024	223020	8487	8,776	8,826	9,542	9,883	8,909	10,934	9,875	9,505	10,447	13,570	17,133	20,651	76,484
2025	223945	8474	8,830	8,824	9,412	9,731	8,805	10,783	10,167	9,471	10,566	13,072	16,892	20,530	78,390

Table A.10 Population Forecast by Age Cohort (EPR)

Year	Total	Population: Ages 0-4, (Ths.)	Population: Ages 5-9, (Ths.)	Population: Ages 10-14, (Ths.)	Population: Ages 15-19, (Ths.)	Population: Ages 20-24, (Ths.)	Population: Ages 25-29, (Ths.)	Population: Ages 30-34, (Ths.)	Population: Ages 35-39, (Ths.)	Population: Ages 40-44, (Ths.)	Population: Ages 45-49, (Ths.)	Population: Ages 50-54, (Ths.)	Population: Ages 55-59, (Ths.)	Population: Ages 60-64, (Ths.)	Population: Ages 65 and greater, (Ths.)
1980	149,239	8,122	8,695	10,663	11,204	9,992	10,541	11,316	8,648	6,332	6,408	7,529	8,761	9,923	31,105
1981	152,474	8,453	8,441	10,625	10,903	10,322	10,914	11,800	9,225	6,826	6,461	7,469	8,762	10,201	32,073
1982	154,762	8,730	8,350	10,367	10,578	10,421	11,254	11,651	10,124	7,406	6,523	7,295	8,732	10,327	33,005
1983	157,945	9,078	8,486	10,102	10,385	10,466	11,659	11,832	10,682	8,192	6,724	7,134	8,788	10,428	33,990
1984	162,673	9,477	8,801	9,867	10,310	10,579	12,171	12,235	11,452	8,940	7,025	7,094	8,845	10,737	35,139
1985	167,232	9,944	9,174	9,607	10,295	10,592	12,606	12,674	12,250	9,598	7,312	7,085	8,861	10,969	36,265
1986	172,188	10,456	9,679	9,387	10,340	10,496	13,021	13,132	13,054	10,327	7,711	7,092	8,907	11,071	37,516
1987	176,860	10,927	10,166	9,411	10,237	10,416	13,192	13,631	13,245	11,489	8,285	7,173	8,869	11,193	38,628
1988	181,578	11,409	10,639	9,611	10,076	10,415	13,204	14,134	13,724	12,216	9,063	7,379	8,789	11,348	39,573
1989	184,999	11,888	11,076	9,894	9,765	10,307	12,997	14,454	14,149	12,942	9,620	7,548	8,691	11,279	40,387
1990	187,550	12,156	11,397	10,141	9,293	10,241	12,705	14,587	14,486	13,603	10,023	7,719	8,656	11,179	41,362
1991	189,453	12,134	11,723	10,553	10,088	8,766	10,088	12,293	14,493	13,964	10,453	8,020	8,587	11,095	42,698
1992	191,996	12,063	11,979	10,911	8,539	9,805	11,924	14,445	14,849	13,905	11,511	8,613	8,700	11,018	43,735
1993	195,277	11,951	12,380	11,366	8,673	9,287	11,582	14,364	15,128	14,161	12,125	9,449	8,947	10,876	44,989
1994	199,084	11,750	12,825	11,716	8,955	8,723	11,334	14,354	15,465	14,611	12,918	10,250	9,319	10,835	46,029
1995	203,385	11,506	13,200	12,133	9,385	8,163	11,182	14,264	15,799	15,169	13,837	11,017	9,674	10,918	47,137
1996	207,278	11,301	13,278	12,566	9,879	7,535	11,006	13,944	16,013	15,667	14,609	11,843	10,135	10,926	48,575
1997	210,891	11,053	13,220	12,888	10,360	7,273	10,632	13,519	16,125	16,190	14,828	13,252	10,857	11,042	49,653
1998	215,045	10,901	13,103	13,364	10,881	7,355	10,048	13,140	16,205	16,766	15,392	14,183	11,889	11,363	50,456
1999	219,545	10,703	12,963	13,879	11,369	7,585	9,428	12,841	16,307	17,375	16,154	15,352	12,872	11,787	50,929
2000	223,142	10,586	12,744	14,306	11,852	7,819	8,810	12,599	16,173	17,757	16,825	16,460	13,711	12,128	51,371
2001	224,087	10,431	12,372	14,456	12,250	8,110	8,128	12,304	15,678	17,728	17,069	17,183	14,341	12,623	51,414
2002	225,421	10,279	11,928	14,326	12,691	8,592	7,820	11,855	15,165	17,687	17,353	17,084	15,750	13,433	51,458
2003	226,011	10,047	11,635	14,042	12,940	9,180	7,892	11,187	14,564	17,325	17,497	17,176	16,422	14,410	51,694
2004	224,264	9,764	11,228	13,449	13,204	9,474	7,837	10,358	13,824	16,932	17,566	17,235	17,066	14,990	51,337
2005	221,995	9,508	10,842	12,856	13,297	9,600	7,958	9,527	13,172	16,135	17,731	17,259	17,520	15,395	51,195
2006	220,037	9,336	10,590	12,338	13,351	9,618	8,027	8,821	12,775	15,312	17,746	17,317	17,995	15,619	51,192
2007	218,380	9,245	10,318	11,893	13,105	9,619	8,283	8,482	12,003	14,572	17,432	17,528	17,495	16,685	51,720
2008	217,066	9,327	10,093	11,586	12,769	9,554	8,663	8,338	11,213	13,926	17,071	17,632	17,404	16,988	52,502
2009	215,994	9,155	9,821	11,336	12,302	9,557	8,844	8,370	10,520	13,268	16,745	17,689	17,473	17,604	53,310
2010	215,908	8,855	9,831	10,972	11,961	9,675	9,187	8,695	9,769	12,869	16,300	17,929	17,671	18,151	54,042
2011	215,372	8,758	9,601	10,754	11,740	10,169	9,329	9,042	8,962	12,491	15,575	17,818	17,732	18,817	54,583
2012	214,915	8,672	9,375	10,482	11,383	10,555	9,156	9,321	8,718	11,899	14,841	17,561	17,942	18,332	56,678
2013	214,844	8,436	9,323	10,206	11,146	11,011	9,030	9,427	8,766	11,279	14,144	17,481	17,995	18,328	58,271
2014	214,858	8,312	9,171	10,001	10,869	11,216	9,193	9,446	8,905	10,618	13,431	17,043	18,353	18,497	59,802
2015	214,621	8,178	9,013	9,851	10,635	11,237	9,229	9,492	9,041	9,902	12,905	16,503	18,611	18,803	61,219
2016	214,276	8,140	8,838	9,649	10,477	10,937	9,416	9,460	9,140	9,433	12,660	16,123	18,657	19,050	62,298
2017	215,345	8,184	8,715	9,562	10,353	10,745	9,596	9,559	9,242	9,203	12,397	15,817	18,671	19,480	63,820
2018	215,679	8,216	8,585	9,426	10,199	10,542	9,644	9,767	9,220	9,085	12,012	15,398	18,602	19,768	65,217
2019	216,530	8,268	8,553	9,261	10,078	10,380	9,623	10,048	9,193	9,090	11,606	14,978	18,590	20,029	66,833
2020	217,511	8,318	8,545	9,122	9,924	10,263	9,477	10,326	9,158	9,185	11,150	14,735	18,454	20,260	68,593
2021	218,462	8,362	8,554	9,003	9,793	10,167	9,282	10,586	9,173	9,346	10,694	14,563	18,158	20,444	70,336
2022	219,373	8,394	8,591	8,877	9,711	10,038	9,115	10,773	9,263	9,446	10,435	14,272	17,825	20,459	72,174
2023	220,278	8,413	8,646	8,776	9,613	9,915	8,969	10,856	9,502	9,449	10,339	13,893	17,427	20,457	74,023
2024	221,180	8,417	8,703	8,753	9,463	9,801	8,835	10,844	9,794	9,426	10,361	13,458	16,991	20,480	75,853
2025	222,094	8,404	8,757	8,751	9,334	9,650	8,733	10,693	10,083	9,393	10,478	12,964	16,752	20,360	77,742

Table A.11 Total Population Forecast (Moody's vs. EPR)

Total Population			EPR 3.2.17			Moody's December 2016 Forecast (Q2 Estimate)		
EPR 3.31.17 Revised			EPR 3.2.17			Moody's December 2016 Forecast (Q2 Estimate)		
Year	County	Change	Year	County	Change	Year	County	Change
1980	149,239		1980	149,239		1980	149,239	
1981	152,474	3,235	1981	152,474	3,235	1981	152,474	3,235
1982	154,762	2,288	1982	154,762	2,288	1982	154,762	2,288
1983	157,945	3,183	1983	157,945	3,183	1983	157,945	3,183
1984	162,673	4,728	1984	162,673	4,728	1984	162,673	4,728
1985	167,232	4,559	1985	167,232	4,559	1985	167,232	4,559
1986	172,188	4,956	1986	172,188	4,956	1986	172,188	4,956
1987	176,860	4,672	1987	176,860	4,672	1987	176,860	4,672
1988	181,578	4,718	1988	181,578	4,718	1988	181,578	4,718
1989	184,999	3,421	1989	184,999	3,421	1989	184,999	3,421
1990	187,550	2,550	1990	187,550	2,550	1990	187,550	2,550
1991	189,453	1,903	1991	189,453	1,903	1991	189,453	1,903
1992	191,996	2,543	1992	191,996	2,543	1992	191,996	2,543
1993	195,277	3,282	1993	195,277	3,282	1993	195,277	3,282
1994	199,084	3,806	1994	199,084	3,806	1994	199,084	3,806
1995	203,385	4,301	1995	203,385	4,301	1995	203,385	4,301
1996	207,278	3,893	1996	207,278	3,893	1996	207,278	3,893
1997	210,891	3,614	1997	210,891	3,614	1997	210,891	3,614
1998	215,045	4,154	1998	215,045	4,154	1998	215,045	4,154
1999	219,545	4,500	1999	219,545	4,500	1999	219,545	4,500
2000	223,142	3,597	2000	223,142	3,597	2000	223,142	3,597
2001	224,087	945	2001	224,087	945	2001	224,087	945
2002	225,421	1,334	2002	225,421	1,334	2002	225,421	1,334
2003	226,011	590	2003	226,011	590	2003	226,011	590
2004	224,264	-1,747	2004	224,264	-1,747	2004	224,264	-1,747
2005	221,995	-2,269	2005	221,995	-2,269	2005	221,995	-2,269
2006	220,037	-1,958	2006	220,037	-1,958	2006	220,037	-1,958
2007	218,380	-1,657	2007	218,380	-1,657	2007	218,380	-1,657
2008	217,066	-1,314	2008	217,066	-1,314	2008	217,066	-1,314
2009	215,994	-1,072	2009	215,994	-1,072	2009	215,994	-1,072
2010	215,908	-86	2010	215,930	-64	2010	215,930	-64
2011	215,372	-536	2011	215,339	-591	2011	215,339	-591
2012	214,915	-457	2012	214,806	-533	2012	214,806	-533
2013	214,844	-71	2013	214,685	-121	2013	214,685	-121
2014	214,858	14	2014	214,665	-20	2014	214,665	-20
2015	214,621	-237	2015	214,333	-332	2015	214,333	-332
2016	214,276	-345	2016	214,678	345	2016	215,498	1,165
2017	214,108	-168	2017	215,107	429	2017	216,565	1,067
2018	214,451	343	2018	215,743	637	2018	217,569	1,003
2019	215,310	859	2019	216,570	826	2019	218,506	938
2020	216,295	985	2020	217,573	1,003	2020	219,379	873
2021	217,244	949	2021	218,530	958	2021	220,202	823
2022	218,148	905	2022	219,460	930	2022	221,138	936
2023	219,041	893	2023	220,378	918	2023	222,085	947
2024	219,930	889	2024	221,295	917	2024	223,020	935
2025	220,820	890	2025	222,223	928	2025	223,945	925

2025 - 2015
6,199

2025 - 2015
7,890

2025 - 2015
9,612

Table A.12 Population by Age Cohort

Population by Age Cohort
EPR Revised 3.31.17

Year	Total	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
1980	149,239	8,122	8,695	10,663	11,204	9,992	10,541	11,316	8,648	6,332	6,408	7,529	8,761	9,923	31,105
1981	152,474	8,453	8,441	10,625	10,903	10,322	10,914	11,800	9,225	6,826	6,461	7,469	8,762	10,201	32,073
1982	154,762	8,730	8,350	10,367	10,578	10,421	11,254	11,651	10,124	7,406	6,523	7,295	8,732	10,327	33,005
1983	157,945	9,078	8,486	10,102	10,385	10,466	11,659	11,832	10,682	8,192	6,724	7,134	8,788	10,428	33,990
1984	162,673	9,477	8,801	9,867	10,310	10,579	12,171	12,235	11,452	8,940	7,025	7,094	8,845	10,737	35,139
1985	167,232	9,944	9,174	9,607	10,295	10,592	12,606	12,674	12,250	9,598	7,312	7,085	8,861	10,969	36,265
1986	172,188	10,456	9,679	9,387	10,340	10,496	13,021	13,132	13,054	10,327	7,711	7,092	8,907	11,071	37,516
1987	176,860	10,927	10,166	9,411	10,237	10,416	13,192	13,631	13,245	11,489	8,285	7,173	8,869	11,193	38,628
1988	181,578	11,409	10,639	9,611	10,076	10,415	13,204	14,134	13,724	12,216	9,063	7,379	8,789	11,348	39,573
1989	184,999	11,888	11,076	9,894	9,765	10,307	12,997	14,454	14,149	12,942	9,620	7,548	8,691	11,279	40,387
1990	187,550	12,156	11,397	10,141	9,293	10,241	12,705	14,587	14,486	13,603	10,023	7,719	8,656	11,179	41,362
1991	189,453	12,134	11,723	10,553	8,766	10,088	12,293	14,493	14,587	13,964	10,453	8,020	8,587	11,095	42,698
1992	191,996	12,063	11,979	10,911	8,539	9,805	11,924	14,445	14,849	13,905	11,511	8,613	8,700	11,018	43,735
1993	195,277	11,951	12,380	11,366	8,673	9,287	11,582	14,364	15,128	14,161	12,125	9,449	8,947	10,876	44,989
1994	199,084	11,750	12,825	11,716	8,955	8,723	11,334	14,354	15,465	14,611	12,918	10,250	9,319	10,835	46,029
1995	203,385	11,506	13,200	12,133	9,385	8,163	11,182	14,264	15,799	15,169	13,837	11,017	9,674	10,918	47,137
1996	207,278	11,301	13,278	12,566	9,879	7,535	11,006	13,944	16,013	15,667	14,609	11,843	10,135	10,926	48,575
1997	210,891	11,053	13,220	12,888	10,360	7,273	10,632	13,519	16,125	16,190	14,828	13,252	10,857	11,042	49,653
1998	215,045	10,901	13,103	13,364	10,881	7,355	10,048	13,140	16,205	16,766	15,392	14,183	11,889	11,363	50,456
1999	219,545	10,703	12,963	13,879	11,369	7,585	9,428	12,841	16,307	17,375	16,154	15,352	12,872	11,787	50,929
2000	223,142	10,586	12,744	14,306	11,852	7,819	8,810	12,599	16,173	17,757	16,825	16,460	13,711	12,128	51,371
2001	224,087	10,431	12,372	14,456	12,250	8,110	8,128	12,304	15,678	17,728	17,069	17,183	14,341	12,623	51,414
2002	225,421	10,279	11,928	14,326	12,691	8,592	7,820	11,855	15,165	17,687	17,353	17,084	15,750	13,433	51,458
2003	226,011	10,047	11,635	14,042	12,940	9,180	7,892	11,187	14,564	17,325	17,497	17,176	16,422	14,410	51,694
2004	224,264	9,764	11,228	13,449	13,204	9,474	7,837	10,358	13,824	16,932	17,566	17,235	17,066	14,990	51,337
2005	221,995	9,508	10,842	12,856	13,297	9,600	7,958	9,527	13,172	16,135	17,731	17,259	17,520	15,395	51,195
2006	220,037	9,336	10,590	12,338	13,351	9,618	8,027	8,821	12,775	15,312	17,746	17,317	17,995	15,619	51,192
2007	218,380	9,245	10,318	11,893	13,105	9,619	8,283	8,482	12,003	14,572	17,432	17,528	17,495	16,685	51,720
2008	217,066	9,327	10,093	11,586	12,769	9,554	8,663	8,338	11,213	13,926	17,071	17,632	17,404	16,988	52,502
2009	215,994	9,155	9,821	11,336	12,302	9,557	8,844	8,370	10,520	13,268	16,745	17,689	17,473	17,604	53,310
2010	215,908	8,855	9,831	10,972	11,961	9,675	9,187	8,695	9,769	12,869	16,300	17,929	17,671	18,151	54,042
2011	215,372	8,758	9,601	10,754	11,740	10,169	9,329	9,042	8,962	12,491	15,575	17,818	17,732	18,817	54,583
2012	214,915	8,672	9,375	10,482	11,383	10,555	9,156	9,321	8,718	11,899	14,841	17,561	17,942	18,332	56,678
2013	214,844	8,436	9,323	10,206	11,146	11,011	9,030	9,427	8,766	11,279	14,144	17,481	17,995	18,328	58,271
2014	214,858	8,312	9,171	10,001	10,869	11,216	9,193	9,446	8,905	10,618	13,431	17,043	18,353	18,497	59,802
2015	214,621	8,178	9,013	9,851	10,635	11,237	9,229	9,492	9,041	9,902	12,905	16,503	18,611	18,803	61,219
2016	214,276	8,140	8,838	9,649	10,477	10,937	9,416	9,460	9,140	9,433	12,660	16,123	18,657	19,050	62,298
2017	215,345	8,184	8,715	9,562	10,353	10,745	9,596	9,559	9,242	9,203	12,397	15,817	18,671	19,480	63,820
2018	215,679	8,216	8,585	9,426	10,199	10,542	9,644	9,767	9,220	9,085	12,012	15,398	18,602	19,768	65,217
2019	216,530	8,268	8,553	9,261	10,078	10,380	9,623	10,048	9,193	9,090	11,606	14,978	18,590	20,029	66,833
2020	217,511	8,318	8,545	9,122	9,924	10,263	9,477	10,326	9,158	9,185	11,150	14,735	18,454	20,260	68,593
2021	218,462	8,362	8,554	9,003	9,793	10,167	9,282	10,586	9,173	9,346	10,694	14,563	18,158	20,444	70,336
2022	219,373	8,394	8,591	8,877	9,711	10,038	9,115	10,773	9,263	9,446	10,435	14,272	17,825	20,459	72,174
2023	220,278	8,413	8,646	8,776	9,613	9,915	8,969	10,856	9,502	9,449	10,339	13,893	17,427	20,457	74,023
2024	221,180	8,417	8,703	8,753	9,463	9,801	8,835	10,844	9,794	9,426	10,361	13,458	16,991	20,480	75,853
2025	222,094	8,404	8,757	8,751	9,334	9,650	8,733	10,693	10,083	9,393	10,478	12,964	16,752	20,360	77,742

Table A.13 Population Year to Year Change

Population Year to Year Change

EPR Revised 3.31.17

Year	Total	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
1980															
1981	3,235	331	-254	-38	-301	331	373	483	577	494	53	-61	0	278	968
1982	2,288	277	-91	-258	-325	98	339	-149	899	580	62	-174	-29	126	932
1983	3,183	347	136	-265	-194	45	406	182	558	787	201	-161	56	101	985
1984	4,728	399	315	-234	-75	113	512	403	770	748	301	-40	57	309	1,150
1985	4,559	467	373	-261	-15	13	435	439	799	658	287	-9	16	232	1,125
1986	4,956	513	505	-220	45	-96	415	458	804	729	399	7	46	102	1,251
1987	4,672	471	487	24	-103	-80	171	499	191	1,162	574	81	-39	122	1,112
1988	4,718	482	474	199	-161	-1	12	503	478	727	778	206	-80	155	945
1989	3,421	480	437	284	-311	-108	-207	320	426	727	557	169	-97	-68	814
1990	2,550	267	320	247	-472	-66	-291	133	337	661	403	171	-35	-100	976
1991	1,903	-22	326	412	-527	-152	-412	-94	100	360	430	300	-69	-84	1,336
1992	2,543	-71	257	357	-227	-283	-369	-48	262	-59	1,058	593	112	-76	1,036
1993	3,282	-112	400	455	134	-517	-341	-81	280	256	614	836	247	-143	1,254
1994	3,806	-201	445	350	282	-565	-248	-10	337	450	792	802	373	-40	1,040
1995	4,301	-244	376	418	430	-560	-152	-90	334	558	919	766	355	83	1,107
1996	3,893	-204	78	433	494	-628	-176	-320	214	498	772	827	460	8	1,438
1997	3,614	-248	-58	322	481	-261	-374	-425	112	523	219	1,408	722	115	1,078
1998	4,154	-152	-117	476	522	82	-584	-379	80	576	564	932	1,032	321	803
1999	4,500	-198	-140	515	488	230	-620	-299	102	609	762	1,169	983	425	473
2000	3,596	-117	-220	428	483	234	-618	-242	-134	382	671	1,108	839	341	442
2001	945	-155	-372	150	398	291	-682	-295	-495	-29	244	723	630	495	43
2002	1,334	-152	-444	-130	441	482	-308	-449	-513	-41	284	-99	1,409	810	44
2003	590	-232	-293	-284	249	588	72	-668	-601	-362	144	92	672	977	236
2004	-1,747	-283	-407	-593	264	294	-55	-829	-740	-393	69	59	644	580	-357
2005	-2,269	-256	-386	-593	93	126	121	-831	-652	-797	165	24	454	405	-142
2006	-1,958	-172	-252	-518	54	18	69	-706	-397	-823	15	58	475	224	-3
2007	-1,657	-91	-272	-445	-246	1	256	-339	-772	-740	-314	211	-500	1,066	528
2008	-1,314	82	-225	-307	-336	-65	380	-144	-790	-646	-361	104	-91	303	782
2009	-1,072	-172	-272	-250	-467	3	181	32	-693	-658	-326	57	69	616	808
2010	-86	-300	10	-364	-341	118	343	325	-751	-399	-445	240	198	547	732
2011	-536	-97	-230	-218	-221	494	142	347	-807	-378	-725	-111	61	666	541
2012	-457	-86	-227	-271	-357	387	-174	278	-244	-592	-735	-257	210	-485	2,094
2013	-71	-236	-52	-277	-237	456	-126	106	48	-620	-696	-80	53	-5	1,593
2014	14	-124	-152	-205	-277	205	164	20	139	-662	-713	-438	358	169	1,531
2015	-237	-134	-158	-150	-233	21	36	45	136	-715	-526	-540	257	307	1,417
2016	-345	-38	-176	-202	-158	-300	187	-32	99	-469	-245	-380	46	247	1,078
2017	1,069	44	-122	-88	-124	-192	180	99	102	-230	-263	-306	15	430	1,522
2018	334	32	-130	-136	-154	-203	47	208	-22	-119	-386	-419	-70	288	1,397
2019	851	52	-32	-165	-120	-162	-21	282	-27	6	-406	-419	-12	260	1,617
2020	981	50	-9	-138	-154	-117	-146	278	-35	95	-455	-243	-136	232	1,759
2021	950	44	9	-119	-131	-95	-195	260	15	161	-456	-173	-296	184	1,743
2022	911	32	37	-126	-82	-129	-167	187	90	100	-260	-290	-333	15	1,839
2023	905	19	55	-102	-97	-123	-146	83	239	4	-96	-380	-398	-2	1,849
2024	903	4	57	-22	-150	-114	-134	-12	292	-23	22	-434	-436	23	1,830
2025	914	-13	54	-2	-130	-151	-103	-150	289	-34	118	-495	-239	-120	1,890