



# **NASHVILLE REGION**

## HEALTH COMPETITIVENESS INITIATIVE

2017 REPORT



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## Description of the Nashville Region Health Competitiveness Initiative: 2017 Report

The Research Center of the Nashville Area Chamber of Commerce commissioned FTI Consulting Inc.'s Center for Healthcare Economics and Policy (“Center”) to collaborate with the Chamber on the development of data and analyses for the Nashville Region Health Competitiveness Initiative. This *Nashville Region Health Competitiveness Initiative: 2017 Report* (“2017 Report”) represents an update and an important extension of actionable data, metrics, and analyses in the Center’s 2015 collaboration with the Nashville Area Chamber of Commerce and stakeholders - “Assessment of Nashville Region Health, Cost, Access, and Quality: Results of Pilot Study.”<sup>1</sup>

The 2017 Report presents current actionable data and metrics to enable stakeholders *to track both status and progress* in health conditions and their impact on utilization and cost and in access to health care services for the Nashville Region as compared to its peer cities.

The 2017 Report adds new analyses for richer insights into the *workforce impact* of chronic conditions and health behaviors and on the Nashville Region’s competitiveness. Increasingly, business leaders, healthcare providers, and community stakeholders seek to understand the economic impact of health on residents and the economic wellbeing and attractiveness of a region. Health represents a vital asset for a region.

The 2017 Report assesses economic and workforce impact issues by analyzing the prevalence of chronic conditions and health behaviors for the Nashville workforce and the resulting demands on healthcare services. It develops *Nashville region-specific medical and productivity costs* associated with three health behaviors and conditions that significantly affect the health status of Nashville’s workforce – *diabetes, obesity, and hypertension*.

The 2017 report examines these conditions and their associated healthcare utilization and time away from work for two age cohorts (specifically, those aged 25-44 and 45-64). This enables assessment of the workforce implications for specific industry sectors in the Nashville region that may be more dependent on older or younger workforce members.

By focusing on the linkages between health, access, and costs and their implications for economic and personal wellbeing, the 2017 Report provides the Community Partners and business leaders in the Nashville region with actionable data and information to identify the most important issues and priorities relevant for the area’s competitiveness. The analyses also focus on metrics presented in comparative fashion for Nashville and its peer cities. These can inform potential interventions and strategies that can contribute important benefits for employers, residents, and the community.

The enhanced data and analyses in the 2017 Report include:

- **Updated and new core metrics for Nashville and its peer cities** to more current data where available; these include data on assets available to address health needs.
- **More detailed data on chronic conditions and behaviors, medical costs, and healthcare service utilization for two specific “workforce age groups” – ages 25-44 and 45-64.** These breakdowns yield greater perspective on the impact of health behaviors and conditions on workforce groups that may be particularly relevant for specific industry sectors in the Nashville region and information on where to act.

<sup>1</sup> Center for Healthcare Economics and Policy, “Assessment of Nashville Region Health, Cost, Access, and Quality: Results of Pilot Study,” (June 2015), <http://www.fticonsulting.com/insights/reports/nashville-area-chamber-healthcare-pilot-study>.

- **Extended literature review, data, and analyses to include estimates of region-specific medical costs and productivity costs for three conditions/health behaviors: diabetes, hypertension and obesity**, identified as high priority for the Nashville region. Actionable data and analyses include prevalence, utilization, and productivity and medical costs associated with these chronic conditions. The economic and workforce impact of these chronic conditions can inform stakeholders about the potential returns from business engagement in these areas.
- **Potential business and collaborative strategies** – the Center compiled an overview of interventions and strategies used by businesses and communities that provide some measurable benefit (return on investment or ROI) for the three important conditions/health behaviors. The 2017 Report also summarizes recent reports on activities and collaboratives. These include efforts to create powerful metrics that cities and regions can use to track health status and to compare regions. A relevant example is a new Blue Cross Blue Shield Health Index, which has measures of the healthiness of populations.
- **Update on stakeholder activity on health in the Nashville region** including complementary activities such as collaborative Community Health Needs Assessments (CHNA) and CHNA implementation plans by Nashville region healthcare providers; new reports on population health; new models to assess impact of interventions such as changes in transportation on health and economics; new efforts by local businesses to promote health and wellbeing of their employees; and public health initiatives and their comparative impact on counties.

The 2017 Report adds an important new section prepared by the Research Center of the Nashville Area Chamber that provides a *comprehensive overview of key workforce statistics and trends* in the Nashville region, and comparisons with the same peer cities used in the health analyses. This new section provides critical information on:

- **The Nashville region economy, population and demographic trends and information relevant to the workforce**, assessment of aging on the workforce, labor force participation rates, and other factors affecting available workforce now and in the future, and information on the importance of specific industry sectors to the Nashville region. Where possible, workforce data use the same age groups as those used in the healthcare data analyses.
- **This comprehensive perspective on workforce and business activity by industry sector** delivers an important context in which to evaluate the impact of health behaviors and conditions on the workforce on the Nashville region economy.

## Message from Community Partners

A healthy population actively participates in the life and economy of a region. In 2015, our organizations came together to release a pilot study, *Assessment of Nashville Region Health, Cost, Access and Quality*, which yielded key insights on specific health outcomes and health behaviors compared with our peer metro regions. The study responded to issues raised in *Nashville Region's Vital Signs*, a collaborative process led by the Nashville Area Chamber of Commerce and the Nashville Area Metropolitan Planning Organization to track priority issues in the region and activate solutions.

With a current tight labor market and an unprecedented number of workers expected to retire in the coming decade, health, mobility, and education attainment play a critical role in addressing workforce availability and resilience. The *2017 Nashville Region Health Competitiveness Report* focuses directly on workforce health data and serves as a major advance in our understanding of health as an economic issue. Health is among our most important assets. This report's data portray economic impact and challenges related to health status for various components of our area's workforce, including medical and productivity costs from absenteeism and presenteeism.

The 2017 report provides greater perspective on the impact health behaviors have on the workforce groups that are particularly relevant for our industry sectors in the Nashville region. We thank the Chamber, FTI, and former Nashville Mayor Bill Purcell who has been instrumental in furthering the dialogue around this issue and emphasizing the fact that health behaviors can be addressed powerfully through workplace and employer influences.

We believe this report will serve as a foundation for engaging employers in health improvement through employer-based interventions. By partnering with employers, the public sector, providers, payors and area nonprofits, we can together address important aspects of a vital asset -- population health, as well as the sustainability and productivity of our workforce.

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## I. Executive Summary

The Nashville Area Chamber of Commerce has partnered with FTI Consulting Inc.'s Center for Healthcare Economics and Policy and a group of regional health service providers, payors, health-related nonprofits and employers to address workplace health and productivity. These stakeholders worked collaboratively around a pilot activity focusing on aspects of health affecting the economy and prosperity of the region. This Report, the *Nashville Region Health Competitiveness Initiative: 2017 Report*, developed by the Center in conjunction with the Nashville Area Chamber's Research Center is an important contribution to that effort.

The Health Competitiveness Initiative 2017 Report presents an update of the 2015 Pilot Report with a refreshed comprehensive profile of health, access, cost and quality of the Nashville region.<sup>2</sup> It adds key new information on health and wellbeing in the Nashville region population, including analyses on hypertension and life expectancy.

The 2017 Report offers a unique and in-depth examination of the impact of chronic conditions on particular segments of the Nashville workforce (specifically, for two age groups of 25-44 and 45-64). The Report uses extensive commercial claims data and current studies of the specific health conditions with high prevalence in the Nashville area (hypertension, diabetes, and obesity) to estimate locally relevant costs and factors driving higher costs. It develops Nashville-specific measures of the productivity and medical costs of chronic disease to present clear measures of these condition-specific costs for the competitiveness of the region and the health of its population.

The Report summarizes information on high impact, community-level interventions for diabetes, obesity, and hypertension to inform Nashville area stakeholders about interventions and strategies with the greatest potential value for employers, residents, and the community. These provide insights and opportunities for expanded and new partnerships among business leaders, insurers and providers - ones that would be highly complementary to current efforts, such as the ITHIM modeling undertaken by the Nashville Area Metropolitan Planning Organization and collaboration among providers in the Nashville area.<sup>3</sup>

The Report adds an important new section prepared by the Research Center of the Nashville Area Chamber with a comprehensive overview of key workforce statistics and trends in the Nashville region, and comparisons with peer cities. This new research provides important context for stakeholders to assess priorities for improvements to workforce health and productivity, and the opportunities with the greatest impact on health and wellbeing of residents, and the economic wellbeing and competitiveness of the area.

The Nashville Area Chamber and the Community Partners' initiatives including this 2017 Report and the 2015 Pilot are at the leading edge of collaborative efforts of businesses, providers, insurers, public and other entities to develop and make use of locally relevant and actionable data to inform priorities, and most importantly to identify and understand the economic impact of health on an area's competitiveness.<sup>4</sup>

<sup>2</sup> The initial pilot study by Center for Healthcare Economics and Policy is entitled, "Assessment of Nashville Region Health, Cost, Access, and Quality: Results of Pilot Study," (June 2015),

<http://www.fticonsulting.com/insights/reports/nashville-area-chamber-healthcare-pilot-study>.

<sup>3</sup> The Integrated Transport and Health Impact Modeling Tool (ITHIM) is described below.

<sup>4</sup> A Health Affairs compendium on workplace and health includes perspectives on the important connections between health and economic costs and engaging leaders for action; see, Alan R. Weil, "The Work/Health Relationship," *Health Affairs* 36, no. 2 (2017):199.

doi: 10.1377/hlthaff.2017.0059 (accessed February 7, 2017). The National Academies of Sciences, Engineering, and Medicine Roundtables on Population Health and on Obesity focus on these initiatives. The importance of collaboratives and "shared value"

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The key findings of the 2017 Report include:

- Stakeholders in many communities, and notably in the Nashville Region, increasingly focus on the economic and health impacts of specific chronic conditions, whose prevalence and associated healthcare service needs lead to higher costs, and broader economic impact.
- There is a notable prevalence of adverse health conditions and health behaviors in the Nashville region, particularly in the age group of 45-64. Prevalence rates for obesity, hypertension, COPD, depression and diabetes are higher than in many of Nashville's peer cities, and often above national averages.
- Older workforce cohorts are important for the current and future vitality of the Nashville area and specific industry sectors; they represent important share of the workforce.
- Costs of adverse health conditions and health behaviors are real and important to individuals and to employers, and include medical costs and lost time and productivity.
- Costs include *direct medical costs* from hospitalization, outpatient visits, pharmaceutical costs, along with lost time and productivity. For example, commercial claims data shows diabetics in the Nashville area experienced an 11 percent hospitalization rate, averaged 15 outpatient visits a year and had an average of 14 prescriptions. Residents with hypertension experienced a 10 percent hospitalization rate, averaged 14 outpatient visits a year and had an average of 12 prescriptions.
- Costs also include *productivity costs* from time away from work (absenteeism) or inability to work, as well as lost productivity due to impact of illness while at work (presenteeism). ***Estimates for Nashville show high costs for diabetes (estimated annual cost \$222.9 million); hypertension (estimated annual cost \$126.4 million) and for obesity (estimated annual cost of \$158.0 million).***
- Strategies and interventions to address these conditions can yield important benefits for employers, residents and communities. The 2017 Report reviews and summarizes research on best practices and potential community-level and business strategies for each of the three conditions.
- There continues to be demonstrated connectivity of Nashville area residents, including Medicare beneficiaries, with the healthcare system. This represents an asset for strategies for health and well-being improvement: Physicians and use of primary-care physicians represent two measures of access to health care. The Nashville area has a greater number of physicians per 100,000 compared to the national average, and generally more than the majority of its peer cities. The region has a higher rate of having primary care visits compared to the national average across all ages. Primary care visits are an important touch point in the continuum of care and maintenance of good health. The Nashville area's high rate of utilization indicates opportunity for doctors' visits to serve to help improve health outcomes.
- Nashville area stakeholders and business leaders are engaged in seeking solutions and strategies to improve workforce health and productivity. These include both individual business and collaborative activities. *Vital Signs 2016* provides key examples of employers involved in innovative health engagement, and this Report provides updates on other initiatives. There is increasing regional and local awareness of the importance of addressing health issues to maintain the economic vitality of the area.

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for business engagement on health are addressed in Kottke, T.E., N.Pronk, A.R. Zindel, and G.J. Isham. 2017. *Philanthropy and beyond: Creating shared value to promote well-being for individuals in their communities*. Discussion Paper, National Academy of Medicine, Washington, DC. <https://nam.edu/wp-content/uploads/2017/04/Philanthropy-and-Beyond-Creating-Shared-Value-to-Promote-Well-Being-for-Individuals-in-Their-Communities.pdf>.

## II. Introduction and Overview

### A. Overview of the Nashville Region Health Competitiveness Initiative: 2017 Report

This Nashville Region Health Competitiveness Initiative: 2017 Report updates the FTI Pilot Study, which presented a comparative health analysis for Nashville relative to 10 peer regions, with current data and analyses in order to provide a way for stakeholders to begin to track progress. It adds new data and analyses to provide more detail and insight into the **workforce impact** of chronic conditions and health behaviors in the Nashville area for the competitiveness of the region. This new report includes assessments of the **medical and productivity costs** associated with key chronic conditions, and a focus on the workforce impact of chronic conditions and health behaviors on specific segments of the Nashville workforce (e.g., those aged 25-44 and 45-64).

The focus on business priorities and competitiveness represents important opportunities to offer stakeholders and business leaders in the Nashville region with actionable data and information so they can identify the most important issues and priorities relevant for competitiveness. These can also inform potential interventions and strategies to deliver higher value returns for business, residents, and the community. The enhanced data and analyses continue to focus on the selected core metrics presented in comparative fashion for Nashville and its peer regions in the Pilot Study.

#### *The Pilot Study*

The Pilot Study presented a baseline assessment of core metrics and actionable data for the Nashville area (MSA) including demographics, health conditions and health behaviors, utilization and costs associated with chronic conditions for Medicare and commercially insured residents, quality, and access measures (including availability and use of physicians as well as insurance coverage). These metrics aligned with Institute of Medicine's core metrics; the Pilot Study report was among the first to provide comprehensive data on medical costs and utilization among the workforce by using commercial claims data rather than more commonly used Medicare data.

The Pilot Study presented core metrics for the greater Nashville area and presented them on a comparative basis with 10 peer regions (MSAs).<sup>5</sup> These metrics included key assets with which Nashville could work to address health concerns (e.g., physician and hospital resources) and the connectivity of residents to these assets through access and utilization of services. The Pilot Study provided relevant data for stakeholders including new “workforce” metrics based on commercial claims data that measured costs and utilization for four chronic conditions: asthma, depression, diabetes, and chronic obstructive pulmonary disease (COPD). These cost and utilization data included hospital and outpatient visits, and pharmaceutical costs; they provide a means to estimate overall medical costs associated with each of these conditions. The Pilot Study's analyses presented insights into the medical and productivity costs (e.g., time away from work) associated with chronic conditions such as diabetes and depression. The Pilot Study also identified chronic conditions and health behaviors such as diabetes, obesity, and smoking where Nashville's core metrics and its comparative position to peer cities suggested priority areas for engagement by stakeholders in the Nashville region. The Pilot Study provided stakeholders the data and information needed to begin to assess strategic priorities and potential interventions.

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<sup>5</sup> Peer metro regions were defined using Metropolitan Statistical Areas or MSAs.

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Among the key findings of the Pilot Study:

- High insurance coverage rates and strong physician supply demonstrate that the appropriate care delivery components are in place effectively to meet the healthcare needs of the Nashville population. Physician supply and access to care are critical for addressing chronic conditions such as diabetes and hypertension.
- Compared with other areas analyzed, healthcare is relatively more affordable in Nashville. Nashville’s residents can access high quality of care that meets their specific healthcare needs with relatively low average payments.
- A high level of connectivity between Nashville’s residents and the healthcare system suggests physicians may be able to better drive change in health behaviors than in comparator areas with lower levels of connection and access. Failing to take advantage of this as a resource to drive change would be a missed opportunity.
- Nashville’s relatively high utilization rates for healthcare services for chronic disease conditions, however, may indicate that an opportunity for enhanced coordination of care also exists, as well as opportunities for cost savings, improved health and productivity.

The Pilot Study’s finding helped stakeholders identify priority problems and the assets in the community available to address these problems. The findings presented objective information important for encouraging business leaders to become involved in altering Nashville’s health culture. Several Nashville organizations are now participating in community health initiatives, and the 2017 report summarizes some of those. These are positive steps for achieving change in a cohesive and collaborative way around the community. There was also recognition of the need to continue to report to stakeholders and the community about how the region is doing, and how it is improving in areas that matter – to continue to provide the community with the most current actionable data and information just as in the first pilot study. That update of actionable data is a key feature of this new Nashville Region Health Competitiveness Initiative 2017 Report, which presents an update of each key metric, and adds new chronic conditions and measures of concern to Nashville stakeholders, such as hypertension and life expectancy.

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Health represents a common theme underlying workforce vitality and competitiveness for Nashville. The 2015 Pilot Study findings on chronic conditions and health behaviors in Nashville coupled with utilization and cost data showed that certain conditions such as diabetes resulted in potentially large productivity costs and medical costs. The prevalence of these and other chronic conditions could have substantial effects on the competitiveness of Nashville relative to its peers.

This new report extends the first report’s data and analyses to provide the relevant information to inform Nashville businesses and stakeholders on what will be required to assure that Nashville’s workforce population is productive and qualified. Nashville expects to see increasing retirement of “Baby Boomers” in the next five years. This increases the importance of having a labor force that may be smaller, but that is more productive going forward in order to build and sustain prosperity. Business engagement to address health issues also requires more information. CEOs and businesses will need to have more granular information than that provided in the Pilot Study to understand when and whether the specific chronic conditions may be expensive to them, and how they need to try to help their workforce population avoid or manage these issues.

This report adds more granularity to the chronic conditions analyses, by focusing on two age groups – those 25-44 and those 45-64. These more detailed analyses offer insights into whether prevalence or costs are higher for one group or

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another – and may provide new insights for individual businesses or sectors with older or younger workforce contingents in the Nashville area. In addition, the Report presents the best available data on the productivity costs associated with diabetes, hypertension and obesity by using national data – and then translating these into estimated costs for Nashville using local wage and workforce estimates. To assist businesses further in considering investment or other strategies, the Report reviews interventions and successful approaches used in other communities for each of these chronic conditions.

This report also adds an important new section prepared by the Research Center of the Nashville Area Chamber that provides a comprehensive overview of key workforce statistics and trends in the Nashville region, including comparisons with the same peer cities used in the core health metrics. This new section includes critical information on the Nashville region economy, population and demographic trends and workforce, assessment of aging on the workforce, labor force participation rates, other factors affecting available workforce now and in the future, and on the specific industry sectors to the Nashville region.

This comprehensive perspective on workforce and business activity by sector provides an important context in which to evaluate the new and expanded data and analyses of the impact of health behaviors and conditions on the workforce health and productivity in the Nashville region. For further context, this report recognizes the complementary health efforts of other Nashville area stakeholder groups. Stakeholders are engaged in many different ways around health illustrating the commitment across stakeholder groups. As an example, the Nashville Area Metropolitan Planning Organization (NAMPO) focused on the status of transportation and its impact on the region including its effects on health, and included development of walkable communities as part of its regional transportation plan. NAMPO implemented a comprehensive tool, the Integrated Transport and Health Impact Model (ITHIM), in the Nashville region to model the potential effects of interventions such as changes in physical activity on health and costs for specific chronic conditions in the Nashville area.<sup>6</sup> Such modeling and development of actionable locally relevant data provide innovative approaches for stakeholders to evaluate the potential health effects of choices and to consider the health effects of other interventions. With these approaches, stakeholders will be better able to assess priorities, engagement, assets, and needed action.<sup>7</sup>

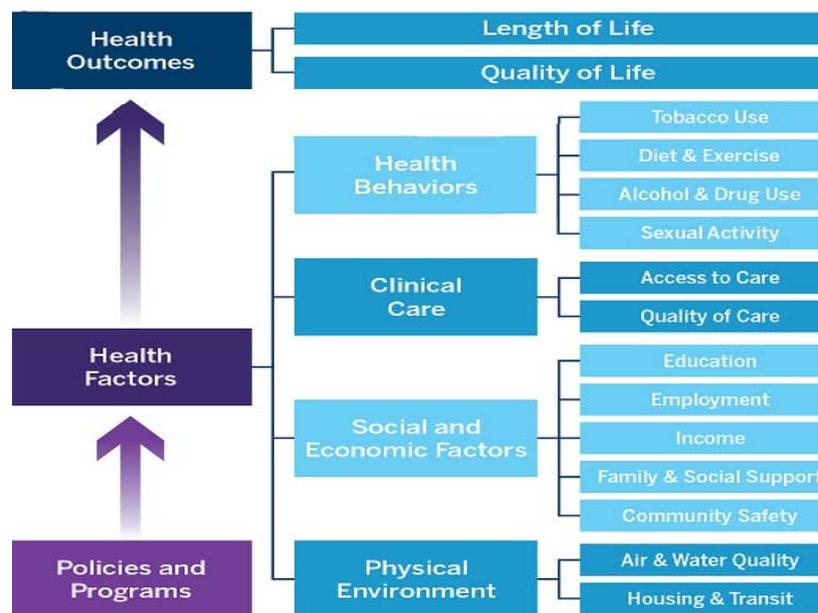
<sup>6</sup> See, Nashville Area Metropolitan Planning Organization, “2015 Annual Report: State of Transportation in Middle Tennessee,” (accessed September 2016). For discussion of ITHIM, see, Geoffrey P. Whitfield, Leslie A. Meehan, Neil Maizlish, and Arthur M. Wendel, “The Integrated Transport and Health Impact Modeling Tool in Nashville, Tennessee, USA: Implementation on Steps and Lessons Learned,” *Journal of Transport & Health* (2016), <http://dx.doi.org/10.1016/j.jth.2016.06.009>.

<sup>7</sup> As examples of collaborative activity in the Nashville area, Vanderbilt University Medical Center (VUMC) and Saint Thomas Health (STH) used their community health needs assessments to hold a joint summit and to identify the community’s priority health needs and create implementation strategies to address health concerns for Nashville area counties. Their efforts identified several challenges -care affordability, mental illness, securing adequate and affordable housing, food, poverty, obesity, and chronic conditions. Summit attendees identified access to health/care coordination, mental and emotional health/substance abuse, social determinants, and wellness/disease prevention and implementation strategies as unmet needs. STH and VUMC chose to develop public health programs in schools, clinics, and community organizations and other programs, and used key metrics to track priority needs. Vanderbilt University Medical Center, “Joint Community Health Needs Assessment for Vanderbilt University Hospitals & Vanderbilt Stallworth Rehabilitation Hospital (August 2016),” [http://vanderbilt.thehcn.net/content/sites/vanderbilt/CHNA\\_Final.pdf](http://vanderbilt.thehcn.net/content/sites/vanderbilt/CHNA_Final.pdf) (accessed September 2016); Saint Thomas Health, “Community Health Needs Assessment,” <http://www.sthealth.com/about-us/mission-integration/community/community-health-needs-assessment> (accessed September 2016). Two reports from the Nashville Area Chamber of Commerce, the 2015 and 2016 Vital Signs Reports, reported relevant data and track key issues affecting the Region’s economic well-being and include assessments of health in the Nashville region compared to several other metro areas. The 2015 report included recommendations to guide action for stakeholders and the community to address health and other priorities. See, “Nashville Region’s Vital Signs 2015,” [http://www.nashvillechamber.com/docs/default-source/pdfs/vital\\_signs\\_2015\\_web.pdf?sfvrsn=2](http://www.nashvillechamber.com/docs/default-source/pdfs/vital_signs_2015_web.pdf?sfvrsn=2) (accessed August 30, 2016). The 2016 Vital Signs Report provides new data and insights for engagement of regional businesses in improving health and productivity, the impact of chronic conditions on workforce, and actions being taken by employers. See, Nashville Region’s “Vital Signs 2016,” [https://s3.amazonaws.com/nashvillechamber.com/PDFs/vital\\_signs\\_2016\\_web.pdf](https://s3.amazonaws.com/nashvillechamber.com/PDFs/vital_signs_2016_web.pdf). The Metro Nashville Public

## B. Approach and Methodology

This report includes community-level metrics – or leading indicators – and expands them to include metrics that provide reliable data that permit cross-community comparisons. To provide the most useful framework for Nashville’s stakeholders, the analysis expands upon the commonly used publically available datasets that track utilization, and costs to include extensive commercial claims data. These data provide a unique perspective in that healthcare utilization among this cohort of residents and workers differs from that of Medicare beneficiaries.<sup>8</sup> The analysis considers other workforce implications. While high utilization of healthcare resources is costly in monetary terms, it also has an indirect cost on productivity as unhealthy workers often require additional time away from work. To quantify productive time lost, the Report includes estimates of average doctor office visits and inpatient admissions for an individual living with a specific chronic disease. These factor into calculation of productivity cost related to a disease. Population health is a broad term, and involves a broad set of components. Many community health assessments focus on factors categorized in the following four broad groups: Health Behaviors, Clinical Care, Social and Economic Factors, and Physical Environment, as depicted in **Figure 1**.<sup>9</sup>

**Figure 1: Population Health Model**



Source: Adapted from County Health Rankings, 2014, Available online at <http://www.countyhealthrankings.org/our-approach>

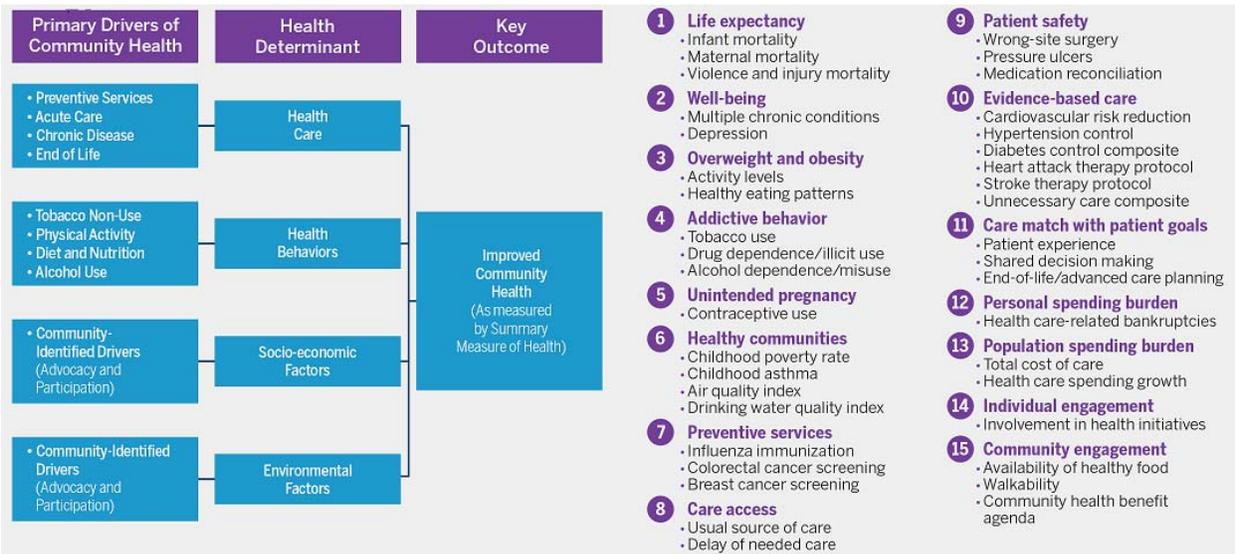
Health Department released its report on health equity in metro Nashville-Davidson County. Using the Social-Ecological Model of Health, it aims to build awareness of health equity; contributing factors and recommendations for ways to address health equity. J. Vick, S. Thomas-Trudo, M. Cole, and A.D. Samuels, (Eds.), “Health Equity in Nashville,” *Metro Nashville Public Health Department Division of Epidemiology and Research and RWJF Center for Health Policy at Meharry Medical College* (2015), <http://www.nashville.gov/Portals/0/SiteContent/Health/PDFs/HealthData/MetroNashvilleHealthEquityReport2015.pdf> (accessed September 2016). *NashvilleHealth* identified issues such as high childhood obesity in public schools, high percentage of adult smokers (compared to the national average), hypertension and a low ranking in community fitness as key health concerns. Based on these concerns, *NashvilleHealth*’s initial areas of focus are child health, hypertension, and tobacco use. See, *NashvilleHealth*, “Our Work,” <http://nashvillehealth.org/our-work/> (accessed September 24, 2016).

<sup>8</sup> Commercial claims data are from Truven’s MarketScan® Commercial Claims and Encounter Research Database, which includes a sample of claims of commercially insured patients and their families seeking treatment across the United States. It contains information about diagnoses, procedures, and payments. The commercial claims sample used is regarded as largely representative of working age employees with commercial insurance. The data does not include persons eligible for Medicare.

<sup>9</sup> Graphic developed by County Health Rankings & Roadmaps, <http://www.countyhealthrankings.org/our-approach>.

**Figure 2** couples the primary drivers of community health and measures of their determinants, including health behaviors (e.g., tobacco use) and healthcare (e.g., delivery of acute care and preventive or primary care services)<sup>10</sup> with the 15 metrics identified in IOM Core Metrics. That report identifies 15 core measures intended to reflect key aspects of the health of individuals and the performance of certain segments of the healthcare delivery system; organized in four domains: Healthy People, Care Quality, Care Cost, and Engaged People.<sup>11</sup>

**Figure 2: IOM Core Metrics and Framework for Improved Community Health**



Source: Adapted from HealthPartners' *Health Driver Analysis for Priority Setting*. Isham Presentation, July 30, 2014. Adapted from the Institute of Medicine (IOM), 2015, *Vital Signs: Core metrics for health and health care progress*. Washington, D.C.: The National Academies Press.

These core metrics represent priority areas for consideration by a variety of different groups of stakeholders, including community-level stakeholders.<sup>12</sup> Since the release of the IOM report in 2015, there has been an effort to identify the metrics that best guide actions and collaboration: “As was stated succinctly in the 2015 Institute of Medicine (IOM) report *Vital Signs*, progress in any human endeavor is a product of understanding the circumstances at play, having the tools available to address the controllable factors, and resolving to take the actions required. Basic to each is the choice of measures—measures that can give the best sense of challenges and opportunities, measures that can guide actions, and measures that can be used to gauge impact. In times of rapid change and constrained resources, measures that are important, focused, and reliable are vital (IOM, 2015).”<sup>13</sup>

<sup>10</sup> This diagram was adapted from Institute of Medicine’s Roundtable on Population Health Improvement, “Business Engagement in Building Healthy Communities,” Workshop Summary, <http://www.nationalacademies.org/hmd/Reports/2014/Business-Engagement-Building-Healthy-Communities.aspx>.

<sup>11</sup> Measures in each domain: *Healthy people*: Life expectancy, well-being, overweight and obesity, addictive behavior, unintended pregnancy, healthy communities; *Care quality*: Preventive services, care access, patient safety, evidence-based care, care match with patient goals; *Care cost*: Personal spending burden, sustainability; *Engaged people*: Individual engagement, community engagement. The importance of focus on core metrics is addressed in: Institute of Medicine (IOM) Institute of Medicine, “Vital Signs: Core Metrics for Health and Health Care Progress,” *Washington, D.C.: The National Academies Press* (2015).

<sup>12</sup> The IOM report listed the Best Current Measure for each of the 15 core measures, but many of these measures are available only at the state level or rely on data that have no standardized collection process or may not be collected regularly. See Institute of Medicine (IOM), “Vital signs: Core metrics for health and health care progress,” *Washington, D.C.: The National Academies Press* (2015), pp. 4-3 and 4-5.

<sup>13</sup> National Academies of Sciences, Engineering, and Medicine, “Metrics that matter for population health action,” *The National Academies Press* (2016). Note that this and other publications reference the wide range of publications and surveys that provide

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Many seek to have a narrower set of metrics for use by communities, which have the attribute of being common across areas and regularly updated, as well as inclusive of both process and results/performance measures.<sup>14</sup> This informed our approach to defining and implementing metrics in the Pilot Study.<sup>15</sup>

While there has been no consensus on the best set of metrics to suit all needs and interests, substantial study over the past two years about the benefits from cross-sector collaboration emphasizes the need for collaboration that includes business leadership and metrics that motivate employers: “Even with strong collaboration between the public health and healthcare communities, the challenges simply are too big to be met successfully by only health sector organizations. *To have enduring impact on improving the health and well-being of families and communities, we believe it is imperative to secure and maintain the active involvement and leadership of the business, education, and government sectors.*”<sup>16</sup> Development of core metrics and actionable data represent key inputs into collaborative efforts. The leadership of the Nashville Area Chamber and the stakeholder group have worked to obtain specific information on key measures of health, to develop standardized metrics and potential goals, and to align stakeholders in a collaboration to identify what is needed to improve community health for a region such as Nashville.<sup>17</sup>

Alignment of business interests with those of the broader community and health and consideration of broader benefits are critical to needed change. Concepts of engaged activity for businesses are those that create a benefit beyond the business and extend to areas well beyond standard health measures. There are new metrics that take into consideration issues broader than health, including education and economic development.<sup>18</sup> In fact, more areas are seeking to develop actionable data at the metro or city-level to assess the health status in smaller geographic areas.<sup>19</sup> There is also

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population health measures, including the Commonwealth Fund, County Health Rankings, CDC measures, and American’s Health Rankings to name some.

<sup>14</sup> Victor J. Dzau, Mark B. McClellan, J. Michael McGinnis, Sheila P. Burke, Molly J. Coye, Angela Diaz, Thomas A. Daschle, et al., “Vital Directions for Health and Health Care: Priorities From a National Academy of Medicine Initiative,” *JAMA* (2017).

<sup>15</sup> A more limited or core metric set includes: “A parsimonious set of measures that provide a quantitative indication of current status on the most important elements in a given field, and that can be used as a standardized and accurate tool for informing, comparing, focusing, monitoring, and reporting change.” See Institute of Medicine (IOM), “Vital signs: Core Metrics for Health and Health Care Progress,” *Washington, D.C.: The National Academies Press* (2015), p. 13.

<sup>16</sup> Lawrence Prybil, Paul Jarris, and Jose Montero, “A Perspective on Public-Private Collaboration in the Health Sector,” *Discussion Paper* (November 3, 2015), <https://nam.edu/wp-content/uploads/2015/11/NAM-Public-Private-Collaboration-Perspective.pdf>.

<sup>17</sup> *Ibid* at 10. “In 2013, the Nashville (Tennessee) Area Chamber of Commerce and the Nashville Area Metropolitan Planning Organization (NAMPO) launched the *Nashville Region’s Vital Signs*, a collaborative initiative intended to identify issues of special importance to the community as a whole and initiate strategies to address them. The growing impact of chronic conditions and access, cost, and quality of health services soon emerged as issues of great importance. In response, the Chamber of Commerce and MPO, public health and health system leaders, and the state’s largest health insurer designed and conducted a comprehensive study of the region’s health status and costs. The resulting report “encompasses core metrics and analyses covering an extensive set of population health categories that track well against the recent [IOM] recommendation of 15 core metrics categories...and provides meaningful and actionable data for stakeholders.”

<sup>18</sup> For example, some reports on metrics focus primarily on health measures: “This 2016 edition of The Commonwealth Fund’s *Scorecard on Local Health System Performance* assesses the state of health care in more than 300 U.S. communities from 2011 through 2014... [and compares] health care access, quality, avoidable hospital use, costs of care, and health outcomes” David C. Radley, Douglas McCarthy, and Susan L. Hayes, “Rising to the Challenge: The Commonwealth Fund Scorecard on Local Health System Performance,” *The Commonwealth Fund* (July 2016), <http://www.commonwealthfund.org/interactives/2016/jul/local-scorecard/>. Other reports develop broader well-being metrics on well-being: “The Measure of America series measures well-being in three vital areas—health, education, and earnings—that shape the opportunities available to us and enable people to invest in their families and live to their full potential.” Kristen Lewis and Sarah Burd-Sharps, “American Human Development Report: The Measure of America 2013-2014,” *Measure of America*, [http://www.measureofamerica.org/measure\\_of\\_america2013-2014/](http://www.measureofamerica.org/measure_of_america2013-2014/).

<sup>19</sup> The Municipal Health Data for American Initiative, a collaboration between the New York University and the National Resource Network, focuses on recording existing data at the city-level to permit city leaders to gauge its status on a set of pre-

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an effort to link an increase in prevalence of a chronic condition or behavior such as obesity and the implications of these trends on workforce effects – on both employers and employees. New and more focused measures are under development. For example, the Measures of America 2013-2014 report adapted an index called the Human Development (HD) index. The HD index measures three core measures – a long and healthy life, access to knowledge, and a decent standard of living – these represent fundamental building blocks of a good life.<sup>20</sup> The report adapted the HD index to develop rankings for the United States at the state and county levels.<sup>21</sup> The metrics analyzed are life expectancy at birth,<sup>22</sup> adult education attainment,<sup>23</sup> and median personal earnings.<sup>24</sup>

### C. Life Expectancy

The Institute of Medicine (IOM) 2015 report “Vital Signs: Core metrics for health and health care progress” identified 15 key measures important when tracking population health.<sup>25</sup> Life expectancy was identified as one of the key measures in the IOM report, and is now included in this 2017 Report. Life expectancy is a measure of wellness and can be used to compare and assess differences across specific geographies. Life expectancy data is available from the Institute for Health Metrics and Evaluation (IHME), an independent research center based at the University of Washington focusing on health issues in the United States, as well as globally; this report uses these data in the analysis.<sup>26</sup>

### D. Health Status, Behaviors, and Related Metrics

The leading indicators developed in this report, and detailed analyses of supply, costs, and utilization, span many of the specific categories and the core measures identified in the IOM report. The measures, to the extent possible, reflect the local or regional areas under consideration, to make them useful for assessing healthcare and health behaviors, and to form a basis for expansion of analyses into broader areas. While social and environmental factors can have a significant impact on health outcomes and are relevant for achieving change, this report focuses primarily on factors relating to health behaviors and clinical care.<sup>27</sup> The objective of this report is a more robust assessment of health

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defined metrics and to compare it to other cities. The initiative proposes a set of about 20 metrics including individual behavior, neighborhood characteristics, and environmental characteristics. Health data may include metrics like rates of diabetes and obesity, in addition to infrastructure (e.g., walkability, transportation, etc.). Andrea Muraskin, "New Project Aims To Help Cities Finally Get Health Data They Can Use," *Side Effects* (March 11, 2016), <http://sideeffectspublicmedia.org/post/new-project-aims-help-cities-finally-get-health-data-they-can-use> (accessed August 22, 2016).

<sup>20</sup> Kristen Lewis and Sarah Burd-Sharps, “The Measure of America 2013-2014 | American Human Development Report,” *Measure of America of the Social Science Research Council* (June 2013), [http://www.measureofamerica.org/measure\\_of\\_america2013-2014/](http://www.measureofamerica.org/measure_of_america2013-2014/) (accessed August 22, 2016).

<sup>21</sup> “Methodology Note,” *Measures of America of the Social Science Research Council*, [http://www.measureofamerica.org/Measure\\_of\\_America2013-2014MethodNote.pdf](http://www.measureofamerica.org/Measure_of_America2013-2014MethodNote.pdf) (accessed August 24, 2016).

<sup>22</sup> This measure is calculated using mortality data from the Centers for Disease Control and Prevention, National Center of Health Statistics, and population estimates from the U.S. Census Bureau Population Estimates Program.

<sup>23</sup> This measure is based on net school enrollment for the population between age 3-24 years old and degree attainment for the population age 25 and over (proportion of the adult population that has earned a high school diploma, a bachelor’s degree, and a graduate/professional degree) using data from the American Community Survey (ACS).

<sup>24</sup> This measure is based on median personal earnings of all workers with earnings for the population ages 16 and over using data from the American Community Survey (ACS).

<sup>25</sup> Institute of Medicine (IOM), “Vital Signs: Core Metrics for Health and Health Care Progress,” *Washington, D.C.: The National Academies Press* (2015), pp. 4-3 and 4-5.

<sup>26</sup> The BCBS Index discussed elsewhere in this report provides a related measure of the healthiness of a population relative to some base measure, and can provide a means to compare areas or track progress for a given region. Blue Cross Blue Shield (BCBS), “Blue Cross Blue Shield Health Index,” <https://www.bcbs.com/about-us/capabilities-initiatives/health-america-initiative/blue-cross-blue-shield-health-index> (accessed February 7, 2017).

<sup>27</sup> The 2015 Pilot Study included Quality of Care analyses related to clinical care.

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conditions and the local healthcare delivery system, including healthcare provider supply, and their impact in order to identify health priorities.

Our analytical framework for building and analyzing data builds on five key components: **Population level health assessment**, including chronic conditions and health behaviors; **Access to care**, including insurance coverage and physician supply; **Healthcare utilization** for both the commercially insured and the Medicare population; and for patients with specific chronic conditions; **Healthcare cost** for both the commercially insured and the Medicare population and **Hospital and life quality** measures, including life quality and life expectancy.

**Figure 3: Framework**



The core set of leading indicators or metrics provided in this report allows stakeholders to assess the Nashville region and to compare it with peer MSA and national performance and to refine comparisons to take factors such as age, education, gender, income, and race into account, where possible.<sup>28</sup> These leading indicators are developed to provide insights into key conditions and drivers in the five broad categories that are useful for stakeholders: **risk factors** (obesity, physical activity, smoking prevalence, mental health) and **chronic conditions** (diabetes, COPD/heart disease/hypertension, asthma, depression);<sup>29</sup> **provider capacity** (number of primary care providers (PCP) and specialists);<sup>30</sup> **costs** (commercial and Medicare for a range of services); **utilization of services** (by chronic condition and generally); and **hospital quality/outcomes** (mortality, readmissions, quality of care, and life expectancy).<sup>31</sup>

This Report focuses on the core metrics shown in **Figure 4**, updated to include two new categories of hypertension and life expectancy. In order to focus metrics and actionable data more specifically on the workforce population, health status and behaviors analyses are provided by age groups (25-44 and 45-64).<sup>32</sup> The analyses include six chronic

<sup>28</sup> The 2015 Pilot Study also adjusted the population groups in the MSAs included in the health status analysis to control for demographic heterogeneity.

<sup>29</sup> The specific choice of chronic conditions may vary for a community; in the case of the Nashville region, the stakeholders asked the Center to focus on these specific conditions for the Pilot Study and to add hypertension to the 2017 Report.

<sup>30</sup> Please see the 2015 Pilot Study for findings related to provider capacity regarding hospitals.

<sup>31</sup> Please see the Pilot Study for findings related to hospital quality/outcomes.

<sup>32</sup> The Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System (BRFSS) Smart Data, 2015. See, [http://www.cdc.gov/brfss/smart/smart\\_data.htm](http://www.cdc.gov/brfss/smart/smart_data.htm).

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conditions (hypertension, asthma, COPD, diabetes, depression, and heart disease), and four behaviors (adult obesity, high stress, physical activity, and smoking).

**Figure 4: The Nashville Metropolitan Statistical Area and Core Metrics (Leading Indicators)**

Identification of Relevant Comparison Geographies: Peer MSAs, State and National Demographics: Age, Education, Gender, Income and Race			
Diabetes	COPD Heart Disease Hypertension	Asthma	Depression
Smoking Prevalence	Obesity	Stress Mental Health	Physical Activity
Access and Provider Capacity Insurance Coverage # PCPs/Specialists # Hospitals/Beds Beds per thousand	Costs Commercial/Medicare Adjusted Inpatient Outpatient/Procedures	Utilization Inpatient Outpatient ED Physician	Quality/ Outcomes Life Expectancy Hospital Measures: Mortality, Readmissions, Patient experience, Timely & effective care

This analysis was conducted using the most recent data available and updated from the 2015 Pilot Study wherever possible.<sup>33</sup> This study continues to use MSAs as the geographic unit of study and comparison.<sup>34</sup> MSAs allow for the use of reliable data consistently measured across all geographies reviewed in this report.

### III. Overview of Nashville and Its Peer MSAs

The analyses presented in this study rely on the development of comprehensive and robust data for Nashville and a peer group of 10 designated Metropolitan Statistical Areas.<sup>35</sup> These “peer MSAs” are MSAs that Nashville has used in comparative analysis for other purposes, including in the 2016 “Vital Signs” report.<sup>36</sup>

- Atlanta-Sandy Springs-Roswell, GA
- Austin-Round Rock, TX
- Charlotte-Concord-Gastonia, NC-SC
- Denver-Aurora-Lakewood, CO
- Indianapolis-Carmel-Anderson, IN
- Kansas City, MO-KS
- Louisville/Jefferson County, KY-IN
- Memphis, TN-MS-AR
- Raleigh, NC
- Tampa-St. Petersburg-Clearwater, FL

<sup>33</sup> For an overview of data used in the analyses presented in this report, see Technical Appendix, Note 1.

<sup>34</sup> For comments regarding the use of MSAs as comparative geographic units, see Technical Appendix, Note 1.

<sup>35</sup> For an overview of MSAs and the delineations used for analysis presented in this report, see Technical Appendix, Notes 1 and 2.

<sup>36</sup> MSA names are representative of the 2013 delineations and consistent with those used in the “Vital Signs” report. Nashville Area Chamber of Commerce, “Nashville Region’s Vital Signs,” (2015), [https://s3.amazonaws.com/nashvillechamber.com/PDFs/vital\\_signs\\_2015\\_web.pdf](https://s3.amazonaws.com/nashvillechamber.com/PDFs/vital_signs_2015_web.pdf) (accessed August 24, 2016).

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There is significant economic and demographic diversity among the sample of peer MSAs. The Nashville MSA has a smaller population (approximately 1.7 million) than many of its peers. Median household income ranges from \$45,844 to \$66,870. Median household income in Nashville (\$52,640) is in line with many of its peers. Racial composition of the population also varies; the percent of the population that identifies as non-Hispanic white ranges from 45% to 78%. Percent of population, age 25 and above, with a college degree ranges from 26% to 43%. The Nashville MSA has 24 hospitals and a per capita hospital bed capacity of 2.85 beds per 1,000 people. **Figure 5** is a map with these MSAs.

**Figure 5: The Nashville Metropolitan Statistical Area and Its Peer Group**



There are several counties in the Nashville MSA, all of which are located in Tennessee. These counties include Cannon, Cheatham, Davidson, Dickson, Hickman, Macon, Robertson, Rutherford, Smith, Sumner, Trousdale, Williamson, and Wilson (Maury County was added in 2013).<sup>37</sup>

The Report presents a detailed analysis of health and healthcare in the Nashville region, with the intent of assisting policy makers and stakeholders in identifying areas where the greatest potential for improvement exists. The analysis begins with an overview of population level health, and then focuses on a subset of chronic conditions to assess the full cost associated with each condition. To explore the connectivity between residents and the healthcare delivery system in the Nashville region, the report includes analysis on access to healthcare, followed by an assessment of utilization and cost for the Medicare population. The report concludes by exploring the productivity implications related to three chronic conditions (obesity, hypertension, and diabetes) and overviews some potential interventions to address these health issues.

<sup>37</sup> The 2015 and this 2017 Report use the 2009 MSA definitions for the majority of analyses, with the exception of the analyses using BRFSS data, which use the 2013 definitions. This provides continuity across results for the commercial claims data and enables use of the Truven data, which use 2009 definitions. While there are some changes across the peer metro regions in the specific MSA definitions, these do not significantly affect comparability of results across the regions. For an overview of changes between the 2009 and 2013 MSA delineations, including differences in the Nashville MSA, see Technical Appendix, Note 2.

## IV. Population Level Health Analysis

### A. Demographics

Using the most recent available data, this Report updates key demographic data, previously reported in the 2015 Pilot Study, for the Nashville MSA and its 10 peer cities (MSAs), and adds metrics on Medicaid and Medicare coverage.<sup>38</sup>

**Table 1: Overview Demographics of All 11 MSAs**

MSA	Population (2014)	Total Households	Female (%)	Age Under 18 (%)	Age 18-64 (%)	Median Income	Bachelor's Degree, Age 25+ (%)
<b>Nashville</b>	<b>1,708,312</b>	<b>621,951</b>	<b>51%</b>	<b>24%</b>	<b>65%</b>	<b>\$52,640</b>	<b>32%</b>
Atlanta	5,597,383	1,930,415	51%	26%	64%	\$56,166	35%
Austin	1,943,465	673,901	50%	25%	66%	\$63,603	41%
Charlotte	1,904,480	683,741	52%	25%	64%	\$53,549	34%
Denver	2,755,856	1,025,246	50%	24%	65%	\$66,870	40%
Indianapolis	1,841,862	683,702	51%	26%	63%	\$52,268	32%
Kansas City	2,096,897	802,726	51%	25%	62%	\$56,994	33%
Louisville	1,321,554	510,129	51%	24%	63%	\$50,932	26%
Memphis	1,334,602	486,121	52%	26%	63%	\$45,844	26%
Raleigh	1,243,035	440,375	51%	26%	65%	\$62,313	43%
Tampa	2,917,813	1,134,997	52%	21%	61%	\$46,876	27%
National	299,612,865	116,211,088	51%	23%	63%	\$53,482	29%

Source: U.S. Census Bureau's Population Estimates Program data, American Community Survey (ACS) Five-Year Estimates (2010-2014), and ACS One-Year 2014 Estimates (<http://factfinder.census.gov>); 2014 population is derived from U.S. Census Bureau's Population Estimates Program data (<https://www.census.gov/popest/about/index.html>) and are based on ACS data. MSAs use the 2009 Census MSA delineation definition. As such, Maury County is not included in the Nashville MSA. Inclusion increases Nashville MSA population.

**Table 2: Overview of Demographics of All 11 MSAs (Continued)**

MSA	Medicare Coverage* (%)	Medicaid Coverage* (%)	Non-Hispanic White (%)	Black (%)	Hispanic (%)	Married (%)	Total Hospital Beds	Total Hospitals	Beds per 1,000 People
<b>Nashville</b>	<b>13%</b>	<b>16%</b>	<b>73%</b>	<b>15%</b>	<b>7%</b>	<b>49%</b>	<b>4,975</b>	<b>24</b>	<b>2.9</b>
Atlanta	12%	15%	50%	32%	10%	48%	9,034	36	1.6
Austin	10%	13%	54%	7%	32%	47%	2,738	20	1.4
Charlotte	13%	15%	60%	24%	10%	48%	3,521	12	1.8
Denver	12%	17%	65%	5%	23%	48%	4,707	17	1.7
Indianapolis	14%	17%	74%	15%	6%	48%	4,959	21	2.7
Kansas City	15%	12%	74%	12%	8%	49%	5,451	31	2.6
Louisville	17%	20%	78%	13%	4%	47%	3,384	17	2.6
Memphis	14%	22%	45%	46%	5%	42%	3,507	12	2.6
Raleigh	12%	12%	63%	20%	10%	52%	1,866	6	1.5
Tampa	21%	18%	66%	11%	17%	44%	8,128	27	2.8
National	16%	19%	63%	12%	17%	48%	738,280	4,445	2.5

Source: U.S. Census Bureau, American Community Survey (ACS) Five-Year Estimates (2010-2014), ACS One-Year 2014 Estimates (see, <http://factfinder.census.gov>), and American Hospital Association's 2015 Survey Database (for bed count and hospital count) (see, [www.aha.org](http://www.aha.org)). MSAs use the 2009 Census MSA delineation definition. \*For Medicare and Medicaid estimates, see Technical Appendix, Note 3.

<sup>38</sup> U.S. Census Bureau/American FactFinder, Table S2701, "2014 American Community Survey 1-Year Estimates," *U.S. Census Bureau's American Community Survey Office* (2014), [www.factfinder.census.gov](http://www.factfinder.census.gov) (accessed August 15, 2016). For additional information regarding the sample used to construct insurance coverage metrics, see Technical Appendix, Note 3.

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According to the U.S. Census Bureau, the Nashville MSA has about 1.7 million people. Approximately 55% of the Nashville MSA population is included in the working age group of 25-64 years old. Twenty-nine percent of the total Nashville MSA population is in the 25-44 year old age group; 26% is in the 45-64 year old age group.

**Table 3: Population by Age Group**

MSA	Age 0-24 (%)	Age 25-44 (%)	Age 45-64 (%)	Age 65+ (%)
<b>Nashville</b>	<b>34%</b>	<b>29%</b>	<b>26%</b>	<b>11%</b>
Atlanta	35%	29%	26%	10%
Austin	36%	33%	23%	9%
Charlotte	35%	29%	25%	11%
Denver	33%	30%	26%	11%
Indianapolis	35%	28%	26%	11%
Kansas City	33%	27%	26%	13%
Louisville	32%	27%	28%	13%
Memphis	36%	27%	26%	11%
Raleigh	35%	30%	25%	10%
Tampa	29%	25%	28%	18%
National	33%	26%	26%	14%

Source: American Community Survey (ACS) Five Year Estimates (2010-2014), Table S0101, see <http://factfinder.census.gov>.

### *B. Life Expectancy*

As noted in Section II, the 2017 Report includes life expectancy as key measure of health and well-being. **Table 4** summarizes the life expectancy at birth in 2013 for males and females for counties in the Nashville MSA and each of the 10 peer MSAs. Life expectancy in the counties included in the Nashville MSA range from a high of 84.1 years for females and 80.2 years for males to a low of 76.3 for females and 70.9 for males. This represents a difference of approximately 8 years for females and 9 years for males within this particular geographic region and highlights disparities in health and wellness that exist even within a MSA.<sup>39</sup> Other measures of health that are available for comparison across counties are presented in the Blue Cross Blue Shield Health Index.<sup>40</sup>

<sup>39</sup> For caveats regarding the life expectancy calculation, see Technical Appendix, Note 4.

<sup>40</sup> The BCBS Health Index measures the impact of over 200 common diseases and conditions on overall health. Each county in the United States is assigned a health metric between 0 and 1, designating the proportion of optimal health reached by the county's population. This measure uses commercially insured data and provides a means to compare a region with others or potentially across time. See, Blue Cross Blue Shield (BCBS), "Blue Cross Blue Shield Health Index," <https://www.bcbs.com/about-us/capabilities-initiatives/health-america-initiative/blue-cross-blue-shield-health-index> (accessed February 7, 2017).

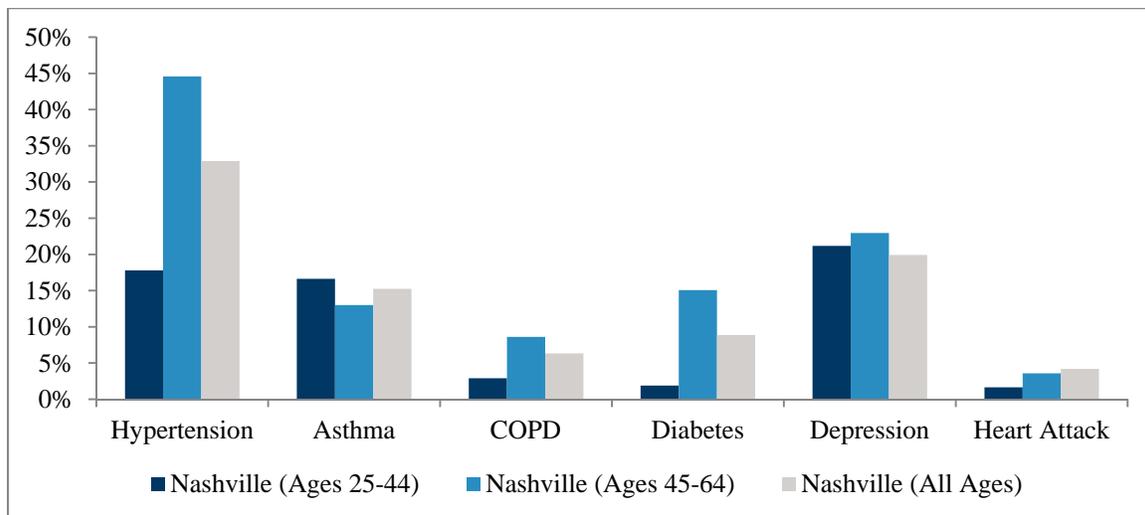
**Table 4: Life Expectancy Statistics for Nashville and the 10 Peer MSAs**

MSAs	Number of Counties	Female			Male		
		Max	Min	Average	Max	Min	Average
<b>Nashville</b>	<b>13</b>	<b>84.1</b>	<b>76.3</b>	<b>78.9</b>	<b>80.2</b>	<b>70.9</b>	<b>74.1</b>
Atlanta	28	83.9	76.3	79.7	80.3	70.5	74.8
Austin	5	83.5	80.2	81.8	79.6	75.1	77.7
Charlotte	6	82.2	78.2	80.1	77.7	71.3	75.1
Denver	10	84.8	82.6	83.0	82.2	78.3	79.1
Indianapolis	10	83.6	78.9	80.5	79.8	73	76.0
Kansas City	15	83.4	77.7	80.3	79.8	72.9	75.7
Louisville	13	82	77.9	79.3	77.9	72.1	74.5
Memphis	8	80.4	74.8	77.6	76.1	67.8	72.1
Raleigh	3	83.2	79.6	80.9	79.2	74.3	76.2
Tampa	4	81.5	80	80.8	76.4	74.3	75.6
National	-	81.2	81.2	81.2	76.5	76.5	76.5

Source: Authors' calculations using Institute for Health Metrics and Evaluation (IHME), US County Profiles, 2013 data. Seattle, WA: IHME, 2015.

### C. Comparative Analyses of Chronic Conditions/Health Behaviors: By Age Groups

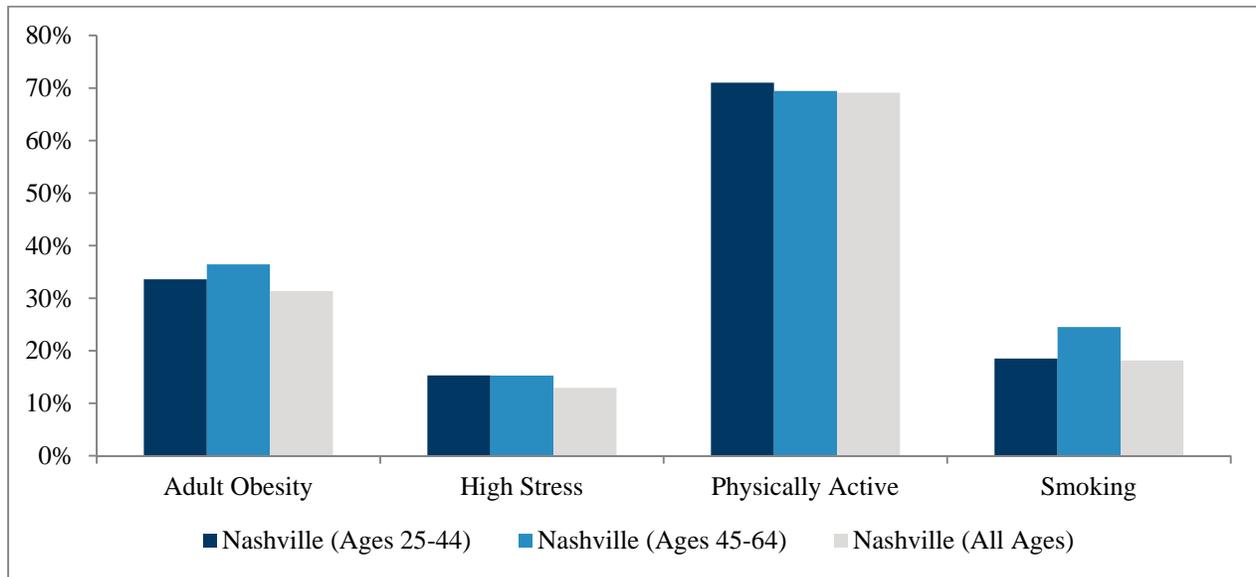
This section presents statistics for the six chronic conditions and four health behaviors for the Nashville area population and then examines the prevalence of each condition by age group. Statistics rely on Centers for Disease Control and Prevention's (CDC) BRFSS Smart Data for 2015, which show prevalence rates for the Nashville MSA population. These prevalence rates for specific conditions may vary somewhat from prevalence rates based on the commercial claims data used in Section VII. Commercial claims data include commercially insured population excluding those over age 64.<sup>41</sup> The column charts that follow show that, as expected, the 45-64 age group experiences greater prevalence, as compared to the overall population, for hypertension, COPD, diabetes, and depression. This age group also has higher rates of smoking and obesity.

**Figure 6: Chronic Conditions in Nashville by Age Breakdown**

Source: The Centers for Disease Control and Prevention, BRFSS Smart Data, 2015.

<sup>41</sup> The SMART survey data from BRFSS provides information on health behaviors and conditions for adults age 18 and older. Prevalence rates for these same conditions limited to the commercial claims data are reported in Table 12.

Figure 7: Health Behaviors in Nashville by Age Breakdown



Source: The Centers for Disease Control and Prevention, BRFSS Smart Data, 2015.

The analysis presented in this section also provides a comparative prevalence assessment of these health conditions for the Nashville MSA population as compared to its 10 peer MSAs. The following analysis, based on Centers for Disease Control and Prevention's (CDC) BRFSS Smart Data, provide updated prevalence of the chronic conditions previously reported in the 2015 Pilot Study and, and expands the original set to include hypertension. **Table 5** below presents statistics regarding chronic conditions and health behaviors for Nashville and the peer MSAs for the "all ages" group. Two additional tables that follow present disaggregated findings, separating the overall population into the two age groups: 25-44 and 45-64.

**Table 5** shows that the Nashville MSA has a higher prevalence rate of hypertension compared to the national average (32.9% vs. 30.5%, respectively). Disaggregating by age group, **Table 6** demonstrates that consistent with finding for the "all ages" group, individuals in the 25-44 age group report a higher prevalence rate of hypertension compared to the national average for that age group (17.8% vs. 15.1%, respectively). **Table 7** shows that the 45-64 age group in the Nashville MSA, similarly, has hypertension prevalence rates that exceed the national average (44.6% vs. 38.6%, respectively); and the rate exceeds that of eight peer MSAs. The majority of chronic conditions and health behaviors presented in this section follow a similar pattern, rates exceed (are worse than) the national average both in aggregate and among the disaggregated age groups.<sup>42</sup>

There are some exceptions. Diabetes prevalence in the Nashville MSA population as a whole is lower than the national average, although still higher than the rates in several peer MSAs. When disaggregated by age, it becomes apparent that the lower "all-ages" rate is accounted for by the relatively low rate of diabetes among the 25-44 age cohort.<sup>43</sup>

<sup>42</sup> While higher rates are considered "worse" for the majority of health behaviors and chronic conditions, for "physically active" lower rates are worse.

<sup>43</sup> When estimating prevalence rates for diabetes limited to the commercial claims data (as reported in Table 12), prevalence rates in Nashville for each of the age groups are somewhat above the national average and several peer cities.

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High stress prevalence in the Nashville MSA is lower than the national average. Disaggregating the age group reveals that the high stress prevalence rate among the younger age group is slightly lower than the national average, but among the older age group, prevalence is slightly higher when compared to the national average.

When aggregating across all age groups, the heart attack rate in the Nashville MSA is similar to that of the national average, however, disaggregating by age group reveals an interesting pattern. The heart attack rate among the *younger* age cohort exceeds the national average while the rate among the older cohort is lower than the national average.

**Table 5: MSA-Level Health and Health Behaviors, 2015 – All Ages**

MSA	MEDICAL BEHAVIORS					HEALTH BEHAVIORS				
	Hypertension	Asthma	COPD	Diabetes	Depression	Heart Attack	Adult Obesity	High Stress	Physically Active	Smoking
<b>Nashville</b>	<b>32.9%</b>	<b>15.2%</b>	<b>6.3%</b>	<b>8.9%</b>	<b>19.9%</b>	<b>4.2%</b>	<b>31.4%</b>	<b>12.9%</b>	<b>69.1%</b>	<b>18.2%</b>
Atlanta	31.7%	12.5%	5.5%	8.9%	14.6%	3.5%	26.6%	10.8%	75.6%	15.4%
Austin	27.3%	14.1%	3.9%	8.2%	15.1%	2.2%	25.9%	12.4%	78.6%	13.7%
Charlotte	34.2%	11.8%	6.8%	11.0%	17.4%	3.4%	31.0%	12.9%	74.3%	16.0%
Denver	26.0%	13.3%	3.9%	6.5%	19.1%	2.7%	19.5%	13.9%	82.8%	14.3%
Indianapolis	30.3%	16.0%	6.0%	10.2%	21.5%	4.6%	31.8%	17.3%	73.4%	20.0%
Kansas City	30.6%	14.7%	6.1%	10.0%	19.0%	4.1%	33.3%	14.2%	75.7%	17.9%
Louisville	36.4%	17.8%	11.6%	12.9%	17.9%	5.7%	33.6%	18.4%	68.2%	24.5%
Memphis	39.5%	12.0%	6.6%	13.3%	15.8%	4.4%	37.3%	17.6%	72.2%	19.2%
Raleigh	29.5%	14.2%	3.0%	8.0%	15.0%	3.1%	23.4%	10.7%	77.5%	13.1%
Tampa	33.7%	13.5%	5.8%	11.8%	17.8%	4.8%	24.8%	15.2%	73.8%	17.6%
National	30.5%	13.6%	5.4%	10.0%	16.7%	3.8%	27.3%	14.4%	75.0%	15.1%

Source: The Centers for Disease Control and Prevention, BRFSS Smart Data, 2015

**Table 6: MSA-Level Health and Health Behaviors, 2015 – Ages 25-44**

MSA	MEDICAL BEHAVIORS					HEALTH BEHAVIORS				
	Hypertension	Asthma	COPD	Diabetes	Depression	Heart Attack	Adult Obesity	High Stress	Physically Active	Smoking
<b>Nashville</b>	<b>17.8%</b>	<b>16.6%</b>	<b>2.9%</b>	<b>1.9%</b>	<b>21.2%</b>	<b>1.6%</b>	<b>33.6%</b>	<b>15.3%</b>	<b>71.0%</b>	<b>18.5%</b>
Atlanta	18.0%	10.2%	1.8%	1.9%	15.2%	1.4%	27.1%	10.5%	77.5%	17.4%
Austin	15.2%	11.1%	1.2%	3.0%	13.2%	0.5%	23.0%	14.1%	80.5%	15.9%
Charlotte	19.2%	10.2%	2.2%	3.3%	15.7%	0.8%	31.6%	11.8%	76.8%	14.4%
Denver	14.2%	13.5%	1.2%	2.1%	17.6%	0.2%	18.9%	14.1%	85.3%	15.6%
Indianapolis	14.1%	17.2%	1.9%	3.1%	18.5%	3.1%	31.1%	17.7%	73.9%	23.6%
Kansas City	13.8%	16.7%	2.1%	2.6%	18.6%	0.3%	32.6%	16.1%	78.7%	21.4%
Louisville	16.9%	20.8%	5.0%	5.6%	17.3%	0.3%	34.0%	21.9%	73.9%	30.5%
Memphis	24.1%	9.5%	3.3%	6.7%	14.1%	2.3%	37.0%	17.3%	78.0%	23.3%
Raleigh	12.2%	12.8%	1.3%	2.4%	13.6%	0.2%	23.8%	12.1%	78.7%	18.5%
Tampa	16.6%	11.9%	0.5%	3.0%	15.1%	0.4%	21.5%	14.1%	78.7%	18.9%
National	15.1%	13.6%	2.2%	3.2%	16.2%	0.9%	27.3%	15.7%	77.0%	17.5%

Source: The Centers for Disease Control and Prevention, BRFSS Smart Data, 2015

**Table 7: MSA-Level Health and Health Behaviors, 2015 – Ages 45-64**

MSA	MEDICAL BEHAVIORS					HEALTH BEHAVIORS				
	Hypertension	Asthma	COPD	Diabetes	Depression	Heart Attack	Adult Obesity	High Stress	Physically Active	Smoking
<b>Nashville</b>	<b>44.6%</b>	<b>13.0%</b>	<b>8.6%</b>	<b>15.1%</b>	<b>23.0%</b>	<b>3.6%</b>	<b>36.4%</b>	<b>15.3%</b>	<b>69.5%</b>	<b>24.5%</b>
Atlanta	40.9%	11.7%	6.7%	12.6%	15.4%	4.0%	28.8%	12.4%	75.2%	19.0%
Austin	40.0%	13.4%	5.4%	14.7%	17.0%	2.9%	30.4%	10.8%	76.7%	12.2%
Charlotte	44.2%	11.7%	10.8%	14.4%	22.8%	4.1%	37.9%	15.1%	66.5%	20.7%
Denver	32.1%	11.2%	4.4%	7.5%	20.7%	2.9%	23.0%	12.4%	81.4%	16.3%
Indianapolis	39.9%	15.1%	8.7%	15.8%	24.9%	5.0%	33.5%	18.8%	73.8%	20.9%
Kansas City	39.8%	13.0%	7.7%	14.1%	21.4%	4.8%	37.7%	14.0%	74.2%	20.7%
Louisville	48.3%	16.0%	15.6%	17.9%	20.3%	7.0%	38.0%	23.4%	64.7%	28.4%
Memphis	53.9%	14.9%	8.7%	15.7%	18.1%	4.6%	45.6%	18.5%	67.7%	20.8%
Raleigh	40.4%	8.7%	2.9%	10.7%	17.2%	2.3%	28.3%	8.1%	77.7%	10.7%
Tampa	37.3%	13.0%	7.9%	13.1%	24.9%	4.7%	27.9%	20.7%	69.4%	22.0%
National	38.6%	12.6%	6.7%	13.4%	18.8%	4.3%	32.1%	14.7%	73.1%	16.8%

Source: The Centers for Disease Control and Prevention, BRFSS Smart Data, 2015

## V. Nashville Region Workforce

### A. Introduction and Overview

The Nashville region is undergoing dramatic economic change. Extraordinary levels of growth are coupled with dynamic changes in the landscape of jobs, skills, and training. Ensuring that the workforce needs of the region remain filled stands among the most significant challenges now and for the foreseeable future.

Sustaining workforce supply in the region will be complicated significantly by a historically large demographic transformation. The forces already underway are not unique to Nashville or any one city or region. Instead, the issues and trends are widespread and likely to persist. Particular challenges for the workforce supply environment in Nashville and elsewhere include:

- A continuous and large numerical and proportional increase in population over age 65
- Shortfalls in hiring during the Great Recession in several key industries and occupations places greater reliance on older workers
- Nashville's diverse industry mix requires small numbers of a very wide array of specialized workers, many of which include older and experienced employees
- Expansion of area business and relocation of business to the area will increase reliance on older, experienced workers for growth and transition needs

Along with changes in the age composition of the population that impact workforce supply, there are ongoing transformations in skills and education requirements in many area industries and occupations. Acquiring new and higher level skills requires a workforce that is capable physically and mentally to add these skills and to be successful in their use. Work demands, in fact, are increasing at a time when many workers are aging and experiencing a host of social and household responsibilities along with heightened probability of adverse health conditions.

## Nashville Region Health Competitiveness Initiative: 2017 Report

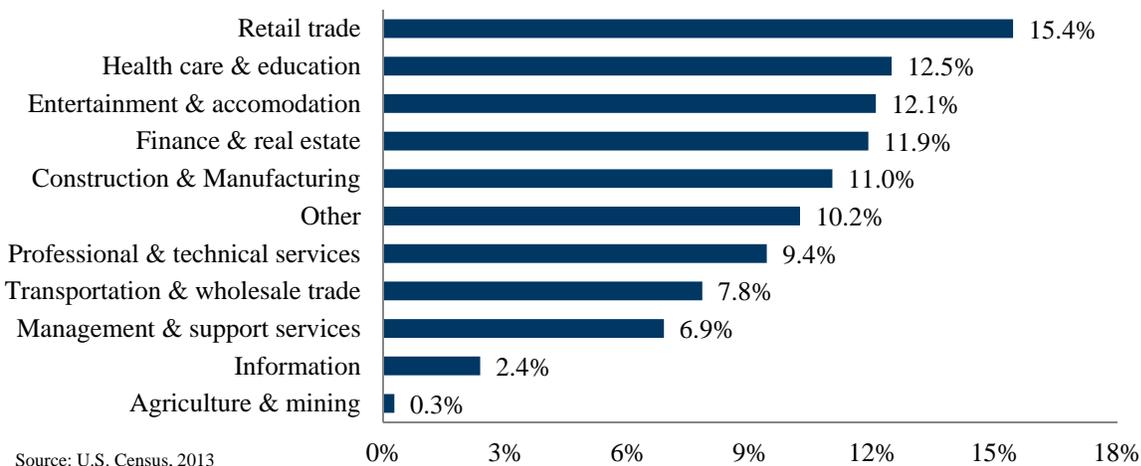
The Families and Work Institute (FWI) has developed national data that highlight important findings about the state of U.S. employees' health.<sup>44</sup> In a tightening labor market for a competitive region such as Nashville, such health adversities could be increasingly diminishing the competitiveness of individuals, of firms, of industries, and of regions as a whole.

### B. The Economy

The Nashville region benefits from a uniquely diverse economy. These diversity factors are widely considered to make the area highly competitive on a national level. The presence of an economy where healthcare management, automotive manufacturing, music and entertainment, tourism, higher education and others vie for ranking among leading industry clusters gives the Nashville region an edge that most others lack. Not overly dependent on any one or few sector(s), this region is able to thrive even when some industries are expanding and others are not. Further, many sectors of the Nashville region operate as tremendous stabilizing forces in the economy. National data show that only two major industry sectors – education and healthcare – at the national level consistently added employment over the past 50 years even during economic contractions, or recessionary periods. The Nashville area has historically experienced an abundance of those two stabilizing industries, and in fact, is a regional and national leader in both.

The Nashville metro area is home to more than 40,000 business establishments, widely distributed across industries and firm size, as demonstrated in the area's reputation for economic diversity. As defined at the "supersector" industry level, the largest sector is retail trade, followed by healthcare, entertainment and finance. Almost half of the enterprises fall within the smallest size class (1-4 employees), and almost 70 percent of companies in the region employ fewer than 10 employees. There is solid representation of larger size classes of businesses, with about 250 companies that employ between 250 and 499 workers; 88 companies with 500 to 999 workers; and 42 with more than 1,000 workers each. The Nashville MSA exhibits a robust diversity of industries; industry clusters are readily seen with the leading positions of healthcare, education, hospitality-related sectors, and the presence of manufacturing, professional and managerial operations and of logistics and distribution. The following figure shows statistics for the joint metro region.<sup>45</sup>

**Figure 8: Establishment by Industry, Joint Metro Region**



<sup>44</sup> FWI uncovers the following leading trends in workforce health: (1) employees' physical health shows downward trends; (2) men's health has been deteriorating more than women's health; (3) mental health has remained stable over some years—but a large proportion of the workforce show signs of clinical depression; (4) sleep problems are pervasive and (5) stress levels are rising. <http://familiesandwork.org/downloads/StateofHealthinAmericanWorkforce.pdf>.

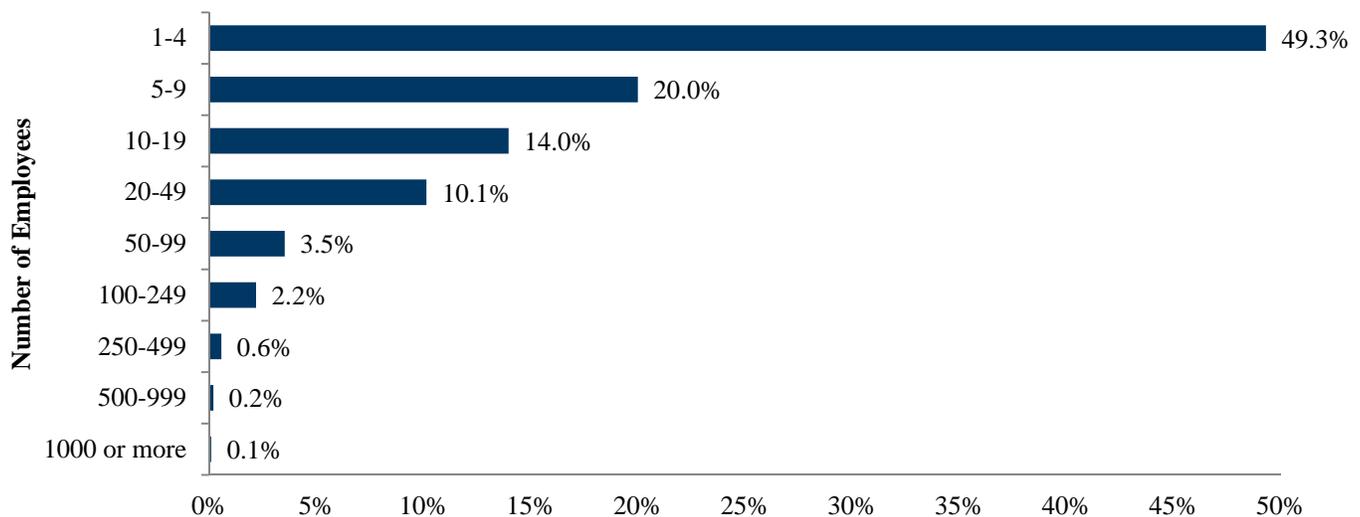
<sup>45</sup> The joint metro region is comprised of the Nashville MSA and the Clarksville MSA.

### C. Population

The Nashville MSA's population, now exceeding 1.8 million,<sup>46</sup> may grow by 6.9 percent through 2020, outpacing the national rate of 2.5 percent. Population growth is expected to slow considerably in the Nashville MSA, Tennessee and the U.S. from 2015 to 2020, relative to the prior five-year period. Demographic composition of the nation ebbs and flows by dominance of particular age cohorts. The natural increase in population is a reflection of age composition that has experienced tremendous variation over the past 70 years, most notably with the Baby Boom and successive waves of "boomlets," augmented by net immigration and births derived from population additions.

The changing age composition of the U.S. population represents one of the most rapid and profound transitions this nation has faced in modern times. The sweep of change will affect many aspects of life and society for years to come. Most importantly, the effects throughout the economy will be felt in patterns of consumption, housing, mobility, education, and certainly workforce matters. The role of the Great Recession in delaying retirement for some and generally reordering transitions into and out of work through upheavals in hiring has likely brought many longer-term events into sharper, more immediate focus in regions like Nashville.

**Figure 9: Establishments by Number of Employees, Joint Metro Region**



Source: U.S. Census, 2013

Research suggests an array of issues that of necessity are now in the forefront of this area's workforce challenges.<sup>47</sup> Understanding how to maneuver through a workforce in flux while maintaining knowledge transfer and optimizing that transfer for workers and employers alike are emerging as key responses to ongoing demographic and technology changes. Identified among these are:

- An important issue is that little action may find most companies, and their learning functions, ill-prepared to adapt to the changing workforce

<sup>46</sup> This estimate represents the most current Census data for the Nashville MSA population. Data analysis in this report that uses health or utilization data from other time periods uses the closest year of Census data available.

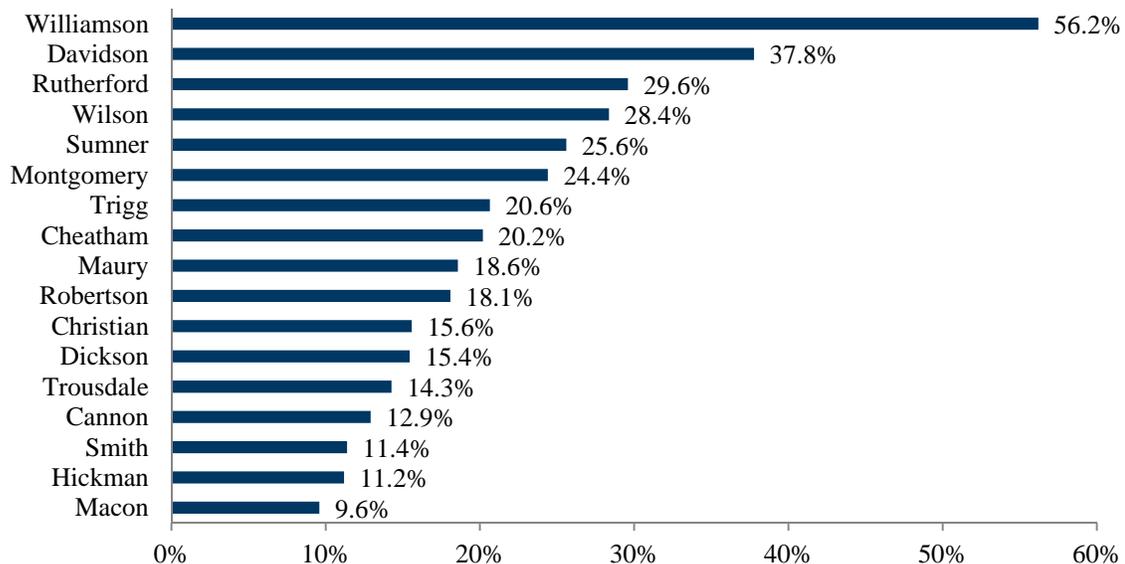
<sup>47</sup> IBM Global Business Services, "Closing the Generational Divide: Shifting Workforce Demographics and the Learning Function," (2006), [http://www-935.ibm.com/services/us/gbs/bus/pdf/g510-6323-00\\_generational\\_divide.pdf](http://www-935.ibm.com/services/us/gbs/bus/pdf/g510-6323-00_generational_divide.pdf) (accessed August 24, 2016).

## Nashville Region Health Competitiveness Initiative: 2017 Report

- Passing the torch of experience is critical through transferring knowledge between generations as a critical capability for organizations
- Moving beyond a "one-size-fits-all" approach as learning executives recognize there are clear differences in the learning preferences of workers from different generations
- Avoiding roadblocks to learning where, for instance, older workers may find more barriers to participating in learning activities
- Bypassing the learning curve by getting new employees rapidly up to speed is taking on a new priority

Employers form an active component of educating and training workers. A recognition that incumbent workers form the very large share of the workforce across time points to the dual need to continuously upgrade skills and education as well as maintain a workforce that is physically and mentally ready for these opportunities. Across the array of counties in the Nashville MSA, there is variability in level of education that points to need for improvement to generate supply adequate to growing demand.

**Figure 10: Percentage of Population with Bachelor's Degrees or Higher**



Source: U.S. Census Bureau and American Community Survey, 2013

With approximately 95 percent of annual jobs created filled by working adults transferring from one job to another, the key focus for filling needed roles is to continue investment and encouragement in education and training for working adults. Data supporting this include<sup>48</sup>:

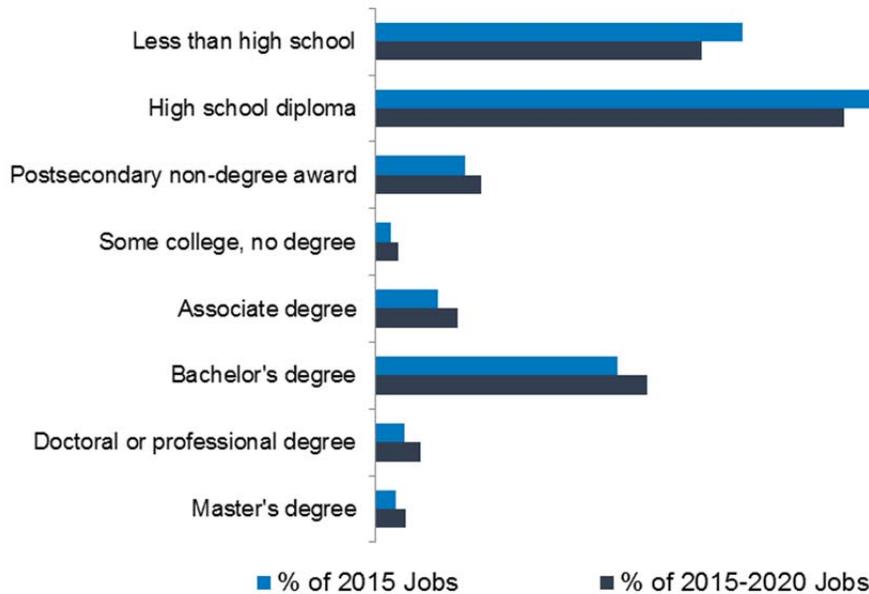
- By 2018, nearly two-thirds of the nation's jobs will require some postsecondary education or training.
- College enrollment by adults will grow twice as fast as enrollments by traditional-age students through 2020.

Adults who have completed high school fare much better than dropouts. Yet even these workers face unemployment rates nearly a third higher than adults with some college, and twice as high as those with a bachelor's degree (9.7 percent vs. 4.5 percent). The transition to a greater share of total new workforce requiring higher levels of education is

<sup>48</sup> Patrick Kelly and Julie Strawn, "Not Just Kid Stuff Anymore: The Economic Imperative for More Adults to Complete College," *National Center for Higher Education Management* (2011), <http://www.nchems.org/pubs/docs/NotKidStuffAnymoreAdultStudentProfile-1.pdf> (accessed August 24, 2016).

a clear reminder that the imperatives to advance capabilities of area workforce during a time of declining growth in workforce supply are significant and challenging.

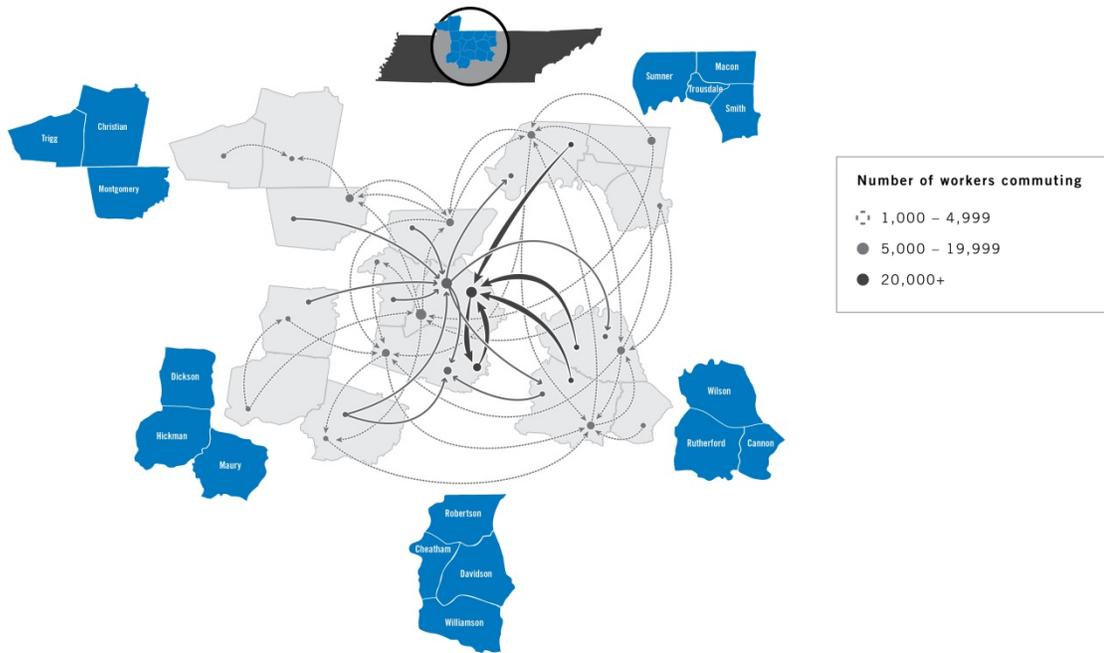
**Figure 11: Employment Composition by Education, Nashville MSA**



#### *D. Transit Workforce*

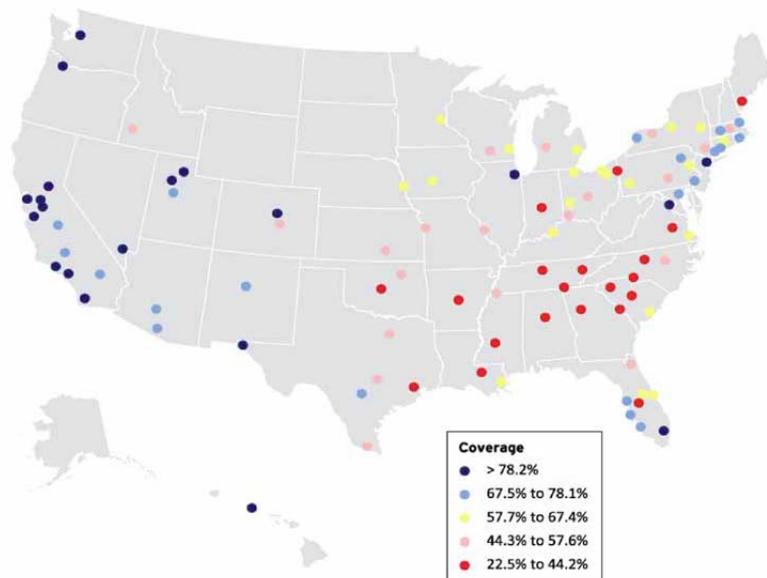
The workforce of the Nashville region, as in many areas, is highly dependent on commuting to work, often in single occupant vehicles. The costs of high reliance on individual driving as a mode of travel are many in terms of lost productivity, accident rates, and overall congestion. However, a frequently under-recognized aspect of high levels of long commuting is the toll that this sedentary and oftentimes stressful activity places on workers. Diminished productivity of workers in the Nashville region and elsewhere is likely to be significant as commute times become longer, as drivers contend with the anxieties of daily driving and as employers struggle to offer alternatives. Commuting difficulties will be a significant obstacle as the Nashville region faces a growing need to bolster the health and vitality of its workforce, particularly older workers. The compounding effects of long and potentially longer commutes due to established residential patterns on older workers with higher levels of adverse health conditions, and added responsibilities as care givers for the young and the old, combine to weaken the capabilities of older age cohorts to function fully in their key roles as workers with long experience and job content and technical knowledge. Additionally, research highlights the ways that commuting is a cost in time and money for those traveling to work, leaving less disposable income for health expenditures or those that would contribute to greater wellness and health.

Figure 12: County-to County Commuting, Joint Metro Region



Source: U.S. Census Bureau Center for Economic Studies, 2011

Figure 13: Share of Working-age Residents with Access to Transit, 100 Metropolitan Areas



Source: Brookings Institution Analysis of transit agency data and Nielsen Pop-Facts 2010 data

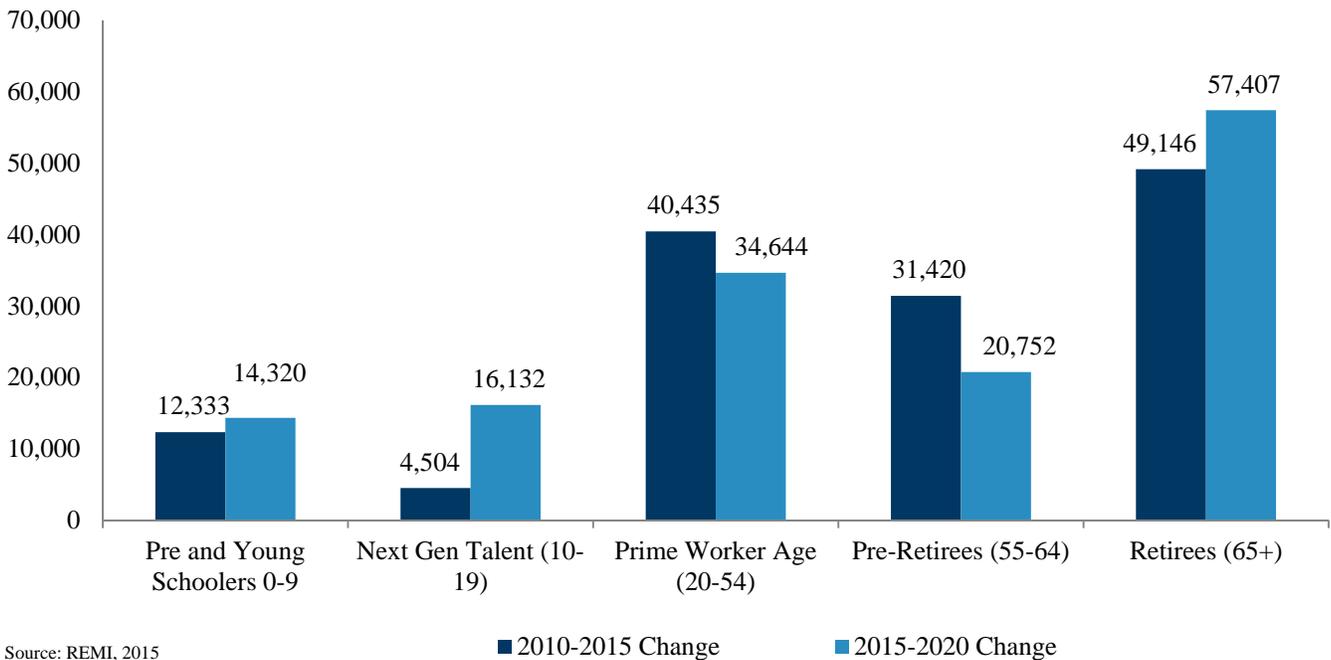
The ability of regions to provide a convenient, affordable nexus between home and work through transit and mobility options becomes increasingly important in large metropolitan areas such as Nashville and others in the comparison set. Recognizing the interrelated nature of the built environment and its role in health of the workforce both at worksites and in transit leads to the importance of considering the connection of investments in infrastructure, in health, and in workforce development.

*E. Age*

An aging population is likely the most significant change and challenge to society’s workforce that occurs over the coming decade. The continuing exit of the Baby Boom generation from the workforce will reshape all industries in some way. The landscape of the environment – physical, social, and economic – will alter in innumerable ways as 76 million Americans retire over two decades. As dramatically as the U.S. was impacted by the Baby Boom coming of age and entering the workforce, the nation is now experiencing a transformation that will be large, important, and long lasting.

The current population of the Nashville MSA finds more than 1 million persons in the primary working age, 20-54. Meanwhile, nearly 250,000 people ages 55-64 are fast approaching retirement age, meaning the area will need to replace those who are currently employed. Even more importantly, workers in the 20 to 54 year age range disproportionately more distributed toward the older end of this age range, and are quickly approaching retirement themselves.

**Figure 14: Age Composition in Joint Metro Region**



Source: REMI, 2015

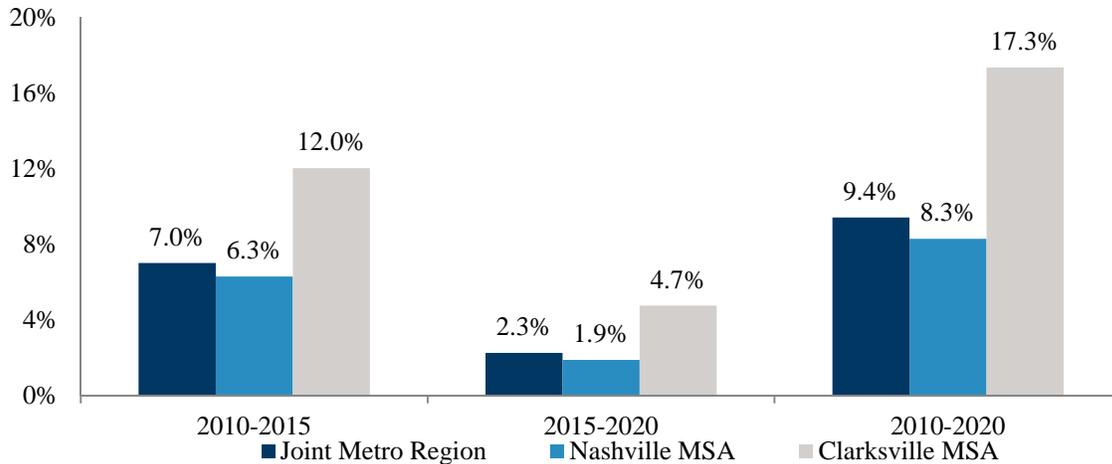
The age cohort shifts projected for the next five years illustrate the magnitude of change, which the area economy will experience in workforce transition. The age 45-64 cohort will increase by 11.3% over the next five years in the Nashville MSA while the 65-84 age range will gain 21.2%. While the 65+ (largely) retiree population will grow from 11.4% of the total metropolitan population to 13.2%, the critical 45-64 age group will remain largely stable.<sup>49</sup> In fact, in none of the counties of the MSA will the 45-64 age cohort increase as a share of overall population between now and five years from now.

Importantly, the movement into and out of the 45-64 age group will be highly influential in the experience of business in the area. Workers in this age range will continue to fill the roles dependent on long experience and higher levels of

<sup>49</sup> EMSI, 2016.

skills and training. A large exodus of this group will mean losses of knowledge base that is critical at a time when that age cohort is not growing relative to other portions of the population. The compounding burdens placed on older workers to deliver high levels of work output and deliver on this cross-generational transition suggest that employers should remain highly focused on optimizing the health and well-being of the 45-64 age worker. This is so because the organizational benefits to firms become particularly high when those businesses design work, health culture, and programs that fully address the unique health issues of that age group.

**Figure 15: Change in Working-Age Population**



Total working-age population across the full range of age cohorts in the Nashville MSA is expected to grow faster than in the nation as a whole. However, growth in all areas, including the Nashville MSA and the U.S., is expected to slow significantly in 2015-2020 compared to 2010-2015. It is critical to note the dramatic changes in pre-retiree and retiree age cohorts in relation to all others in the next five years, in addition to changes that have already occurred.

The reshaping of the population composition of the Nashville region is evidenced by the continuing diminution of the Baby Boom age cohort as a participant in the labor force. The illustration of ‘population pyramids’ for 2000, 2015 and 2030 highlights the shift toward a predominantly older population. The exit of key personnel in many roles, many in occupations already difficult to fill, will characterize much of the remainder of this decade and through 2030 as retirement persists at record high levels.<sup>50</sup>

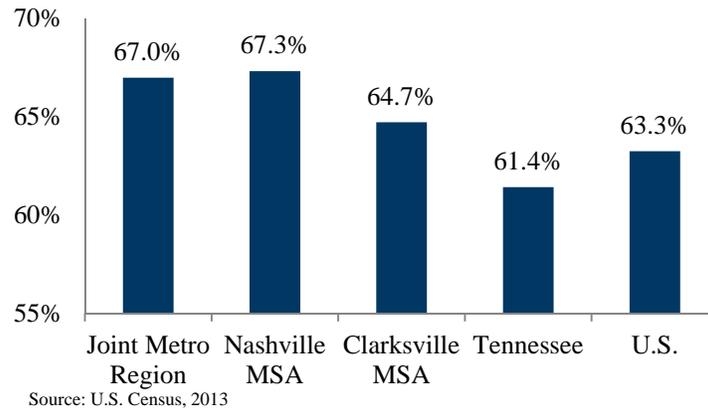
#### ***F. Labor Force Participation***

National labor force participation levels have declined to 30-year lows understanding and projections suggest further decline. Clearly, this matter is significant in understanding and resolving workforce needs now and into the future.

While the Nashville MSA maintains a comparatively strong level of labor force participation overall, the recognition that a substantial portion of the older workforce will be retiring indicates that the area will need to take steps to ensure an adequate supply of workforce.

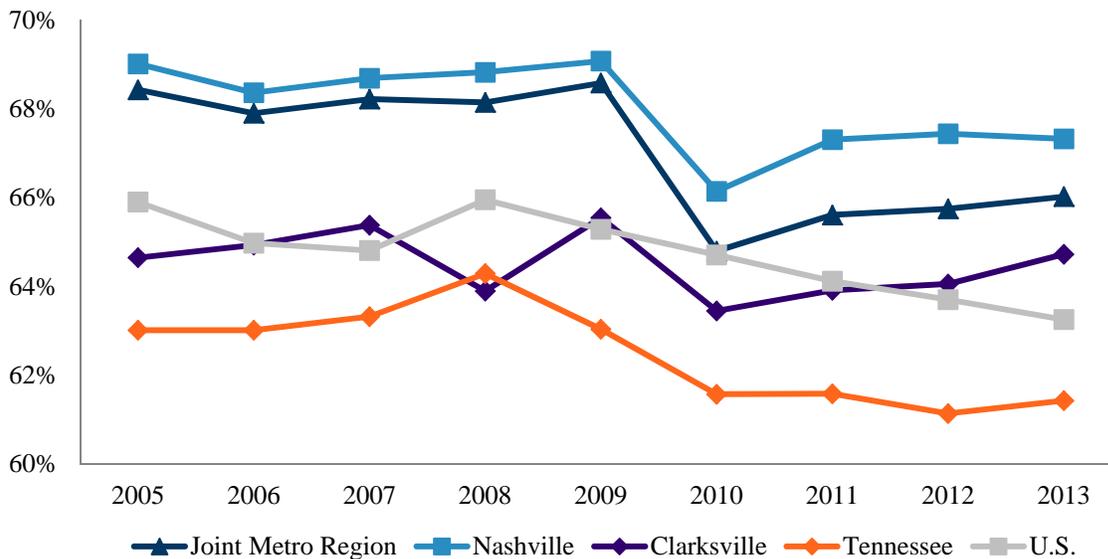
<sup>50</sup> REMI, 2015.

**Figure 16: Labor Force Participation**



Labor force participation in the Nashville MSA has continued to remain well above the state and national levels. Participation rates in this area increased by approximately 1.2 percentage points in the three years through 2013, while a loss occurred in both Tennessee and the nation over that period.

**Figure 17: Changes in Labor Force Participation, 2005-2013**

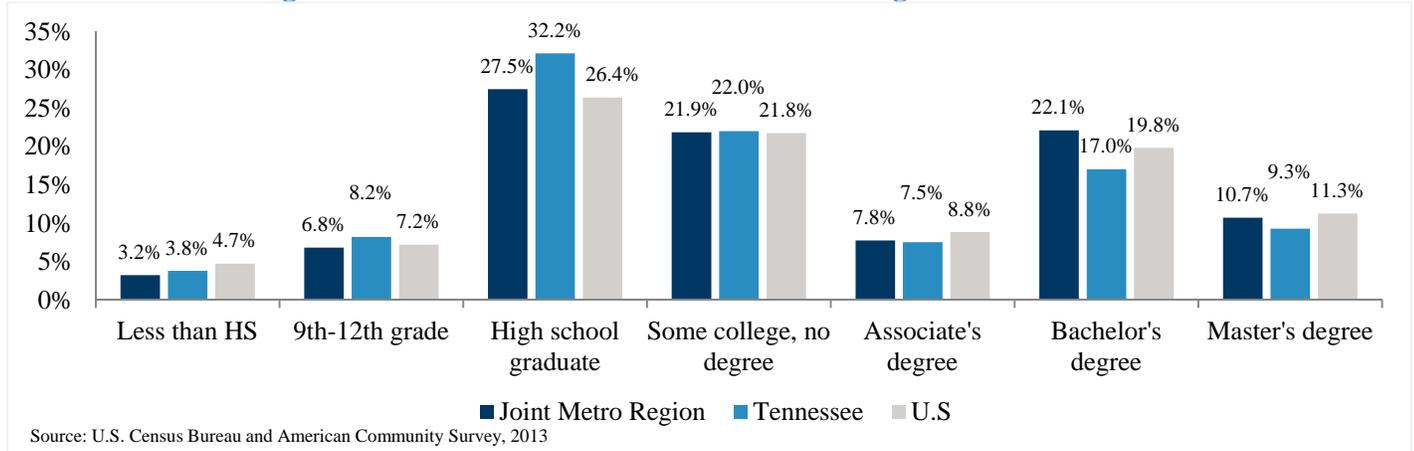


Source: U.S. Census, 2013

Labor force participation levels continue to drop for reasons that are only partially understood. The attendance of larger numbers of young people in postsecondary education is one positive aspect of the workforce environment that reduces participation rates in the short term but increases the long term competitiveness and participation of degree completers. The Nashville MSA, through an increasingly diverse and complex industry mix, is a beneficiary of those long terms gains but also suffers from the short-term gaps in employment by younger persons and others advancing their education. At the same time, many discouraged and displaced workers throughout the nation may have simply

opted out of the labor force on a sustained basis. Also, the development of the ‘gig economy’ that perhaps does not fully tabulate labor force participants is an emerging phenomenon.<sup>51</sup> The relationship of declining labor force participation rates to the health of a region’s workforce points to a need for increased emphasis on active workforce participants to continue to remain active. Younger age cohorts overall have been particularly underrepresented in the workforce relative to earlier periods. Therefore, heightened dependence on older workers is a reality that employers increasingly recognize.

**Figure 18: Educational Attainment of Adults Age 25 and Over**



Data show that, relative to other MSAs, the Nashville region remains a disproportionate leader in older workforce with lower levels of educational attainment.<sup>52</sup> The ability of workers age 45-64 to gain further education will remain a key factor in the region’s competitiveness. The health and well-being of those persons to take on this important step in career advancement likely means more robust support systems from employers and partnering institutions to allow the flexibility and attentiveness to health and wellbeing that have not been widespread priorities for the area.

**Table 8: Educational Attainment for Population Age 45-64, by MSA**

Education	Nashville	Atlanta	Austin	Charlotte	Denver	Indianapolis	Kansas City	Louisville	Memphis	Raleigh	Tampa
Less than 9th grade	3.5%	3.6%	5.9%	3.7%	4.0%	2.6%	2.3%	2.7%	3.4%	3.0%	3.2%
9th to 12th grade, no diploma	7.6%	6.4%	5.0%	7.5%	4.8%	6.6%	5.4%	7.5%	8.3%	4.7%	7.2%
High school graduate (includes equivalency)	30.8%	25.3%	19.6%	26.3%	21.4%	31.8%	27.3%	32.9%	29.9%	20.3%	30.0%
Some college, no degree	21.0%	21.0%	21.7%	22.5%	22.1%	20.7%	23.8%	22.4%	24.8%	19.6%	22.1%
Associate's degree	7.4%	7.9%	7.3%	9.4%	8.4%	8.2%	7.5%	8.4%	7.3%	10.4%	10.5%
Bachelor's degree	19.0%	22.6%	25.4%	20.6%	24.5%	19.0%	20.9%	15.5%	17.1%	26.8%	17.5%
Graduate or professional degree	10.7%	13.2%	15.1%	9.9%	14.7%	11.2%	12.7%	10.7%	9.2%	15.1%	9.5%

Source: U.S. Census 2014

**G. Self-employed Workforce**

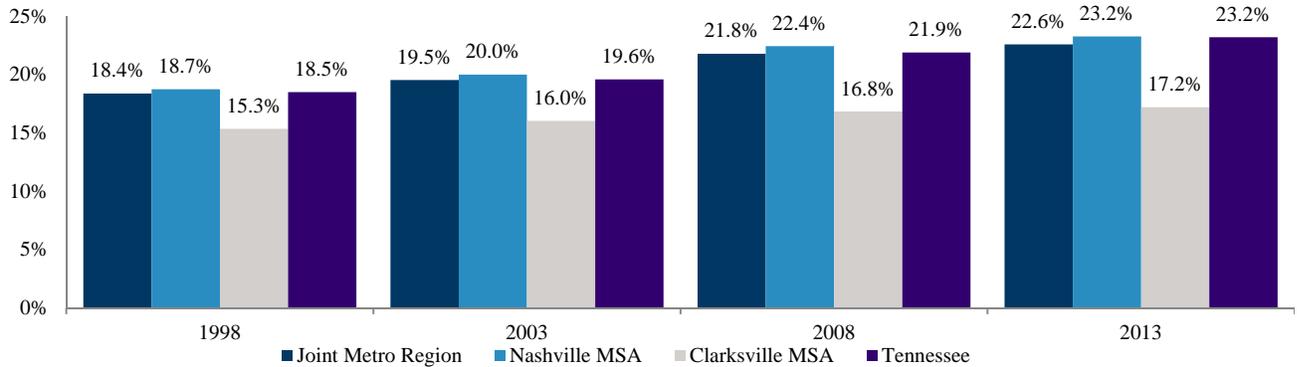
Levels of self-employment in the Nashville MSA are much higher than in the nation. Key industries originated in the region through entrepreneurial development, particularly healthcare management and music and entertainment. Data, available in five-year spans from Census sources, show growth in self-employment over the past two decades in the Nashville MSA. A considerable increase in self-employment activity occurred between 2003 and 2008, perhaps

<sup>51</sup> Ian Hathaway and Mark Muro, “Tracking the Gig Economy: New Numbers,” *The Brookings Institution* (October 13, 2016), <https://www.brookings.edu/research/tracking-the-gig-economy-new-numbers/>.

<sup>52</sup> Table 8 uses the same Census data and years for the Nashville MSA and peer cities as used in the health data.

relating to the onset of the economic downturn and shift to part-time employment, as well as the region’s historic level of entrepreneurial activity and opportunity. By 2013, self-employment levels in the area exceeded those of 2008, and associated incomes largely matched or exceeded 2003 levels. As with the workforce as a whole, older persons comprise a sizable portion of the total. Ensuring that workers not directly attached to employers also are integrated into planning for greater focus on health and wellness is a particularly important topic for the Nashville region.

**Figure 19: Self-Employed Workers, 1998-2013**

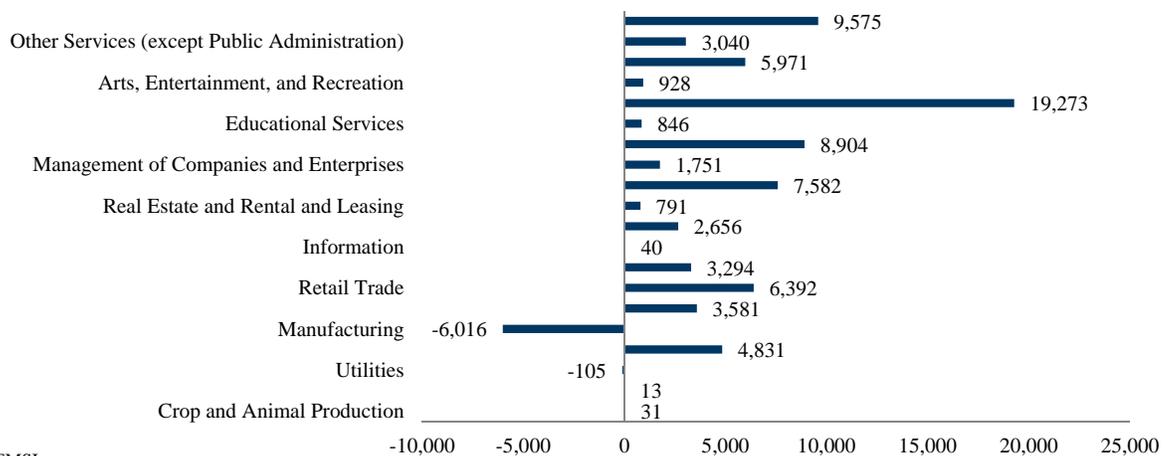


Nashville is home to more than 147,000 businesses classified as “non-employers.” These are businesses with no paid employees and typically are unincorporated businesses or persons working as contract workers. The professional services sector makes up 14 percent of this segment of the region’s workforce, with a total of 20,780 non-employers. This is followed by construction workers at 11.4 percent, or 16,842 non-employers.<sup>53</sup>

**H. Industry Composition: Nashville Region**

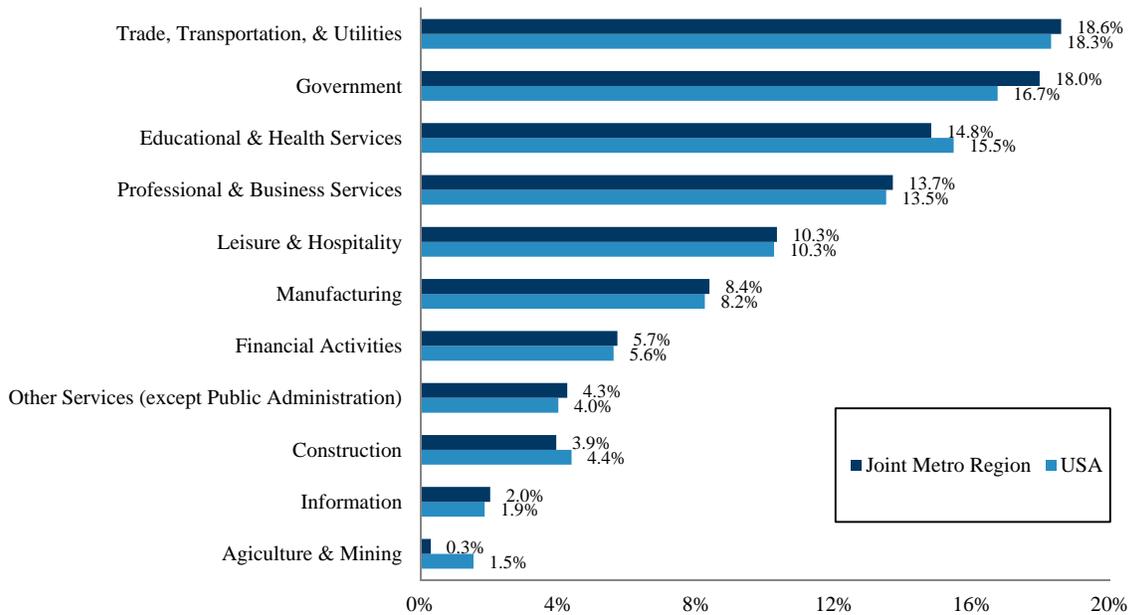
The diverse industry mix of the Nashville MSA offers opportunities as well as challenges in maintaining a workforce that is available to meet quantity and quality requirements for demand. Balancing the changing skill demands in occupations with a rapidly aging workforce presents a unique and major challenge for the area.

**Figure 20: Joint Metro Region: Projected Job Change, 2015-2020**



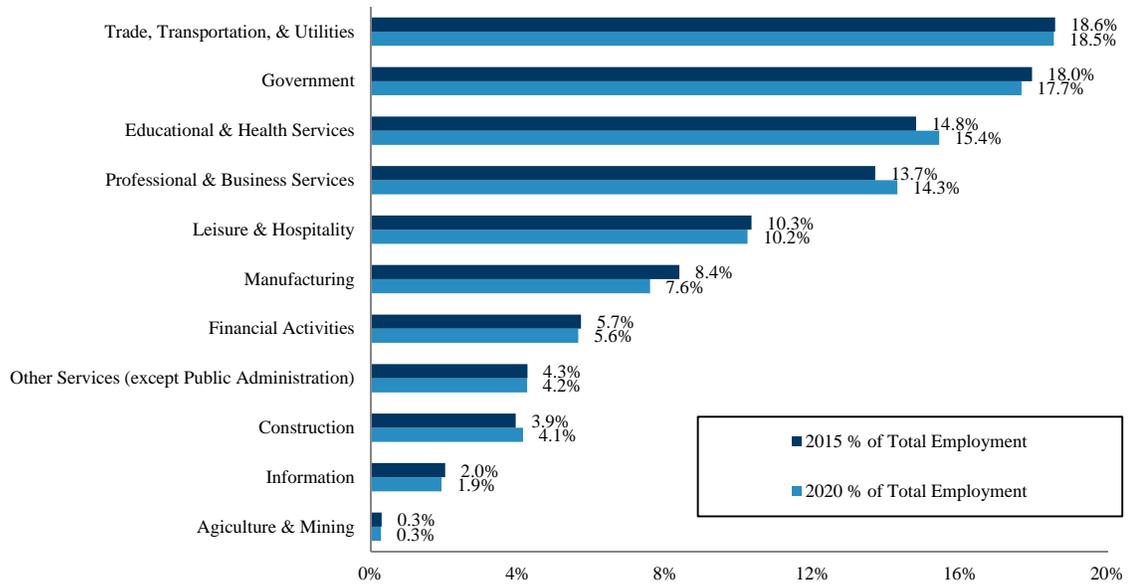
<sup>53</sup> Detailed tables are available from the authors upon request.

**Figure 21: Employment by Industry, U.S. and Joint Metro Region, 2015**



Source: EMSI

**Figure 22: Industry composition, 2015 vs projected, Joint Metro Region**



Source: EMSI

## VI. Access and Assets

### A. Physicians

The number of physicians and the population's use of primary care physicians represent two measures of “access to healthcare” for residents of the Nashville area. The 2015 Pilot Study examined the availability of primary care physicians along with psychiatrists and psychologists; the original analysis, updated here, uses the most recently available National Provider Identifier (NPI) data.<sup>54</sup>

The Nashville MSA has a greater number of physicians, psychiatric physicians and psychologists, and internal medicine physicians per 100,000 compared to the national average (see **Table 9**).<sup>55</sup> However, the Nashville MSA is below the national average for family medicine physicians per 100,000 by MSA.<sup>56</sup> When analyzing the number of physicians per 100,000 by MSA, Nashville ranks 3<sup>rd</sup> compared to its 10 peer MSAs, following Indianapolis and Denver.

**Table 9: Physicians per 100,000 by Metropolitan Statistical Area, National and Peer Group, Composite (2016)**

MSA	Physicians	Psychiatric Physicians and Psychologists	Family Medicine Physicians	Internal Medicine Physicians	Internal and Family Medicine Physicians	Census 2010 Population Count
<b>Nashville</b>	<b>318</b>	<b>37</b>	<b>23</b>	<b>83</b>	<b>106</b>	<b>1,589,934</b>
Atlanta	232	33	25	60	85	5,268,860
Austin	259	41	41	54	95	1,716,289
Charlotte	255	30	38	62	100	1,758,038
Denver	345	58	45	81	127	2,543,482
Indianapolis	356	33	51	87	138	1,756,241
Kansas City	289	42	45	66	111	2,035,334
Louisville	284	44	32	65	97	1,283,566
Memphis	211	28	22	54	75	1,316,100
Raleigh	198	45	27	47	74	1,130,490
Tampa	294	31	38	86	124	2,783,243
National	288	30	39	74	113	289,261,315

Source: Center for Medicare & Medicaid Services' NPPES NPI Dataset, 2016 for physician count [numerator] ([http://download.cms.gov/nppes/NPI\\_Files.html](http://download.cms.gov/nppes/NPI_Files.html)); 2010 Census population from the 2010 U.S. Census Bureau's Metropolitan/Micropolitan Statistical Area Population and Estimated Components of Change data for population [denominator] (<http://www.census.gov/popest/>)

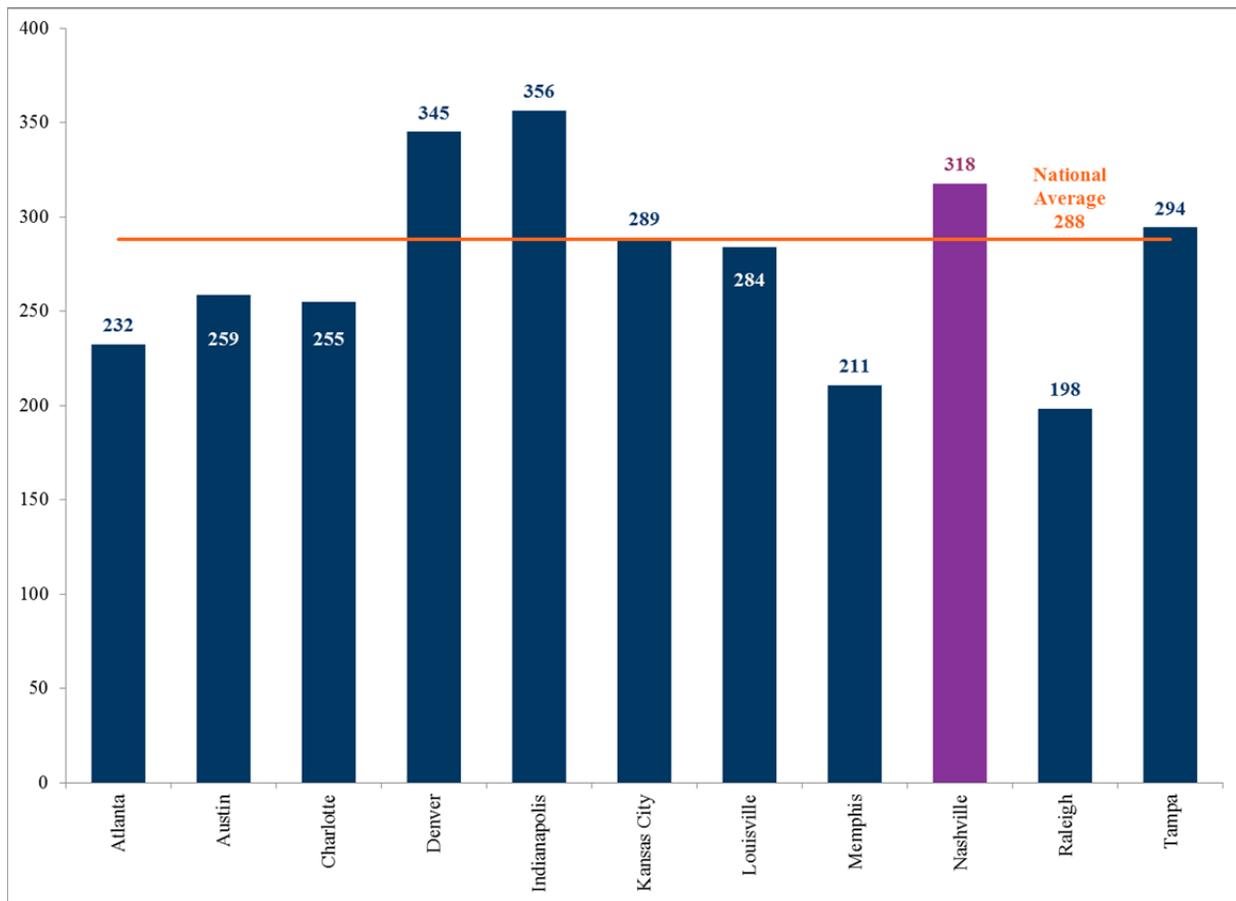
<sup>54</sup> Center for Medicare & Medicaid Services' NPPES NPI Dataset, 2016 for physician count [numerator], [http://download.cms.gov/nppes/NPI\\_Files.html](http://download.cms.gov/nppes/NPI_Files.html); 2010 Census population from the 2010 U.S. Census Bureau's Metropolitan/Micropolitan Statistical Area Population and Estimated Components of Change data for population [denominator], <http://www.census.gov/popest/>.

<sup>55</sup> The national average is based on the average across all MSAs in the nation.

<sup>56</sup> This is moderated by the relatively high supply of internists, which often serve as primary care physicians.

Below is a graphical representation of the physician counts by MSA compared to the national average.

**Figure 23: Physicians per 100,000 by MSA and Peer Group**



Source: Center for Medicare & Medicaid Services' NPPES NPI Dataset, 2016 for physician count [numerator] ([http://download.cms.gov/nppes/NPI\\_Files.html](http://download.cms.gov/nppes/NPI_Files.html)); 2010 Census population from the 2015 U.S. Census Bureau's Metropolitan/Micropolitan Statistical Area Population and Estimated Components of Change data for population [denominator] (<http://www.census.gov/popest/>)

**Physician Use:** This Report updates and extends the Pilot Study analysis of primary care visit utilization using the most current data available. **Table 10** below depicts aggregate rates and rates by age group break down. The Nashville MSA has a high rate of primary care utilization compared to the national average across all ages (72.2% vs. 70.6%, respectively). Primary care visit rates for the younger cohort (age group 25-44) are in line with the national average and peers, however, the rate among the 45-64 year old age group exceeds the national average (78.4% vs. 74.1%, respectively) as well as that of many of peer group.

**Table 10: Percentage of Population that had a Primary Care Visit – All Ages, Ages 25-44, Ages 45-64**

MSA	Primary Care Visit (%) All Ages	Primary Care Visit (%) Ages 25-44	Primary Care Visit (%) Ages 45-64
<b>Nashville</b>	<b>72.2%</b>	<b>61.8%</b>	<b>78.4%</b>
Atlanta	72.5%	64.3%	74.5%
Austin	63.6%	52.9%	70.3%
Charlotte	72.6%	64.4%	73.2%
Denver	65.0%	57.6%	65.0%
Indianapolis	66.0%	57.3%	71.1%
Kansas City	67.9%	58.9%	70.8%
Louisville	73.6%	63.5%	77.2%
Memphis	75.4%	65.5%	80.1%
Raleigh	74.6%	66.8%	78.8%
Tampa	72.4%	61.1%	72.6%
National	70.6%	61.3%	74.1%

Source: The Centers for Disease Control and Prevention, BRFSS Smart Data, 2015

### *B. Insurance Coverage*

One way to measure access to healthcare (services) is by insurance coverage. In the Nashville MSA, approximately 12% of the population was uninsured in 2014, consistent with the national average. Since 2010, Nashville has steadily lowered its percent-uninsured population from 15% in 2010 to approximately 12% in 2014, following similar trends with its peer MSAs (see **Table 11**).

**Table 11: Percent of Uninsured Population, 2010-2014**

MSA	Uninsured 2010 (%)	Uninsured 2011 (%)	Uninsured 2012 (%)	Uninsured 2013 (%)	Uninsured 2014 (%)
<b>Nashville</b>	<b>15%</b>	<b>14%</b>	<b>13%</b>	<b>13%</b>	<b>12%</b>
Atlanta	20%	20%	18%	19%	15%
Austin	19%	19%	18%	17%	15%
Charlotte	17%	17%	16%	16%	13%
Denver	16%	15%	15%	14%	10%
Indianapolis	15%	13%	14%	14%	12%
Kansas City	13%	14%	13%	13%	11%
Louisville	13%	13%	13%	13%	8%
Memphis	16%	17%	15%	16%	14%
Raleigh	15%	14%	14%	13%	12%
Tampa	19%	18%	18%	17%	15%
National	15%	15%	15%	14%	12%

Source: American Community Survey, 2010-2014 1-Year Estimates

\*Percent uninsured is determined using the ACS One-Year 2010-2014 Estimates, which only reports counties with a population 65,000 or more.

## VII. Chronic Conditions Analysis

This section presents an update of the chronic condition analysis and metrics from the 2015 Pilot Study (which used 2011 data), using commercial claims data from 2013.<sup>57</sup> The following analysis includes patient level statistics relating to four chronic conditions reported in the Pilot Study: Asthma, Chronic Obstructive Pulmonary Disease (COPD), Depression, and Diabetes, as well as Hypertension (newly added). Hypertension is a common condition in the U.S. that increases the risk of heart disease and stroke.

In order to provide more detailed and actionable data on the workforce implications of these conditions, the data and metrics are for all ages as well as disaggregated by age group (25-44 and 45-64).<sup>58</sup> The initial analyses include:

- Prevalence of chronic conditions based on commercial claims for 2013 and by age group (25-44, 45-64, and all ages).
- Costs and utilization metrics by chronic conditions for the Nashville MSA presented by age groups (25-44, 45-64, and all ages).

### A. Prevalence of Chronic Conditions Based on Commercial Claims Data: Comparative Analyses

A starting point of the analysis is to examine prevalence among the working age population of the chronic conditions in Nashville and its peer MSAs (using the commercial claims data and methodology from 2015 Pilot Study). The following tables report prevalence for the total population and by age groups for five chronic conditions: asthma, COPD, depression, diabetes, and hypertension.<sup>59</sup>

**Update of Chronic Condition Analyses Using 2013 Data:** Table 12 shows the prevalence of the chronic conditions based on the commercially insured data, and compares prevalence across the 11 MSAs and nationally.<sup>60</sup> The analysis includes a breakdown by age group into the two key age group categories. The data indicate that, in general, the Nashville MSA is about in the middle or lower end of the range (worse) in relation to its peers for all but asthma, and that prevalence in each of the conditions is higher for the 45-64 age group. Nashville disease prevalence exceeds the national rates for COPD, depression, diabetes, and hypertension. Not surprisingly, the breakdown by age groups demonstrates that there is some variation in condition prevalence between the younger and older age groups in Nashville. The variance is largest between the two age groups for diabetes and hypertension prevalence in Nashville.

<sup>57</sup> Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2011 & 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved. Note that some changes in the percentages may be due to sample differences between the 2011 and 2013 data.

<sup>58</sup> The statistics and analysis presented in this section are for the commercially insured population under age 65.

<sup>59</sup> The updated tables include detailed cost and utilization statistics by health condition and age group.

<sup>60</sup> Prevalence of chronic conditions for the population that is commercially insured differs from prevalence of conditions identified in BRFSS due to difference in sample populations and the methodology used to identify disease conditions. The commercially insured population is expected to be healthier than the general population as they are younger (age 64 and under). Disease rates increase with age, thus a younger population should be healthier, all things equal.

**Table 12: Comparison of Chronic Condition Prevalence by MSA and Age Cohort: 2013**

MSA	Asthma		COPD			Depression			Diabetes			Hypertension			
	Asthma (All Ages)	(Ages 25-44)	Asthma (Ages 45-64)	COPD (All Ages)	(Ages 25-44)	COPD (Ages 45-64)	Depression (All Ages)	(Ages 25-44)	Depression (Ages 45-64)	Diabetes (All Ages)	(Ages 25-44)	Diabetes (Ages 45-64)	Hypertension (All Ages)	(Ages 25-44)	Hypertension (Ages 45-64)
<b>Nashville</b>	<b>2.4%</b>	<b>2.0%</b>	<b>2.5%</b>	<b>1.1%</b>	<b>0.5%</b>	<b>2.4%</b>	<b>4.7%</b>	<b>5.6%</b>	<b>6.4%</b>	<b>6.2%</b>	<b>3.6%</b>	<b>13.8%</b>	<b>15.0%</b>	<b>10.3%</b>	<b>32.7%</b>
Atlanta	3.1%	2.2%	2.7%	0.7%	0.4%	1.5%	3.6%	4.2%	4.7%	5.4%	3.1%	12.2%	14.7%	10.2%	32.3%
Austin	3.0%	2.1%	2.8%	0.5%	0.3%	1.1%	3.5%	4.3%	4.8%	4.3%	2.9%	10.7%	9.1%	6.2%	23.4%
Charlotte	2.3%	1.5%	2.3%	0.7%	0.4%	1.5%	3.2%	3.9%	4.3%	4.2%	2.8%	10.3%	10.0%	7.2%	24.4%
Denver	3.1%	2.4%	3.1%	0.5%	0.2%	1.1%	4.0%	4.5%	5.3%	2.9%	1.8%	6.7%	6.9%	4.1%	17.2%
Indianapolis	3.1%	2.4%	3.0%	1.0%	0.5%	2.3%	4.9%	5.7%	6.5%	5.0%	2.8%	11.5%	12.3%	7.8%	28.3%
Kansas City	2.9%	2.2%	2.7%	0.9%	0.5%	1.9%	3.8%	4.7%	4.9%	4.4%	2.6%	10.6%	9.1%	6.3%	22.0%
Louisville	3.0%	2.2%	2.9%	1.6%	0.7%	3.5%	4.4%	5.2%	5.6%	5.6%	3.3%	12.1%	14.9%	10.0%	32.0%
Memphis	2.7%	2.2%	2.7%	1.0%	0.4%	2.1%	3.2%	3.9%	4.3%	6.5%	4.3%	14.2%	17.6%	13.7%	38.0%
Raleigh	2.4%	1.8%	2.0%	0.4%	0.2%	0.8%	3.1%	3.8%	4.0%	4.1%	2.8%	9.5%	9.4%	6.9%	22.4%
Tampa	3.2%	2.5%	3.1%	1.1%	0.5%	2.3%	3.9%	4.3%	5.4%	5.5%	3.2%	11.8%	14.2%	9.2%	30.3%
National	3.0%	2.3%	3.0%	1.0%	0.5%	2.0%	4.3%	5.0%	5.6%	5.2%	3.0%	11.5%	12.4%	8.1%	27.7%

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

### *B. Evaluation of Utilization and Costs for Six Chronic Conditions*

This section contains updated core metrics on cost and utilization based on commercial claims data for the set of chronic conditions included in the original report, as well as for hypertension (a new addition in this 2017 edition). The statistics are disaggregated by age group. The following graphics present summary statistics for six chronic conditions: diabetes, hypertension, depression, COPD and asthma, and hypertension. These provide relevant data for quantifying the medical and productivity costs related to these conditions.<sup>61</sup>

**Diabetes:** **Figure 24** shows 2013 utilization and cost statistics for Nashville residents in the sample with diabetes.<sup>62</sup> Diabetics experienced an 11% hospitalization rate, averaged 15 outpatient visits a year,<sup>63</sup> and an average of 14 prescriptions. The graphic also reports average costs to insurers and individuals for hospitalization, outpatient visits and prescriptions.<sup>64</sup>

<sup>61</sup> For information about possible extensions in future work, see Technical Appendix, Note 5.

<sup>62</sup> Patients may have more than one chronic condition and patients with a specific chronic condition may seek care for an ailment unrelated to their chronic condition; utilization (including number of prescriptions) and cost measures apply to patients' healthcare utilization in general and are not specific to treatment for a given condition.

<sup>63</sup> Outpatient visit counts presented in these figures refer to all outpatient visits, which includes services received in a hospital outpatient facility or other outpatient settings, in addition to doctor's office visits and ER visits.

<sup>64</sup> For more information about how to interpret these statistics, see Technical Appendix, Note 6.

**Figure 24: Utilization and Costs Associated with Diabetes in Nashville (All Ages)**

Diabetes (All Ages)					
11%		15		14	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$34,969	\$1,307	\$5,621	\$911	\$3,778	\$626

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Figure 25** presents the same statistics for diabetic Nashville residents aged the 25-44. This age group experienced a 9% hospitalization rate, averaged 14 outpatient visits a year, and an average of 13 prescriptions. Costs are somewhat lower than that those for the all ages group.

**Figure 25: Utilization and Costs Associated with Diabetes in Nashville (Ages 25-44)**

Diabetes (Ages 25-44)					
9%		14		13	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$33,759	\$1,222	\$4,710	\$833	\$3,036	\$487

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Figure 26** presents the data for the diabetic 45-64 age group. This group experienced an 11% hospitalization rate, averaged 16 outpatient visits a year, and 15 prescriptions. The costs in the categories below generally exceed those of the younger and all ages groups.

**Figure 26: Utilization and Costs Associated with Diabetes in Nashville (Ages 45-64)**

Diabetes (Ages 45-64)					
11%		16		15	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$35,791	\$1,312	\$5,765	\$879	\$3,910	\$652

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Hypertension: Figure 27** shows utilization and cost metrics as of 2013 for Nashville residents with hypertension. Residents with hypertension experienced a 10% hospitalization rate, averaged 14 outpatient visits a year, and managed

an average of 12 prescriptions. The graphic presents the average cost data for hospitalization, outpatient visits and prescriptions for this group.

**Figure 27: Utilization and Costs Associated with Hypertension in Nashville (All Ages)**

Hypertension (All Ages)					
10%		14		12	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$31,185	\$1,358	\$4,979	\$837	\$2,474	\$439

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Figure 28** presents utilization and cost statistics for Nashville residents aged 25-44 with hypertension. The group experienced a 9% hospitalization rate, averaged 12 outpatient visits a year, and an average of 11 prescriptions. Costs are relatively lower than the all ages population averages.

**Figure 28: Utilization and Costs Associated with Hypertension in Nashville (Ages 25-44)**

Hypertension (Ages 25-44)					
9%		12		11	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$25,547	\$1,367	\$4,022	\$777	\$1,719	\$311

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Figure 29** presents statistics for the 45-64 age group with hypertension. The 45-64 age group experienced a 10% hospitalization rate, averaged 14 outpatient visits a year, and had an average of 12 prescriptions. Costs, as presented in the categories below, generally exceeded those of the younger age group.

**Figure 29: Utilization and Costs Associated with Hypertension in Nashville (Ages 45-64)**

Hypertension (Ages 45-64)					
10%		14		12	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$31,944	\$1,335	\$5,161	\$833	\$2,674	\$474

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Figure 30** presents 2013 utilization and cost metrics for Nashville MSA residents with depression. Individuals with depression experienced a 15% hospitalization rate, averaged 19 outpatient visits a year, and managed an average of 14

prescriptions. The graphic presents the average cost data for hospitalization, outpatient visits and prescriptions for this group.

**Figure 30: Utilization and Costs Associated with Depression in Nashville (All Ages)**

Depression (All Ages)					
15%		19		14	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$23,973	\$1,348	\$5,606	\$988	\$3,399	\$475

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Figure 31** presents the same data for Nashville residents aged 25-44 with depression. The group experienced a 12% hospitalization rate, averaged 17 outpatient visits a year, and an average of 13 prescriptions. Costs are generally somewhat lower than the total population averages.

**Figure 31: Utilization and Costs Associated with Depression in Nashville (Ages 25-44)**

Depression (Ages 25-44)					
12%		17		13	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$19,220	\$1,415	\$4,690	\$965	\$2,277	\$375

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Figure 32** presents the data for the age group 45-64 with depression in 2013. This group experienced a 16% hospitalization rate, averaged 21 outpatient visits a year, and an average of 16 prescriptions. The cost, by category, is generally higher than for both the younger and all ages group.

**Figure 32: Utilization and Costs Associated with Depression in Nashville (Ages 45-64)**

Depression (Ages 45-64)					
16%		21		16	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$30,034	\$1,271	\$6,539	\$1,059	\$3,827	\$607

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Chronic Obstructive Pulmonary Disease: Figure 33** shows 2013 utilization and cost statistics for Nashville MSA residents in the sample with COPD. Patients with COPD experienced a 24% hospitalization rate, averaged 21

outpatient visits a year, and an average of 17 prescriptions. The graphic also reports average costs to insurers and individuals for hospitalization, outpatient visits and prescriptions for this sample.

**Figure 33: Utilization and Costs Associated with COPD in Nashville (All Ages)**

COPD (All Ages)					
24%		21		17	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$37,069	\$1,292	\$7,934	\$1,205	\$3,860	\$621

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Figure 34** shows the same data for Nashville residents aged 45-64 with COPD. Due to a small sample size, the analysis does not include cost and utilization statistics for COPD for the age group 25-44. The 45-64 age group experienced a 26% hospitalization rate, averaged 22 outpatient visits a year, and an average of 18 prescriptions. While most costs are somewhat higher than the all ages population averages, inpatient costs are lower than the average.<sup>65</sup>

**Figure 34: Utilization and Costs Associated with COPD in Nashville (Ages 45-64)**

COPD (Ages 45-64)					
26%		22		18	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$34,310	\$1,253	\$8,213	\$1,219	\$4,218	\$689

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Asthma:** **Figure 35** shows 2013 utilization and cost metrics for Nashville residents with Asthma. Residents with asthma experienced a 14% hospitalization rate, averaged 17 outpatient visits a year, and managed an average of 13 prescriptions. The graphic presents the average cost data for hospitalization, outpatient visits and prescriptions.

<sup>65</sup> There are several reasons this unexpected result could occur. There are many variables that can influence cost to treat patients, including where the patient seeks treatment and the severity of the condition. It may also be a result of sample composition whereby a few severe, costly cases can influence the average.

**Figure 35: Utilization and Costs Associated with Asthma in Nashville (All Ages)**

Asthma (All Ages)					
14%		17		13	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$27,207	\$1,309	\$5,100	\$886	\$2,484	\$445

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Figure 36** presents utilization and cost statistics for 2013 for Nashville residents aged 25-44 with asthma. The group experienced a 15% hospitalization rate, averaged 17 outpatient visits a year, and an average of 13 prescriptions. Costs for prescriptions are relatively lower than the all ages population averages; outpatient costs are higher, and inpatient costs are mixed.

**Figure 36: Utilization and Costs Associated with Asthma in Nashville (Ages 25-44)**

Asthma (Ages 25-44)					
15%		17		13	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$23,613	\$1,539	\$5,321	\$930	\$2,081	\$383

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

**Figure 37** presents statistics for the 45-64 age group with asthma. The 45-64 age group experienced a 19% hospitalization rate, averaged 22 outpatient visits a year, and an average of 17 prescriptions. Nearly all cost categories exceed those for the all ages and younger age group.

**Figure 37: Utilization and Costs Associated with Asthma in Nashville (Ages 45-64)**

Asthma (Ages 45-64)					
19%		22		17	
Hospitalization Rate		Outpatient Visits		Prescriptions	
Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:	Average Cost to Insurer:	Average Cost to Individual:
\$32,775	\$1,209	\$7,332	\$1,091	\$3,715	\$674

Source: Author analysis using Truven Inpatient Services, Outpatient Services, and Annual Enrollment Files, 2013 data, MarketScan Commercial Claims and Encounters Database. Copyright © 2016 Truven Health Analytics. All Rights Reserved.

### *Productivity Implications Related to Chronic Conditions*

The potential productivity cost that results from doctor office visits, which likely require time away from work, is not trivial. If each office visit is conservatively estimated as requiring two hours of time (including roundtrip transportation),<sup>66</sup> the annual time away from work among the population with the chronic conditions identified above ranges from approximately two and a half days to more than four full eight-hour work days, depending on age group and condition. The time away from work for office visits for the population with diabetes ranges between 2.7 days (for the younger cohort) to 3 days (for the older cohort). For hypertension, the range is narrower: 2.5 days (for the younger cohort) to 2.8 days (for the older cohort). For depression, the estimated time away from work for office visits ranges between 3.8 days to 4.3 days. COPD is associated with 3.8 days and asthma ranges from 3.5 days (for the younger cohort) to 4.3 days (for the older cohort).<sup>67</sup> As discussed in Section IX, time away from work has productivity implications and contributes to the indirect costs associated with illness.

## VIII. Healthcare Utilization and Cost

This section provides some summary information on healthcare utilization and costs across the Nashville region and the designated peer MSAs. The analysis includes separate samples of commercially insured individuals as well as those covered under Medicare. Comparing utilization and cost provides a reference point by which to measure the affordability of healthcare and highlights the variation that exists in the consumption of healthcare resources. Information on utilization and cost per patient by care setting (inpatient and outpatient) for the commercially insured population in this section, as well as for the Medicare population, are described in the body of the 2015 Pilot Study.<sup>68</sup>

### *A. Commercially Insured*

For easy reference, this section includes summary information from the 2015 Pilot Study on healthcare utilization and costs across the Nashville region and the designated peer MSAs for the commercially insured population. Healthcare utilization varies widely across the United States. Variation may be due to many factors, including the health of the underlying population, physician treatment patterns, or differences in coordination of care. The analysis here covered healthcare service consumption in the Nashville region using data on a sample of commercially insured individuals (enrollees). A summary of the main findings are as follows:<sup>69</sup>

- Nashville’s commercially insured sample population has relatively high utilization and ranks the third highest for use of any inpatient or outpatient service among the peer group.
- Nashville’s sample population has a relatively high rate of hospitalizations (4.1%), which exceeds that of most of its peer MSAs.

<sup>66</sup> The analysis assumes that employees visit a doctor during working hours. However, many individuals work atypical hours, and some doctors offer evening or weekend care. To the extent that employees are able to schedule a doctor’s visit outside of working hours, the time spent would account to a loss of leisure time.

<sup>67</sup> These estimates are based on detailed utilization data to calculate average number of doctor office visits for patients with specific chronic conditions.

<sup>68</sup> Center for Healthcare Economics and Policy, “Assessment of Nashville Region Health, Cost, Access, and Quality: Results of Pilot Study,” (June 2015), <http://www.fticonsulting.com/insights/reports/nashville-area-chamber-healthcare-pilot-study>.

<sup>69</sup> The analysis assumes that sample populations are representative of the underlying population. The commercial claims data represent a sample of individuals in each community. Differences in utilization may reflect the different composition of the sample as populations are heterogeneous (i.e., the sample population in one MSA may contain individuals that are sicker and, therefore, are higher consumers of healthcare services than in a more healthy comparison group).

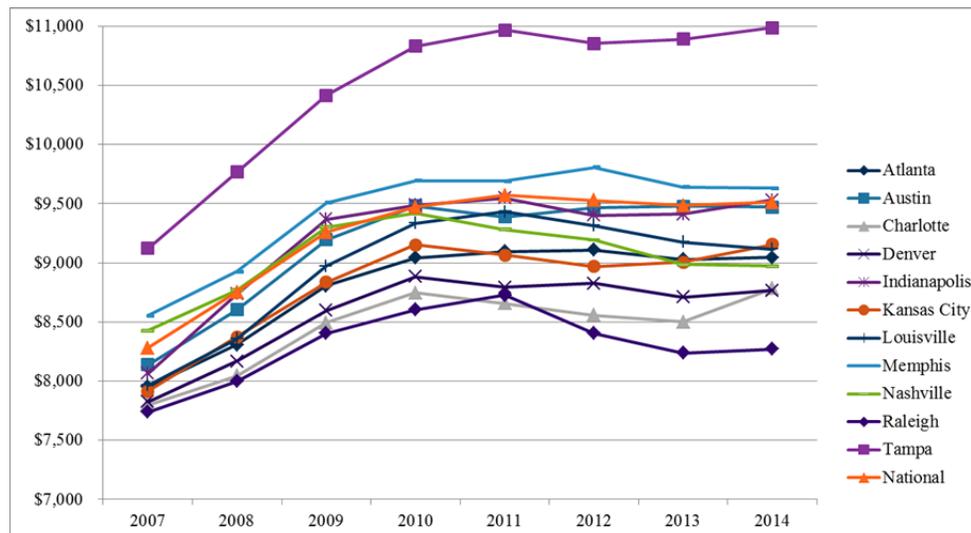
## Nashville Region Health Competitiveness Initiative: 2017 Report

- Relative to other peer MSAs, Nashville has a higher proportion of enrollees (77.6%) who visit a doctor's office in a given year.
- Patients in Nashville tend to visit a doctor more frequently than in the peer MSAs, an average of 6.7 times in 2012. Only Austin has a greater average frequency of visits (6.8 visits per patient).
- More than 12% of the commercially insured sample population in Nashville had at least one emergency department visit. Only three peer MSAs had higher rates of emergency department utilization: Kansas City (15.7%), Memphis (13.4%), and Louisville (13.0%).
- Nashville has a relatively low proportion of enrollees (1.1%) who visited the ED and did not visit a doctor's office at any point during the calendar year.

### B. Medicare

The analysis included a full update of the Medicare healthcare cost and utilization analyses; this represents an update of the analyses with the most current available data (2014). **Figure 38** shows the average Medicare cost per Medicare beneficiary from 2007 to 2014. Among the peer group, Tampa's cost per beneficiary is consistently highest. Conversely, except for 2011, Raleigh had the lowest Medicare cost per beneficiary. During these years, Nashville moved from having the third highest costs in 2007 to ninth highest in 2014 with \$8,972 spent per beneficiary. Over that time period, Nashville moved from 1.8% *above* the National average, to 6.0% *below* the national average, while the national average has risen by 14.8% from \$8,280 to \$9,510 per beneficiary.

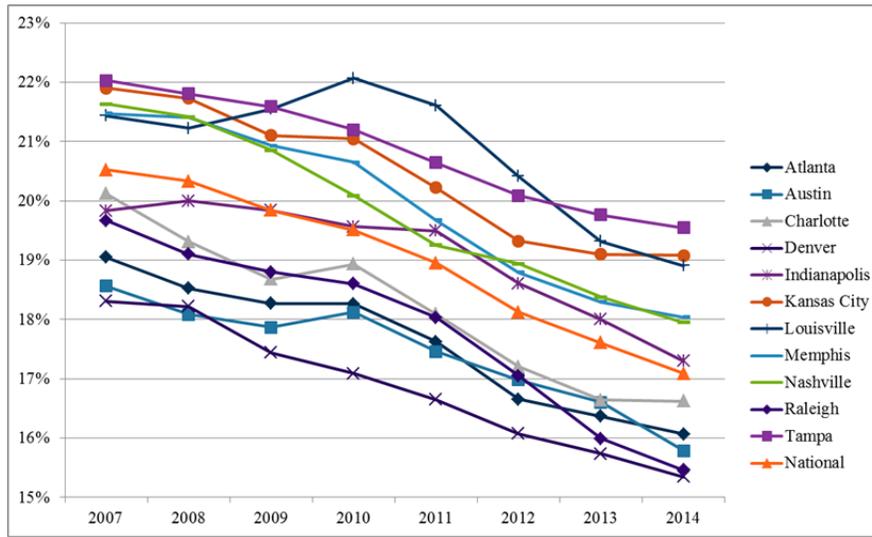
**Figure 38: Total Medicare Cost per Beneficiary in Peer Group MSAs and Nationally, 2007-2014**



Source: CMS Geographic Variation Public Use File, 2007-2014 ([https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV\\_PUF.html](https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV_PUF.html))

**Figure 39** shows that the number of beneficiaries with at least one visit has been trending down since 2009 for Nashville and all MSAs in the peer group. The national average rate declined from 21% to 17% over the time period, while Nashville's rate declined from 22% to 18%. The percentage of beneficiaries who utilized inpatient services ranked third highest in 2007 and fifth highest in 2014, and was slightly above the national average in each year.

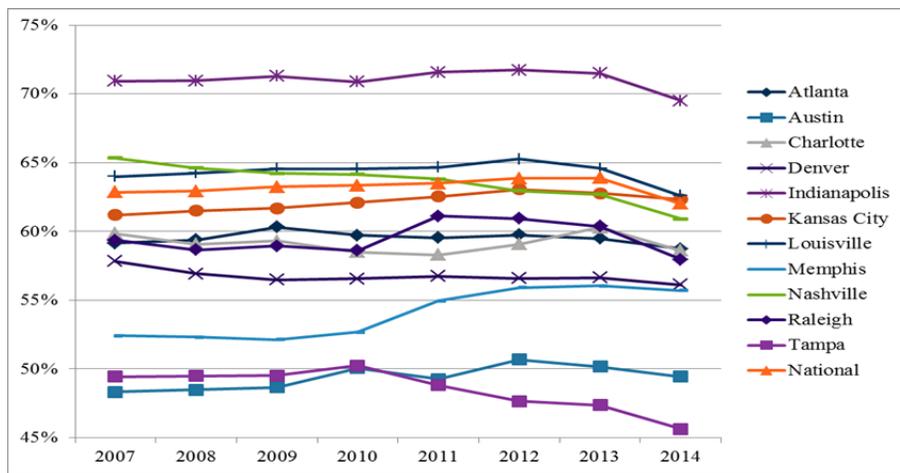
**Figure 39: Inpatient Users- Percentage of Beneficiaries with an Inpatient Stay in Peer Group MSAs and Nationally, 2007-2014**



Source: CMS Geographic Variation Public Use File, 2007-2014 ([https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV\\_PUF.html](https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV_PUF.html))

**Figure 40** shows how the peer MSAs compare with each other and Nashville on the percentage of beneficiaries with an outpatient visit. Many of the peer MSAs show moderate changes up to 2013 followed by a drop in 2014. Nashville continues to have a high rate of utilization. Indianapolis consistently has had the highest rate of the peer group while Tampa and Austin have had the lowest. In 2014, 61% of beneficiaries had at least one outpatient visit in Nashville.

**Figure 40: Outpatient Users- Percentage of Beneficiaries with an Outpatient Visit in Peer Group MSAs and Nationally, 2007-2014**



Source: CMS Geographic Variation Public Use File, 2007-2014 ([https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV\\_PUF.html](https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV_PUF.html))

## IX. Framing the Issues for Moving Forward: Medical and Productivity Costs

### A. Implications of Employee Health for Costs, Competitiveness, and Wellbeing

As of December 2016, the United States civilian labor force numbered approximately 160 million people.<sup>70</sup> This workforce produced an estimated \$19 trillion in GDP as of the fourth quarter of 2016.<sup>71</sup> Underlying these workforce numbers and output are factors driving productivity, and one notable constraint on productivity is poor employee health.

Poor employee health is costly in terms of both medical cost and quality of life, yet many of the factors that drive poor health are changeable.<sup>72</sup> Poor employee health affects firms through medical costs, absenteeism (employees too ill to work, creating lost output), and presenteeism (employees reporting to work despite illness, not able to perform at 100% output).<sup>73</sup> While medical costs associated with poor employee health are substantial, the costs associated with lost productivity due to absenteeism and presenteeism are even greater. Studies demonstrate that *modifiable* health risk factors drive significant medical spending. A 2012 study, for example, found that 22 percent of employer medical spending could be attributed to 10 health risk factors<sup>74</sup> common among the employed population.<sup>75</sup> Accordingly, employers are becoming more aware of the costs attributed to poor employee health and how it affects the bottom line. A paper by leading scholars states “Many employers have become convinced that their organizations can play an important role in reducing health risk factors among employees, which, in turn, will lead to lower healthcare costs, reduced absenteeism, and improved on-the-job productivity.”<sup>76</sup> Several studies including the World Economic Forum (“WEF”) Report: “Workplace Wellness Alliance Report – Making the Right Investment: Employee Health and the Power of Metrics”<sup>77</sup> explore aspects of wellness programs, their ability to drive change, their impact on improved productivity, and how to measure their ROI. These topics are increasingly more relevant as chronic conditions become more prevalent and healthcare costs continue to rise.

<sup>70</sup> Bureau of Labor Statistics, Current Population Survey, “Labor Force Statistics from the Current Population Survey,” [http://data.bls.gov/pdq/SurveyOutputServlet?request\\_action=wh&graph\\_name=LN\\_cpsbref1](http://data.bls.gov/pdq/SurveyOutputServlet?request_action=wh&graph_name=LN_cpsbref1) (accessed April 20, 2017).

<sup>71</sup> U.S. Department of Commerce, Bureau of Economic Analysis, “National Income and Product Accounts Gross Domestic Product: Fourth Quarter and Annual 2016 (Third Estimate) Corporate Profits: Fourth Quarter and Annual 2016,”

<https://www.bea.gov/newsreleases/national/gdp/gdpnewsrelease.htm> (accessed April 1, 2017).

<sup>72</sup> Poor employee health results in an additional \$576 billion in costs borne by employers. Sarah Kliff, “Poor Health Costs Employers \$576 billion,” *The Washington Post* (September 14, 2012),

<https://www.washingtonpost.com/news/wonk/wp/2012/09/14/poor-health-costs-employers-576-billion/> (accessed September 6, 2016).

<sup>73</sup> Presenteeism is defined as “The action of employees coming to work despite having a sickness that justifies and absence as a consequence, they are performing their work under sub-optimal conditions.” C. Biron et al., “At Work but Ill: Psychosocial Work Environment and Well-Being Determinants of Presenteeism Propensity,” *Journal of Public Mental Health* 5, no. 26 (2006).

<sup>74</sup> Depression, blood glucose, blood pressure, body weight, tobacco use, physical inactivity, stress, cholesterol, nutrition and eating habits, and alcohol consumption.

<sup>75</sup> Ron Z. Goetzel, Xiaofei Pei, Maryam J. Tabrizi, Rachel M. Henke, Niranjana Kowlessar, Craig F. Nelson, and R. Douglas Metz, “Ten Modifiable Health Risk Factors are Linked to More Than One-Fifth Of Employer-Employee Health Care Spending,” *Health Affairs* 31, no. 11 (2012): 2474-2484.

<sup>76</sup> Ron Z. Goetzel, David Shechter, Ronald J. Ozminkowski, Paula F. Marmet, Maryam J. Tabrizi, and Enid Chung Roemer, “Promising Practices in Employer Health and Productivity Management Efforts: Findings From a Benchmarking Study,” *Journal of Occupational and Environmental Medicine* 49, no. 2 (2007): 111-130.

<sup>77</sup> World Economic Forum, “Workplace Wellness Alliance Report – Making the Right Investment: Employee Health and the Power of Metrics” (2013), <https://www.weforum.org/reports/workplace-wellness-alliance-making-right-investment-employee-health-and-power-metrics>.

The effects of poor health are widespread, affecting not only individuals, but communities and businesses as well. Poor health affects individual wellbeing and quality of life. Businesses are keenly aware of the impact of poor health and concerned about the relationship between employee health, costs, and productivity.<sup>78</sup> Many large employers focus on medical costs associated with poor employee health. However, medical costs alone do not capture the full effect of poor health; the productivity costs in the US related to poor health may account for \$260 billion a year in lost economic output.<sup>79</sup>

Because poor health jointly affects businesses, communities, and individuals, business-led efforts to drive positive change may be effective and sustainable. Shared value creation, an idea developed by Porter and Kramer, demonstrates how employers gain by addressing societal issues.<sup>80</sup> Societal cost can represent true economic costs to a firm; therefore addressing specific societal issues can improve the firm's bottom line. In this framework, health is an important driver of business success and a vital community asset. Health-related spending is not a "cost" but an investment in productivity<sup>81</sup> and investments made by firms to improve the health of their workforce can positively affect health in the community. This health improvement could improve worker performance, decrease absences, and increase productivity.

Efforts do not necessarily need to be large and expensive to be effective; even a small investment in wellness programs can have a positive impact. A recent study found that a workplace sponsored physical activity challenge<sup>82</sup> could have a positive impact on employee health, fitness, and lifestyle.<sup>83</sup> The results showed that low-cost and easy-to-implement wellness initiatives could improve worker well-being.

However, several challenges remain in effectively utilizing business investment to improve health. Such investments are best targeted at the intersection of community health and wellbeing and firm performance.<sup>84</sup> Creating an appropriate framework is difficult and firms grapple with the challenges of identifying appropriate health metrics and measuring return on investment, important items for making the case for business investment in health.<sup>85</sup> Productivity costs are difficult to measure at the firm level. However, quantifying productivity costs may provide greater insight into how to motivate and drive change.

<sup>78</sup> Leslie Pray, "The Role of Business in Multisector Obesity Solutions: Working Together for Positive Change: Workshop in Brief," *National Academies of Sciences, Engineering, and Medicine* (June 2016): 5.

<sup>79</sup> Karen Davis, Sara R. Collins, Michelle M. Doty, Alice Ho, and Alyssa L. Holmgren, "Health and Productivity Among US Workers," *Issue Brief (Commonwealth Fund)* 856, (2005): 1-10.

<sup>80</sup> Michael E. Porter and Mark R Kramer, "Creating Shared Value," *Harvard Business Review* 89, no. 1/2 (2011): 62-77. Societal issues are wide-ranging and diverse and include issues that impact individuals including general prosperity, environmental degradation or health and wellness. For an application of shared value to industries including healthcare, see: Kottke, T.E., N.Pronk, A.R. Zindel, and G.J. Isham. 2017. *Philanthropy and beyond: Creating shared value to promote well-being for individuals in their communities*. Discussion Paper, National Academy of Medicine, Washington, DC. <https://nam.edu/wp-content/uploads/2017/04/Philanthropy-and-Beyond-Creating-Shared-Value-to-Promote-Well-Being-for-Individuals-in-Their-Communities.pdf>.

<sup>81</sup> National Academies of Sciences, Engineering, and Medicine, "Exploring Shared Value in Global Health and Safety: Workshop Summary," Washington, DC: The National Academies Press (2016), doi: <https://doi.org/10.17226/23501>.

<sup>82</sup> The physical activity challenge consisted of employees tracking their activity level over an 8-week period and completing a survey about the effects of the initiative.

<sup>83</sup> Jeff Berko, Ron Z. Goetzl, Enid Chung Roemer, Karen Kent, and Janet Marchibroda, "Results From the Bipartisan Policy Center's CEO Council Physical Activity Challenge to American Business," *Journal of Occupational and Environmental Medicine* 58, no. 12 (2016): 1239.

<sup>84</sup> Nicolaas P. Pronk, Catherine Baase, Jerry Noyce, and Denise Stevens, "Corporate America and Community Health: Exploring the Business Case for Investment," *Journal of Occupational and Environmental Medicine* 57, no. 5 (2015): 493-500.

<sup>85</sup> *Ibid.*

In light of the special role employers have in driving positive change and in recognition of the idea of shared value creation, this report includes a medical cost and productivity overview and analysis section. The analysis includes a review of studies, analyses, and reports to focus on the costs (both direct and indirect) associated with the three conditions that are prevalent in the Nashville region: diabetes, hypertension, and obesity. The medical costs associated with these conditions are substantial at the national level:

- Approximately 20% of U.S. healthcare expenditures go toward treating individuals with diabetes.<sup>86</sup>
- Estimated direct healthcare costs associated with hypertension are \$42.8 billion.<sup>87</sup>
- Obesity raises individual medical costs by an average of over \$2,700 per year.<sup>88</sup>

Indirect costs associated with productivity are more difficult to measure, but are profound at the national level. Presenteeism among individuals with diabetes ranges from an excess or increased incremental cost (as compared to individuals without diabetes) of 1.8% to 38% of annual productivity.<sup>89</sup> Obesity may account for an additional one day of work missed per year.<sup>90</sup> Individuals with uncontrolled hypertension lose between two to three days' worth of productivity during the year due to absenteeism and presenteeism associated with the condition.<sup>91</sup> Recent research exploring several risk factors (obesity, physical inactivity, and smoking) and chronic diseases (hypertension and diabetes) finds that absenteeism increases with the number of conditions reported.<sup>92</sup> As many of these risk factors are correlated, these further compound the productivity implications related to poor health. This productivity loss implicates significant financial costs. In 2015 dollars, absenteeism associated with diabetes was estimated to cost in excess of \$2 billion, hypertension over \$10 billion, and obesity over \$11 billion.<sup>93</sup>

These costs are even more significant when considering the relationship between poor health and turnover.<sup>94</sup> Replacing workers is costly in that it requires firm resources to hire and train new employees. New employees also may face a period of lower productivity when starting a new job. Together, estimated cost of turnover is about 15 to 20 percent of an employee's wage.<sup>95</sup> A report released by the National Institute of Aging using data collected by the

<sup>86</sup> Xiaohui Zhuo, Ping Zhang, Lawrence Barker, Ann Albright, Theodore J. Thompson and Edward Gregg, "The Lifetime Cost of Diabetes and its Implications for Diabetes Prevention," *Diabetes Care* (September 2014), <http://dx.doi.org/10.2337/dc13-2484> (accessed August 23, 2016).

<sup>87</sup> Dariush Mozaffarian, "Heart Disease and Stroke Statistics-2015 Update: A Report From the American Heart Association," *Circulation* 131, no. 24 (2015): E29, as cited in The Centers for Disease Control and Prevention, "Evidence Summary: Control High Blood Pressure," *The 6/18 Initiative*, <http://www.cdc.gov/sixteenteen/bloodpressure/index.htm> (accessed August 23, 2016).

<sup>88</sup> John Cawley and Chad Meyerhoefer, "The Medical Care Costs of Obesity: An Instrumental Variables Approach," *Journal of Health Economics* 31, no. 1 (January 2012): 219–230.

<sup>89</sup> American Diabetes Association, "Economic Costs of Diabetes in the US in 2012." *Diabetes Care* (March 2013), <http://dx.doi.org/10.2337/dc12-2625> (accessed August 23, 2016).

<sup>90</sup> Garrett R. Beeler Asay, Kakoli Roy, Jason E. Lang, Rebecca L. Payne, and David H. Howard, "Absenteeism and Employer Costs Associated With Chronic Diseases and Health Risk Factors in the US Workforce," *Preventing Chronic Disease* (2016);13:150503. DOI: <http://dx.doi.org/10.5888/pcd13.150503> (accessed January 25, 2017).

<sup>91</sup> Victoria Unmuessig, Paul A. Fishman, Hubertus JM Vrijhoef, Arianne MJ Elissen, and David C. Grossman, "Association of Controlled and Uncontrolled Hypertension With Workplace Productivity," *The Journal of Clinical Hypertension* (2015): 220

<sup>92</sup> Garrett R. Beeler Asay, Kakoli Roy, Jason E. Lang, Rebecca L. Payne, and David H. Howard, "Absenteeism and Employer Costs Associated With Chronic Diseases and Health Risk Factors in the US Workforce," *Preventing Chronic Disease* (2016);13:150503. DOI: <http://dx.doi.org/10.5888/pcd13.150503> (accessed January 25, 2017).

<sup>93</sup> Ibid.

<sup>94</sup> Not all individuals with chronic conditions report that they are in poor health, a factor that may affect estimates of productivity costs associated with chronic conditions. For more information, see Technical Appendix, Note 7.

<sup>95</sup> Health Boushey and Sarah Jane Glynn, "There are Significant Business Costs to Replacing Employees," *Center for American Progress* (2012), <https://www.americanprogress.org/issues/labor/report/2012/11/16/44464/there-are-significant-business-costs-to-replacing-employees/> (accessed September 5, 2016).

HRS found that employees in poor health are more likely to retire early than their healthy counterparts. Among retirees in the 55-59 age group, poor health was cited as an important factor in their retirement decision.<sup>96</sup> When employees in this age category separate from firms, in many cases they take with them tremendous human capital accumulated over the years. In addition, chronic conditions and health conditions can have other employment costs. Otherwise, healthy employees may leave the workforce to care for family members with chronic conditions. The cost to replace employees who leave the workplace as a result of caregiving is estimated to cost U.S. businesses in excess of \$2.8 billion annually.<sup>97</sup>

While disability due to chronic conditions may lead individuals to drop out of the labor force in some cases, many employees with chronic conditions do have lengthy careers. Researchers using data collected from the Health and Retirement Study found that individuals with chronic illness (e.g., asthma, heart disease, diabetes)<sup>98</sup> tend to accumulate fewer assets over their lifetime and as a result, retire *later* than their counterparts.<sup>99</sup> This increases both the need and likely return from wellness initiatives that may decrease prevalence of and/or severity of chronic conditions among employees. Failure to act could mean lengthy tenure with a less productive employee during which direct and indirect costs accumulate. Action to increase health and wellbeing may offset both indirect and direct costs associated with chronic conditions, rendering the employee happier, healthier, and more productive during his career.

Tobacco use, obesity, and physical inactivity are three risk factors that influence incidence of chronic conditions, such as hypertension and type-2 diabetes. While these factors have a profound impact on individual health, the CDC designated them as “winnable battles” – public health challenges for which strategies to address them exist.<sup>100</sup>

## B. Diabetes: Related Costs and Interventions

### 1. Overview

Diabetes, a chronic condition that is largely preventable, reduces quality of life for individuals with the condition and places a tremendous burden on the healthcare system. While costs, as measured by medical expenditures, are generally a focal point when discussing the increase in diabetes prevalence, the productivity implications related to diabetes are substantial. The significant costs associated with absenteeism and presenteeism related to diabetes may encourage employers to adopt or promote interventions that will reduce the incidence of diabetes among their employee population and perhaps among individuals in the community.

### 2. Medical Costs of Diabetes

Generally, surveys or claims data are used to measure medical costs. Claims data comes from a variety of sources and includes commercial claims data as well as Medicare claims data. Often, analysis of cost based on survey data relies

<sup>96</sup> U.S. Department of Health and Human Services, National Institute of Aging, “Growing Older in America: The Health and Retirement Study,” (2015) <https://www.nia.nih.gov/health/publication/growing-older-america-health-and-retirement-study/chapter-2-work-and-retirement> (accessed September 5, 2016).

<sup>97</sup> MetLife Mature Market Institute, “The MetLife Caregiving Cost Study: Productivity Losses to U.S. Businesses,” (2006), <http://www.caregiving.org/data/Caregiver%20Cost%20Study.pdf> (accessed September 5, 2016).

<sup>98</sup> The authors note that the vast majority of those identified as being chronically ill as flagged by presence of a condition do not report that they are in poor health or that they experience functional limitations in activities of daily living, a common measure used to assess disability.

<sup>99</sup> M. Solaiman Miah and Virginia Wilcox-Gök, “Do the Sick Retire Early? Chronic Illness, Asset Accumulation and Early Retirement,” *Applied Economics* 39, no. 15 (2007).

<sup>100</sup> <https://www.cdc.gov/winnablebattles/> (accessed January 25, 2017).

on the Medical Expenditure Panel Survey (MEPS), a comprehensive survey source that collects information for both households and insurance companies.<sup>101</sup> Recent analysis of the costs associated with diabetes based on these data sources find that it is substantial:

- Approximately 20% of U.S. healthcare expenditures go toward treating individuals with diabetes.<sup>102</sup>
- On average, people with diabetes have medical costs that are 230% greater than individuals without.<sup>103</sup>
- Among individuals covered by employer-sponsored insurance and younger than 65, medical costs in 2013 were 3.5 times higher for someone with diabetes than someone without.<sup>104</sup>
- Discounted average excess lifetime medical costs related to diabetes depend upon the age of diagnosis. Discounted excess lifetime expenditures, by age of diagnosis, are as follows:<sup>105</sup>
  - Age 40: \$124,600
  - Age 50: \$91,200
  - Age 60: \$53,800
  - Age 65: \$35,900

### 3. Productivity and Indirect Costs of Diabetes

The American Diabetes Association released a 2012 study estimating the economic burden of diabetes.<sup>106</sup> The analysis included productivity costs that include absenteeism, presenteeism, and the inability to work. To assess these productivity costs related to diabetes, the authors used a survey instrument that collects demographic and health condition information as well as information on days missed from work and employment status. To measure presenteeism, the authors used a survey instrument based on self-reported incidence of disease affecting work performance.

Absenteeism related to diabetes ranges from less than 2 to 7 percent of total working days. Controlling for age, race, gender, weight, and hypertension status, analysis using NHIS data find that workers with diabetes miss 3 additional days compared to workers without diabetes.<sup>107</sup> A recent study with more moderate results found that diabetes is associated with 1 to 2 days of absenteeism.<sup>108</sup>

<sup>101</sup> The survey includes information regarding demographic characteristics of the individual, health condition, healthcare utilization, and costs.

<sup>102</sup> Xiaohui Zhuo, et al., “The Lifetime Cost of Diabetes and its Implications for Diabetes Prevention,” *Diabetes Care* (September 2014), <http://dx.doi.org/10.2337/dc13-2484> (accessed August 23, 2016).

<sup>103</sup> American Diabetes Association, “Economic Costs of Diabetes in the US in 2012,” *Diabetes Care* (March 2013), <http://dx.doi.org/10.2337/dc12-2625> (accessed August 23, 2016).

<sup>104</sup> Health Care Cost Institute, “Per Capita Health Care Spending on Diabetes: 2009-2013,” Issue Brief #10, May 2015, <http://www.healthcostinstitute.org/files/HCCI%20Diabetes%20Issue%20Brief%205-7-15.pdf> (accessed August 23, 2016).

<sup>105</sup> Xiaohui Zhuo et al., “The Lifetime Cost of Diabetes and its Implications for Diabetes Prevention,” *Diabetes Care* (September 2014), <http://dx.doi.org/10.2337/dc13-2484> (accessed August 23, 2016).

<sup>106</sup> American Diabetes Association, “Economic Costs of Diabetes in the US in 2012,” *Diabetes Care* (March 2013), <http://dx.doi.org/10.2337/dc12-2625> (accessed August 23, 2016).

<sup>107</sup> Ibid.

<sup>108</sup> Garrett R. Beeler Asay, et al., “Absenteeism and Employer Costs Associated With Chronic Diseases and Health Risk Factors in the US Workforce,” *Preventing Chronic Disease* (2016);13:150503. DOI: <http://dx.doi.org/10.5888/pcd13.150503> (accessed January 25, 2017).

Presenteeism among individuals with diabetes ranges from an excess (as compared to individuals without diabetes) of 1.8 to 38% of annual productivity.<sup>109</sup> Controlling for factors that may influence presenteeism (age, weight, etc.) produces a results in a productivity loss of 6.6% (14 days per worker per year) related to diabetes.<sup>110</sup>

Inability to work, as measured by unemployment related to long term disability, for individuals with diabetes may result from amputations or other comorbidities. Having diabetes increases the probability of being out of the workforce by 2.4 percentage points for individuals age 18-65. Controlling for individual characteristics, analysis finds that individuals with diabetes are 10 percentage points less likely to be in the labor force than their peers without diabetes.<sup>111</sup>

In 2012, the indirect costs attributed related absenteeism, presenteeism, and inability to work were estimated to be:<sup>112</sup>

- Absenteeism: \$5.0 Billion
- Presenteeism: \$20.8 Billion
- Inability to work (related to diabetes): \$21.6 Billion

#### 4. *Diabetes-Related Interventions*

The CDC collaborated with healthcare providers, payers, and purchasers in targeting six common costly behavioral/health conditions: Tobacco Use, High Blood Pressure, Healthcare-Associated Infections, Asthma, Unintended Pregnancy, and Diabetes. To target these conditions, the CDC recommends 18 proven initiatives that can drive change.<sup>113</sup>

The two initiatives for Diabetes include (1) promoting screening<sup>114</sup> for high glucose levels as part of a risk assessment and (2) promoting access to the National Diabetes Prevention Program.<sup>115</sup> The Diabetes Prevention Program (DPP) is an evidenced-based lifestyle-coaching program geared toward reducing prediabetes among prediabetics. The program runs for one year and includes sixteen core classes and six post-core classes. Main tenets of the program include physical activity, weight loss, stress reduction, and lifestyle change. Through physical activity and diet modification, participants can lose 5-7% of body weight and reduce prediabetes risk by 58%.<sup>116</sup>

Two well-studied tools demonstrated to reduce the onset of type-2 diabetes are the use of Metformin (an oral medication that lowers blood sugar) and lifestyle interventions (such as the DPP). An economic analysis conducted by Michigan Center for Diabetes Translational Research, studied 3,234 pre-diabetic individuals assigned to one of three

<sup>109</sup> American Diabetes Association, “Economic Costs of Diabetes in the US in 2012,” *Diabetes Care* (March 2013), <http://dx.doi.org/10.2337/dc12-2625> (accessed August 23, 2016).

<sup>110</sup> American Diabetes Association. 2008 “Economic Costs of Diabetes in the US in 2007.” *Diabetes Care*. March 2008, <http://dx.doi.org/10.2337/dc08-9017> (accessed August 23, 2016).

<sup>111</sup> American Diabetes Association, “Economic Costs of Diabetes in the US in 2012,” *Diabetes Care* (March 2013), <http://dx.doi.org/10.2337/dc12-2625> (accessed August 23, 2016).

<sup>112</sup> Ibid.

<sup>113</sup> <http://www.cdc.gov/sixeighteen/docs/6-18-factsheet.pdf> (accessed September 8, 2016).

<sup>114</sup> A screening test may involve a laboratory test to determine glucose levels or a questionnaire developed to assess risk factors such as family history, age, and height and weight combinations. See <http://www.cdc.gov/diabetes/prevention/pdf/prediabetestest.pdf> (accessed September 8, 2016).

<sup>115</sup> For more information about the Diabetes Prevention Program, see Technical Appendix, Note 8.

<sup>116</sup> The DPP is based on curriculum developed by the CDC. For more information, including supporting statistics, see <https://www.cdc.gov/diabetes/prevention/prediabetes-type2/index.html> (accessed September 8, 2016).

groups: DPP, Metformin, or Placebo.<sup>117</sup> The costs of the interventions (for the DPP and Metformin groups) were assessed and compared against the medical care costs for the individuals in each of the three groups. The results demonstrate that lifestyle interventions, such as the DPP, are cost effective. Over a 10-year period, they found that relative to the placebo group, the DPP group's medical costs were \$2,000 less.<sup>118</sup> The researchers also found that quality of life (assessed by a series of metrics<sup>119</sup>) was higher for the DPP group as well.

### C. Obesity: Related Costs and Interventions

#### 1. Overview

For decades, the obesity rate in the United States has been increasing. This is worrisome because obesity increases the risk of developing many serious health conditions including type 2 diabetes, cancer, stroke, osteoarthritis, depression, hypertension, and myocardial infarction.<sup>120</sup> Because obesity is related to such a wide variety of health conditions, the economic costs of obesity (both direct and indirect) are substantial. Obesity results in both direct and indirect cost to both the employer and the employee. A 2009 study noted that obesity-related medical expenditures are borne initially by the employer and passed through in part to the employee through increased premiums, copayments, and deductibles.<sup>121</sup> Highlighting these costs as well as the productivity implications may serve as a call to action and lead to adoption of interventions developed to reduce body weight and thereby decrease the prevalence of obesity.

#### 2. Medical Costs of Obesity

Using data from the Medical Expenditure Panel Survey (MEPS),<sup>122</sup> a comprehensive health related survey, researchers produced estimates of the medical costs attributed to obesity.<sup>123</sup> Analysis of the medical costs attributable to obesity finds that those are substantial:<sup>124</sup>

- Approximately 16.5% of U.S. healthcare expenditures go toward treating individuals with obesity.
- On average, obesity raises medical costs by \$2,741 per year.
- Results for women exceed that for men: \$3,696 vs. \$1,171.
- Excess expenditures are primarily driven by individuals with very high BMI.

<sup>117</sup> The Diabetes Prevention Program Research Group, "The 10-Year Cost-Effectiveness of Lifestyle Intervention or Metformin for Diabetes Prevention," *Diabetes Care* 35, no. 4 (April 2012): 723-730. <http://dx.doi.org/10.2337/dc11-1468>.

<sup>118</sup> Metformin use also reduced medical costs, but by a smaller margin and the average "savings" in medical expenses were less than the medication costs.

<sup>119</sup> Quality of life was assessed using the Self-Administered Quality of Well-Being Index. This is a widely-used assessment tool. Metrics include mobility, level of pain, emotional outlook, as well as others. For more information about this assessment tool, see <https://hoap.ucsd.edu/qwb-info/QWB-Manual.pdf> (accessed September 8, 2016).

<sup>120</sup> John B. Dixon, "The Effect of Obesity on Health Outcomes," *Molecular and Cellular Endocrinology* 316 (2010): 104–108.

<sup>121</sup> Eric A. Finkelstein, Justin G. Trogon, Joel W. Cohen and William Dietz, "Annual Medical Spending Attributable to Obesity: Payer- and Service-Specific Estimates," *Health Affairs (Millwood)* 28 (2009): w822-w831.

<sup>122</sup> MEPS includes information from both households and insurance companies. The survey includes information regarding demographic characteristics of the individual, health condition, healthcare utilization, and costs.

<sup>123</sup> For a discussion of the complications related to estimating the costs associated with obesity and the approach the author's employ to address these challenges, see Technical Appendix, Note 9.

<sup>124</sup> John Cawley and Chad Meyerhoefer, "The Medical Care Costs of Obesity: An Instrumental Variables Approach," *Journal of Health Economics* 31, no. 1 (January 2012): 219–230.

### 3. Productivity and Indirect Costs of Obesity

In addition to direct medical costs, there are significant productivity-related implications. Research studying obesity related absenteeism finds the estimates of the effect are wide ranging, spanning from approximately 1 day per year,<sup>125</sup> to in excess of an additional week of missed work per year.<sup>126</sup> Absenteeism related productivity costs are estimated to exceed \$12 billion annually.<sup>127</sup> Cost related to presenteeism may be even more profound. A 2010 study reported that the most costly component of poor health was presenteeism.<sup>128</sup> Obesity-related presenteeism may be associated with between 2 and 22 days of lost productivity per year and is estimated to cost \$30 billion annually. Together, increased obesity-related absenteeism and presenteeism has been estimated to cost US employers an additional \$42.8 billion annually.<sup>129,130</sup>

### 4. Obesity-Related Interventions

Interventions designed to combat obesity typically fall into three main categories: school, workplace, or community. This section focuses first on workplace related interventions as presented in a report published by the CDC.<sup>131</sup> Workplace interventions to combat obesity include nutrition education, exercise programs, training in behavioral techniques, and specific dietary prescription to aid weight loss. Based on a review of 35 studies of interventions in the workplace setting, a CDC taskforce recommends combined nutrition and physical activity programs. A 2010 study provided a comprehensive evaluation of workplace wellness efforts to determine if they are effective and to assess return on investment.<sup>132</sup> The report finds that a variety of interventions including the provision of self-help educational materials, sponsored exercise programs and activities, and individual counseling were effective. The estimated average return on investment for such programs was over \$3 for each \$1 spent.

There are several other examples of interventions for obesity at a community level. Some have emphasized that the keys to success are to link together the health of employees and firms and communities, and to find solutions that enhance health outside of the healthcare delivery system.<sup>133</sup>

<sup>125</sup> Garrett R. Beeler Asay, et al., “Absenteeism and Employer Costs Associated With Chronic Diseases and Health Risk Factors in the US Workforce,” *Preventing Chronic Disease* 2016;13:150503. DOI: <http://dx.doi.org/10.5888/pcd13.150503> (accessed January 25, 2017).

<sup>126</sup> Eric A. Finkelstein, Marco daCosta DiBonaventura, Somali M. Burgess, and Brent C. Hale, “The Costs of Obesity in the Workplace,” *Journal of Occupational and Environmental Medicine* 52, no. 10 (Oct 2010): 971-976.

<sup>127</sup> Eric Finkelstein, et al., “The Costs of Obesity in the Workplace,” *Journal of Occupational and Environmental Medicine* 52, no. 10 (Oct 2010): 971-976. However, estimates vary. Asay (2016) estimates that obesity-related absenteeism costs US employers \$11.2 billion annually.

<sup>128</sup> This is true for both obese and non-obese employees. Eric Finkelstein, et al., “The Costs of Obesity in the Workplace,” *Journal of Occupational and Environmental Medicine* 52, no. 10 (Oct 2010): 971-976.

<sup>129</sup> Eric Finkelstein, et al., “The Costs of Obesity in the Workplace,” *Journal of Occupational and Environmental Medicine* 52, no. 10 (Oct 2010): 971-976.

<sup>130</sup> Costs estimates vary. Judith A. Ricci and Elsbeth Chee, “Lost Productive Time Associated with Excess Weight in the U.S. Workforce,” *Journal of Occupational and Environmental Medicine* 47 (2005):1227–1234 estimate productivity loss comparing obese workers to normal weight workers and find that costs estimated to be \$11.7 billion.

<sup>131</sup> David Katz, et al., “A Report of Recommendations of the Task Force on Community Preventive Services,” (2015), <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5410a1.htm> (accessed August 28, 2016).

<sup>132</sup> Katherine Baicker, David Cutler, and Zirui Song, “Workplace Wellness Programs Can Generate Savings,” *Health Affairs* 29, no. 2 (2010).

<sup>133</sup> Nicolaas P. Pronk and K.M. Venkat Narayan, “The application of systems science to addressing obesity at the workplace,” *Journal of Occupational and Environmental Medicine* 58, no. 2 (2016):123–125. For a summary of some interventions see Leslie

## D. Hypertension: Related Costs and Interventions

### 1. Overview

Hypertension, a disease that is particularly dangerous because there are often no symptoms, can cause heart attack, stroke, kidney failure, and problems with cognitive function, among other serious health conditions.<sup>134</sup> This is concerning because hypertension is widespread, affecting approximately 1 in 3 Americans.<sup>135</sup> Luckily, many relatively easy things can help to both treat and prevent hypertension.

### 2. Costs for Hypertension

According to CDC, high blood pressure was associated with an average direct cost of \$42.8 billion (2011).<sup>136</sup> Hypertension is considered the 8<sup>th</sup> leading cause for direct health expenditure in the United States following heart conditions, cancer, trauma-related disorders, mental disorders, COPD & asthma, osteoarthritis, and diabetes mellitus.<sup>137</sup> Approximately 70 million adults in the United States have high blood pressure and high cholesterol; only half of the adults with high blood pressure and 1 in 3 adults have high cholesterol under control.<sup>138</sup> Nationwide costs for hypertension as a risk factor due to healthcare services, medications, and missed days of work are estimated to reach \$222.5 billion by 2020 (2008).<sup>139</sup>

### 3. Productivity and Indirect Costs of Hypertension

A 2015 study analyzed lost productive time due to absenteeism and presenteeism among patients who had controlled and uncontrolled hypertension compared to patients who had blood pressure within the normal range. The analysis relied upon patient response to a questionnaire which included all items of a Work Health Questionnaire, a survey measuring items such as rating of employee status, usual work time, missed full or partial work days due to illness, and health-related loss productive time on workdays over a 2-week recall period.<sup>140</sup> The aggregated total of hours lost

Pray, "The Role of Business in Multisector Obesity Solutions: Working Together for Positive Change: Workshop in Brief," *National Academies of Sciences, Engineering, and Medicine* (June 2016).

<sup>134</sup> Mayo Clinic, see <http://www.mayoclinic.org/diseases-conditions/high-blood-pressure/basics/complications/con-20019580> (accessed September 24, 2016).

<sup>135</sup> American Heart Association, see [https://www.heart.org/idc/groups/heart-public/@wcm/@sop/@smd/documents/downloadable/ucm\\_319587.pdf](https://www.heart.org/idc/groups/heart-public/@wcm/@sop/@smd/documents/downloadable/ucm_319587.pdf) (accessed September 24, 2016).

<sup>136</sup> Dariush Mozaffarian, "Heart Disease and Stroke Statistics-2015 Update: A Report From the American Heart Association (vol. 131, pg. e29, 2015)." *Circulation* 131, no. 4 (2015): E535-E535, as cited in The Centers for Disease Control and Prevention, "Evidence Summary: Control High Blood Pressure," *The 6/18 Initiative*, <http://www.cdc.gov/sixteenteen/bloodpressure/index.htm> (accessed August 23, 2016).

<sup>137</sup> Dariush Mozaffarian, Emelia J. Benjamin, Alan S. Go, et al., "Heart Disease and Stroke Statistics-2016 Update: A Report From the American Heart Association," *Circulation* 133, no. 4 (2016): 447.

<sup>138</sup> The Centers for Disease Control and Prevention, "Evidence Summary: Control High Blood Pressure," *The 6/18 Initiative*, <http://www.cdc.gov/sixteenteen/bloodpressure/index.htm> (accessed August 23, 2016).

<sup>139</sup> The costs associated with "hypertension as a risk factor" is defined as portions of the costs of complications for heart problems associated with hypertension, including chronic heart failure, chronic heart disease, stroke and other cardiovascular diseases. Paul A. Heidenreich, et al., "Forecasting the Future of Cardiovascular Disease in the United States: A Policy Statement From the American Heart Association," *Circulation* 123, no. 8 (2011): 933-44. <http://doi:10.1161/cir.0b013e31820a55f5>.

<sup>140</sup> The Work Health Questionnaire is a self-administered version of the Work and Health Interview. See Walter F. Stewart, Judith A. Ricci, Carol Leotta, and Elsbeth Chee, "Validation of the Work and Health Interview," *Pharmacoeconomics* 22 (2004): 1127-1140, as cited in Victoria Unmuessig, Paul A. Fishman, Hubertus Vrijhoef, Arianne Elissen, and David C. Grossman,

due to lack of productivity (presenteeism) and hours missed of work (absenteeism) result in the total lost productive time per employee due to illness.<sup>141</sup> Uncontrolled hypertensive patients had a higher likelihood of reporting any lost productive time as well as a greater number of hours lost due to absenteeism relative to patients with controlled hypertension.

- Among hypertensive patients (controlled and uncontrolled), an average of 1.33 hours of time was lost due to presenteeism, while an average of 1.04 hours of time was lost due to absenteeism over the 2-week period. Over a one-year period, an average of 34.58 hours (1.44 days) would be lost due to presenteeism, and an average of 27.04 hours (1.13 days) would be lost due to absenteeism.<sup>142</sup>
- Uncontrolled patients report slightly higher levels of presenteeism compared to controlled hypertensive patients.<sup>143</sup> Due to absenteeism, controlled hypertensive patients lose an average of 0.72 hours while uncontrolled patients lose an average of 1.35 hours over the 2-week period. When projected over a one-year period, controlled hypertensive patients lose an average 18.72 hours due to absenteeism, while uncontrolled patients lose an average of 35.1 hours.

A 2004 study compiled data using various methodologies to measure productivity losses in the workplace for several costly chronic diseases. Based on average impairment and prevalence estimates, the results of the study showed that hypertension had the highest overall economic burden of illness to employers (\$392 per employee per year).<sup>144</sup> To calculate costs for absenteeism and presenteeism, the authors calculated the hours lost by \$23.15, which represents the average 2001 hourly wage and benefits in the U.S.

- Absenteeism: \$170 per employee per year.<sup>145</sup>
- Presenteeism: \$246 per employee per year.<sup>146</sup>

#### 4. Hypertension-Related Interventions

##### • CDC 6/18 Initiative: Controlling High Blood Pressure

The CDC has proposed two payer interventions through its 6/18 initiative to decrease the high cost burden associated with hypertension. The 6/18 initiative partners with healthcare providers, payers, and patients to control healthcare

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"Association of Controlled and Uncontrolled Hypertension With Workplace Productivity," *The Journal of Clinical Hypertension* (2015): 218.

<sup>141</sup> Victoria Unmuessig, et al., "Association of Controlled and Uncontrolled Hypertension With Workplace Productivity," *The Journal of Clinical Hypertension* (2015): 218.

<sup>142</sup> Ibid.

<sup>143</sup> Controlled patients lose an average of 1.27 hours compared to 1.39 hours due to presenteeism compared to uncontrolled patients. Victoria Unmuessig, Paul A. Fishman, Hubertus Vrijhoef, Arianne Elissen, and David C. Grossman, "Association of Controlled and Uncontrolled Hypertension With Workplace Productivity," *The Journal of Clinical Hypertension* (2015): 220.

<sup>144</sup> Ron Z. Goetzel, Stacey R. Long, Ronald J. Ozminkowski, Kevin Hawkins, Shaohung Wang, and Wendy Lynch, "Health, Absence, Disability, and Presenteeism Cost Estimates of Certain Physical and Mental Health Conditions Affecting US Employers," *Journal of Occupational and Environmental Medicine* 46, no. 4 (2004): 398.

<sup>145</sup> The value is the average annual dollar impact per employee per year due to absence. Ron Z. Goetzel, et al., "Health, Absence, Disability, and Presenteeism Cost Estimates of Certain Physical and Mental Health Conditions Affecting US Employers," *Journal of Occupational and Environmental Medicine* 46, no. 4 (2004): 405.

<sup>146</sup> This value is the "estimated annual per-employee cost of presenteeism in overall population, by condition (using average impairment rates and a \$23.15/hr. wage estimate)." The overall population also includes individuals without the chronic condition. Ron Z Goetzel et al., "Health, Absence, Disability, and Presenteeism Cost Estimates of Certain Physical and Mental Health Conditions Affecting US Employers," *Journal of Occupational and Environmental Medicine* 46, no. 4 (2004): 406.

costs and improve care through evidence-based practices.<sup>147</sup> The first intervention promotes methods to improve access and adherence to prescription drugs, such as antihypertensive and lipid-lowering medications through opportunities for payers and providers.<sup>148</sup> The second payer intervention seeks to promote a team-based approach to controlling hypertension, which may include having a team of providers working together, such as physician, nurse, pharmacist, community health worker, and patient teams.<sup>149</sup> In addition, patients would have access to devices to self-monitor blood pressure and create incentives for compliance.

- **The Rochester Model**

In 2012, the Finger Lakes Health Collaborative launched the “Rochester Model” to reduce the cost of local healthcare by focusing on high blood pressure in the community. The Collaborative consisted of local businesses, providers, insurers, labor, community organizations, the United Way, and minority consumer coalitions. The Rochester Model focused on improving control of high blood pressure by targeting adherence and generic options. The goal was to reduce hospital admissions from stroke, heart attacks, heart failure, and need for kidney dialysis, which will reduce costs and work loss for employers and insurers. The first aspect of the project focused on developing a community-wide high blood pressure registry that contained data from the three major health systems aggregated for a community report, but that could also be shared through the health systems, at the individual, practice, and system level. Since there is no paid staff to collect information on blood pressure, the project organizers decided that blood pressure would be collected through patient records during the designated timeframe, be it paper or electronic health record.

<sup>147</sup> The Centers for Disease Control and Prevention, “Evidence Summary: Control High Blood Pressure,” *The 6/18 Initiative*, <http://www.cdc.gov/sixeighteen/bloodpressure/index.htm> (accessed August 23, 2016).

<sup>148</sup> The Community Preventative Services Task Force found strong supporting evidence of the effectiveness of reducing patient out-of-pocket costs on medication combined with other interventions in improving adherence and blood pressure and cholesterol outcomes. The CDC reports the following evidence from recent studies to support this intervention: -One study examining the effects of value-based insurance design on medication adherence found that the combination of disease-management program and reduction or elimination of copayments for antihypertensive medication increased patient compliance from 1.4% to 3.2% one year into the study and adherence by 2.1% to 5.2% two years after value-based payments began. See Joel F. Farley, Daryl Wansink, Jennifer H. Lindquist, John C. Parker, and Matthew L. Maciejewski, “Medication Adherence Changes Following Value-Based Insurance Design,” *The American Journal of Managed Care* 18, no. 5 (2012): 265–74. -Another study examined the effect of value-based insurance design providing structured pharmacist-based educational services found that varied copayments for patients depending on risk for cholesterol-lowering therapy saw improvement in patient medication compliant and reduction in use of other services, such as hospitalizations and ER services. See Debra Wertz, et al., “Clinical and Economic Outcomes of the Cincinnati Pharmacy Coaching Program for Diabetes and Hypertension,” *Managed Care* 21, no. 3 (2012):45–54. A systematic review of 13 studies found evidence suggesting generous coverage did not lead to significant changes in medical spending. However, reduced copayments were associated with improved adherence (on average 3.0% over one year) and lower out-of-pocket spending for medication. See, Joy L. Lee, Matthew L. Maciejewski, Shveta S. Raju, William H. Shrank and Niteesh K. Choudhry, “Value-Based Insurance Design: Quality Improvement But No Cost Savings,” *Health Affairs (Millwood)* 32, no. 7 (2013): 1251–7, <http://doi:10.1377/hlthaff.2012.0902><http://doi:10.1377/hlthaff.2012.0902>.

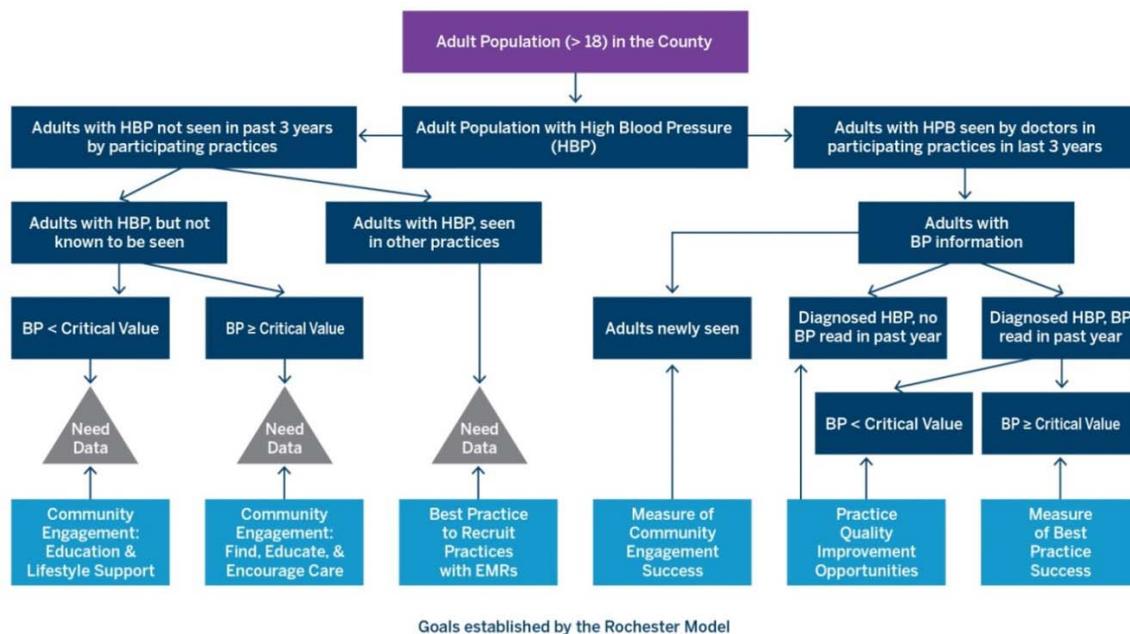
<sup>149</sup> The CDC advises that commercial or private insurance plans take part in this initiative. A patient’s individual plan will determine if home blood pressure monitors will be covered. Furthermore, these benefits will only be for beneficiaries in private plans enrolled in disease management programs for high blood pressure or other high-risk conditions. The CDC Community Guide Task Force analyzed several studies and found the following evidence to support this intervention: -A review of team-based care was associated with large improvement of patients with controlled blood pressure (increase by 12%), systolic blood pressure decreased (median reduction by 5.4 mmHg); and diastolic blood pressure decreased (median reduction by 1.8 mmHg). See, Krista K. Proia, et al., “Team-Based Care and Improved Blood Pressure Control: A Community Guide Systematic Review,” *American Journal of Preventive Medicine* 47, no. 1 (2014):86–99. doi: 10.1016/j.amepre.2014.03.004. -A literature review found strong evidence for interventions that engage community team-based health workers to improve blood pressure and cholesterol in patients with increased risk for heart disease. Community health workers used more than one method of communicating with patients. See, The Community Guide, “Cardiovascular Disease Prevention and Control: Team-Based Care to Improve Blood Pressure Control,” (Sept. 15, 2015), <http://www.thecommunityguide.org/cvd/CHW.html>.

The second component of the project identified barriers to successfully achieving blood pressure targets in the high-risk population. A survey of the community conducted by a community awareness workgroup identified that while respondents desired a lifestyle change, they were unable to execute these changes. Many patients visiting their primary care physicians to test for high blood pressure often leave the office without any plans for improvement, leaving this medical issue unresolved. To address this “clinical inertia”, an Education Work Group defined three important tasks to promote practitioners to take high blood pressure more seriously<sup>150</sup>:

- Educate practitioners on high blood pressure guideline recommendations.
- Conduct meetings with primary care practices that are interested in reducing high blood pressure rates within their practice.
- Increase certification among clinical hypertension experts within a health system or health center to become American Society of Hypertension (ASH) specialists.

This initiative was unique because the motivation and funding for action came from the business community through the Rochester Business Alliance.<sup>151</sup> The Finger Lakes Health Systems Agency announced that high blood pressure in Monroe County has improved 13.7% since 2010.<sup>152</sup>

**Figure 41: Overview of a Hypertension Initiative: Rochester**



Source: Adapted from Bisognano, John D., Paul S. Speranza, Lawrence M. Becker, et al., "Creating Community Collaboration to Improve the Care of Patients with High Blood Pressure: Lessons from Rochester, New York." *The Journal of Clinical Hypertension* 14, no. 3 (2012): 178-183.

<sup>150</sup> "Clinical inertia" is defined in the article, as patients testing positive for hypertension are not given an implementation plan to control their blood pressure. John D. Bisognano, Paul S. Speranza, Lawrence M. Becker, et al., "Creating Community Collaboration to Improve the Care of Patients with High Blood Pressure: Lessons from Rochester, New York," *The Journal of Clinical Hypertension* 14, no. 3 (2012): 178-183.

<sup>151</sup> Ibid.

<sup>152</sup> Beth Adams, "Public Health Campaign Targets Rochester Neighborhoods with More High Blood Pressure," <http://wxnews.org/post/public-health-campaign-targets-rochester-neighborhoods-more-high-blood-pressure> (accessed August 30, 2016).

- **Other National Initiatives to Control High Blood Pressure**

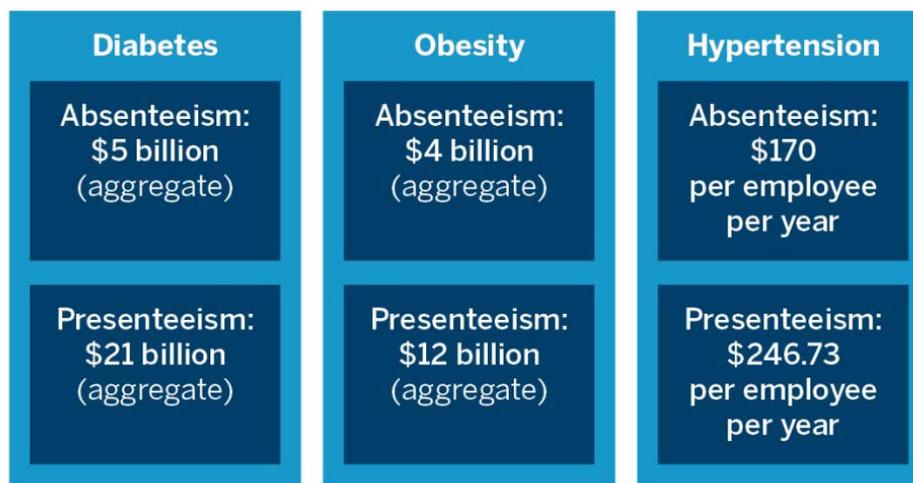
In November 2015, the American Heart Association (AHA) in collaboration with the American Medical Association (AMA) launched the *Target: BP* initiative that aims to reduce stroke and heart attacks by urging healthcare providers to prioritize controlling high blood pressure. Participants of the program work with current AHA guidelines on blood pressure and aim to get lower readings. The AHA and AMA recognize participants who attain high levels of control.<sup>153</sup>

The CDC also conducts the Million Hearts Hypertension Control Challenge. This competition recognizes practices, clinicians, and health systems that work with their patients to control hypertension at or above 70% through innovations in health information technology and electronic health records, patient communication, and healthcare team approaches. In 2015, Million Hearts recognized 18 practices and systems as champions.<sup>154</sup>

### *E. What This Means for Nashville: Applying National-Level Estimates to the Local Area*

In order to provide actionable information for Nashville, national level estimates of productivity loss due to each of the three specific conditions (diabetes, obesity, and hypertension) were used to develop estimates of the monetary cost of productivity loss specifically for the working population in Nashville.<sup>155</sup>

**Figure 42: National: Estimated Annual Productivity Costs**



Source: American Diabetes Association, "Economic Costs of Diabetes in the US in 2012," *Diabetes Care* (March 2013), <http://dx.doi.org/10.2337/dc12-2625>; JA Ricci, E Chee, "Lost Productive Time Associated with Excess Weight in the U.S. Workforce," *47 Journal of Occupational and Environmental Medicine* (2005):1227–1234; Ron Z Goetzel, Stacey R. Long, Ronald J. Ozminkowski, Kevin Hawkins, Shaohung Wang, and Wendy Lynch, "Health, Absence, Disability, and Presenteeism Cost Estimates of Certain Physical and Mental Health Conditions Affecting US Employers," *Journal of Occupational and Environmental Medicine* 46, no. 4 (2004): 405.

<sup>153</sup> The American Heart Association, "AHA, AMA Launch High Blood Pressure Initiative," *American Heart Association News*, <http://news.heart.org/aha-ama-launch-high-blood-pressure-initiative/> (accessed August 22, 2016).

<sup>154</sup> Million Hearts, "Hypertension Control Champions," <http://millionhearts.hhs.gov/partners-progress/champions/index.html> (accessed August 23, 2016).

<sup>155</sup> The working age population is defined as those aged 25-64.

Application of these national estimates to the Nashville population provides a means to quantify the costs associated with absenteeism and presenteeism for the Nashville working age population with diabetes, hypertension, and obesity.<sup>156</sup>

**Figure 43: Nashville: Estimated Annual Productivity Costs**



Source: Author's calculations. These values are presented for illustrative purposes only; true costs may be lower or higher. The estimates are based on the number of individuals in the Nashville MSA age 25-64 and do not reflect the productivity costs for the entire working age population. Estimates are not adjusted to account for the labor force participation or unemployment rates.

- For diabetes, the estimated annual cost of absenteeism and presenteeism in the Nashville MSA for the working age population is \$39.3 million and \$183.6 million respectively (\$222.9 million combined).
- The cost for absenteeism related to hypertension in the Nashville MSA is \$55.6 million and the costs for presenteeism are estimated at \$70.8 million (\$126.4 million combined).
- The cost of absenteeism related to obesity in the Nashville MSA is estimated to be \$28.2 million and for presenteeism the estimated costs are \$129.8 million (\$158.0 million combined).

Overall costs for the three conditions would include these costs as well as direct costs (e.g., medical costs associated with inpatient, outpatient, and physician visits as well as pharmaceutical and other costs).

## X. Conclusion: Addressing the Workforce Challenge

The Nashville region has experienced tremendous economic success over many years due to its diverse industry set, its entrepreneurial culture, its location, its favorable business climate and its abundance of workforce talent.<sup>157</sup> That dividend of talent is potentially at risk now and in the future due to an aging population with the prospect of substantial and increasing disruption in the supply of experienced workers.

The Research Center at the Nashville Chamber estimates that net new supply of labor between 2015 and 2020 will range between -2,000 and 50,000, either of which are far below historical trends. These projections, accounting for area graduates, unemployed persons returning to work and net in-migration, suggest a need for more intense pressure to grow the talent pool and consequently support economic growth and development.

<sup>156</sup> For detail on the methodology used to create these estimates, see Technical Appendix, Note 10.

<sup>157</sup> The Nashville Area Chamber's Research Center is the primary author of this section.

Achieving better outcomes for maintaining a high level of workers is an imperative for the Nashville region. Engagement of business and industry to embrace a culture of health for workers can and will yield results in retaining workers. Particular attention to the 45-64 age cohorts, shown to be vital to many of the region's sectors, is the foremost need and opportunity. Employer attention to the physical, mental and emotional health of their employees in the Nashville area will be an important and high priority way they can preserve the numerical and quality advantages and goals.

The prosperity of the Nashville region relies on business and workers experiencing success. As demonstrated by a wide body of literature, effective workplaces are those that recognize that employees are an organization's greatest resource - and, that they make a critical difference in the organization's ability to not merely survive, but to thrive.<sup>158</sup> Organizations such as the Nashville Area Chamber of Commerce and an array of leading organizations in the region have together identified how sustain competitiveness through a foundation of data and awareness, followed by action. Leading by example and leading through collaboration are the hallmarks of Nashville's success and means to provide new opportunities to blend a culture of health and wellbeing with a meaningful workforce strategy.

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<sup>158</sup> See e.g., The State of Health in the American Workforce, which concludes "To be truly effective, a workplace—its design, practices and policies—must benefit both the organization and its employees." <http://familiesandwork.org/downloads/StateofHealthinAmericanWorkforce.pdf>.

## Technical Appendix

### Note 1: Metropolitan-Level Data and Definitions of Areas

The analysis uses *publicly available* data that are reliable and usable to construct Metropolitan Statistical Area (MSA)-level estimates for the population level health, access, parts of healthcare utilization and costs, including: Centers for Disease Control and Prevention’s Behavioral Risk Factor Surveillance System (BRFSS) survey data, which provide information on health behaviors and conditions for adults age 18 and older; the National Plan & Provider Enumeration System’s (NPES) National Provider Identification (NPI) dataset, which provides physician counts both in aggregate and by specialty and the Centers for Medicare & Medicaid Services’ (CMS) Geographic Variation and Public Use File, which provides information concerning the distribution of Medicare beneficiaries, costs, and healthcare utilization.

In some instances, the most recent data available are for 2012; and relevant dates are included. The lag between when data are collected and when they are released and available for analysis is due to the time required to prepare and carefully vet the data for accuracy. The Report relies on *proprietary commercial claims* data to explore utilization, costs, and chronic condition prevalence among the commercially insured. Data on every commercially insured individual in Nashville and each peer MSA does not exist and the analysis uses the most comprehensive data source available. Commercial claims data are from Truven’s MarketScan® Commercial Claims and Encounter Research Database, which includes a sample of claims of commercially insured patients and their families seeking treatment across the United States. It contains information about diagnoses, procedures, and payments. The commercial claims sample used is regarded as largely representative of working age employees with commercial insurance. The data does not include persons eligible for Medicare. The extensive database contains detailed cost information, including both insurer and patient payments for the commercially insured population – an important set of residents often left out of comparative scorecards or rankings due to lack of data. The data used in this analysis allow the classification of utilization by location of service (inpatient, doctor’s office, other outpatient facility, etc.) and identification of treatment (utilization) patterns by patient segment.

MSAs are used frequently for comparison purposes in healthcare and for a wide variety of demographic, economic, and other data. They represent effective units of analysis because they correspond to areas that regional planning authorities oversee and reflect interconnectedness among communities located in metropolitan areas.

Analyses in the 2017 report (and in the 2015 Pilot Study) are conducted at the “metro” MSA level; metro MSAs are areas with large urban cores. The census creates metropolitan areas as a way to analyze a set of counties that has a “high degree of social-economic integration with the core [a densely settled concentration of population, consisting of an urbanized area of 50,000 or more population] as measured through commuting ties with the counties containing the core.” [https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/fedreg\\_2010/06282010\\_metro\\_standards-Complete.pdf](https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/fedreg_2010/06282010_metro_standards-Complete.pdf). Metropolitan areas include the counties that have economic involvement with the urban core area of a specific county. Metropolitan Statistical Areas are delineated by the U.S. Census Bureau and are updated periodically.

All health-related analyses presented in the 2017 and the 2015 report, with the exception of the analysis based on the most recent BRFSS data, uses 2009 MSA delineations. The BRFSS data analyses uses 2013 delineations. It was not possible to keep the specific geographic level of the MSA consistent across all of the health analyses in the report because the most recent BRFSS releases uses the 2013 delineations while the Truven data analysis uses the 2009 delineation. Therefore, the geographic areas in the BRFSS analysis vary somewhat from the precise scope of the geographic areas used in other health-related analyses. BRFSS data were added because they provide the most current and sound data at the MSA level for several aspects of the Report’s analysis. As detailed below, the changes in

precise MSA definitions tend to change overall population estimates; sensitivity analyses indicate they do not result in significant changes in our health-related analyses or conclusions.

**Note 2:** There are some changes between the 2009 MSA definitions and the 2013 definitions that include counties both added and removed from one or more of the 11 MSAs used in this Report. With regard to the Nashville MSA, there is some difference between 2009 and 2013 definitions, with the addition of Maury County. For the health data analysis, Maury County is not included in the Nashville MSA in order to keep the population data consistent with the health data. Had this county been included, the Nashville MSA population would have been higher than reported statistics.

**Note 3:** The most recent data available for this analysis is 2014 data. Insurance coverage is determined using the ACS One-Year 2014 Estimates, which only report counties with a population 65,000 or more. As a result, the ACS sample excludes certain counties in the peer MSAs and Nashville due to a small sample size. Medicare and Medicaid coverage is determined using the ACS One-Year 2014 Estimates, which also only reports counties with a population 65,000 or more. The Center reviewed a second set of estimates, which presents averages over a five-year period and includes all counties (regardless of population). Estimates based on the five-year period with all counties provide similar though slightly lower estimates.

**Note 4:** The methodology used in calculating life expectancy is sensitive to the effects of migration. Life expectancy estimates in areas with low overall migration may be more reliable than in areas with high migration. MSAs use the 2009 Census MSA delineation definition in this analysis.

**Note 5:** Future work could include utilization of the Charlson Comorbidity Index, a method of categorizing patient comorbidities based on ICD-9-CM diagnosis codes found in administrative claims data. Each comorbidity category carries a weight of 1 to 6, based on the adjusted risk of mortality or resource use. The sum of all the weights for each patient results in a single comorbidity score. A patient with a higher comorbidity score predicts a higher risk of mortality and resource use. The original index was developed with 19 categories by Charlson, et al. in 1987, but has since been modified to 17 categories in 1992. These include supporting sets of comorbidities, ICD-9-CM diagnosis codes, and appropriate weights. See Richard A. Deyo, Daniel C. Cherkin, and Marcia A. Ciol, "Adapting a Clinical Comorbidity Index for Use with ICD-9-CM Administrative Databases." *Journal of Clinical Epidemiology* 45, no. 6 (1992): 613-619.

**Note 6:** These costs are averages for the subsample of patients with claims in a specific category. For example, the average cost to the insurer of \$35,000 for a hospital visit is the average cost among the 13% of the population that had an inpatient visit during the time period under review. These statistics provide an estimate of potentially avoidable healthcare costs and productivity losses related to depression. These estimates provide a reference point that can be used to assess possible savings, which may be achieved through interventions that lower overall prevalence.

**Note 7:** Many people with chronic conditions do not report that they are in poor health, despite the presence of a condition such as diabetes or asthma, thereby making it difficult to capture the productivity implications related to illness. In a study using data collected by the Health and Retirement Study (HRS), the authors found that the vast majority of those identified as being chronically ill (as flagged by presence of a condition) do not report that they are in poor health. The Health and Retirement Study is a longitudinal panel study of Americans over age 50. The survey was launched in 1992 and data is collected every two years. The study collects information on income, expenditures, health and healthcare related items, and cognitive functioning. See <http://hrsonline.isr.umich.edu/index.php?p=start> (accessed September 6, 2016). Nor do they report that they experience functional limitations in activities of daily living, a common measure used to assess disability. See M. Solaiman Miah and Virginia Wilcox-Gök, "[Do the Sick Retire Early? Chronic Illness, Asset Accumulation and Early Retirement.](#)" *Applied Economics* 39, no. 15 (2007).

**Note 8:** The Diabetes Prevention Program is a well-studied intervention geared toward diabetes. Other less popular programs include: Medical Nutrition Therapy – Therapy involving a specified diet tailored by a professional nutritionist or registered dietitian. See American Diabetes Association, “Nutrition Recommendations and Interventions for Diabetes,” *Diabetes Care* January 2007, <http://dx.doi.org/10.2337/dc07-S048> (accessed August 23, 2016); Case Management – The planning and coordination of healthcare for individuals with diabetes to improve their healthcare resource utilization and improve the probability that they stay healthy; Disease Management – The coordination of care for individuals with diabetes in an effort to reduce development of or the impact of co-morbid conditions; and Self-Management—Teaching people about their condition, how to manage diabetes, and how to increase quality of life. See <http://www.thecommunityguide.org/diabetes/index.html> (accessed August 23, 2016).

**Note 9:** Medical cost estimates due to obesity can be complicated by measurement error and inability to determine causation. Obesity rates may be based on self-reported estimates of weight and height and studies show that individuals tend to underestimate their weight and overestimate their height. M. Wen and L. Kowaleski-Jones, “Sex and Ethnic Differences in Validity of Self-Reported Adult Height, Weight and Body Mass Index,” *Ethnicity & Disease* 22, no. 72 (2012). This produces bias in the obesity estimates and can lead to underestimates of the incremental medical cost attributed to obesity (as fewer of people who are actually obese are correctly identified). In addition, causality is difficult to determine because it may not be clear if people with specific health conditions such as depression or other chronic illness are more likely to become obese rather than the reverse. A seminal study addresses both these issues by use of an empirical technique (instrumental variables) commonly used in the field of economics. John Cawley and Chad Meyerhoefer, “The Medical Care Costs of Obesity: An Instrumental Variables Approach,” *Journal of Health Economics* 31, no. 1 (January 2012): 219–230.

**Note 10:** In calculating productivity loss, we rely on estimates of absenteeism and presenteeism related to each specific condition using the referenced national studies. For diabetes, the condition is estimated to be responsible for 3 days of absenteeism and 14 days of presenteeism annually per person. Absenteeism related to obesity is conservatively estimated to account for 0.5 days and 2.3 days of presenteeism. Hypertension is estimated to account for 1.13 days of absenteeism and 1.44 days of presenteeism. To translate productivity loss into a monetary cost, the analysis uses the average hourly wage rate in the Nashville MSA as reported by the Bureau of Labor Statistics. See BLS, Occupational Employment and Wages in Nashville-Davidson-Murfreesboro-Franklin–May 2015 released June 17, 2016, [http://www.bls.gov/regions/southeast/news-release/pdf/occupationalemploymentandwages\\_nashville.pdf](http://www.bls.gov/regions/southeast/news-release/pdf/occupationalemploymentandwages_nashville.pdf) (accessed September 9, 2016). The average hourly wage rate (\$21.49) was multiplied by the work hours lost due to each of the conditions above to get the average annual individual productivity cost by condition. To derive population wide estimates, the individual cost are multiplied by the number of individuals in Nashville, age 25-64, with the condition. Calculations are based on assumption of full unemployment. Total population in Nashville is presented in Table 2 “Overview Demographics of All 11 MSAs” and the percent of the population in the 25-64 age group is presented in Table 3 “Population by Age Group.” The percent of the working age population with each condition is presented in Table 6 “MSA-Level Health and Health Behaviors, 2012 – Ages 25-44” and Table 7 “MSA-Level Health and Health Behaviors, 2012 – Ages 45-64” for ages 25-44 and 45-64 respectively. The methodology produces estimates that are in line with national-level figures for the indirect costs associated with chronic conditions. Individual level productivity cost estimates were obtained from the following sources: American Diabetes Association. 2013 “Economic Costs of Diabetes in the US in 2012.” *Diabetes Care*. March 2013, <http://dx.doi.org/10.2337/dc12-2625>, American Diabetes Association. 2008 “Economic Costs of Diabetes in the US in 2007.” *Diabetes Care*. March 2008, <http://dx.doi.org/10.2337/dc08-9017>; Finkelstein, Eric et al. 2010. “The Costs of Obesity in the Workplace.” *Journal of Occupational and Environmental Medicine*. Oct 2010. Volume 52, Number 10:971-976; Victoria Unmuessig, Paul A. Fishman, Hubertus JM Vrijhoef, Arianne MJ Elissen, and David C. Grossman, "Association of Controlled and Uncontrolled Hypertension With Workplace Productivity," *The Journal of Clinical Hypertension* (2015): 218.

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The experienced healthcare professionals at the Center for Healthcare Economics and Policy work closely with clients to provide **Data Driven Strategy** solutions based on empirical analyses and modeling. Successful achievement of the Triple Aim – reducing the per capita cost of healthcare, improving the health of populations, and enhancing the experience of care – is most effective when driven by well-informed and involved stakeholders. The Center works with providers, insurers, employers, and community groups to address current and forecasted opportunities by facilitating optimal solutions grounded in solid data analysis.

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## About the Research Center

The Research Center, led by Dr. Garrett Harper, authored the data and analysis on workforce patterns and trends as part of this study. The Research Center conducts research on a variety of different topics and strives to be a center of knowledge for the community. End products for research clients engage many levels of planning and analysis to support industry needs and goals for growth. Regardless of the scope of your project, the Chamber's Research Center is equipped to deliver the data you need to feel confident in your results. With sensible, rational and consistent methodologies, the Research Center works with businesses, social institutions, communities, and entrepreneurs to help them function better and make strategic decisions.

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