



HOUSTON'S ECONOMIC FUTURE: **HEALTH CARE**

A REPORT ON HOW THE HEALTH CARE INDUSTRY AFFECTS OUR REGION

CENTER FOR HOUSTON'S FUTURE

CENTER FOR HOUSTON'S FUTURE FURTHERS THE REGION AS A TOP GLOBAL COMMUNITY IN WHICH TO WORK AND LIVE.

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- Strategic Planning
- Business/Civic Leadership Development
- Community Engagement

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LETTER FROM THE PRESIDENT/CEO

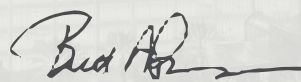
In 2019, Center for Houston's Future embarked on a project to better understand the role health care plays in the region's overall economy, with the goals of identifying how we can better position this key sector to grow and how we can improve the health of our community.

This work has been made possible with the support of HCA Houston Healthcare, which generously underwrote this study and has served as an invaluable partner in connecting the Center with the region's health care community.

The Center's work has also benefited from the over 150 participants in our interviews, focus groups and surveys over the past year. Patrick Jankowski from the Greater Houston Partnership provided invaluable feedback on the economic modeling.

Our original release date for this study was scheduled for March of 2020—right as Covid-19 was first hitting the country. This report has been revised in light of all that we have witnessed and learned from battling the pandemic over the past seven months. I believe these lessons reinforce the findings of our study that the region's health and its health care sector are key to the region's continued economic prosperity.

We're grateful for the spirit of collaboration and common purpose of all our partners. We hope this report will serve as a springboard for others to join in the effort.



— Brett A. Perlman



HEALTH CARE DRIVES JOB GROWTH IN THE REGION:

1 IN **4**



FROM **2019** TO **2036**

WILL BE IN **HEALTH CARE**

HEALTH CARE
ACCOUNTS FOR:

12%

OF THE REGION'S
EMPLOYMENT



5.4%

OF GDP

MODELING HOUSTON'S ECONOMIC FUTURE: HEALTH CARE IN 2036



BASE SCENARIO

PROJECTION OF
HISTORICAL TRENDS
FROM 2007-2019

+\$25.9B
IN GDP

+104%
INCREASE IN GDP
FROM 2019

+412K
JOBS



LABOR SHORTAGE SCENARIO

+\$18.4B
IN GDP

-\$7.4B
(-29%) IN GDP
FROM BASE CASE

-111K
JOBS (-27%)
FROM BASE CASE



RAPID TECHNOLOGY ADOPTION SCENARIO

+\$25.5B
IN GDP

FLAT
(-1%) IN GDP
FROM BASE CASE

-159K
JOBS (-39%)
FROM BASE CASE



LIFE SCIENCES SCENARIO

+\$39.0B
IN GDP

+\$13.1B
(+57%) IN GDP
FROM BASE CASE

+73K
JOBS (18%)
FROM BASE CASE

Executive Summary

The story of health in the Houston region is complex, contradictory and multifaceted.

On the one hand, we are justifiably proud of our health care sector, which includes the Texas Medical Center, the world's largest medical complex; some of the nation's premier hospitals and universities; and a vanguard of medical research. On the other hand, there are major health disparities across the region, some occurring within miles of the Medical Center. We lead the nation in the rate of uninsured residents, contributing to a negative feedback loop between high levels of health care disparities and rising health care costs shouldered across the region. Moreover, Houston area residents on average experience worse health care outcomes than those in most other states.¹

For the past year, Center for Houston's Future has been on a journey to profile the story of health and health care in the Houston region. We've interviewed experts, reviewed academic literature, conducted focus groups and surveyed employers to better understand the complexities of our health and health care sectors.

There have been many insightful reports published on various aspects of the health of the residents in the Houston region, on the need to address Houston's health challenges and on the effect of our health care industry on the region's economy. But no single report has attempted to create a broad and systemic picture of how we're faring across multiple dimensions of the region's health care system, and then assess how rapid changes in technology and in the delivery of and access to health care will affect our community from an economic and workforce perspective.

This report provides that picture by focusing on the economic vitality of Houston's health care sector and developing a holistic view of how changes in this sector affect the region's overall economic health.

First, we create a profile of the region's health sector by summarizing key trends in employment and economic footprint, the cost of care, health outcomes, social determinants of health, access to care, innovation in the life sciences and regional employers' health care concerns.

We next look at the developments in technology and business models that will affect our health care sector and the way health care is delivered going forward.

Finally, we use scenarios we developed to predict what the health care sector might contribute to the region in terms of employment and economic growth. We look out approximately 16 years to 2036, the bicentennial of both our state and our city, as a milestone to paint a picture of the role of the health care sector in our regional economy.

We end with an overview of how the current pandemic has stressed our health care system and provide ideas and recommendations that could be adopted to affect the direction in which we're heading.

Our hope is not to predict the future, but to foster a community-wide discussion among business leaders, health sector professionals and governmental officials on how we might shape this future and make Houston's health care sector a model for our country and the world in delivering health care services, in promoting wellbeing and healthy lifestyles, in accessing health care and in creating new medical technology innovation.

We begin this journey with a description of the Houston region's health care sector.

¹ Commonwealth Fund. "2020 Scorecard on State Health System Performance." <https://2020scorecard.commonwealthfund.org/>.

² References to Greater Houston or the Houston region in this report refer to the Houston-The Woodlands-Sugar Land Metropolitan Statistical Area comprising Austin County, Brazoria County, Chambers County, Fort Bend County, Galveston County, Harris County, Liberty County, Montgomery County and Waller County.

³ Organization for Economic Co-operation and Development. "Health Spending Indicators." <https://data.oecd.org/healthres/health-spending.htm>.

Our Health Care Sector:

Our report includes a comprehensive profile of the region's health care sector looking across multiple areas for a baseline snapshot of where we are today. Some of our primary conclusions are:

- ▶ **Employment and Workforce Growth:** Greater Houston's health care industry plays a key role in the region's overall economy. The sector has been a core source of Houston's employment growth over the past decade. From 2008 to 2018, health care jobs grew at an annual rate of 3.5 percent in Greater Houston, compared to non-health care jobs, which grew at only 1.7 percent over the same period. 80,000 (or roughly 30 percent) of the region's health care jobs today did not even exist just a decade ago.
- ▶ **Meeting Growing Demand for Health Care Workers:** The health care industry is expected to experience workforce shortages in the next decade as overall demand for nurses, physicians and medical technicians grows faster than supply. We summarize the key underlying factors driving this gap and identify possible solutions such as developing a more comprehensive health care workforce pipeline or expanding the use of physician extenders.
- ▶ **Regional Economic Contribution:** The health care sector, however, has not been as large an economic engine for the regional economy compared to the number of people employed. While health care accounted for nearly 12 percent of the region's employment, it generates just 5.4 percent of Greater Houston's GDP.² This is because the health care sector does not have a large effect (called a "multiplier") in terms of creating new jobs in other sectors of the economy.
- ▶ **Cutting Edge Medical Innovation:** The life sciences are a promising area of the overall health care sector in Houston with a potentially high economic payoff. A foundation is being laid to nurture this area, but work remains. Employment in the life science research sector has declined over the past decade. The number of people in Houston working in biotechnology and life sciences research and development is 13 percent lower today compared to ten years ago. However, there are many recently announced and ongoing efforts to commercialize cutting-edge innovations developed at many of our research hospitals and to build a life sciences hub in the region.

Triple Aim:

Our report seeks to provide a picture of how we're faring regionally on health care both as an important segment of our region's economy as well as addressing the health needs of Houston area residents. Overall, the goals of our health care system should be to achieve the 'triple aim': to reduce cost, to improve the quality of health care services and to make health care more accessible to more of our residents. We present key indicators on how well the Houston region's health care system is performing in terms of cost, access to care, and health outcomes.

- ▶ **Health Care Spending:** The region's spending on health care steadily increased over the past decade (growing annually by 6.2 percent), but at a lesser pace than in the nation overall. From 2010 to 2018, the portion of household spending in the region devoted to health care rose from 5.9 percent to 7.1 percent of overall consumer expenditures. Nationally, the share of consumer spending allocated to health care rose from 6.6 percent to 8 percent over the same time period. When compared to other health care systems across the world, Americans spend a higher proportion of our income on health care.³ Many observers argue that the level and growth rate of household spending on health care is unsustainable since it is rising even faster than our spending on total goods and services not only in Houston but also throughout the country.
- ▶ **Employer Views on Health Care:** Employers are the main source of insurance coverage in Houston but are increasingly struggling to pay the growing cost of their health benefit plans. We surveyed human resources professionals from businesses in Greater Houston to better understand their unique health care challenges. On the whole, survey respondents indicated that employers are increasingly open to new models of covering health care that prioritize slowing cost increases while improving quality.
- ▶ **Insurance Coverage:** One of the key barriers to accessing health care is a lack of health insurance. More Houstonians have health care coverage today compared to a decade ago. From 2013 to 2018, the uninsured rate dropped by 5 percentage points from 23 percent to 18 percent as roughly 765,000 people gained health insurance. The region still lags the nation, however, in terms of health insurance. For example, the region's uninsured rate for children (12 percent) is double that of the national rate (6 percent).

► **Impact of Social Factors on Health:** The so-called social determinants of health, factors caused by one's economic circumstances, genetic makeup, environmental conditions and living circumstances largely determine whether someone is healthy or not. Some experts estimate that fewer than 15 percent of health outcomes are determined by clinical care, with the rest subject to socioeconomic factors, behaviors and genetics. In the Houston area, the overall health picture has been steadily improving over the past decade. From 2010 to 2019, a key performance measure, the number of years of life lost in the region from premature death, declined by 11 percent. While there has been an improvement in the region's overall health over the past decade, the region continues to experience significant disparities in health outcomes and access to care—a resident of Fort Bend county will, on average, live four years longer than a person living in Galveston.

Emerging Trends in Health Care:

A confluence of disruptions will likely transform the health sector over the next decade and a half. We include a synopsis of potential disruptions to our current model of delivering care, such as:

► **Looking at the Whole Picture:** A collection of studies published over the past decade find that nearly a third of every dollar that enters the current U.S. health care system is wasted.⁴ Reasons for this pattern include waste on administrative systems, unsafe care, fraud and avoidable admissions. Moreover, our system features numerous pricing failures that drive high health care costs. In response, a “whole picture” approach to delivering care is ascendant as the system seeks solutions addressed at downward cost pressures that lie outside of hospitals. These include avoidable admissions, reducing admissions, recognizing the influence of social health determinants and curbing over-treatment.

⁴ William H. Shrank, Teresa L. Rogstad and Natasha Parekh. “Waste in the U.S. Health Care System: Estimated Costs and Potential for Savings,” *Journal of the American Medical Association*. October 7, 2019. <https://jamanetwork.com/journals/jama/article-abstract/2752664.healthres/health-spending.htm>.

► **Shift from Traditional Ways of Paying for Health Care:** The adoption of value-based care, a system in which medical payments are linked to the quality of care provided, is highly probable going forward. While the system is imperfect and is the subject of disagreements over how it should be structured, implementation of value-based care is widely considered to be an essential step toward controlling rising health care costs by paying less for volume and more for value and shifting providers' focus from delivering care to promoting health. This approach is not being implemented as quickly as anticipated for reasons that include a lack of trust between providers and payers, challenges with systems infrastructure, and potential legal and regulatory barriers.

► **Health Care on Demand:** Health care providers are already trying to shift the location where many kinds of care are delivered from the hospital to outpatient settings to improve outcomes, limit cost and reduce cost-inefficient use of hospital services. These efforts are potentially the vanguard of a health-care-on-demand paradigm that promotes a more convenient and patient-centered approach. As technology continues to advance, existing frameworks for delivering care will likely need to adapt. It's possible that hospitals will increasingly shift to treating patients off campus and, in response, narrow the range of traditional services that hospitals themselves offer. Hospitals throughout the country are already reducing the number of beds and some are closing.

► **Rise of the Consumer in Health Care:** In an age where many individuals are accustomed to easily managing their life with a smartphone, patients are increasingly demanding greater convenience, transparency, and value when accessing health care. By 2036, we expect a more consumer-centered model will develop in which patients are more active in their health decisions. This move from patient to health care consumer will be facilitated by technological

IT'S POSSIBLE THAT HOSPITALS WILL INCREASINGLY SHIFT TO TREATING PATIENTS OFF CAMPUS...



advances in data interoperability and collection and will give the consumer more control while facilitating closer collaboration among the many stakeholders in the health care sector. As technology allows more individualized diagnoses of health problems, new kinds of health care services that are more precise and tailored to the specific patient will also emerge. We acknowledge, however, that these developments may represent a kind of double-edged sword: While patients will have more control, they may have limited capability to make informed decisions about their health care.

- ▶ **More Integrated Health Care Delivery:** The process of delivering care is becoming increasingly team-based, cost-conscious and concerned with reaching patients beyond traditional delivery locations like hospitals. As such, we anticipate that the region's health workforce will expand to include home caregivers, social workers, teachers and others outside the traditional medical profession. In addition, the integration of new technologies is creating new demand for professions such as data analysts, health information managers and telemetry monitoring managers.
- ▶ **Different Business Structures:** Another key structural change in health care currently is a move toward vertical integration, allowing providers to offer a greater range of services spanning primary, community, acute and post-acute care. Health care stakeholders are largely pursuing vertical integration not just for the gains in scale-induced operating efficiency, but also to access broader data sets and to build their capabilities in data and advanced analytics. However, while these developments have the potential to lower per-capita health care costs, many economists worry that the consolidation of health care firms will lead to higher costs by decreasing competition.

How Technology Innovation Will Shape Health Care Services:

New technologies in health care may completely reshape how health care is delivered and practiced. We detail some of the most promising technological innovations that might achieve widespread implementation over the next 10 to 15 years. It is important to note, however, that the effect of these technologies on health care outcomes and cost remain unclear.

- ▶ **Telemedicine:** Aided by advancements in technology like the rollout of 5G cellular networks, the increased adoption of telemedicine—virtual interactions between patients and clinicians—will enable a ‘care anywhere’ model that will improve access to care, increase the productivity of health workers and could curtail health care costs.
- ▶ **Medical Internet of Things:** The widespread use of personal, connected medical devices will contribute to the rise of the Medical Internet of Things (MIoT), which might enable an advanced form of telemedicine. Adoption of the MIoT will allow for 24/7 patient monitoring and a shift in focus to prevention and early intervention. These medical devices could also enable the automation of certain administrative, logistic and diagnostic tasks currently performed by workers.
- ▶ **Artificial Intelligence:** The burgeoning science of teaching computer systems to learn from data and detect patterns should enable machines and algorithms to perform more administrative and clinical health care functions. The potential applications for these technologies are myriad, and this technology has vast potential to reshape the health care workforce and change how health care is delivered. Soon, AI could perform data-based work and human workers would transition into roles that interpret, give advice based on, and integrate the resulting information into care plans and operations.

...TECHNOLOGY HAS VAST POTENTIAL TO RESHAPE THE HEALTH CARE WORKFORCE AND CHANGE HOW HEALTH CARE IS DELIVERED.



► **Better Access to Health Care Data:** Many of the technological disruptions that could improve patient care and decrease health care costs rely on data interoperability—the ability of different IT systems to exchange and interpret data. However, there are challenges in synchronizing the flow of data across the many platforms and systems used to store patient electronic health records. Advancements in data operability going forward will open up massive amounts of data that can be extrapolated and analyzed. The aftermath is a health care system that is increasingly patient-centric and decentralized, allowing health to be monitored and administered quickly and efficiently from remote locations.

Future of Houston's Health Care Sector:

Looking to 2036, just a decade and a half away and Houston's 200th anniversary, we used our economic forecasting model to analyze how different technological and workforce scenarios in the health care sector would affect both the region's job and economic growth. Main conclusions are:

- **Labor Shortage:** Health care is the uncontested leader in fueling employment growth for the region. Assuming historical trends, we expect that one in every four jobs added in Greater Houston from 2019 to 2036 will be in health care. This projection, however, is contingent on a sufficient supply of qualified workers to fill these jobs. Our “**labor shortage**” scenario contemplates a situation where the Houston region fails to generate sufficient workers.
- **Rapid Technology Adoption:** Accelerating the use of technology such as AI and machine learning would likely depress employment growth but boost the economic output of the region's health care sector. Under a “**rapid technology adoption**” scenario, we calculate the health care sector would produce 38 percent fewer jobs, but that gains in worker productivity would entirely offset any effect on regional GDP.
- **Thriving Life Sciences:** Transforming the health care sector into an engine of economic growth would require a focus on creating high-multiplier jobs. Creating a **thriving life sciences** hub is one way to do this.

Looking at GDP as a measure of our region's economic growth, it is almost certain the economic output of the health care sector will grow over the next 16 years. How significant that growth is, however, varies widely depending on how circumstances play out. We lay out four scenarios. For context, the health care sector contributed \$27.7 billion to Houston's regional GDP in 2019.



In the **baseline** scenario, our modeling suggests the health care sector would add another \$25.9 billion in economic output by 2036, an increase of 104 percent.



The **labor shortage** scenario adds \$18.4 billion in GDP, 29 percent (\$7.4 billion) less than the baseline case.



The GDP effect of the **rapid technology adoption** case is virtually equal to the baseline. While fewer jobs would be created in this scenario compared to the baseline, our model suggests that gains in worker productivity would entirely offset any loss in economic output.



The **thriving life sciences** scenario adds \$39 billion in GDP, a 51 percent boost (\$13 billion) over the baseline case. Given that the Houston region's overall 2018 GDP was \$445 billion, the economic effect of the life sciences scenario would be equivalent to growing today's regional economy by 9 percent.

- **Major Lessons Learned from COVID-19:** Many of the trends and disruptions shaping the health care sector have dramatically accelerated as a result of managing the current pandemic. We detail how the pandemic has elevated the need for a comprehensive health care workforce pipeline and accelerated the adoption of new technologies used to deliver care. We follow by identifying several steps that the region might undertake to enhance the resiliency of our health care system and its ability to weather a future public health crisis.

Conclusions

We close our report with a call to action for the business community to assert leadership on addressing the region's health care challenges. We hope that this report sparks a community-wide discussion on how we can become a model for the country for developing a health care system that provides affordable, accessible care and quality care; is cost efficient; and drives economic growth.

Houston's Unique Health Care Vulnerabilities and Advantages

IN THE INTERVIEWS AND FOCUS GROUPS CONVENED WITH HEALTH CARE STAKEHOLDERS, THE CENTER ASKED PARTICIPANTS TO ASSESS HOUSTON'S UNIQUE HEALTH CARE ADVANTAGES AND VULNERABILITIES; THE ANSWERS WE HEARD WERE BOTH DAUNTING AND ENCOURAGING.

In terms of Houston's health care vulnerabilities, some of the most common points expressed include:

- ▶ One of the distinguishing features of the health care situation in Houston is our 19 percent uninsured rate—the highest among the nation's major metropolitan areas. This makes Houston uniquely vulnerable to federal and state level decisions on matters like changes to the public charge law. Given the difficulties large portions of our population face in accessing health care, policies that discourage enrollment in public health care programs only further complicate the aim of providing coverage to the uninsured.⁵
- ▶ Texas, in general, is falling behind other states in addressing social determinants of health due to the high uninsured rate, a lack of Medicaid expansion, higher rates of poverty and a sizable undocumented population that is not able to get insurance coverage. These circumstances financially strain health care providers, who must provide more charity care to uninsured patients unable to pay than counterparts in other states.⁶
- ▶ Houston businesses rely on attracting high-skilled workers from outside the region—both in the health care sector and across the region's industries—and there are concerns over our ability to continue to attract workers as health care costs rise. Moreover, many warned that Houston is at risk of losing talent (students, businesses, researchers) to other regions. As one interviewee noted, "If you go to both a medical school and residency program in the same state, you are 80 percent likely to stay in the region. The likelihood drops significantly if you only do school or residency. Texas has a lot of medical schools but not enough residency programs. So, 40 percent of students are leaving the state – so we are losing all the assets we are training. And if they leave, they never come back."

Health care experts also cited competitive advantages for Houston's health care sector going forward:

- ▶ The region's diverse population is a unique advantage. Many noted that a melting pot like Houston is an ideal place to pioneer and implement new technologies such as AI-enabled analytics, clinical trials and personalized medicine. Our racial and ethnic diversity provides researchers with large, robust datasets needed to refine these advances.
- ▶ The current model of providing care is not accessible for much of our population, given the diversity of racial and ethnic identities, religions, socioeconomic classes, nativities and insured statuses here. Many of our interviewees argued that these challenges actually make Houston an ideal place to innovate new integrated models of care as "we will have to find our own unique way."
- ▶ If Houston can devise a solution to address our diverse population's health care needs and ensure access to care for the uninsured, our efforts could serve as a model for the nation. "Innovation will come from having all these working, uninsured adults—productive members of society whose employers don't want to leave behind to a stream of sick days and all the other drags on employment from poor health."

“If you go to a medical school and residency program, you are 80% likely to stay in the region. The likelihood drops significantly if you only do school or residency. Texas has a lot of medical schools but not enough residency programs. So, 40 percent of students are leaving the state – so we are losing all the assets we are training. And if they leave, they never come back.”

⁵ As of early 2020, state statistics indicate that the number of children enrolled in public health insurance declined by 234,000 over the past two years. Many experts believe that a leading reason for this drop is a immigration proposal that has caused immigrants to fear that enrolling in these programs might jeopardize their family's ability to secure legal permanent status. Dianne Solis and Obed Manuel. "Trump's new public charge rule may already have scared thousands of Texas families off public health insurance," Dallas Morning News. January 2020. <https://www.dallasnews.com/news/immigration/2020/01/28/trumps-new-public-charge-rule-may-have-already-scared-thousands-of-texas-families-off-public-health-insurance/>.

⁶ It is important to note, however, that the majority of people who visit ERs have private insurance. According to the National Hospital Ambulatory Medical Care Survey, uninsured ER visitors (citizen or non-citizen) accounted for only 14.1% of all visits nationally.

I. Profile of the Houston Region's Health Care Sector

In this section of the report, we examine Houston's health care sector from various perspectives.

While there exist many insightful reports on various aspects of the health of residents in the Houston region, on the need to address Houston's health challenges and on the impact of our health care industry on our region's economy, no single report has attempted to create a broad and systemic picture of how we're faring across multiple dimensions of the region's health care system. Our report seeks to provide a picture of our performance on health care both as an important segment of our region's economy as well as on how we're addressing the health needs of Houston area residents.

Beyond examining how we can improve health care and the health of our region's residents, health care is an important sector of the Houston region's economy in terms of creating jobs and generating economic growth. A combination of growing the economic value of our health care sector while improving health care outcomes and reducing costs represents the ultimate objective for our health care sector.

In this chapter, we assess how we are progressing toward these objectives. As we will see, the story of health in the Houston region is a complex, contradictory and multifaceted one.

We begin with an assessment of the economic role of the health care sector, before proceeding to examine health outcomes and cost factors.

Role of Health Care in Houston's Economy

In our work examining the economic impact of a sector, we generally look at measures of employment and economic growth. We examine each of these in turn.

Overall, the data here indicate a mismatch between the employment and economic footprint of the health care industry: While the health care sector is a major employment engine for the region's economy, it has not driven a commensurate level of growth in regional GDP. The indicators also suggest higher-multiplier segments of the health care sector such as life sciences are not growing in tandem with the industry as a whole.

Employment

Health care has been a major driver of job growth for the nation and the Houston region, trends only expected to strengthen in coming decades. According to the federal Bureau of Labor Statistics (BLS), registered nurses, home health aides and medical assistants, medical secretaries, personal care aides, and medical and health services managers all rank in the 30 occupations with highest predicted job growth nationally. BLS forecasts that 17 of the 30 fastest-growing occupations over the next decade are health-related. For example, it anticipates the number of health aides and personal care aides will rise by 36 percent from 2018 to 2028.

There are concerns over whether there will be enough qualified workers to fill these roles, especially given the escalating demands for health care workers nationally and locally.

In this section, we look at the local health care workforce, noting changes over the past decades, what caused them and future ramifications.

Chart A shows the annual growth rate for health care employment by job category from 2008 to 2018. For context, the region's annual growth rate for all jobs from 2008 to 2018 was 3.5 percent, which nine of the fourteen health care occupations exceeded. Grouped

together by major occupation categories, the combined annual growth rates were:

- ▶ **3.9%** Health Care Support Occupations
- ▶ **3.7%** Technologists and Technicians
- ▶ **3.2%** Health Care Practitioners

The fastest-growing occupation groups include medical technicians and support workers. Since these jobs tend to be lower skilled than health practitioner occupations, they are likely more vulnerable to displacement from technology and automation. It is possible that the historically high growth rates in areas such as medical diagnostic technicians—4.7 percent annually—will fall as advanced analytics and AI take hold.

Chart B compares the actual employment figures for health care jobs from 2008 and 2018. During this period, total

employment rose by 41 percent from 196,100 to 275,740. This growth was disproportionately led by two occupations: Of the 80,000 jobs added over the decade, one-fourth were nurses and nearly one-third were health aides and assistants.

Overall, the data show a 47 percent rise in all health care support occupations, a 45 percent increase in health care technicians and technologists and a 38 percent rise in health practitioners.

Of particular note, the number of registered nurses in the Houston region was just over 53,000, a 31 percent increase since 2008. Over the same time, the number of postsecondary nursing teachers decreased by 17 percent. These two data points suggest our regional capacity to train the additional number of nurses we need is diminishing.

Chart: A. Growth in Medical Occupations

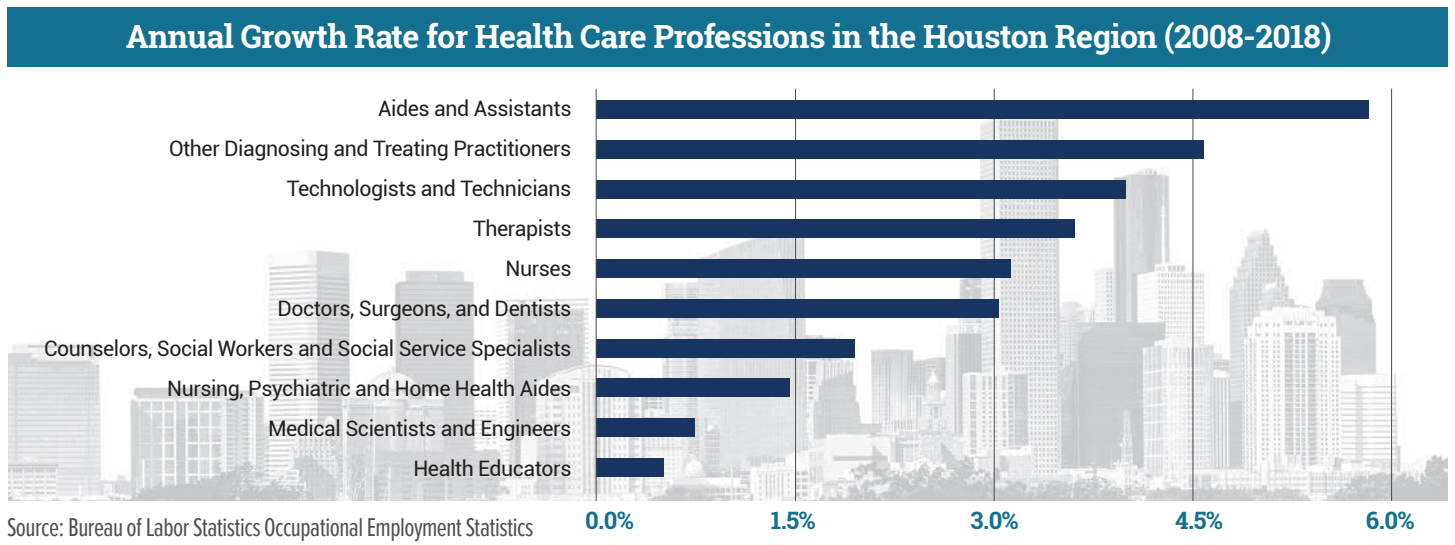
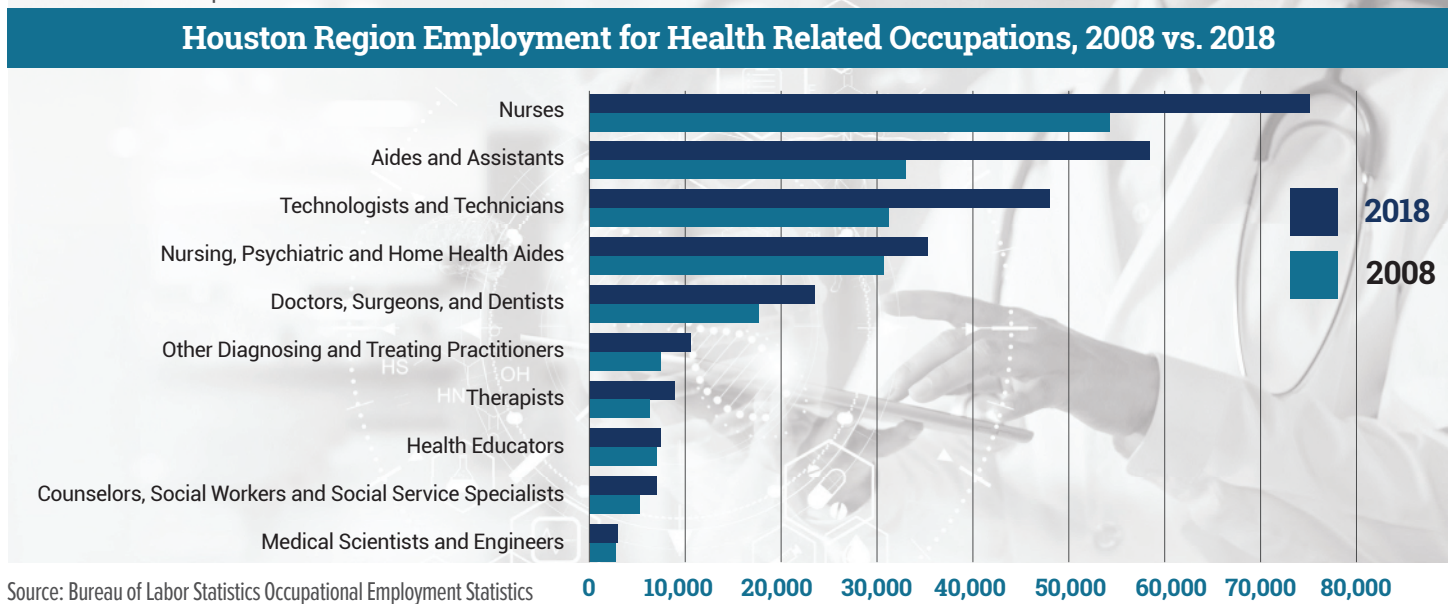


Chart: B. Medical Occupations 2008 vs. 2018



Underlying factors affecting health care employment

Supply/demand gap for specialized physicians/primary care providers/nurses and certain techs

The health care industry is expected to experience workforce shortages in the next decade as overall demand for nurses, physicians and medical technicians grows faster than supply, a pattern that has been starkly exacerbated by the current pandemic. According to the Association of American Medical Colleges, there is a projected total physician shortage of between 46,900 and 121,900 physicians by 2032. The shortage of non-primary care specialties—a significant part of which is accounted for by a shortfall in surgical specialties—is projected to be greater than the shortage of primary care specialties by 2032. According to the Texas Department of State Health Services, the increasing shortage of primary care physicians in Texas will fall across a range of primary care specialties, including family medicine, general internal medicine, obstetrics and gynecology, and psychiatrists. Pediatrics is the only primary care specialty in the state expected to see a surplus by 2030.

Research conducted by the Texas Workforce Commission indicates that there were 3,613 more open positions for registered nurses than workers available to fill them in 2018. Moreover, TWC analysis finds that this gap is widening, with the difference between new job openings for registered nurses and workers able to fill those jobs increasing by 1,254 each year.

A recent paper from the Mercer Project also stresses significant needs for positions requiring far less formal

education than physicians, such as technicians, home health aides and advanced practice providers (e.g. nurse practitioners or physician's assistants).

The drastic increases in demand, especially for primary care physicians, are mainly driven by population growth and aging.

A widening gap in supply and demand for health care workers will affect the entire sector, but hospitals will particularly struggle. According to the Bureau of Labor Statistics, 57 percent of all registered nurses are employed by hospitals. The same figure for physicians and surgeons is 31 percent.

Increased reliance on physician extenders and patient advocates going forward

Facing a lack of available physicians, the health care industry will likely hire for positions such as physician extenders (e.g. nurse practitioners or physician assistants) and patient advocates who can offer many of the same services provided by doctors at cheaper costs.

There are limits, however, to this strategy since under current Texas law, nurses cannot fully practice without oversight from a physician or directly bill for their services.

Another possibility involves developing nurse extender roles by training family caregivers and health educators. Overall, the trend toward decentralizing the role of doctors in the patient experience indicates a health care future where services are increasingly delivered by teams rather than individual physicians.



New technologies and workforce demand

Will technology compensate for a lack of qualified health care workers, and by how much? There was substantial disagreement when the Center posed this question in focus groups and interviews with subject-matter experts.

One common view is that the use of new technologies will have little effect on bridging the gap between supply and demand in the health care workforce. The real issue stems from the lack of a comprehensive pipeline for developing the workforce and inadequate financial incentives. Moreover, we repeatedly heard that expecting AI to replace doctors in interpreting patient information, making decisions and conducting surgical procedures is misguided: “You can’t just equip lower-skilled and lower-educated workers with AI without incurring massive liability issues,” said one person. Members of this camp also posited that the implementation of AI in health care would simply free up doctors and nurses to focus on tending to patients.

On the other hand, many believed new technologies would certainly replace some positions. Individuals in this camp cited telemedicine and new patient self-monitoring tools as examples of technology already making health care provision less labor intensive. They argued that it is very likely AI will displace both most of the lower-skilled jobs in health care (stocking medication, delivering meals, scheduling, etc.) as well as many data-driven specialties like pathology and radiology.

A minority of interviewees even posited that the application of artificial intelligence in health care will reach a point in the next decade and a half when machines are better able to diagnose, treat and perform surgery on patients. They argue doctors will transition to providing “handling, human care and love,” roles that won’t require years of medical school and residency. They believe this transition will eliminate potential or actual shortages in the health care workforce.

Reasons for constrained labor supply

Globally, populations are aging and driving increasing demand for health care services. The World Health Organization projects that by 2030, the shortage of health care workers will exceed 14 million. Like in much of the rest of the world, demand for nurses, doctors and medical technicians in Houston will outstrip our ability to supply those workers over the next few decades.

For example, one HR director from a major hospital emphasized how attracting foreign-born providers has become increasingly essential to meeting her organization's staffing needs. She recounted how she regularly hires individuals in the Philippines six years in advance to meet her organization's demand for nurses.

Burnout from workers needing to adapt to constantly evolving technology and demands for greater efficiency

Health system change leaders will need to articulate a compelling value story for staff and patients from day one—a task that will require them to gain a thorough understanding of a technology's true value and purpose.

Local health care employers report that employee burnout is a growing challenge, made worse as the demands of the pandemic response have exhausted health care workers. Across all occupations, the work of delivering care is increasingly driven by data.

Health care workers must continuously adapt to new technologies deployed to improve the efficiency and quality of care. Any technological revolution in health care can only be achieved with the support of the staff on the ground.

However, skilled professionals often view new technologies with suspicion. Many physicians view electronic health records and pay-for-performance reimbursement (or value-based care) as innovations that compromise the doctor/patient relationship by prioritizing technology and competition. Providers should work with physicians to ensure they don't retire or quit in protest.

Deloitte's 2019 Global Health Care Outlook asserts that increasing work hours and heavier workloads have markedly jeopardized health employees' morale and led to higher burnout rates.⁷ It finds that burnout rates are higher for women and older age groups, who cited (before the pandemic) having too many bureaucratic tasks and working too many hours as main causes.

The trends in the physician workforce are limiting the supply of aptly skilled workers, leading to needs for change in the

roles for practitioners (e.g., expanding nurses' roles to include drug prescriptions) and technologies to aid care delivery.

Generational demographics

An aging workforce and changes in physician working hours/lifestyles are driving the supply-side cause of shortages of appropriately skilled staff. According to the Association of American Medical Colleges (AAMC), more than 2 out of 5 currently active physicians will be 65 or older within the next decade, putting over 40 percent of the current physician workforce at risk for retirement over the next decade. Furthermore, physician burnout and changing lifestyle desires, especially with the entry of the millennial workforce, are also accelerating the reduction of working hours and retirement. AAMC notes that from 2000 to 2016, declines in hours worked were greatest for young male physicians.

These ongoing transformations have led to the occupational tenure among health care workers decreasing. For example, one HR director at a major Houston hospital estimated that while nurses from the baby boomer generation averaged a work tenure somewhere around 25-30 years, today's hires might work in their profession for a decade or less. This may be the same for physicians. Leaders are particularly concerned by this emerging pattern given that they expect a wave of retirements from baby-boomer aged workers in the next five to ten years. It is possible that stresses on the workforce posed by the current pandemic may accelerate this generational shift.

In conversations with subject-matter experts and during focus groups convened by the Center, we repeatedly heard that these generational differences will require the health care industry to make changes such as instituting shorter, more flexible shifts and affording employees more control over their work schedules.

Lack of adequate workforce pipeline

Health care providers are trying to bridge the expected labor supply/demand gap by developing career pipelines. Increasingly, providers are starting to recruit in high schools, and encouraging students to pursue health care careers. Employers are also developing innovative public-private partnerships with postsecondary schools, where curricula and education are supported and informed by employers. HR experts say partnering with educational institutions is a key strategy for hiring qualified workers and boosting retention rates. Our conversations with medical educators identified a possible obstacle to the pipeline flow: Many postsecondary schools cannot hire and keep enough qualified educators to train individuals at the college level. The educators said they cannot compete with private-sector salaries.

⁷ Deloitte. "2019 Global Health Care Outlook: Shaping the Future." 2019. <https://documents.deloitte.com/insights/2019globalhealthcareoutlook>.

Health Care's Regional Economic Output

We can evaluate health care's contribution to the regional economy by looking not just at employment but also at the total economic output generated annually by the sector.

The value of goods and services produced by the region's "health care and social assistance" sector was \$24.4 billion in 2017, according to the U.S. Bureau of Labor Statistics. The Houston metropolitan area GDP exceeded \$448 billion for 2017, meaning the health care sector accounts for just over 5 percent of regional economic output.

Given that the sector employs more than 600,000 workers, or about 11 percent of all jobs in the region, the data suggests health care does not generate economic growth proportional to the level of employment it sustains.

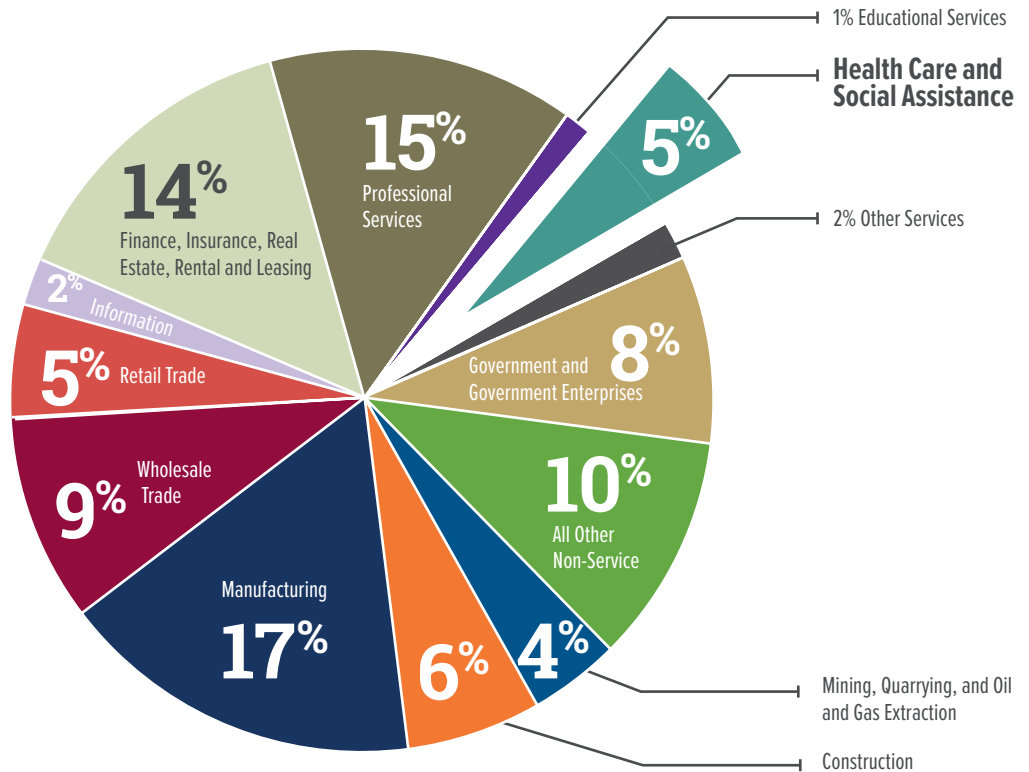
That's because the health care sector is largely a service industry rather than a goods-exporting sector (the latter generally features a higher worker to economic output ratio). It is important to note, however, that this is a generality and there are many exceptions to the rule, including medical device manufacturing and life science innovation.

⁸ Under the industry classification system used to categorize BEA data, much of the economic output produced by Houston's oil and gas sector is included not just in the mining category but also in trade and manufacturing.

Chart: C. Health Care Share of Regional GDP

2017 Houston GDP by Industry

Source: Bureau of Economic Analysis⁸



Using the industry GDP per worker ratio as a measure of labor productivity, we can look at productivity gains for the local health care sector over time. Pictured in Chart E is each Houston industry's rate of growth for output per worker from 2006 to 2018.

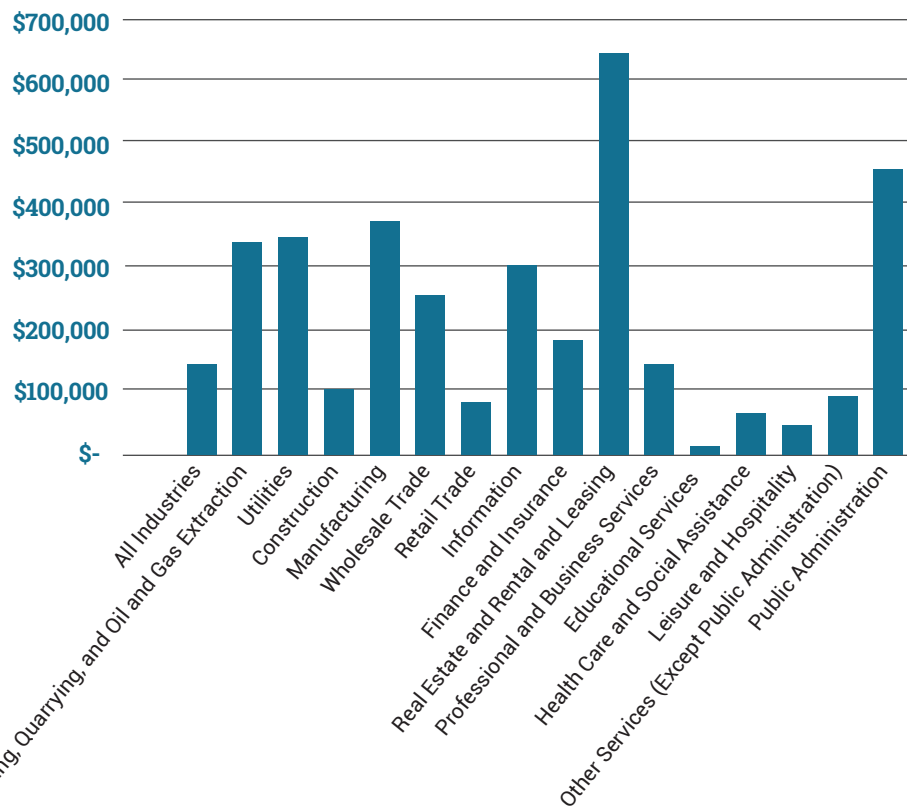
The overall rate of worker productivity growth across Houston's industries was 0.2 percent a year. However, there is great variation across industries. For example, the Information sector grew 5 percent more efficient each year while manufacturing experienced annual declines in worker productivity of -0.7 percent.

Health care, on the other hand, falls in the middle of the spectrum, with the productivity of the health care workforce rising just 0.3 percent a year. Traditionally, the primary means through which companies improve workforce productivity are upgrading machinery, beefing up worker training and implementing new technologies. The data here suggest Houston's health care sector has lagged behind peer industries like energy, professional services and IT in such steps.



Chart: D. Industry Productivity Comparison

GDP/EMPLOYMENT



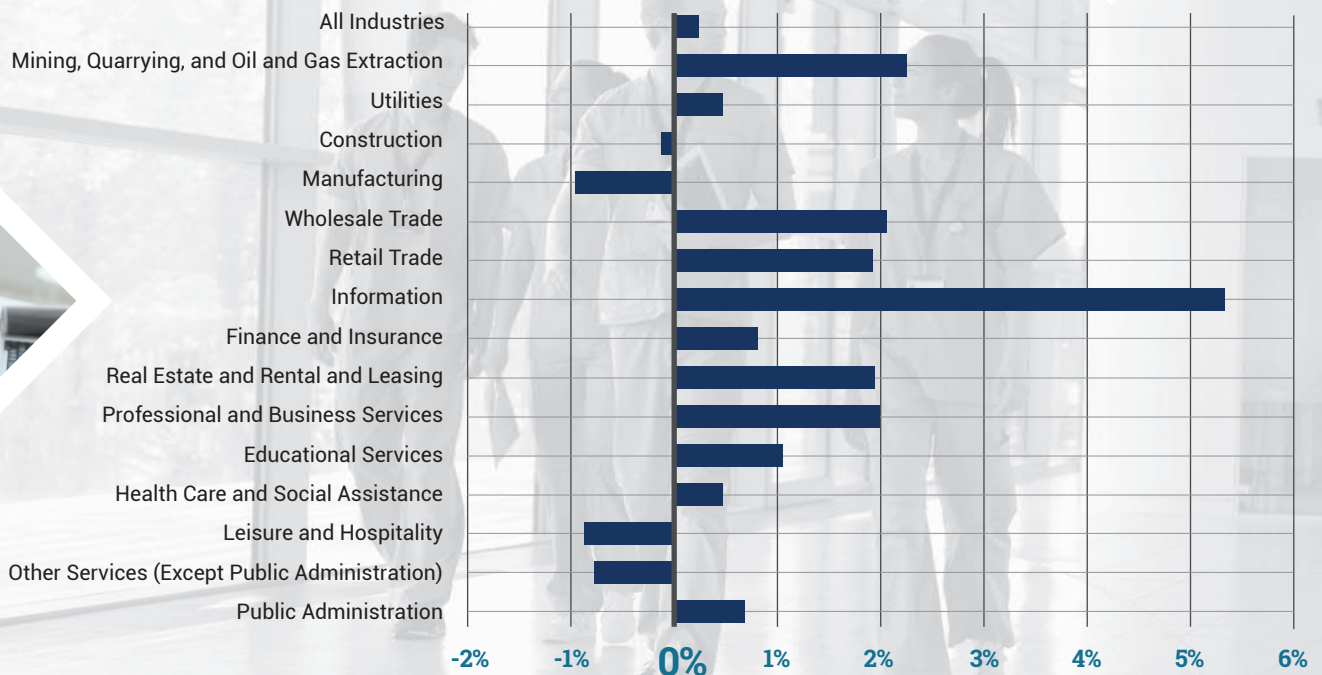
The graph shows the value of economic output each worker produces by industrial sector. The values displayed are the ratio of each industry's GDP and employment. In 2017, the economic output associated with the mean health care worker was \$63,164, weighing in 58% lower than the average across all sectors of \$150,140.

Source: Bureau of Economic Analysis and Texas Workforce Commission



Chart: E. Productivity Compound Annual Growth Rates

Annual Growth in Worker Productivity by Industry (2006-2018)



Source: Bureau of Economic Analysis and Texas Workforce Commission



Innovation in the Life Sciences

The life sciences represent a trillion-dollar plus global industry, spanning pharmaceutical development, medical device manufacturing, research and commercialization of biotechnology and more. In the United States, the industry has clustered on the East and West Coasts.⁹

But many cities across the nation have prioritized cultivating life sciences in their economic development strategies, given the high-skilled employment and lucrative benefits associated with the industry.

Greater Houston has the potential to become the so-called Third Coast if we continue to build momentum that's starting to take hold. In this section, we highlight where we are, discuss potential obstacles and detail a series of positive developments, including: innovation in the Texas Medical Center, significant contributions from the state's Cancer Prevention and Research Institute and work on The Ion.

In a 2019 report by commercial real estate company CBRE on life science clusters, Houston didn't rank in the nation's leading 10 markets, but promisingly did rank second—behind Seattle—on a list of top-ten fastest growing life sciences markets. Here are several other indicators that offer a sense of our recent status:

Medical Research

Life sciences innovations can be tied to advances made in medical research institutions. As such, measuring the concentration of these institutions can indicate a competitive advantage of a region's life sciences industry.



Table: F. CBRE Ranking of Top Markets for Medical Research and Health Services

HOSPITALS AS RANKED BY U.S. NEWS AND WORLD REPORTS				
MARKET	RANK	# RANKED IN TOP 25	# RANKED IN TOP 100	NIH FUNDING TO RANKED INSTITUTIONS (MILLIONS)
Boston-Cambridge	1	5	5	\$1,189
Los Angeles	2	5	5	\$802
New York City	3	1	4	\$1,391
Philadelphia	4	1	4	\$791
San Francisco Bay Area	5	2	3	\$1,214
Cleveland	6	1	4	\$295
St. Louis	7	2	2	\$484
San Diego	8	1	4	\$652
Pittsburgh	9	1	2	\$575
Raleigh-Durham	10	0	2	\$898
Seattle	11	1	2	\$797
Houston	12	0	4	\$509
Minneapolis	13	0	3	\$269
Chicago	14	1	2	\$396
Washington, D.C.-Baltimore	15	1	1	\$663
Columbus	16	1	2	\$169
Phoenix	17	0	3	\$ -
New Jersey	18	0	2	\$ -
Dallas/Ft. Worth	19	0	3	\$181
Orange County	20	0	0	\$ -



In CBRE's assessment of the top ranked markets for medical research and health services, Houston ranks 12th in the country. While our premier medical research institutions pull down over half a billion dollars in federal grant funding every year, the amount puts us closer to areas like Pittsburgh and St. Louis rather than Boston or West Coast cities.

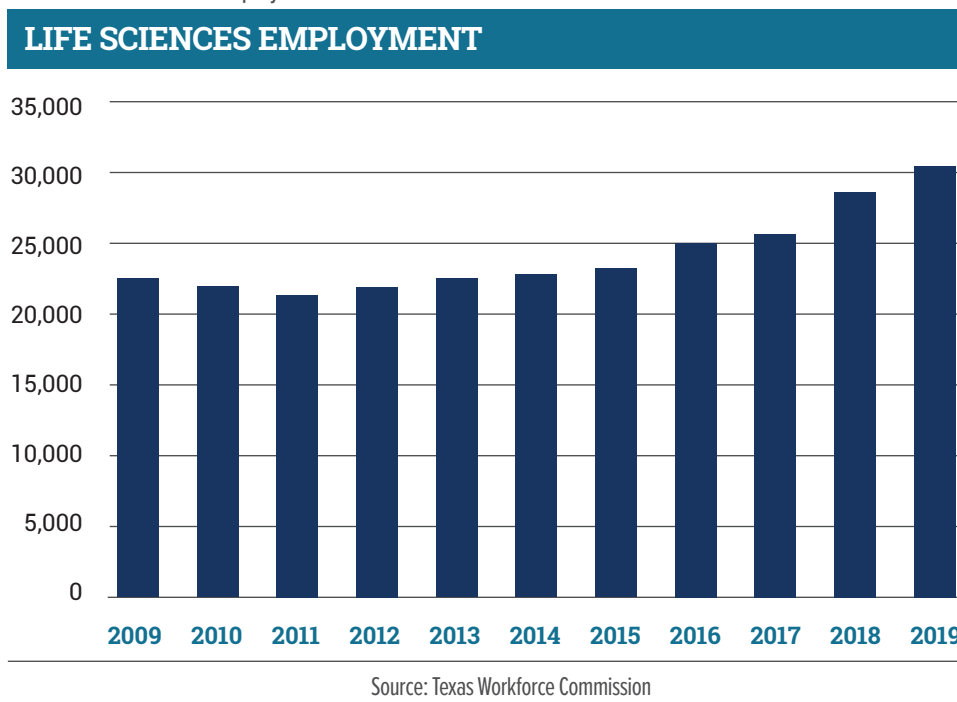
Source: CBRE

Life Sciences Employment

As Chart G shows, regional employment in life sciences rose steadily over the past decade, climbing nearly 37 percent from 2009 to 2019. More importantly, the data show employment growth has accelerated in the past year, suggesting Houston is moving in the right direction in developing the required workforce.

While Greater Houston's life sciences employment grew at an annual rate of 3.2 percent from 2009 to 2019, the growth rate for the past five years—2012 to 2019—reached 4.7 percent.

Chart: G. Life Sciences Employment



⁹ "PitchBook-NCVA Venture Monitor." April 8, 2019. https://pitchbook.com/news/reports/1q-2019-pitchbook-nvca-venture-monitor?utm_medium=nl-na&utm_source=reports&utm_campaign=1q-2019-pitchbook-nvca-venture-monitor.



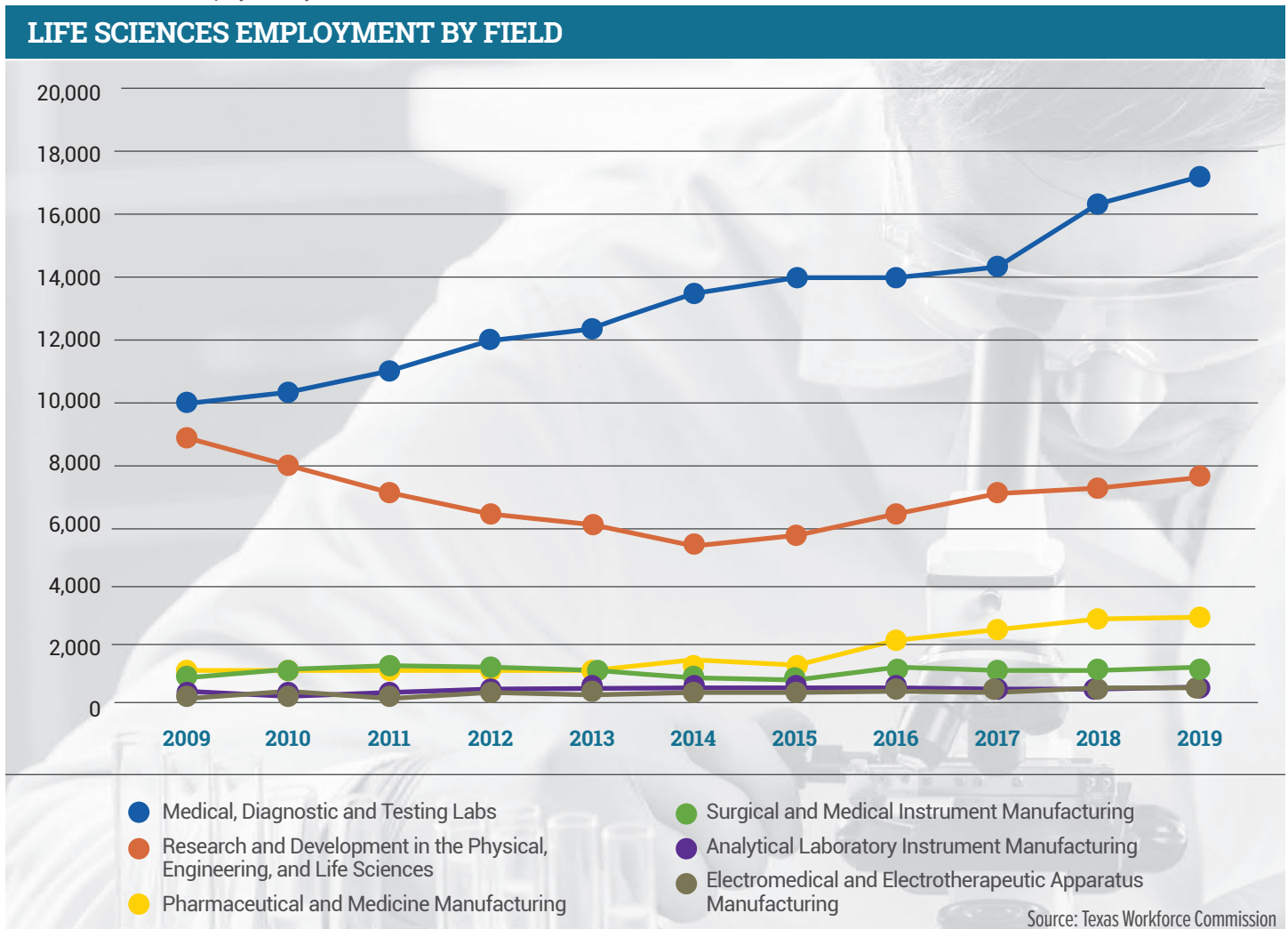
Chart H breaks out life sciences employment in Greater Houston by specialty. Over 90 percent of the region’s life sciences employment is in medical, diagnostic and testing labs; research and development; and pharmaceutical manufacturing.

Employment in medical, diagnostic and testing labs has largely driven the increase in the sector over the past decade—9 in every 10 jobs added in the life sciences from 2009 to 2019 were in this field.

While employment in research and development rose 41 percent from 2014 to 2019, the number of people working in R&D declined slightly over the past decade: 8,677 Houston employees worked at research and development firms in 2009, the figure fell to 7,513 as of 2019.

Lastly, pharmaceutical manufacturing has emerged as another source of employment growth in the life sciences over the past few years—growing by 14 percent annually from 2012 to 2019. Employment doubled between 2015 and 2016 and has continued to rise precipitously, a positive development for the region’s life sciences cluster.

Chart: H. Life Sciences Employment by Field



Participants in interviews and focus groups identified several hurdles the region faces in cultivating our still-nascent life sciences industry.

First, they noted Houston is still energy-dominant, with investment in health care primarily targeted at services and buildings. Developing life sciences will require financial investment and figuring out how to attract venture capital from areas like Boston and Silicon Valley. Second, many highlighted the difficulty of retaining life science talent, businesses and intellectual property in the region, noting some companies in the field relocate from Texas as soon as they begin growing.

On the positive side, recent developments in our area aim to start dealing with the above challenges. Interlocking and positively reinforcing efforts are happening on a variety of fronts as follows.

Texas Medical Center

Houston's Texas Medical Center (TMC) is the largest medical complex in the world, employing more than 110,000 people with more than 10 million patient visits every year. TMC is working to position Houston as a global leader in health research and life sciences.

In 2018, TMC announced plans for TMC3, a collaborative effort of the Medical Center, Baylor College of Medicine, Texas A&M University Health Science Center, University of Texas Health Science Center at Houston and University of Texas MD Anderson Cancer Center to build a life sciences research campus.

The project will create physical spaces to bridge TMC's existing clinical and research campuses. The aim is to accelerate research discoveries and commercialization of biotechnology and bioscience innovations by fostering collaboration between TMC's research experts and the private sector. TMC3 is expected to open in 2022.

TMC's Innovation Institute has also developed business incubators, fellowships and partnerships with private companies to help facilitate commercialization of technological innovations in health care and the life sciences.

For example, TMCx provides startups with shared workspace, professional development programs on health care entrepreneurship and a comprehensive mentorship initiative. Other innovation incubators located on the TMC campus include JLABS, a partnership with Johnson & Johnson, and

the AT&T Foundry, a collaboration with AT&T.

Accelerators and incubators provide essential support for emerging businesses in the life sciences. An analysis published last year by Pitchbook looked at life science startups that had raised at least \$4 million and found that nearly one in four benefited from involvement with an accelerator or incubator.¹⁰

As of spring 2020, the 260+ companies that have participated in TMC's innovation programs have raised just shy of \$1 billion in total funding.

In February 2020, Texas A&M announced it would build a half-billion-dollar complex in the TMC area for its Engineering Medicine (EnMed) program as well as housing for medical and nursing students. EnMed is a two-degree program that allows students to earn a master's in engineering and a medical doctor's degree from A&M.

As part of the program, students must invent new devices or processes before graduating.

"I expect to see transformative ideas generated by Texas A&M's broadened presence in Houston," said Dr. M. Katherine Banks, vice chancellor of engineering and national laboratories at the Texas A&M System and dean of Texas A&M's College of Engineering.

Bob Harvey, president and CEO of the Greater Houston Partnership, said in a statement at the time: *"Texas A&M's EnMed program fits right into what we are doing in Houston. Our city has long been recognized as a destination for world-class health care and cutting-edge research, thanks to the incredible institutions in the Texas Medical Center. Houston is also becoming known as an attractive location for both mature and emerging life science and biotech companies. We are, indeed, becoming the 'Third Coast' for life sciences."*

Beyond life sciences, TMC is also home to health care innovation in general. For example, Houston Methodist this year opened its Technology Hub as a *"complete environment"* for clinical and medical staff and patients to experience and evaluate innovations including those in the digital health field.

¹⁰ "PitchBook-NCVA Venture Monitor." April 8, 2019. https://pitchbook.com/news/reports/1q-2019-pitchbook-nvca-venture-monitor?utm_medium=nl-na&utm_source=reports&utm_campaign=1q-2019-pitchbook-nvca-venture-monitor

Cancer Prevention & Research Institute of Texas

The Cancer Prevention & Research Institute of Texas, known as CPRIT, is providing a needed boost to the life sciences capabilities of Texas and Greater Houston.

CPRIT was created in 2007 after voters approved spending \$3 billion on the fight against cancer. In November 2019, voters approved an additional \$3 billion for cancer research and prevention. By February 2020, CPRIT had:

- ▶ Awarded more than \$2.5 billion in grants to Texas research institutions and organizations for academic research, prevention and product development research.
- ▶ Recruited 200 researchers, supported the establishment, expansion or relocation of 40 companies to Texas, and generated over \$4.5 billion in additional public and private investment.
- ▶ Provided 6.2 million life-saving cancer prevention and early detection services reaching Texans from all 254 counties.

CPRIT's efforts to attract scientists to Texas universities and cancer research institutes are aimed at advancing cancer research efforts and promoting economic development.

Houston, given its strong connection to cancer research and treatment, has received a significant share of CPRIT funding. As of February 2020, MD Anderson Cancer Center alone had received \$465 million in CPRIT grants. MD Anderson, of course, isn't the only local institution to receive funding. For example:

- ▶ In September 2019, the Texas Medical Center itself was awarded \$5 million to develop an accelerator specifically designed for individuals or early-stage startups focused on developing novel cancer therapeutics.
- ▶ In August 2018, University of Texas Health Science Center at Houston was awarded \$4.4 million to establish the UTHealth Cancer Genomics Core—to provide state-of-the-art sequencing facilities and bioinformatics service and training.
- ▶ In another example, a researcher was recruited to Rice University from University of Florida as part of a \$5 million grant.

CPRIT has provided funding for 40 companies totaling \$440 million, with 20 of them based in Houston. To receive that funding, companies must bring matching funds to the table.

Given that those non-CPRIT investments may come from outside Houston, investors may seek to move companies—once they become mature—outside of the state and replace local management teams with non-Texan CEOs.

But continued development of a life sciences infrastructure, along with a broader innovation ecosystem, could help both attract and retain companies, workers and capital.

The Ion

Work is underway to develop a 16-acre innovation corridor with work, live and play spaces and infrastructure in Houston's Midtown area. The Ion, now under construction, is the first phase and centerpiece. The historic Sears building on Main Street is being transformed into a space to bring entrepreneurial, corporate and academic interests together in collaborative spaces. The Rice University-backed project will also include restaurant and entertainment amenities.

Gayle Farris, a regional partner focused on life sciences at real estate development and management firm Transwestern is working on projects in the TMC area. She previously handled life sciences real estate development in markets such as Boston and Philadelphia. She stressed the importance of a variety of factors coming together for success: a built environment with spaces for work and play, including amenities that attract talent. An overall emphasis on technology and innovation—not just in life sciences—is also key.

Houston is in the process of laying the right foundation, she said, pointing to everything from the innovation corridor to CPRIT, which she called tremendously important. Success does not happen overnight. Boston took 25 years to mature into a life sciences hub, she said, adding that Houston is around Year 7. What's happening in TMC is important as it will allow medical institutions, universities and pharma companies to collaborate, breaking free of silos that have impeded progress.

More venture capital, more mass transit and additional focus on education are needed. The region's oil-and-gas-focused engineering expertise and talent pool should branch out to technology, health care and life sciences. We must encourage young people to work in these fields. Farris noted that some markets offer free community college toward those ends.

Given progress to date, Farris and others believe that with continued focus Houston could indeed develop into the nation's Third Coast for life sciences.

Achieving the Triple Aim:

Better Health Care Outcomes, Improving the Health of our Community and Lowering the Cost of Health Care

According to the Triple Aim framework developed by the Institute for Healthcare Improvement, a robust health care system is one that delivers optimal health outcomes while simultaneously controlling costs. In this section, we examine several indicators related to the cost of providing and consuming health care. We then turn our attention to looking beyond our system of providing health care to consider how we're doing on keeping our community healthy. We conclude that while the region has made considerable progress over the past decade in terms of improving access to health care and health outcomes, much more work is needed to bring us in line with our peers. In addition, the rising cost of health care continues to outpace growth in income for both individuals and employers.

Measures of the Efficiency, Cost and Quality in our Health Care System

The picture of how the Houston community is doing on improving the efficiency and cost-effectiveness of our health care system is a mixed one: While we're better at delivering preventative care and avoiding unnecessary hospitalizations, the number of emergency room visits continues to increase significantly, suggesting Houston's health care system is falling behind in terms of routing patients to affordable settings for health care. In addition, growth in health care spending among the region's households continues to outpace residents' income gains.

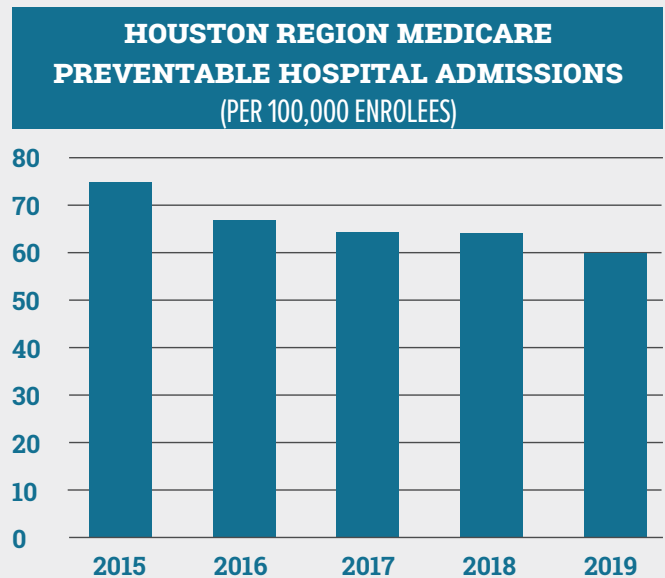
Many patients end up going to hospitals for problems that could have been avoided if symptoms were addressed earlier in outpatient primary care. For example, a person with hypertension can mitigate their risk for stroke by managing their blood pressure.

Preventable hospital admissions are a measure of patient hospital visits for conditions that could have potentially been prevented by outpatient primary care. This serves as a proxy for how well the system delivers preventative health care, improving outcomes at cheaper costs.

Chart I displays the rate of preventable hospital admissions per thousand Medicare beneficiaries in the Houston region. From 2015 to 2019, the rate of preventable hospital admissions for Medicare recipients notably improved,



CHART: I. PREVENTABLE HOSPITAL ADMISSIONS



Source: Medicare Public Use File

declining by 19 percent. Since Medicare accounts for 20 percent of all health care spending, this suggests the region has made significant progress in ensuring people are treated in more affordable out-patient settings when appropriate.

It is important to note that while Medicare claims data is widely considered the best source of information on U.S. health care spending, there are shortcomings in applying this information to the entire population.

Medicare beneficiaries are by definition an older and insured population, the opposite of what distinguishes the Houston region's population when it comes to health care challenges. Moreover, several studies have demonstrated that Medicare and private spending are not necessarily related since private insurance spending is largely driven by health care provider prices rather than the volume of services provided (as is the case with Medicare).¹¹

¹¹ The Commonwealth Fund. "The Limits of Using Medicare Data to Evaluate U.S. Health Care Spending." December 2015. <https://www.commonwealthfund.org/blog/2015/limits-using-medicare-data-evaluate-us-health-care-spending>.

Hospital readmissions are defined as when a patient returns to a hospital within 30 days after being discharged from an earlier hospital stay. Readmissions are among the costliest cases to treat, and since 2012, hospitals are penalized by programs like Medicare for having higher-than-normal readmission rates. For our purposes, this measure can gauge ineffective care transition from hospitalization and inadequate care coordination. Several studies in the past couple of years have calculated the annual cost of unplanned hospital readmissions nationally to be 15 to 20 billion dollars every year. Reducing hospital readmissions can significantly improve the financial health of a health care system.¹³

The number of acute hospital readmissions among the local Medicare population is pictured in Chart J. The Houston region has made substantial progress in this area over the past decade with hospital readmissions significantly declining. Even as the number of Medicare beneficiaries grew, readmissions dropped from 23,235 in 2007 to 20,182 in 2017—an overall 13 percent decrease over the ten-year period.

While hospital admissions may be on the decline throughout the region, emergency room visits have dramatically escalated over the past decade. The rate of emergency room visits for every thousand Medicare beneficiaries is pictured in Chart K. The use of the Emergency Room grew from 553 visits per thousand beneficiaries in 2007 to 653 per thousand in 2017—an 18 percent increase over the decade.

It is universally acknowledged that visiting an emergency room is the most expensive means of receiving health care. The national average cost of an emergency room visit in 2017 was \$1,389, according to the Health Care Cost Institute.

Chart: J. Acute Hospital Readmissions

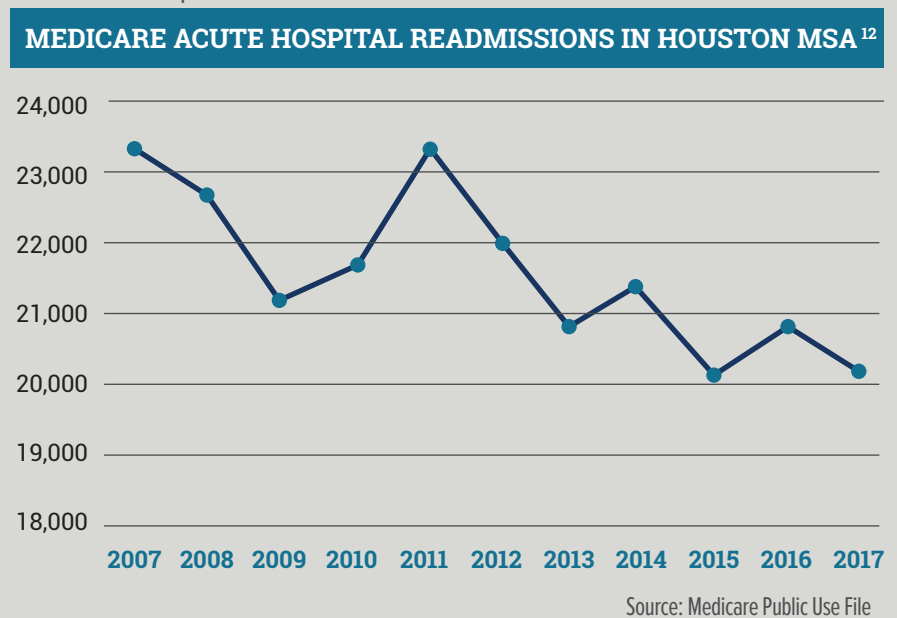
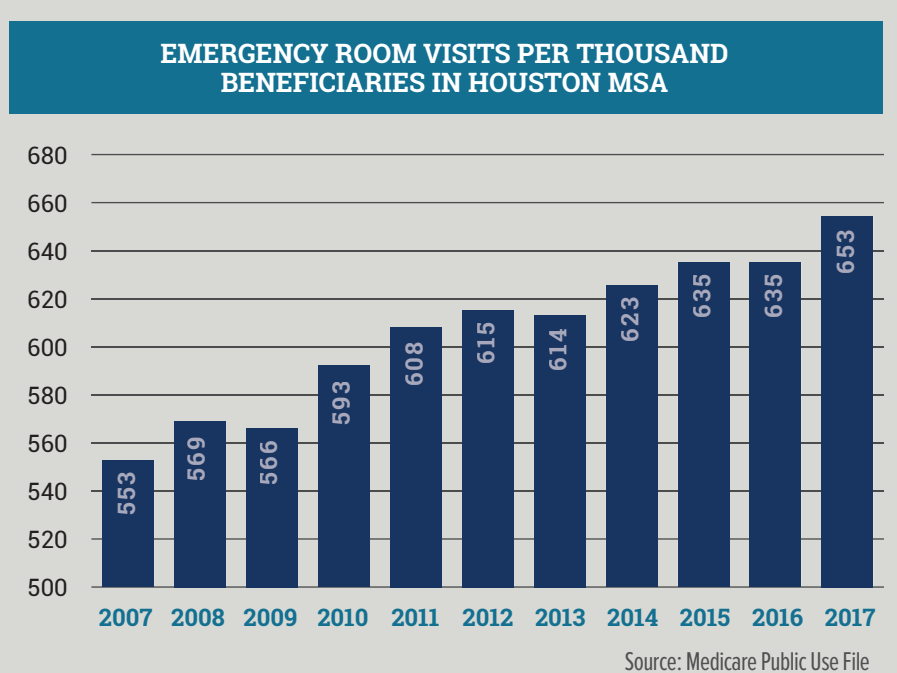


Chart: K. ER Visits



Houston is not unique in this respect: Multiple recently published studies have found that emergency department visits rose nationally despite more Americans gaining health insurance coverage under the Affordable Care Act.¹⁴

It is unclear what is behind this significant increase in the use of emergency rooms. One predominant theory shared by some health experts

is that individuals go to the ER because of financial hurdles beyond lack of insurance coverage. Another possible cause for this dynamic might be that newly covered individuals are more likely to use the ER in the short term as the cost becomes less prohibitive. On the whole, it is evident Houston's health care system is falling behind in terms of routing patients to more affordable settings for health care.

Chart: L. Medicare Costs

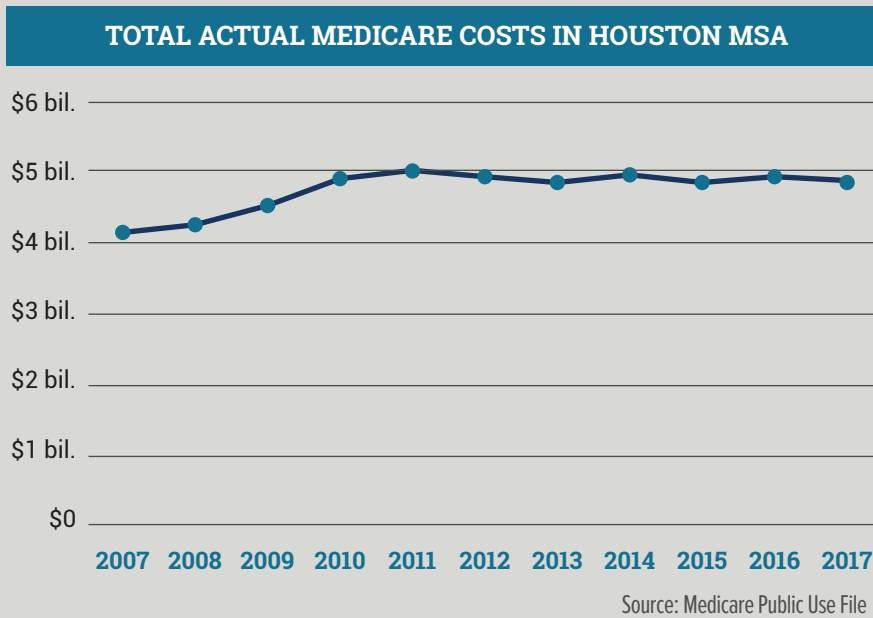
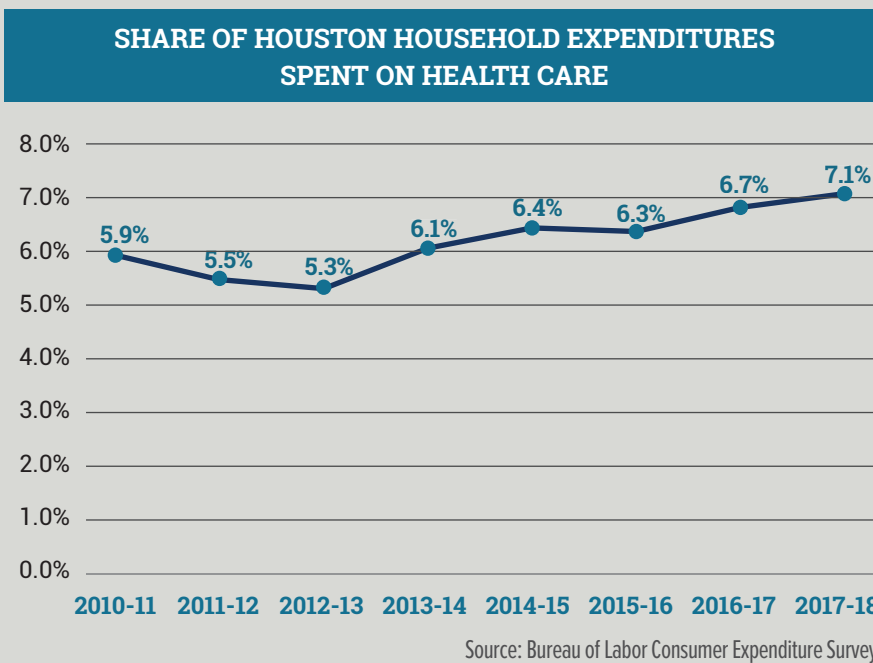


Chart: M. Consumer Spending on Health Care



Charts L and M show health care spending in the region over time.

Pictured in Chart L are the total Medicare costs for the Houston region from 2007 to 2017. Over the ten years, Medicare spending rose by only 19 percent or 1.7 percent annually (1.97 percent annually per capita). Notably, Medicare spending has remained relatively flat in the past five years of

available data; fewer Medicare dollars were spent in 2017 than in 2012.

This is likely because Medicare costs are largely a function of enrollment in the program and the health profile of the beneficiary population. The data suggest that any increases in Medicare enrollment over the past decade have been offset by cost savings within the program.

We can also examine consumer spending data for insight on overall health spending in the region, given that Medicare data do not represent the entire patient population. Chart M shows the percentage of household spending in the region on health care from 2011 to 2018.

This shows that consumers saw health care spending rising faster than income. Over the seven-year period, spending on health care grew by an average of 6.2 percent annually, with mean household health care spending rising from \$3,157 in 2011 to \$4,909 by 2018. However, the portion of household spending on health care only grew from 5.9 percent to 7.1 percent during this period because of the sizable gains in income the region's households secured during this period.

These figures are in line with national trends. From 2011 to 2018, consumer health care spending grew at an annual rate of 5.8 percent, with the share of total household expenses increasing from 6.6 percent to 8 percent.

Ultimately, the data suggest that growth in health care costs continue to exceed growth in other types of consumer spending as well as individuals' incomes.

¹² The Centers for Medicare and Medicaid defines an acute hospital as one that provides inpatient medical care and other related services for surgery, acute medical conditions or injuries (usually for a short-term illness or condition).

¹³ Eric Alper, Terrence O'Malley and Jeffrey Greenwald, "Hospital discharge and readmission." July 2020. <https://www.uptodate.com/contents/hospital-discharge-and-readmission>.

¹⁴ Adam Singer, Henry Thode and Jesse Pines "US Emergency Department Visits and Hospital Discharges Among Uninsured Patients Before and After Implementation of the Affordable Care Act." JAMA Netw Open. April 2019. <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2730788>.

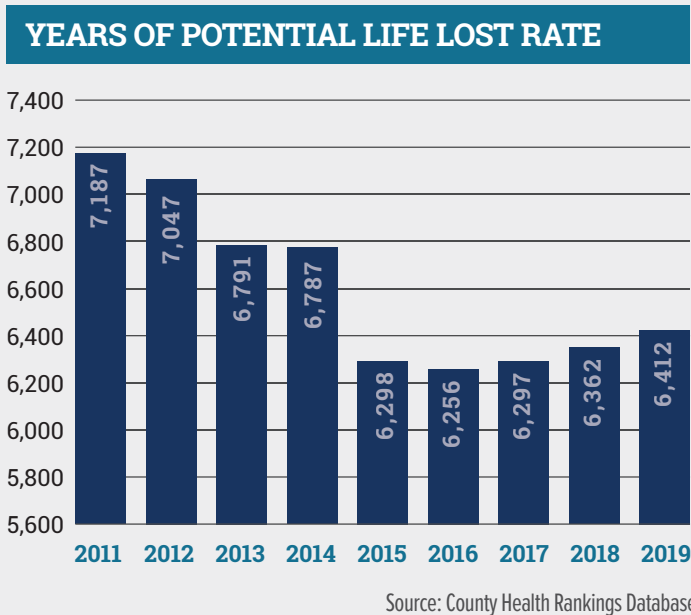
Health Outcomes

To get a sense of the health of the region’s residents, we look at several indicators that, on the whole, suggest the Houston region is making gains in terms of improving population health. However, major health disparities persist across the region in terms of geography and population demographics.

Years of potential life lost (YPLL) estimates the average number of years someone would have lived if they had not died prematurely. A woman who dies at age 45 instead of 75 because her blood pressure was not properly treated and managed is an example of a premature death. The statistic is one way to gauge overall progress improving health outcomes. For example, assuming an average lifespan of 75 years, the death of a 40-year-old (35 years lost prematurely) would be weighted three and a half times more than the death of a 65-year-old (10 years lost prematurely).

Chart N displays how the YPLL in our region changed from 2011 to 2019. The bars represent the rate of years of potential lost (among people less than 75 years old) for every 100,000 people in our region.

Chart: N. Years of Potential Life Lost

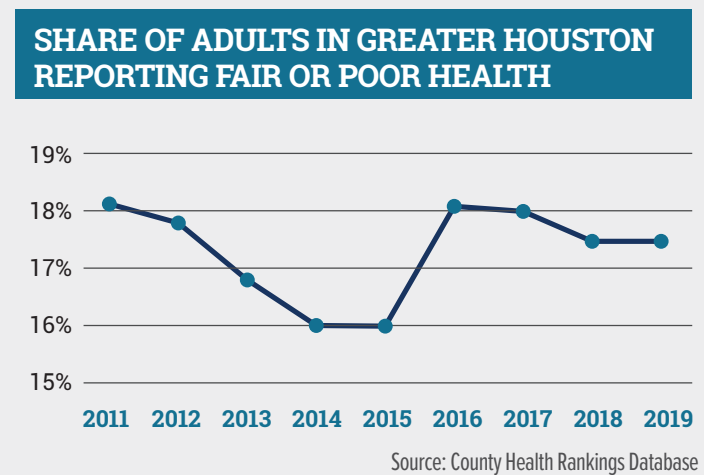


The region has made substantial gains in limiting premature deaths compared to where we were eight years ago. Over this period, the years of life lost prematurely in Greater Houston declined nearly 11 percent, from 7,187 YPLL per

100,000 people to 6,412 YPLL per 100,000. Thus, the region was able to substantially decrease the frequency of premature death from 2011 to 2019 even as Greater Houston’s population grew by about 1 million people.

The data indicate that the bulk of improvement in this area, however, took place at the beginning of the last decade. While the Houston region’s YPLL rate dropped 12 percent in the five-year period beginning in 2011, progress on this front has largely stalled and may actually be getting worse since 2015. While the YPLL rate in Greater Houston as of 2019 is still significantly lower than nearly a decade ago, the years of potential life lost in our region has actually increased slightly since 2015 (a two percent rise over five years).

Chart: O. Health Status Reporting



Improvements in the overall health of the region’s population can be seen not just from analyzing medical data but also in our residents’ perceptions of their own health. Chart O represents the percent of adults in the Houston region who self-reported fair or poor health.

From 2011 to 2019, those adults saying they were in fair or poor health declined by one percentage point, from 18.1 percent to 17.2 percent. Similar to the YPLL data presented earlier, progress on this indicator primarily took place in the first half of the decade, with much of those gains reversed between 2015 to 2017. It is important to note that one in every six adults in the Houston area consider themselves to be in good health.

Social Determinants of Health

Addressing so-called social determinants of health is gaining importance as communities—including Houston—look for ways to address health disparities and to shift from focusing on health care to health. Many factors affect the health of people and communities. Circumstance and environment affect health.

Where we live, our environment, genetics, income, education level and relationships with friends and family all considerably

affect health. Those are in addition to the more commonly cited factors of access and use of health care services.

Social determinants of health include socioeconomic factors as well as aspects of the physical environment.

These determinants—or things that make people healthy or not—include:

What is needed to bring Houston to the U.S. average?



210,000
fewer obese people



371,000 people
doing more physical activity



20,000 fewer obese
high school students



1,200
more primary care providers



245,000
more annual check ups



91,000
fewer diabetics



100
fewer infant mortalities



1,400 fewer instances of
severe maternal morbidity



91,000 fewer people
with mental health illness



8,800
more mental health providers

INCOME AND SOCIAL STATUS:

Higher income and social status are linked to better health. The greater the gap between the richest and poorest people, the greater the differences in health.

SOCIAL SUPPORT NETWORKS:

Greater support from families, friends and communities is linked to better health.

CULTURE: Customs and traditions, and the beliefs of the family and community all affect health.

GENDER: Men and women suffer from different types of diseases at different ages.

PERSONAL BEHAVIOR AND COPING SKILLS:

Balanced eating, keeping active, smoking, drinking, and how we deal with life's stresses and challenges all affect health.

PHYSICAL ENVIRONMENT:

Safe water and clean air, healthy workplaces, safe houses, communities and roads all contribute to good health.

EMPLOYMENT AND WORKING CONDITIONS:

People with jobs are healthier, particularly those who have more control over their working conditions.

EDUCATION: Low education levels are linked with poor health, more stress and lower self-confidence.

GENETICS: Inheritance plays a part in determining lifespan, healthiness and the likelihood of developing certain illnesses.

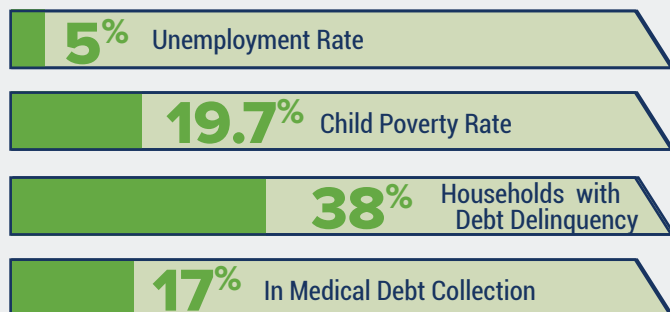
HEALTH SERVICES: Access and use of services that prevent and treat disease influences health.

For example, poor health is correlated with poverty, which adversely affects health by increasing everyday stress and the difficulties of meeting basic needs. Poverty, in many instances, requires trade-offs between adequate food and shelter, and access to needed medical treatment, prescription medicines or preventive care.

SOCIAL DETERMINANTS OF HEALTH DASHBOARD

Chart: P. Social Determinants of Health Dashboard

ECONOMIC STABILITY*



*Please note that data presented here does not account for the impact of Covid-19

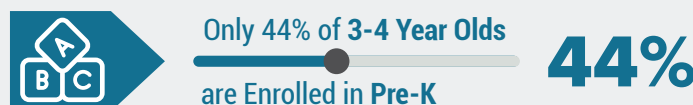
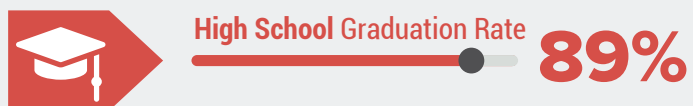
FOOD QUALITY



NEIGHBORHOOD & PHYSICAL ENVIRONMENT



EDUCATION



On this page we have assembled a high-level snapshot of some of the key indicators factoring into the region's social determinants of health. Our profile does not dive into extensive detail on these indicators, however, given the vast array of measures available to assess social determinants of health. A selection of some of the extensive, high-quality research already conducted by organizations like Rice University's Kinder Institute for Urban Research and the Episcopal Health Foundation is available for further reading.

Rather, we highlight several indicators related to our regional population's ability to access health care, which is predominantly determined by a person's insured status.

Source: American Community Survey and County Health Rankings. Indicators in the snapshot cover different windows in time during 2017 to 2019.

Critical Issues in Houston's Mental Health Care Landscape:

The mental health landscape of Greater Houston is representative of that of Texas' as a whole. Current estimates report that there are 1.38 million Texan children and adults with a mental health condition and 1.9 million with a substance abuse condition.¹⁵ Furthermore, because of the large population size of the region, the Houston area leads the state with the greatest number of residents needing mental health services. Some of the most critical issues facing local and state mental health care today relate to insufficient access to care, inadequate continuity of care, and lack of coordination across institutions.

One driver of insufficient access to care is that, much like the physical health care system, the mental health care model is reactive rather than preventative. Dating as far back as the 1850s, state-run hospitals delivered mental health services.¹⁶ Since state-run hospitals cannot provide services at scale, the prevailing mental health care model heavily relies on the correctional system, emergency rooms, juvenile justice, foster care, and child welfare systems to provide care. This reactionary system is costly. In the fiscal year 2016-2017, Texas spent \$1.4 billion in emergency room costs, \$450 million in criminal justice costs, and \$230 million in juvenile justice system costs to provide mental health care to people with severe needs.¹⁷

Two factors perpetuate this reactionary response—a lack of early access to care (i.e., providing care before people have run-ins with these institutions), and a lack of continuity of care (i.e., the continuation of treatment after they leave these institutions).¹⁸ Several innovative efforts are addressing the lack of early access to care by expanding the traditional mental health care delivery model. An integrated health model, in which a patient gets time with a mental health professional as part of their routine primary care visit, is one such innovative effort. Another is the establishment of mental health services in places frequented by children and their families, such as schools and daycares, since 50 percent of mental illnesses requiring lifelong care present before the age of 14.¹⁹

Telemedicine is another promising platform to increase access to care and is especially useful to combat another critical issue facing the mental health industry today—a workforce shortage. In 2019, over 96 percent of the 254 counties in Texas were designated as county-wide mental health professional shortage areas (MHPSAs)²⁰, and seven of the nine counties in the greater Houston region are MHPSAs also.²¹ Not only is there a shortage of mental health professionals causing long waitlists or requiring the patient to travel far distances to see a provider, but the existing workforce in Texas is aging.

The other factor that perpetuates the reactionary model, a lack of continuity of care for patients, is partly a consequence of overall coordination and data-sharing across the various mental health care service providers to track assessments, treatments, and outcomes for a given patient. Nor is there a sufficient coordinated effort to analyze trends, needs, and service gaps for a population. Additionally, different funding streams that dictate varying eligibility requirements, reimbursable treatment types, and permissible allocations of funds also inhibit coordination between service providers. As a result, individuals receive inconsistent care on an isolated, as-needed basis rather than on an ongoing, person-centered treatment plan.

Finally, the most recent policy change to the public charge rule²² should be considered for its impact on mental health care in Texas and the region. Recent research has confirmed that undocumented immigrant parents are choosing not to seek health care for themselves and their children, who may be legal residents.²³ Considering that 25 percent of Texas children have a parent who is not a U.S. citizen, this climate of fear has the potential to exacerbate the mental health needs of vulnerable populations and significantly impact downstream mental health providers, such as emergency rooms and correctional systems.²⁴

¹⁵ Texas Health and Human Services. *Texas Statewide Behavioral Health Fiscal Years 2017-2021 Strategic Plan Update*. Second edition: February 2019.

¹⁶ Meadows Mental Health Policy Institute. "Texas Mental Health Landscape—Brief Overview." February 10, 2016.

¹⁷ Meadows Mental Health Policy Institute. "House Select Committee on Mental Health: The Current Mental Health Landscape and Opportunities for Improvement." February 2016. www.texasstateofmind.org%2Fwp-content%2Fuploads%2F2016%2F12%2FBrief-Overview-of-Landscape.pdf&usg=AOvVaw3V_fgQ4zGlr8T-zw_bizk.

¹⁸ Meadows Mental Health Policy Institute. "Review of Harris County Mental Health Systems Performance Final Report." May 2015.

¹⁹ National Alliance on Mental Illness. *Mental Health by the Numbers*. Retrieved from: <https://www.nami.org/learn-more/mental-health-by-the-numbers>

²⁰ A county is designated as a mental health professional shortage area (MH-PSA) by the Health Resources and Services Administration if there are more than 30,000 individuals per provider.

²¹ Human Resources and Services Administration. *Mental Health Professional Shortage Areas, by County, 2019-TX*. Retrieved from: <https://www.data.HRSA.gov>

²² *Immigrants seeking either lawful permanent residency or a visa may be denied if they have been determined to be a "public charge", someone who currently receives, or may receive in the future, support from specific social assistance programs.*

²³ Wong, T.K., Cha, J., Villarreal-Garcia, E. "The impact of changes to the public charge rule on undocumented immigrants living in the U.S." US Immigration Policy Center. August 13, 2019. <http://usipc.ucsd.edu/publications/usipc-public-charge-final.pdf>.

²⁴ Center for Public Policy Priorities & Children's Defense Fund of Texas. *Briefing: The New "Public Charge" Rule and Impact on Texans*. (Presentation) September 26, 2019.

Access to Care

Across the nation, the number of uninsured individuals markedly declined following the 2010 passage of the Affordable Care Act, which expanded Medicaid eligibility and revamped individual insurance markets. Despite Texas' declining to participate in Medicaid expansion, Houston has made real progress in ensuring health insurance coverage for the region's population. Yet, nearly one in five residents still lacks health insurance.

Chart Q on the right depicts the portion of the Houston area's population that lack health insurance coverage. In just the four-year period ranging from 2013 to 2018, the percentage of uninsured residents here shrank from 23 percent to 19 percent. Still, the region's uninsured rate continues to exceed that of peer cities and the nation at large. For example, the uninsured rate for the entire country in 2018 was 9 percent.

Chart R shows the uninsured rate by age group for both region and nation. We can see that nearly three in ten Houstonians aged 19 to 44 are uninsured. According to the Census Bureau, our region has the highest uninsured rate and second-highest child uninsured rate among major metropolitan areas.

Across every age group, Houston's level of uninsured individuals surpasses the nation, but the gap is most acute among children. Despite programs aimed at covering minors, Houston's uninsured rate for youth ages 6 to 18 (12 percent) is double the nation's (6 percent).

Key factors contributing to this disparity in insurance coverage include state and federal policies as well as the Houston region's unique demography. Our relatively young, racially and ethnically diverse population corresponds with the demographic categories that are least likely to have insurance coverage.

Chart: Q. Uninsured Rate

SHARE OF POPULATION LACKING HEALTH INSURANCE COVERAGE

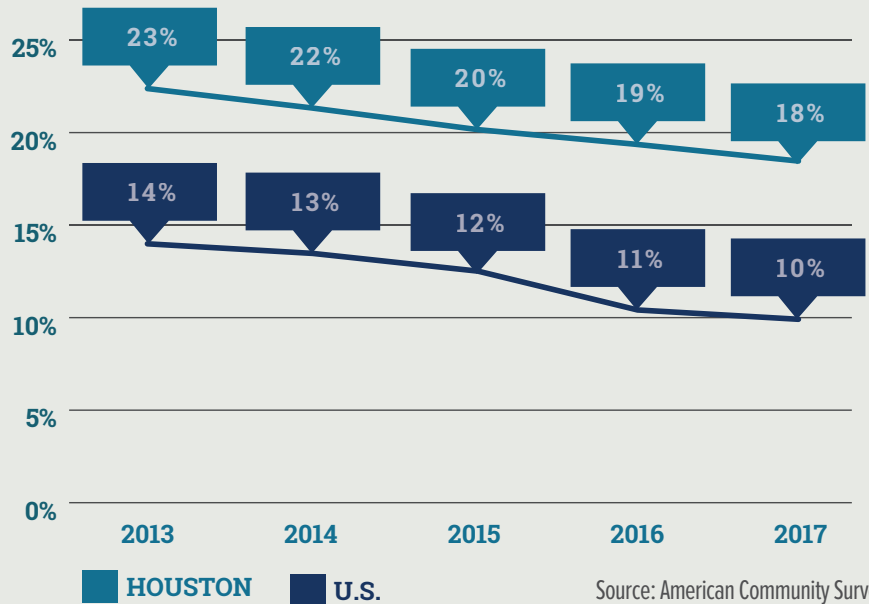
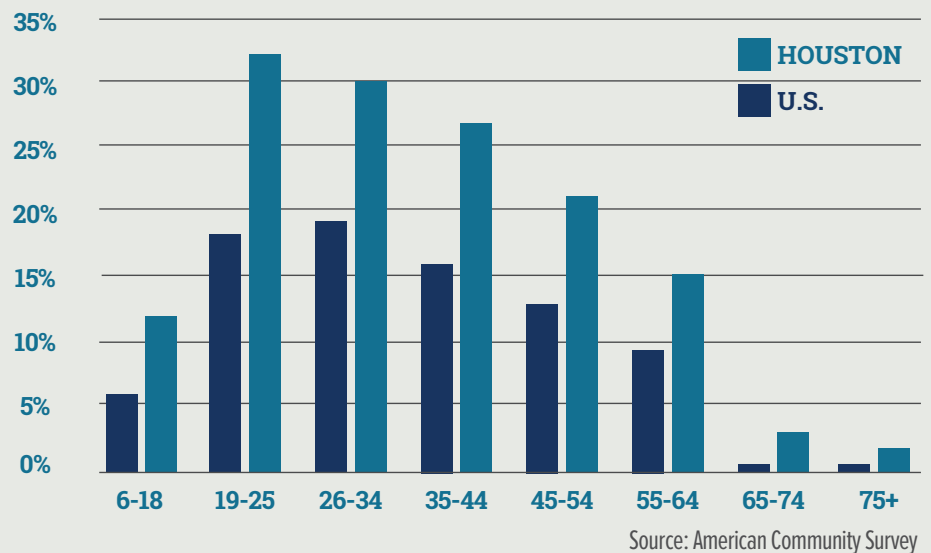


Chart: R. Uninsured Population by Age

HOUSTON REGION UNINSURED POPULATION BY AGE



The region's enormous foreign-born population includes nearly 700,000 undocumented immigrants who lack means to get coverage. In addition, many local health care experts predict that new policies enacted at the federal level will cause immigrants with legal status and their children to drop off the rolls of government programs, for fear they will hurt their ability to become citizens. From 2017 to 2019, enrollment in the Children's Health Insurance Program fell 7 percent and Medicaid participation dropped by nearly 3 percent even as the population grew, according to state figures.

Medicaid Expansion

Despite its political controversy, expanding Medicaid would represent a meaningful step towards improving access to care and health outcomes as well as helping the state shoulder the burden of rising health care spending.

Expanding Medicaid would help draw down more federal dollars to the state for health spending, save the state money (by virtue of the matching arrangement where the federal government would cover 90 percent of expansion costs), reduce the administrative burden of health care costs and ultimately provide better outcomes.

Health insurance is critical to ensuring access to health providers and facilitating care coordination. Myriad studies demonstrate a strong link between a person's insurance status and their health outcomes.

Meanwhile, one in five Houston region residents lacks health insurance coverage, one of the highest rates in the nation. Of the 5 million uninsured Texans, just over half (2.7 million) are in low-wage households without access to employer-based

insurance. 1.3 million of those adults could gain coverage under a Medicaid expansion. Translated to a regional level, this suggests that expanding Medicaid would provide nearly a fifth of our uninsured residents with insurance coverage.

In addition, health care spending is highly concentrated: the top 1 percent of spenders account for more than one-fifth of all spending, while the top 10 percent of spenders account for two-thirds of all spending.²⁵ Meanwhile, the bottom 50 percent of spenders are responsible for just 3 percent of all health care costs.

Another benefit of expanding Medicaid would include helping to curtail those costs, for example by allowing states to shift treatment of chronic diseases to more home- and community-based services that offer equivalent quality care at a reduced price. Medicaid's costs per beneficiary are substantially lower than for private insurance—22 percent less for adults—and have been growing more slowly than per-beneficiary costs under private employer coverage.²⁶

²⁵ NIHCM Foundation analysis of data from the 2014 Medical Expenditure Survey National Institute for Health Care Management. "Spending for Private Health Insurance in the United States." 2015. www.nihcm.org/2Fcomponent%2Fcomponent%2Ftask%3Ddownload%26file%3Dpublication_pdf%26id%3D347&usg=AOvVawOjyqkEXJ_rzZfvV-ep7Peh.

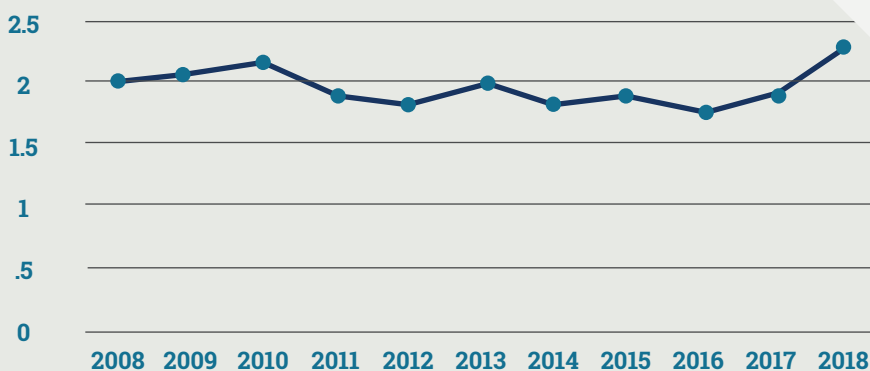
²⁶ Center on Budget and Public Policy Priorities. "Frequently Asked Questions about Medicaid." November 2019. <https://www.cbpp.org/research/health/frequently-asked-questions-about-medicaid>.

While it is increasingly common for individuals to seek health care from non-physician providers such as physician assistants or nurse practitioners, the vast number of patients see doctors. As such, physician availability functions as an indicator of access to care.

The number of physicians per capita in the Houston region has remained largely steady over the past decade, with a slight improvement over the past two years. As shown on Chart S, the region's doctor-per-capita ratio improved from 2.00 in 2008 to 2.23 physicians per 1,000 residents by 2018. Houston compares well to the nation at large in this respect; nationally, the ratio of physicians per 1,000 individuals was 2.08 in 2018.

Chart S. Physician Ratio

HOUSTON REGION PHYSICIANS PER 1,000 RESIDENTS



Source: Bureau of Labor Statistics Occupational Employment Statistics and U.S. Census Bureau Population Estimates



Employer Concerns

Employers are the primary source of health insurance coverage for a majority of Houstonians, but businesses often lament that they have little influence on how health care is delivered and paid for. One of our focus group participants summarized the situation by observing, “Health care is a unique domain where employers are left out of the discussion, despite rising costs.”

In focus groups and interviews, the issue of employers struggling to meet the escalating cost of providing health insurance coverage for their employees arose repeatedly. These conversations stressed that a high-quality, efficient health care system is essential for the competitiveness of our region’s businesses. A dysfunctional system risks direct losses for businesses in the form of absenteeism, higher costs for both workers and employers and the possibility

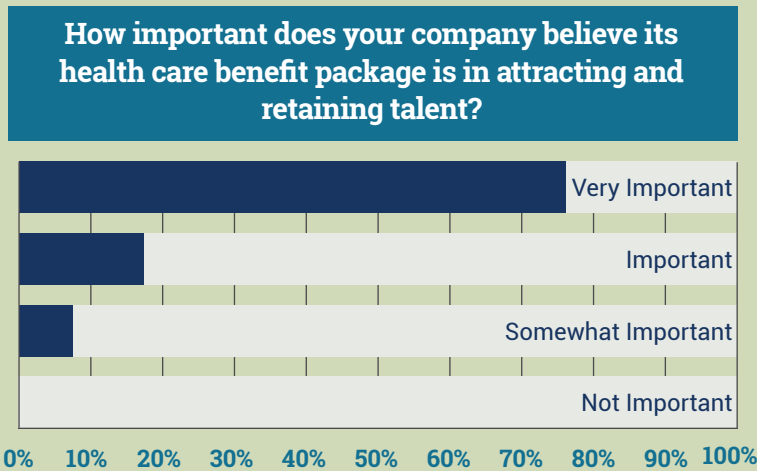
that firms will move their operations elsewhere.

In January 2020, the Center conducted a survey targeting human resources directors and chief operating officers to assess the Greater Houston business community’s views on health care issues. The goals of the survey were to better understand employers’ views of the changing health care landscape, their most pressing concerns related to health care and what steps Houston businesses are taking to address these challenges.

Below are some of the key takeaways from the survey, which include employer perspectives on cost and affordability, reimbursement models and workplace wellness.

Source: Center for Houston’s Future 2020 Employer Health Care Survey

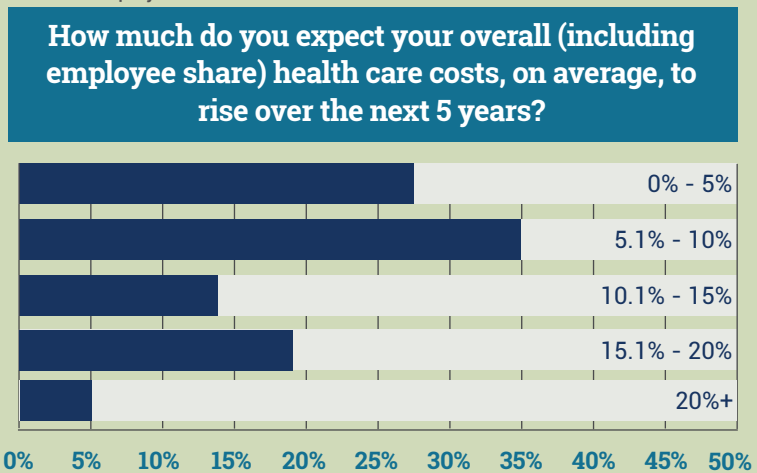
Chart: T. Role of Health Care in Talent Attraction/Retention



Employers recognize health care benefits as critical to attracting and retaining workers.

Three in four respondents considered their health care benefit plans to be “very important” in attracting and retaining talent. None surveyed reported that health care benefits were “not important” in recruiting and keeping workers.

Chart: V. Employer Health Care Cost Prediction



Houston area employers expect their health care costs to increase significantly over the next five years.

Survey participants provided a variety of responses when asked to predict the extent to which their overall health care costs would rise by 2025. Nearly three-quarters of respondents (73 percent), however, expected costs to increase annually by more than five percent. Moreover, one in four projected that their health care cost burden would grow by more than 15 percent every year.

“When employers look at their bottom line, in what other areas do they let something go up six, seven, ten, fifteen percent every year and step back and say, ‘Just take it’. They’ve left health care to the providers, to the insurers, the middlemen and to government. And they’re absent from the room. On what other aspect of their bottom line does this happen? ... We should find our own way.”



ABOUT THE SURVEY: Center for Houston’s Future conducted an online survey of human resource directors and chief operating officers working at firms in the Houston region. The survey received 40 responses. Nearly 90 percent of those completing the survey represent employers operating in Harris County. However, they span all of Houston’s major industries and represent businesses whose workforce range from 40 to 38,000 employees.

Chart: W. Employer Health Care Initiatives

What are the top three steps your company is taking today to address the health care issues identified?

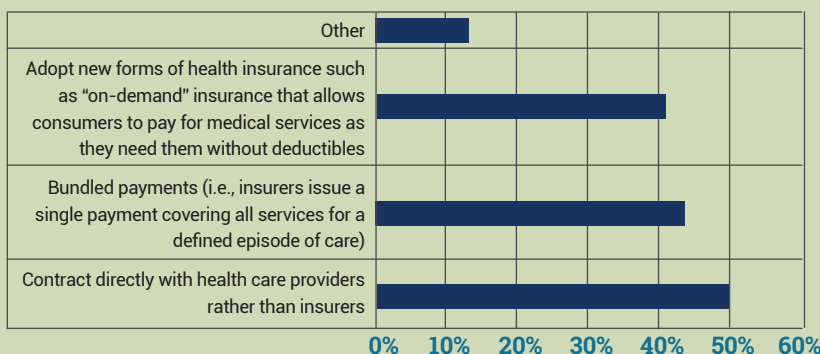
8%	Other
14%	Actively assist employees in seeking high-quality care
19%	Pass premium increases to employees
27%	Develop partnerships with hospital and health care providers to lower the cost of care
49%	Offer a variety of network and plan choices to employees at different prices
51%	Provide access to tele-health or mobile apps
59%	Develop wellness and preventative health programs (to assist employees managing chronic conditions, general health or engaging in preventative health efforts)
70%	Offer high deductible/HSA plans

Employers are seeking new and innovative ways to manage rising health care costs and improve their workers’ health.

Houston employers are actively pursuing a variety of approaches to address their businesses’ health care challenges. Over half of respondents reported that their businesses are seeking to manage costs and improve health by offering telehealth options for their workers, building wellness programs and offering high-deductible insurance plans. The data on wellness programs and telehealth are mixed at best in terms of actually reducing year-on-year costs.

Chart: Y. Employer Interest in New Models of Coverage

As reimbursement models increasingly stress accountability for quality and cost, is your company interested in any of the following?



Employers are open to new models of covering health care that prioritize cost and quality.

A substantial number of respondents reported interest in exploring nontraditional reimbursement models for health care. Two in five indicated that they were interested in providing new forms of health insurance such as “on demand” coverage without deductibles or bundled payment plans. Half of the survey participants noted that their companies are attracted to the possibility of covering their workforce more cheaply by forgoing insurance companies and contracting directly with providers.

II. Health Care Sector Trends

This chapter focuses on likely key disruptors in the health care sector over the next 10-15 years. Some of the changes are underway and will only accelerate.

The perspective reflects a synthesis of input gathered from interviews with subject-matter experts, an extensive literature review and facilitated brainstorming sessions with local health care leaders.

We address disruptions to existing health care models and then consider how technological advances could reshape the industry. We also consider effects on both patient care and provider operations. You will see that the various disruptions and models aren't standalone—and, in fact, intersect, overlap and, in some cases, function together.

Shifting Models of Care

In many of the conversations with subject-matter experts held by the Center, the subject of how the industry in Houston has changed over the past decade and a half particularly centered on the evolution of payment models. They cited various examples including insurance plans being managed differently, businesses and providers coming up with their

own plans and physician groups opting out of programs like Medicaid. We found a wide consensus that models for delivering health care will change rapidly over the next decade and a half.

First, care will involve a whole-person approach to improving health. That includes more outpatient care, community-based care and recognition of social determinants of health. Traditional health care organizations must evolve rapidly as consumers increasingly demand better service, convenience and value, especially as Amazon, Google, Walmart and others move into the space. Also coming into play: evolving employment models and more vertical integration in the industry.

Value-based Care: Medical Payments are Linked to the Quality of Care Provided

Value-based care is the broad name for the concept of linking payments to the quality of medical care provided. Some providers are already adopting these core tenets and others lag, and disagreements remain about the best way to structure such a system. But implementing some type of value-based care is widely considered to be an essential step for limiting the increase in health care costs and shift focus from delivering care to promoting health.

In our focus groups, participants largely said that they saw embracing value-based ideas as essential to a transition from a system focused on providing health care to one that results in the best health outcomes.

A value-based operating model starts with a commitment to collect and share data on the actual health outcomes a hospital delivers to patients. Reimbursements are tied to quality performance metrics that assess patient experience and clinical outcomes. For example, the metrics might assess how well a provider prevents patients from getting sick or being readmitted to the hospital within a certain time frame. This represents a departure from a volume-based/fee-for-service model and offers different ways to think about costs: whether the costs and service actually contribute to outcomes that matter to patients.

That approach requires secure platforms for sharing data and a sustainable reimbursement model that benefits both providers and payers. Implementation is possible only with enduring payer/provider collaboration, sharing of patients' health data and necessary IT and analytical resources.²⁷

In our focus groups, participants saw embracing value-based ideas as essential to a transition from a system focused on providing health care to one that results in the best health outcomes. The consensus among our focus group participants is that Houston is a late adopter on this trend, lagging a decade behind regions in the northeast like Boston. However, some individual hospital chains or organizations have not embraced such changes. This is a role for employers to instruct those that negotiate their contracts to pay for value rather than volume.

Whole Picture Approach: Shift from Episodic Treatment of Symptoms to Active Personalized Health Management

A collection of studies published over the past decade find that nearly a third of every dollar that enters the current U.S. health care system is wasted. One response gaining support


is a whole-picture focus, which includes dealing with factors that lie outside of hospitals or doctors' offices but affect health. These include avoidable admissions, reducing readmissions, recognizing the influence of social health determinants and curbing over-treatment.

There is an ongoing shift away from episodic treatment of symptoms to active personalized health management. Examples include helping patients make healthy lifestyle choices, treating chronic diseases early, more outpatient care, community-based care, an increased emphasis on mental health, recognition of social determinants of health and paying only for treatments that are proven to add value. An emphasis on active personalized health management is unlikely to reduce waste, but it could control costs by providing services in lower cost settings.

The U.S. Centers for Disease Control and Prevention estimates that treating chronic diseases which could otherwise be averted with preventive care comprises three-quarters of the nation's health care spending. As such, the common theme of such initiatives is focusing on health rather than health care. Components of wellbeing constitute a kind of health ecosystem that prioritizes prevention and early intervention. Health care services, then, are designed to meet needs in a resource-efficient manner over longer time cycles. Employers should assess the savings to them in a short timeframe such as three years. While all these new ideas provide better care, few return investments quickly.

²⁷ Deloitte. "2020 US and global health care outlook." <https://www2.deloitte.com/us/en/pages/life-sciences-and-health-care/articles/us-and-global-health-care-industry-trends-outlook.html>.





Diabetes Care: An example of Shifting Care Models

Multi-stakeholder partnerships are being created here in Houston and across the world to tackle chronic diseases. In 2014, Danish pharmaceutical firm Novo Nordisk, University College London and Steno Diabetes Center Copenhagen launched the Cities Changing Diabetes initiative to fight the rise of the disease in urban areas across the world, including Houston.

The local effort is comprised of a series of organizations including city, county, health systems, employers, community-based groups and houses of faith. Cities Changing Diabetes-Houston spent more than a year researching the diabetes epidemic in Houston, including identifying populations and profiles of those most at risk. For example, it mapped: isolated skeptics, financially-pressured caregivers, concerned seniors and time-pressured young adults.

The program has also established efforts focused on care, outreach and prevention, such as the Houston Diabetes Resource Center (HRDC). The HDRC is a coalition of certified practitioners from area health care institutions, the City of Houston, Harris County, the American Diabetes Association, the Association of Diabetes Care and Education Specialists, the CORE initiative, peer support programs, and diabetes self-management education programs offered in faith-based settings. This coalition created a web-based community platform to provide the Greater Houston community with resources for people with diabetes to ask health care professionals questions related to the day-to-day management of their disease, receive authentic information and advice, or be referred to a verified treatment facility.

The Institute for Spirituality and Health at the Texas Medical Center trains “lay leaders in diverse communities of faith to address pressing health needs, with a special focus on diabetes.” It also works with those who go through the

program to implement their own programs for members of their congregations. One participant in the training told the Houston Chronicle in 2018 her own family changed its diet and exercised more as a result.

The Robert Wood Johnson Foundation awarded \$2.4 million to The University of Texas Health Science Center at Houston aimed at evaluating and sharing practices from Cities Changing Diabetes in Houston, Mexico City and Vancouver. A virtual hub, the Healthy Cities Research Hub, will focus on understanding social and environmental conditions in urban areas in these North American cities that contribute to development of Type 2 diabetes and best practices to address them.

“This is an opportunity to extend the community-based work of the Cities Changing Diabetes initiative through new tools for evaluation and dissemination so that the results proven here can help other cities,” said Stephen Linder, Ph.D., lead researcher of the project, in 2017. He is also working with lead researchers in Mexico City and Vancouver.

“When one-third of our US population either suffers from pre-diabetes or diabetes, the problem is of such size and scale that it is beyond the ability or resources of any one organization to provide a life-changing solution. Initiatives such as the HDRC, that are backed by a coalition of experts in public and private settings, have an opportunity to deliver substantial positive economic impact by improving the physical and mental health, and productivity of people with diabetes, their caregivers, and employers,” said Umesh Verma, CEO of Houston-based Blue Lance and Chairman of the Board of the American Diabetes Association. *“The path to helping people with diabetes thrive is to form a coalition of trusted partners and leverage their combined expertise, resources and connections.”*

There is also emphasis on continuous health care rather than episodic treatment of symptoms. The overall approach lines up concepts of personalized, consumer-driven and value-based health care.

This approach requires collaboration across different industries and professions. Addressing social determinants takes partnering with a wide range of partners including those working on employment, housing, education and transportation. For example, one doctor the Center interviewed noted, “I, oftentimes, have to refer a child not to a pulmonologist for his or her asthma, but to a specialist called a fair housing attorney. They can get a landlord to remediate the carpeted apartment flooded during Harvey, which two years later is still triggering \$5,000 of emergency room visits. This path is way, way, way cheaper and more efficient than doing something medical.”

Shift to Outpatient Treatment/ ‘Care Anywhere’ Model

Providers are already trying to shift many types of care from hospitals to outpatient settings, seeking to improve outcomes, limit costs and reduce hospital overcrowding. Such efforts are part of a “health-care-on-demand” mindset and patient-centered approach. In these approaches, patient requests are immediately fulfilled. Injury and illnesses

may be treated or diagnosed via platforms and apps that connect patients to doctors or nurses, leading to immediate recommendations, future appointments or home visits.

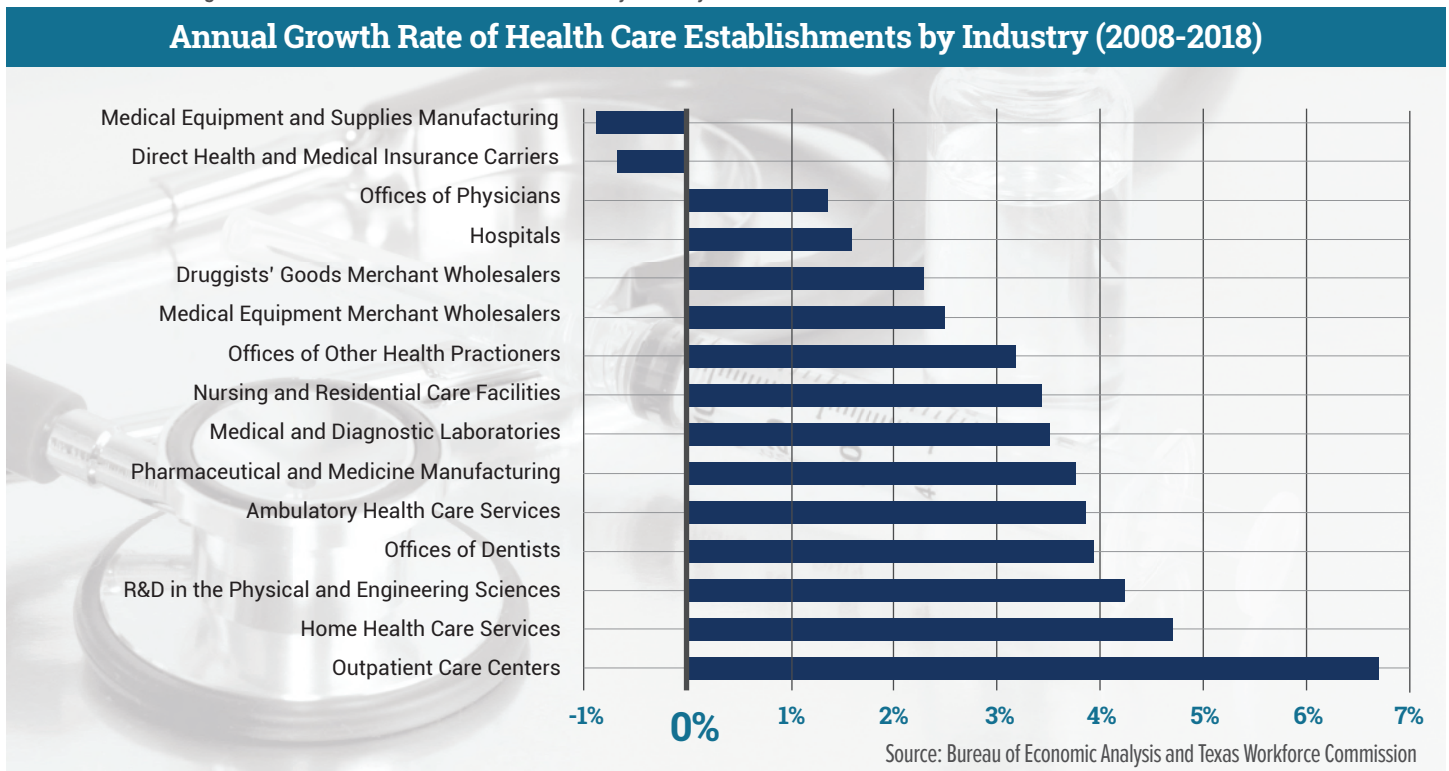
Individuals are already increasingly likely to visit an urgent care center instead of a primary care provider, according to McKinsey’s 2018 Consumer Health Insights Survey.²⁸ Those reporting they visited an urgent care center rose from 2014 to 2018, while those who said they saw their primary care doctor declined from 83 percent to 70 percent.

We see that reflected in the Houston marketplace, as Chart Z shows a jump in the number of outpatient care centers and home health care businesses from 2008 to 2018.

As technology advances, existing frameworks for delivering care must adapt. Hospitals may increasingly shift to treating patients off campus—like hospital-owned standalone emergency rooms—perhaps narrowing the range of traditional services in their main campuses. Non-acute care might generally migrate to outpatient settings. As such, health care providers will need to rethink how patients access their services and implement digitization strategies and remote health solutions.

²⁸ McKinsey & Company. “Healthcare consumerism today: Accelerating the consumer experience.” April 2019. [healthcare.mckinsey.com/%?Fwp-content%?Fuploads%?F2020%?F02%?FHealthcare-consumerism-today-Accelerating-the-consumer-experience.pdf&usg=AOvVaw2Ez-kPjioJfzUgbGRqwhvC](https://www.mckinsey.com/industries/healthcare/consumerism-today-accelerating-the-consumer-experience).

Chart: Z. Rate of Change in Number of Health Care Establishments by Industry





Consumer-driven Health Care (‘Retailization’)

Patients are increasingly demanding greater convenience, transparency and value when accessing health care, especially in an age where people are used to managing many aspects of life with a smartphone.

Today, our country’s health care system is comprised of a jumbled array of disparate parts (insurers, hospital systems, pharmacies, medical device makers, etc.). By 2036, we expect the patient/consumer to play an increasingly important role in the health model. Technological advances in data compatibility and collection will facilitate closer collaboration among the many health care stakeholders. We can also expect new kinds of services that are tailored to a specific patient.

Ultimately, framing patients as health care consumers involves individuals taking greater control and responsibility for their own care. Consumer-driven health care envisions patients ordering tests online, practicing self-care and seeking medical treatment in their own homes. It also may threaten the traditional roles of radiologists, pathologists and other medical professionals.

This is no easy task and the amount of consumer education required must not be underestimated. Think of the fact that consumers have not put a dent in obesity and diabetes, despite the knowledge that these conditions can often be prevented. It is not trivial to expect consumers to embrace “consumer-driven health care” without deliberate educational interventions as well as incentives and disincentives.

In this outcome, patients, enabled by technology, will select

and reward providers that demonstrate value—solutions that are coordinated, convenient, customized and accessible—just as in online banking and shopping. Leveraging AI, big data and analytics, a mobile app could in theory analyze an X-ray, MRI, or other sophisticated test on a smartphone, faster and more accurately than a physician.²⁹

Under this framework, the current delivery model will eventually shift from business-to-business to consumer-to-business. Consumers will become empowered and informed stakeholders accessing, analyzing and sharing information.³⁰

New Players Entering the Market

The entry of internet, big retail and other nontraditional players into the business of selling and delivering health care products and services is another disruptor. Amazon, Google and Walmart are applying their understanding of consumer expectations and their machine-learning tools to anticipate and meet customer demands.³¹

Over time, these companies may develop a real understanding of the depth and complexity of health care delivery. At the same time, consumers are likely to demand better service and experience from their health care provider. Traditional health care organizations must evolve rapidly to keep pace with new disruptors entering the market.

One cautionary note: In some case these models and trends work together. In some cases, they conflict. For example, consumers who go to stand-alone retail clinics may not get treated in a whole-picture approach and may not have a primary care doctor.

Models of Employment are Shifting

Care delivery is becoming increasingly team-based and focused on reaching patients outside of traditional delivery locations like a single campus hospital. We anticipate the region’s health work force morphing to include home caregivers, social workers, teachers and others outside the medical profession. In addition, technology advances are





giving rise to the need for data analysts, health information managers and telemetry monitoring managers.

New workforce models are needed to retain existing personnel and to restructure their occupational roles if we are to fulfill the demand for more personalized and integrated (better coordinated) care delivery. Going forward, the industry expects that patients will receive care from a continuum of people and competencies.

As health care organizations pursue a more integrated approach to delivering care, traditional roles will shift. For instance, the main role of a primary care physician in the future might be as the center of a patient's care coordination hub. There, they would manage the team of health care professionals—such as home health aides, pharmacists, social workers, therapists and specialists—serving a patient. Their role would focus on providing more coordinated and continuous care to improve patient outcomes. In addition, this coordination would make health care more cost-efficient by enlisting the services of the highest skilled professionals only in the case of the most vulnerable, at-risk patients. In this scenario, medical schools would need to modify how physicians are taught with an emphasis on training doctors in clinical advisory roles.

Vertical Integration

Another key structural change already happening in health care in Houston is a move to vertical integration, in which hospitals or hospital chains offer a greater range of services spanning primary, community, acute and post-acute care or insurance companies acquire pharmacy firms.

Nationally, some hospitals are offering health insurance or becoming so-called accountable care organizations. An ACO provider takes responsibility for the provision of health care to a specific population. Typically, ACOs are paid a fixed amount to provide care and are expected to reduce per-patient costs while achieving predefined care metrics.

According to a 2018 report by Boston Consulting Group, hospitals are largely pursuing vertical integration not just to boost efficiencies but also to get access to broader data sets and the chance to improve their expertise in data and advanced analytics.


Vertical integration also offers a chance to provide care with the abilities to share full patient data and ensure seamless continuity of care. (For example, patients can be “handed over” to community clinics prior to hospital discharge.) Other benefits include abilities to attract personnel by offering multidisciplinary training and career paths involving both hospital and community settings.

One downside of the trend is that it risks giving unchecked market power to just a handful of health care provider organizations that represent nearly all the hospital capacity and care delivery in a region, resulting in higher prices.

²⁹ Accenture. "Digital Health Technology Vision 2020." 2020. https://www.accenture.com/_acnmedia/PDF-130/Accenture-Health-Tech-Vision-2020.pdf#zoom=40.

³⁰ Deloitte. "2020 US and global health care outlook." <https://www2.deloitte.com/us/en/pages/life-sciences-and-health-care/articles/us-and-global-health-care-industry-trends-outlook.html>.

³¹ Healthcare Information and Management Systems Society. "2019 Healthcare Trends Forecast: The Beginning of a Consumer-Driven Reformation." 2019. https://www.himss.org/sites/hde/files/d7/u397813/2019_HIMSSPreviewandPredictions.pdf.



Providers are already trying to shift many types of care from hospitals to outpatient settings, seeking to improve outcomes, limit costs and reduce hospital overcrowding. Such efforts are part of a “health-care-on-demand” mindset and patient-centered approach. In these approaches, patient requests are immediately fulfilled.

Technology Disruption

Digital technologies have the potential to improve health outcomes by facilitating information sharing, better analyzing data and improving access to clinicians with specialized skills. Ultimately, the promise of digital innovation is a seductive one: improving care quality at significantly lower costs.

In this section, we summarize some of the key technological advances that, with widespread adoption, might refigure the health care landscape over the next couple of decades: telemedicine, the medical internet of things (IoMT), advanced analytics and automation enabled by machine learning and advances in data compatibility.

Telemedicine/ Care Anywhere Model

Telehealth or telemedicine allows long-distance interactions between patients and clinicians. Telehealth has existed since the advent of the telephone, but the rise of high-speed Internet has accelerated interest across the industry in adopting telehealth practices that allow for care anywhere.

Telemedicine offers the promise of better: chronic disease management, care for underserved or remote populations that lack providers, ability to monitor patient health continuously and records of patients taking drugs. Physicians may also be better able to coordinate a patient's care.³²

Remote care, in some cases, is approaching parity with face-to-face care in terms of the patient experience and clinical quality, as technology improves. Hospitals may be able to shift a wide range of clinical services online or via telephone. For example, visits not needing physical examinations or that serve to gather information like blood pressure readings could take place in a patient's home with telemedicine. Hospitals might respond by narrowing the array of services they offer on site, as technology fully matures.

Telemedicine may also be used to boost the efficiency of practitioners, increasing patient access to care and helping bridge the workforce supply/demand gap. For example, a nurse might be able to work remotely and still build strong patient relationships with high-value interactions. That in turn could help reduce nurse burnout and potentially create more

workplace fulfillment.³³ Telemedicine also affords patients the option of remotely consulting a less-credentialed health practitioner such as a nurse instead of seeing their doctor in person, thus freeing up time spent by physicians.

Some roadblocks slowing the widespread adoption of telemedicine include issues in adapting medical billing and reimbursement, policy and licensing requirements and fear of increasing medical errors.³⁴ Additionally, some patients remain wary of using telemedicine. Another issue involves crafting the payment structure of telemedicine services: it is possible that increased use of telemedicine might raise overall costs by creating new billing opportunities. However, the embrace of telemedicine as part of the response to Covid-19 has largely addressed these barriers to adoption. Many of the regulatory hurdles have been addressed by emergency authorizations, and patients and doctors are now increasingly amenable to using telehealth.

Medical IoMT

"The rise in the numbers of connected medical devices, together with advances in the systems and software that support the capture and transmission of medical grade data, connectivity technologies and services, have created the Internet of Medical Things (IoMT)," Deloitte explained in its 2018 report on "Medtech and the Internet of Medical Things."

The rise of in-hospital and at-home wearable devices can be viewed as a kind of advanced form of telemedicine. Patients can be monitored 24/7, allowing for faster and more efficient care and an increased focus on prevention and early intervention. Artificial intelligence could analyze a patient's medical data and allow for personalized care recommendations.

With these devices, patients might monitor their own chronic conditions and treatment effectiveness in real time and send information to their care providers, presumably improving health outcomes. This technology also has the potential to help stop preventable diseases and epidemics more effectively by improving infectious disease surveillance.³⁵

Many barriers remain for wide-spread implementation of IoMT. Hospitals and care-providers are currently grappling with integrating these devices and handling and



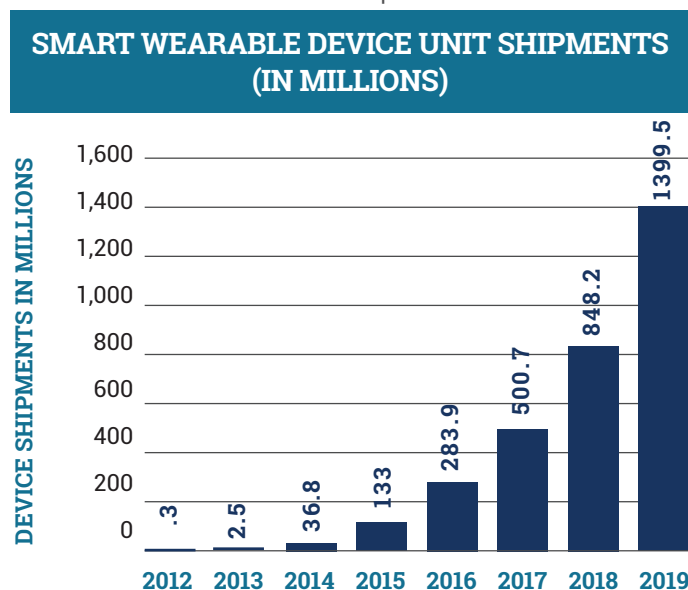
processing data from devices. Establishing an appropriate IT infrastructure to handle massive flows of information that need to be quickly processed is a major obstacle. In addition, many providers remain skeptical on the efficacy and benefit of relying on personal medical devices.

Another major barrier involves patient privacy concerns: ensuring the integrity of medical data, setting up protocols for data sharing and selling and allaying a consumer's fear of privacy intrusions. As well, use of wearables and use of apps beyond 6 months has been problematic, with users foregoing the devices after a certain time.

If implemented, wide-scale use of personal medical devices could transform the health care sector in multiple ways. In the short-to-medium term, the use of these devices might allow for automation of administrative, logistic and certain diagnostic tasks. Long-term, the use of the IoMT might replace certain clinical functions.

How the IoMT will affect the work of clinicians, however, is still unclear. On the one hand, it might free up time for health care providers to focus on delivering care and building relationships with patients. On the other hand, the myriad data collected by these devices might be counterproductive by offering an overwhelming amount of data without clearly articulating how this information could support clinician decision making.

Chart: AA. Smart Wearable Device Unit Shipments



Source: Health Analytics³⁶

TECHNOLOGY IN ACTION: HCA'S SPOT

A prime example of how AI is already being used to improve health care and produce better patient outcomes is HCA Healthcare's Sepsis Prediction and Optimization of Therapy (SPOT) tool.

Sepsis is a deadly infection and one of the most common causes of death during hospitalization—approximately 270,000 Americans die from the condition each year. Early recognition and treatment of sepsis can drastically improve a patient's chance of survival. Every moment counts as sepsis mortality grows by roughly five percent every hour it goes unnoticed. However, sepsis is difficult to diagnose, and its symptoms are often confused with other diseases.

HCA used machine learning and artificial intelligence techniques to create a tool that would help detect sepsis in patients earlier, saving lives. Using more than 31 million patient care records housed in HCA's national data warehouse, SPOT's developers were able to refine the tool's sensitivity and accuracy to an extent that it can detect signs of sepsis not normally noticed by people. The algorithm reviews data like patient vital signs, lab results and nursing reports in real time and alerts clinicians when it detects the possibility of sepsis.

This tool is likely the first of many to use aggregated data and artificial intelligence to help support clinicians' decision making and improve patient outcomes. To date, HCA has used this tool with over 2.5 million patients and estimates SPOT has helped save more than 8,000 lives over the past five years.

³² Deloitte. "2020 US and global health care outlook." <https://www2.deloitte.com/us/en/pages/life-sciences-and-health-care/articles/us-and-global-health-care-industry-trends-outlook.html>.

³³ *Ibid.*

³⁴ *Ibid.*

³⁵ McKinsey & Co. "Smart cities: digital solutions for a more livable future" <https://www.mckinsey.com~/media/mckinsey/industries/capital%20projects%20and%20infrastructure/our%20insights/smart%20cities%20digital%20solutions%20for%20a%20more%20livable%20future/mgi-smart-cities-full-report.ashx>.

³⁶ Health IT Analytics. "Explaining the Basics of Internet of Things for Health Care." May 2016. <https://healthitanalytics.com/features/explaining-the-basics-of-the-internet-of-things-for-healthcare>.



Advanced Analytics/AI

AI, Big Data and machine learning collectively refer to technologies that enable machines to sense, comprehend, act and learn so they can perform administrative and clinical health care functions.³⁷

Big Data is typically referred to as large volumes of high velocity (how fast the data is coming in), complex, and variable (different types of information that are variously formatted) data that require advanced techniques and technologies to enable the capture, storage, distribution, management and analysis of the information. Once it is processed into a universal database, advanced medical analytics can radically overhaul how health care is practiced.

With the massive amounts of medical information now available through electronic health records and personal medical devices, advanced analytics can improve clinical trials, fast track new products, assist in patient diagnosis, review historical data to benefit public health, predict at-risk patients and initiate preventative care, regularize genomic analysis and reduce fraud, waste and abuse.

McKinsey estimates fully implementing advanced health analytics could save more than \$300 billion per year in the U.S. health care industry and generate cost savings of up to 30 percent for health systems.

Big data and machine learning—the burgeoning science of teaching computer systems to learn from data and detect patterns—should enable machines and algorithms to perform more administrative and clinical health care functions. The potential applications for these technologies are myriad, but immediate uses include automating imaging diagnostics and designing programs that can monitor and quickly diagnose patients, reducing medical costs and errors.

How this technology will affect the workforce and the extent to which technology can change physician roles is a matter of debate. One possibility is that applications of AI and machine learning will automate administrative (e.g., documentation, insurance processing, scheduling), logistics (e.g., delivering linens, meals, medical supplies) and clinical

(e.g., robot-conducted surgery) tasks. Many of the subject-matter experts the Center interviewed expect technology to free health care professionals from repetitive, mundane tasks and let them focus on their core responsibilities. Soon, AI could then perform the data-based work and people would transition into roles that interpret, give advice based on, and integrate the resulting information into care plans and operations. Another possibility is that technology will increase nurses' capacities to act as physician extenders, potentially filling some functions now performed only by doctors.

Next generation robotics are being used increasingly in pharmacies (e.g., drug compounding preparation), and surgery (e.g., supporting and augmenting the surgeon). In the near future, it is possible that robots will perform tasks such as delivering, decontaminating and sterilizing medical equipment and materials; performing routine operations such as drawing blood; and assisting people with mobility challenges. Yet, we are in the early stage of robotics. The cost of these technologies remains a challenge and it is unclear if leveraging them will improve efficiencies and outcomes enough to justify the additional cost.

Barriers to fully deploying artificial intelligence in health care include issues with data interoperability and a lack of standardization as well as challenges related to health care professionals' and patients' acceptance and trust of the new tools.

As a result, some interviewees believe health care will be a "late adopter" of these technologies but will have the opportunity to build on learnings and best practices from other fields. Lastly, while consumers have signaled that they are ready to interact with robots and AI for routine operations, they are still wary of them making critical decisions. It seems likely that the role of AI in the foreseeable future will be to complement, not replace, medical providers.

Advances in Data Interoperability

The health care future promised by the technological disruptions just described all rely on collecting data from multiple sources in order to develop analytic tools, facilitate



research or enable personalized medical decision-making. Patients get medical care from a range of sources from hospitals to pharmacies to physicians, often based on location and availability. At the moment, there is no universal way to access a patient's electronic health record (EHR) across organizational boundaries.

According to a report on *"Finding the future of care provision: the role of smart hospitals"* by McKinsey & Company in 2019, data transparency among health systems is key in ensuring patients receive quality care wherever they choose to go. A patient's health records that are shared include *"government data platforms, population health agencies, and payers, as well as other providers."*³⁸

The concept of data transparency that transcends organizational boundaries is known as interoperability. Benefits of enabling interoperability include easily accessible patient records, reduced medical errors and costs, and increased quality care—particularly of chronic illnesses. But there are still significant obstacles. These include establishing a standard of rules and customs for sharing information while considering the challenges of particular practitioners who are more resistant to change—like physicians in small practices with limited IT support.

Many of the technological disruptions that could improve patient care and decrease costs rely on interoperability.

Massive amounts of data can be extrapolated and analyzed if EHRs can be easily shared or accessed beyond a single organization's boundaries. The health care system can be increasingly patient-centric and decentralized. Care can be administered quickly and efficiently to remote locations.

A majority of physicians across the US stated EHRs *"have had a negative impact"* on physician-patient relationships, efficiency and workflow, while only 14 percent *"reported a positive experience with EHR vendors."*³⁹ According to physicians in Texas, their main reasons for not implementing EHRs is because they are cost-prohibitive and create security/liability concerns for patients. Nevertheless, EHRs have become more effective in recent years, and dissatisfaction has begun to slowly drop, mainly due to the growing number of users and modifications made to them. More improve-

ments must be made for the product to be useful and desired by the entire medical industry. Unfortunately these improvements have been slow, but by 2036, it is likely virtually all physicians will be using EHRs.

³⁷ Accenture. "Artificial Intelligence: Healthcare's New Nervous System." 2017. https://www.accenture.com/_acnmedia/PDF-49/Accenture-Health-Artificial-Intelligence.pdf#zoom=50.

³⁸ McKinsey & Company. *Finding the future of care provision: The role of smart hospitals*. May 2019. <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/finding-the-future-of-care-provision-the-role-of-smart-hospitals>.

³⁹ Jamoom, Heisey-Grove, Yang and Scanlon. "Physician Opinions about EHR Use by HER Experience and by Whether the Practice had optimized its EHR use." July 2016. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5084912/>.



Greater Houston HealthConnect is a nonprofit health information exchange incubated by Center for Houston's Future, the City of Houston and the Harris County Healthcare Alliance. It was created to help local health care providers share the information in their patients' electronic health records. Most patients have multiple doctors and care providers, each with their own system for storing electronic health records. Communication breakdowns risk harming patient safety, quality of care and efficiency in delivering care.

HealthConnect facilitates the global integration of a patient's medical information by serving as a kind of data clearinghouse. It provides an internet-based exchange where electronic medical records can be accessed by patients and health care providers across Southeast Texas.

First started in 2012, GHHC today serves more than 1,050 venues—over 95 percent of our region's largest hospital and health systems—and deals with the data of over 6 million unique patients.

III. Model: The Health Care Sector of 2036



“We tend to grossly overestimate the speed with which the change will happen and greatly underestimated the extent of the change. It’ll be more than 15 years before huge changes happen. But I think in 25 years, health care will be unrecognizable.”

—Center focus group participant

In this chapter, we project how changes in work force and technology use in Greater Houston’s health care sector could affect its future. We shaped our modeling with information gleaned from current academic literature. Our work was also informed by findings from interviews and focus groups the Center convened with about 50 health care stakeholders and subject-matter experts. We selected 2036—Houston’s 200th anniversary—as a milestone for analyzing the effects of different scenarios.

Key findings from our model include:

- ▶ Health care is the uncontested leader in fueling employment growth for the region. We expect one in every four jobs added in Greater Houston from 2019 to 2036 will be in health care. This projection, however, is contingent on enough qualified workers to fill these jobs.
- ▶ Accelerating the use of technologies such as AI and machine learning would likely depress employment growth but boost the economic output of the region’s health care sector. We calculate the health care sector would produce 38 percent fewer jobs under these circumstances compared to our baseline projections, but the gains in worker productivity would entirely offset any effect on regional GDP.
- ▶ The region should prioritize the creation of so-called “high-multiplier” jobs if we want the health care sector to transform into an engine of economic growth. Our modeling finds that developing a burgeoning life sciences hub in Houston would add \$13.1 billion to the region’s economy by 2036.

Scenarios for the Future of Houston's Health Care Sector

We identified four scenarios for the region's health care sector and modeled the resulting effects on regional employment and GDP in 2036. The scenarios were selected to illustrate how many of the key drivers and disruptions shaping the health care industry discussed earlier in the report will shape the region's economic future. Information on our model approach and assumptions we used is detailed in the appendix.



Baseline scenario: Using baseline data from 2012 to 2019, our first scenario projects what might happen if growth in our health care sector proceeds at the same pace and in the same way over the next 16 years. As a continuation of status quo trends, this case extrapolates the historical rate of technology adoption in the industry and assumes moderate growth in life sciences enterprises.



Thriving life sciences scenario: The "life sciences" includes businesses focused on biotechnology, pharmaceuticals, biomedical technologies, medical devices and research. This scenario presumes most of the region's health care sector grows at historical rates, but that we will also nurture a robust life sciences hub, which creates substantial economic value.



Rapid technology adoption: In this scenario, we explore the role that expediting new technologies would play. Here, aggressively using AI, machine learning techniques, telemedicine and automation will make care more cost effective. This case presumes diminishing employment growth as technology eliminates many relatively mundane tasks performed by employees and substantially boosts productivity of remaining workers.

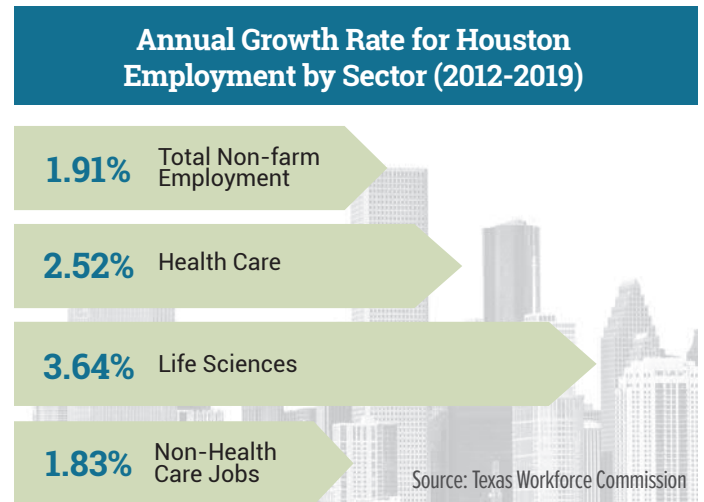


Workforce shortage scenario: This case depicts a future in which the region's health care industry fails to develop a pipeline to meet workforce needs and faces a severe shortage of workers. We presume a 20 percent drag on employment growth. Here, one in every five health care jobs that would normally be filled will go unhired.

Employment Projections

To assess the economic outlook for the region's health care sector, we begin by reviewing how health care hiring has progressed historically and extrapolating those trends through 2036.

Chart: AB. Growth Rates for Health Care Fields



An analysis of data from 2012 to 2019 indicates that the health care industry—particularly the life sciences sector—outperformed the region in terms of creating jobs. Over this seven-year period, the annual growth rate for health care jobs (2.52 percent) was 37 percent higher than the growth rate for regional employment outside of health care (1.83 percent). Moreover, the pace of employment growth in life sciences exceeded growth in non-health care fields by 2x.

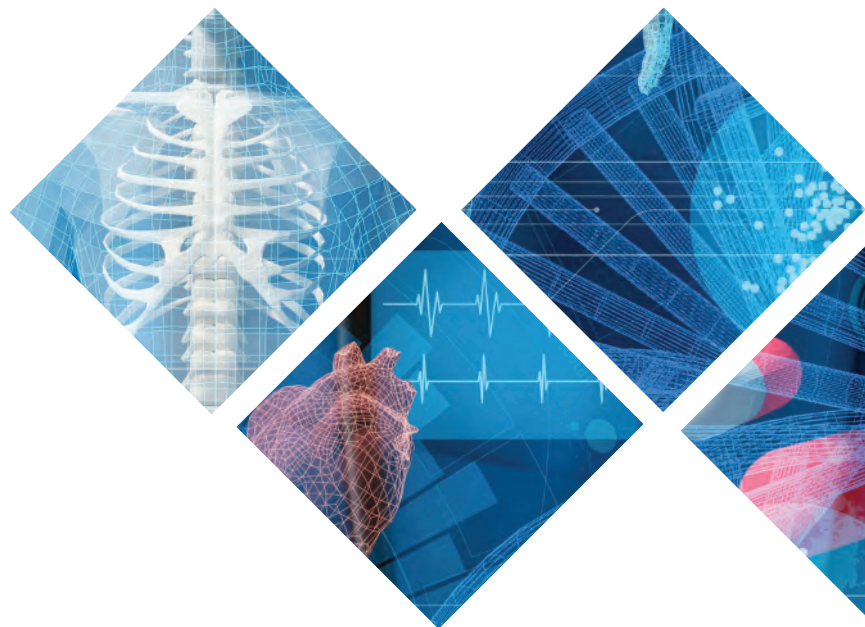
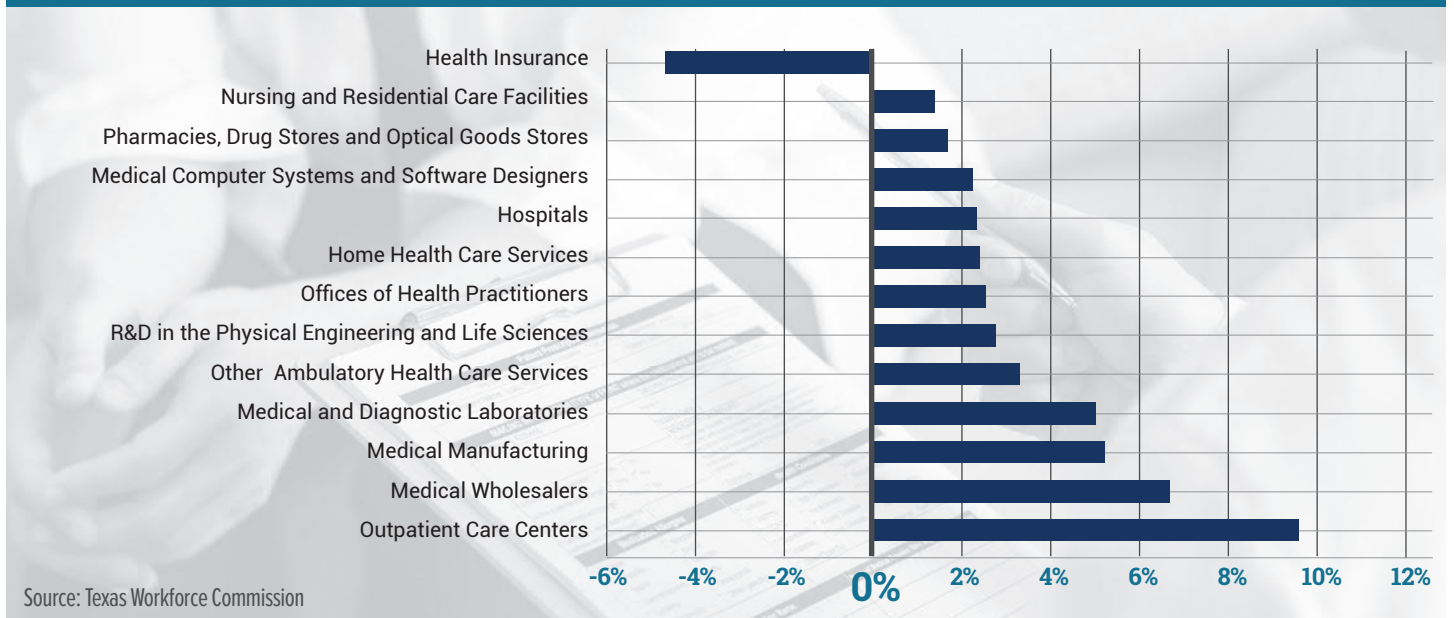


Chart: AC. Growth Rates for Health Care Fields

ANNUAL HEALTH CARE EMPLOYMENT GROWTH RATES BY INDUSTRY (2012-2019)



Demand for workers varies across the different industries comprising Houston’s health care sector. Chart AC depicts the annual employment growth rates for these respective industries. While the overall sector grew at a rate of 2.5 percent, industries including outpatient care centers (9.5 percent) and medical wholesalers (6.9 percent) experienced dramatic employment growth.

Chart: AD. Health Care Employment by Industry

2019 HEALTH CARE EMPLOYMENT BY INDUSTRY

Source: Texas Workforce Commission

It is important to note, however, that the fastest growing industries comprise a relatively small portion of the region’s overall health care employment. The four segments with the most rapid employment growth—outpatient care, medical wholesalers, medical manufacturing and medical diagnostic laboratories—comprised only 11 percent of jobs in the overall health care workforce. On the other hand, hospitals and health care practitioner offices represent just under six out of every ten health care jobs. Annual employment growth in these areas has averaged a little over 2 percent.

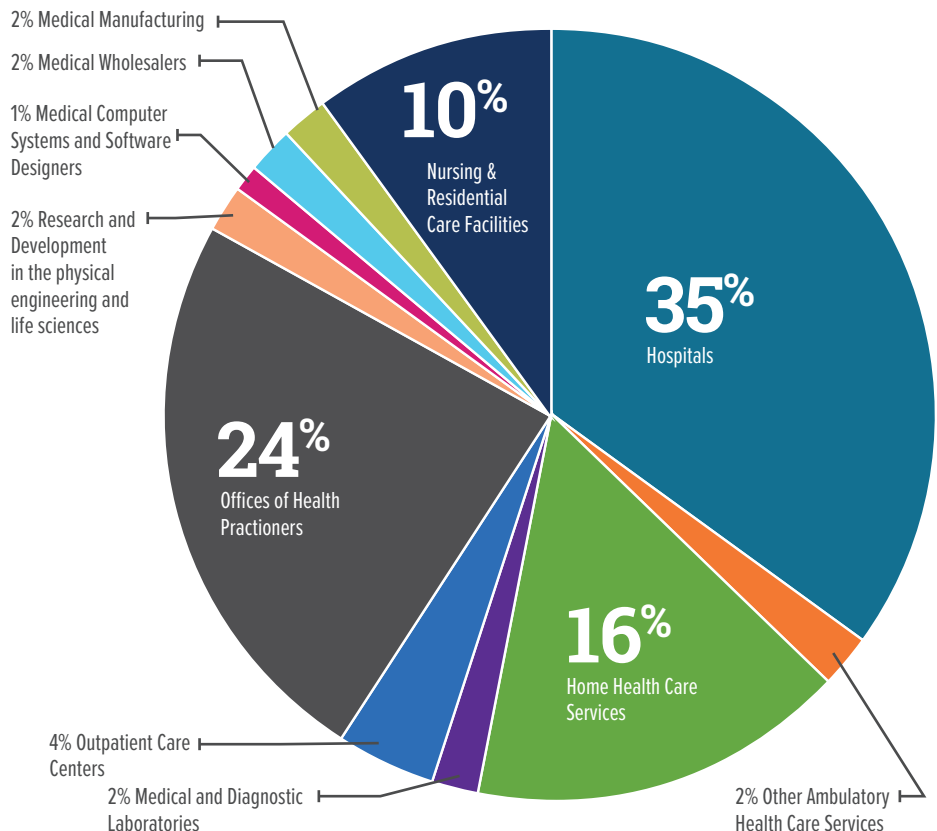
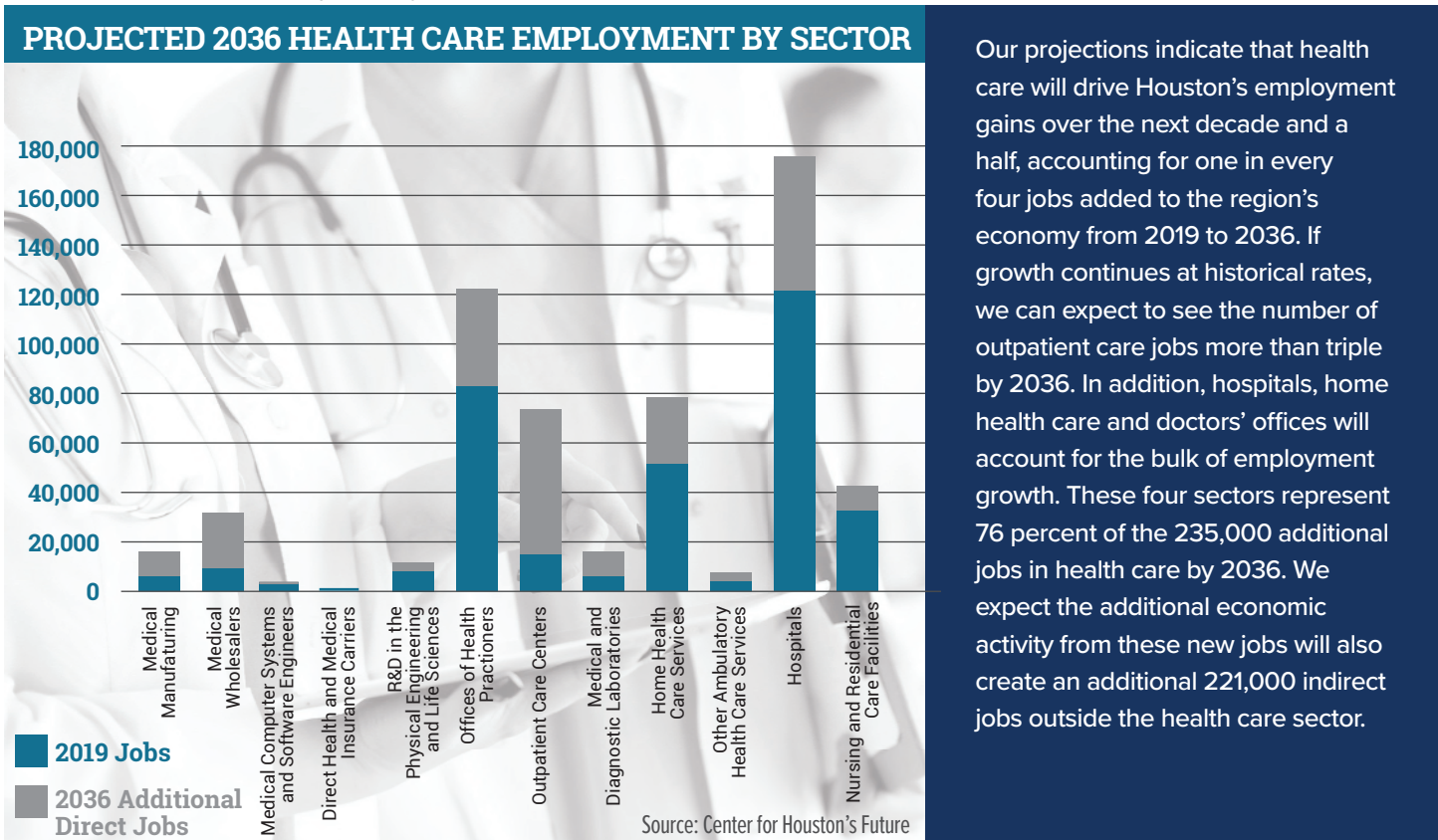


Chart: AE. 2036 Health Care Employment Projections

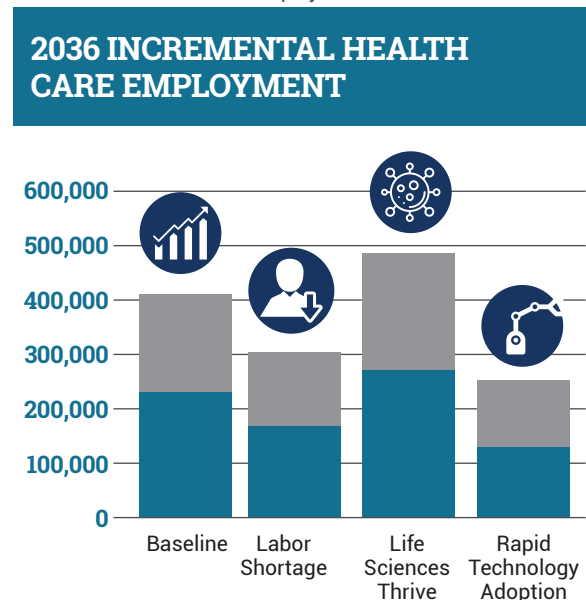


Our projections indicate that health care will drive Houston's employment gains over the next decade and a half, accounting for one in every four jobs added to the region's economy from 2019 to 2036. If growth continues at historical rates, we can expect to see the number of outpatient care jobs more than triple by 2036. In addition, hospitals, home health care and doctors' offices will account for the bulk of employment growth. These four sectors represent 76 percent of the 235,000 additional jobs in health care by 2036. We expect the additional economic activity from these new jobs will also create an additional 221,000 indirect jobs outside the health care sector.

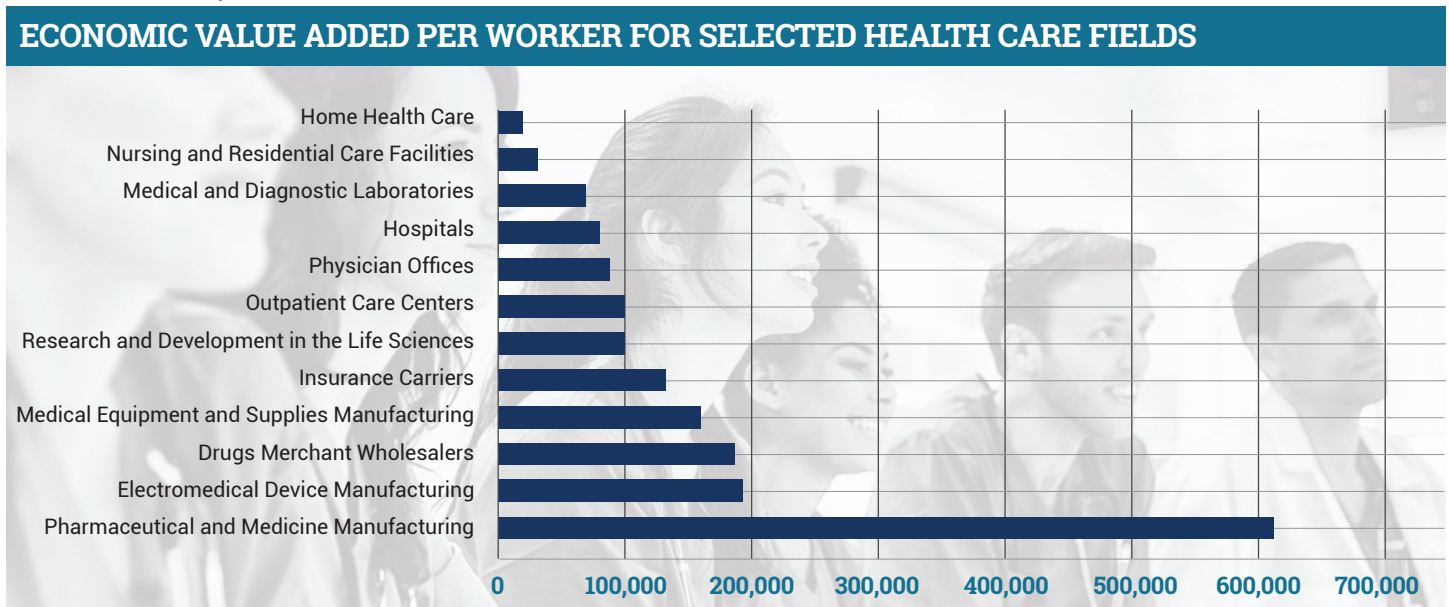
There are significant differences in employment outcomes across the scenarios:

- ▶ Under the **baseline scenario**, we expect direct health care employment to increase by 235,077 to a total of 594,554 jobs in 2036. This increase will be augmented by an additional 176,450 indirect jobs created, resulting in a total incremental change of 411,527.
- ▶ A **labor shortage** would depress employment growth (27 percent below the baseline), with only a 172,416 rise in direct employment and a 129,416 boost in indirect employment. Under the labor shortage scenario, the overall 2036 employment forecast totals 531,893 workers.
- ▶ Cultivating a **thriving life sciences** hub would yield the highest employment growth among all the considered scenarios. Here, the health care sector would create 277,247 jobs over a seventeen-year period with a total of 636,724 jobs by 2036 (18 percent above the baseline). This growth would also produce another 208,103 indirect jobs.
- ▶ Lastly, the **rapid technology adoption** scenario results in the smallest employment gain. The health care sector would produce 144,740 direct jobs by 2036 with an accompanying increase in indirect employment of 108,642 (38 percent below the baseline). Total sector employment in 2036 would be 504,217 jobs.

Chart: AF. 2036 Scenarios Employment



Source: Center for Houston's Future



Source: Center for Houston's Future

Economic Value Added Differences by Industry/Job

Gross Domestic Product (GDP) is a key, widely accepted measure of economic activity. We project the 2036 effect on the region's GDP under each of the four scenarios by calculating the economic value added by a typical health care worker within each health care field.⁴⁰

A key dynamic in the health care sector's economic influence on the overall economy lies in how different health care jobs have widely different levels of economic impact. For example, adding a job in pharmaceutical manufacturing on average creates another four jobs outside the health care space. Each job added in an outpatient care facility will indirectly generate less than two additional jobs.

Chart AG shows the average economic value added by workers in various health care fields, further illustrating the disparate economic significance of occupations across the health care sector. The economic value added from the average job in pharmaceutical production (\$621,962), for instance, is thirty times that of an average job in home health care (\$20,684).

To create economic and employment projections for Houston's health care sector, our model uses a widely accepted set of employment multipliers sourced from the IMPLAN economic modeling platform. The overall employment multipliers—a measure of how boosting employment in one area will yield additional job growth across the general economy—for the region's health care sector are displayed in the table to the right.⁴¹ We estimate an overall employment multiplier for Houston's health care sector of 1.75,

meaning that, on average, each health care job added will create another 0.75 jobs.

Multipliers for occupations across the industry vary widely and growing the fields with the largest employment multipliers will result in greater contributions to the region's economy. For example, a job in pharmaceutical manufacturing has a multiplier of over 5 while the home health care multiplier is just 1.2. Moreover, the employment multiplier for life sciences jobs in Houston is 45 percent higher than that of health care occupations outside life sciences.

As such, our model suggests that, assuming historical trends, the life sciences will constitute 12 percent of all health care jobs added through 2036 but be responsible for 26 percent of the indirect employment generated by health care during this period.

This pattern is not unique to Houston. For context, Massachusetts is home to what is widely considered the global epicenter of life sciences research anchored by Boston. The 28,000 people employed there in biotechnology R&D are a minuscule fraction of Massachusetts' nearly 3.7 million workers, but the sector is responsible for 7 percent of the state's GDP.⁴²

Table: AH. Multipliers Table

INDUSTRY	AVERAGE IMPLAN EMPLOYMENT MULTIPLIER FOR HOUSTON
OVERALL HEALTH CARE	1.75
LIFE SCIENCES	2.44
HEALTH CARE (excluding Life Sciences)	1.68

Source: IMPLAN

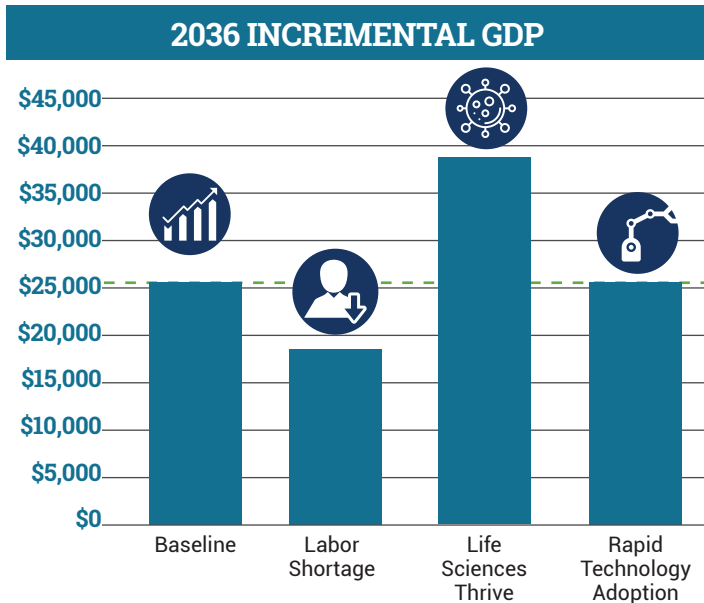
GDP Impact

Over the next sixteen years, it is almost certain the economic output of the health care sector will grow. How significant that growth is, however, varies widely depending on how circumstances play out. Chart AI depicts the change in regional GDP associated with each of the four scenarios. For context, the health care sector contributed \$27.7 billion to Houston's regional GDP in 2019.

- ▶ In the **baseline scenario**, our modeling suggests the health care sector would add another \$25.9 billion in economic output by 2036, an increase of 104 percent.
- ▶ The **labor shortage scenario** adds \$18.4 billion in GDP, 29 percent (\$7.4 billion) less than the baseline case.
- ▶ The **thriving life sciences scenario** adds \$39.0 billion in GDP, a 51 percent boost (\$13.1 billion) over the baseline case. Given that the Houston region's overall 2018 GDP was \$445 billion, the economic effect of the life sciences scenario would be equivalent to growing today's regional economy by 9 percent.
- ▶ Lastly, the GDP effect of the **rapid technology adoption** case is virtually equal to the baseline. While fewer jobs would be created in this scenario compared to the baseline, our model suggests that gains in worker productivity would entirely offset any loss in economic output.



Chart: AI. Scenario GDP

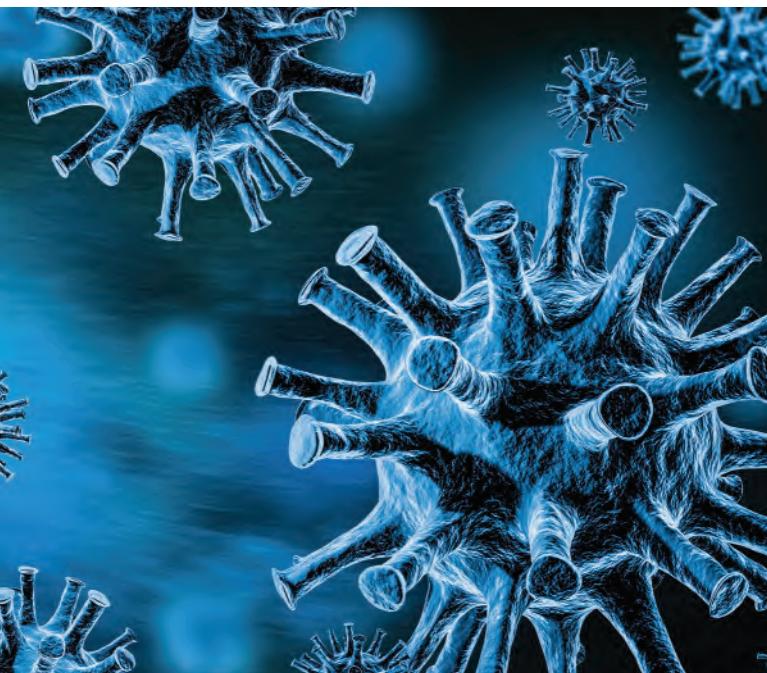


⁴⁰ "Value Added" is the difference between the total costs associated with producing goods and services and their ultimate price and can help gauge worker productivity. It is essentially a combination of the payment to workers and return to capital. Value Added is analogous to GDP in that it indicates the net output of a sector after totaling the total value of economic output and deducting intermediate inputs.

⁴¹ The figures are a weighted average incorporating the economic multiplier associated with each health care field with the number of employees in that respective field.

⁴² Silicon Republic. "The sheer scale of Boston's life sciences sector is truly eye-opening." September 2018. <https://www.siliconrepublic.com/companies/boston-life-sciences-sector>.

IV. The Covid-19 Pandemic



The Covid-19 pandemic has accelerated many of the emerging trends and disruptions identified in this report and severely strained our health care system.

In addition to testing the capacity of our hospitals to treat patients, the economic disruption from the pandemic has led to a substantial increase in unemployment, which subsequently has led to a spike in our already-high uninsured rates. It has also jeopardized the region's employers' ability to cover the cost of their employees' health care coverage. Nationally, over 20 million workers lost their jobs in the beginning months of the pandemic. One study estimates that the spike in unemployment will lead to 31 million people losing their health insurance this year.⁴³ Texas alone is expected to add another 700,000 uninsured residents in addition to the 5 million that already lack insurance.

In addition, health care providers have struggled financially as their patient loads dropped severely during the pandemic, an issue that will likely compound as this pent-up demand spikes and patients return to scheduling doctor's appointments.

We conducted a series of interviews with regional health care experts as to how the pandemic has altered the trajectory of these trends, as well as what lessons we have learned to better prepare our health care system for the next public health crisis. Our findings are detailed in this section.

Workforce

Our conversations with health care providers revealed a consensus view that the pandemic has exacerbated many of the already-existing challenges to developing our health care workforce.

The need to develop a comprehensive pipeline for the health care workforce—for low, middle, and high skilled workers—has become even more apparent. Houston health care providers noted that providing adequate staffing ranked among their biggest challenge in responding to the pandemic, with nurses in particularly high demand. Many stated that emergency authorizations that relaxed regulations to allow nurses to cross state lines became essential to being able to provide the care needed throughout the community. These efforts allowed hospitals to address shortfalls in needed health care professionals by importing them from out of state, something that state law had previously prevented.

The pandemic has also heightened the need for the region to train, attract and retain more community workers, mental health specialists and IT professionals. Community workers have proven invaluable in assisting the pandemic response efforts, helping identify at-risk individuals and promote best practices for public health throughout the community. Our



region's ability to meet the demand for mental health care was inadequate before this year. The demand for mental health services has skyrocketed as people experience an exceptional time of fear and uncertainty. Lastly, IT solutions have proved invaluable in helping hospitals increase their efficiency and hedge against a constrained labor pool; their services are in higher demand than ever.

Burnout in the health care workforce has also continued as a top concern for health care providers. During the past year, health care providers have witnessed an appalling level of death and also became surrogate family members for patients not allowed visitors. As a result, HR executives across the region's major hospitals predict that the pandemic will accelerate the generational shift already occurring in the workforce as baby boomers retire and are replaced with millennials. Addressing burnout will likely require offering more flexibility to health care employees and a greater emphasis on improving workplace culture to retain talent.

Training and skills development in the workforce are another focus area that health care experts have identified.

The pandemic has led to the implementation of technologies from virtual ICUs to telehealth platforms, and often the biggest challenge in rolling out these platforms is training workers in how to properly use them. As a result, the region's health care providers are increasingly focused on upskilling their workforce to handle digitization and to be more agile, with an emphasis on project-based as opposed to job-based work. In addition, our interviewees noted that a teams-based approach is increasingly ascendant. During the surge in the region's Covid-19 cases, many hospitals adopted a teams-based approach to providing nursing care, something that helped mitigate against the labor shortage. These providers noted that we need to shift how we train our health care practitioners so that they are better prepared to work in nontraditional health care models, such as teaching them how to engage with interprofessional teams.

Advancements in technology

One of the most striking features of the region's response to the coronavirus is the accelerated adoption of new health care technologies used in treating patients. As one hospital executive noted, "We have progressed more in the past 6 months than the past 2 years in terms of adopting new technologies."

The central role telemedicine has played has been a dominant feature of the pandemic response. Whereas many providers and patients were reluctant to use telemedicine services prior to the pandemic and insurance reimbursement issues hindered widespread adoption, our interviewees agreed that telemedicine is now the norm and is likely here to stay.

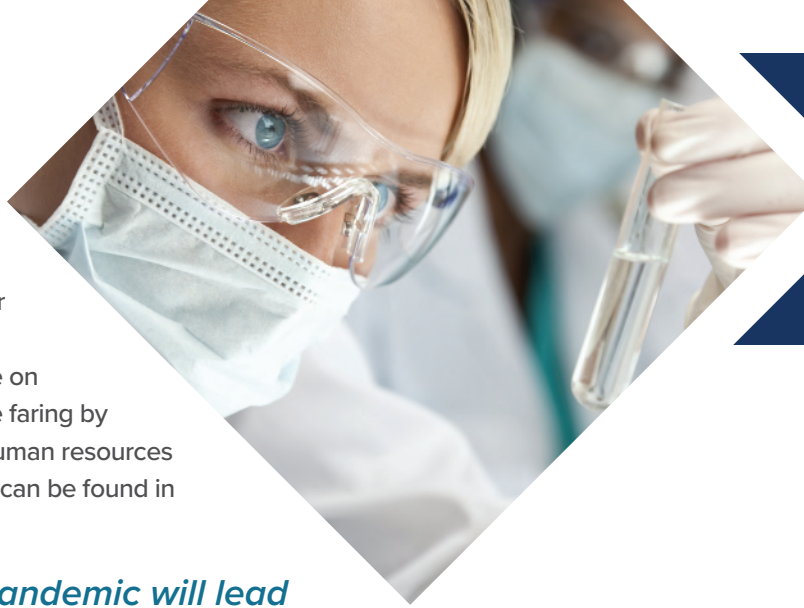
The benefits associated with using telemedicine include access to health care, particularly mental health care, as well as helping alleviate the strain on the limited health care workforce by increasing providers' efficiency. However, our interviewees noted that more research is needed to establish whether or not telehealth leads to equivalent health outcomes that in-person care produces. They called for more research into the question of the long-term effectiveness of a telehealth visit. In addition, there are concerns that telehealth services might not be accessible to the portion of the population that lacks internet access or an internet-connected device.

Experts noted that the pandemic has accelerated the development of technologies that deal with how to deliver care outside of hospitals and to identify best practices. They cited the development of algorithms to eliminate hospital waiting rooms and improve internal navigation in hospitals as key advancements to improve efficiency.

The advent of virtual ICUs and use of predictive analytics has allowed nurses to become more efficient and treat more patients. These technologies allow for practitioners to monitor patients virtually, offering systems that monitor a patient's vital signs and mobilize a response when they go awry. These forms of virtual care allow for clinicians to prioritize care to patients most in need and help encourage the use of best practices for treatment.

The major stumbling block to building upon these technological advancements, interviewees note, is the lack of data standardization. While adoption of technology has not been a problem—providers are eager to implement them to help manage their strained resources—the dearth of interoperable data has stymied the development of next-generation advancements such as algorithms that could assess the effectiveness of experimental treatments or monitor patients in real time.

⁴³ David Blumenthal, M.D., M.P.P., Elizabeth J. Fowler, Ph.D., J.D., Melinda Abrams, M.S., and Sara R. Collins, Ph.D. "Covid-19 — Implications for the Health Care System". <https://www.nejm.org/doi/full/10.1056/nejmsb2021088>.

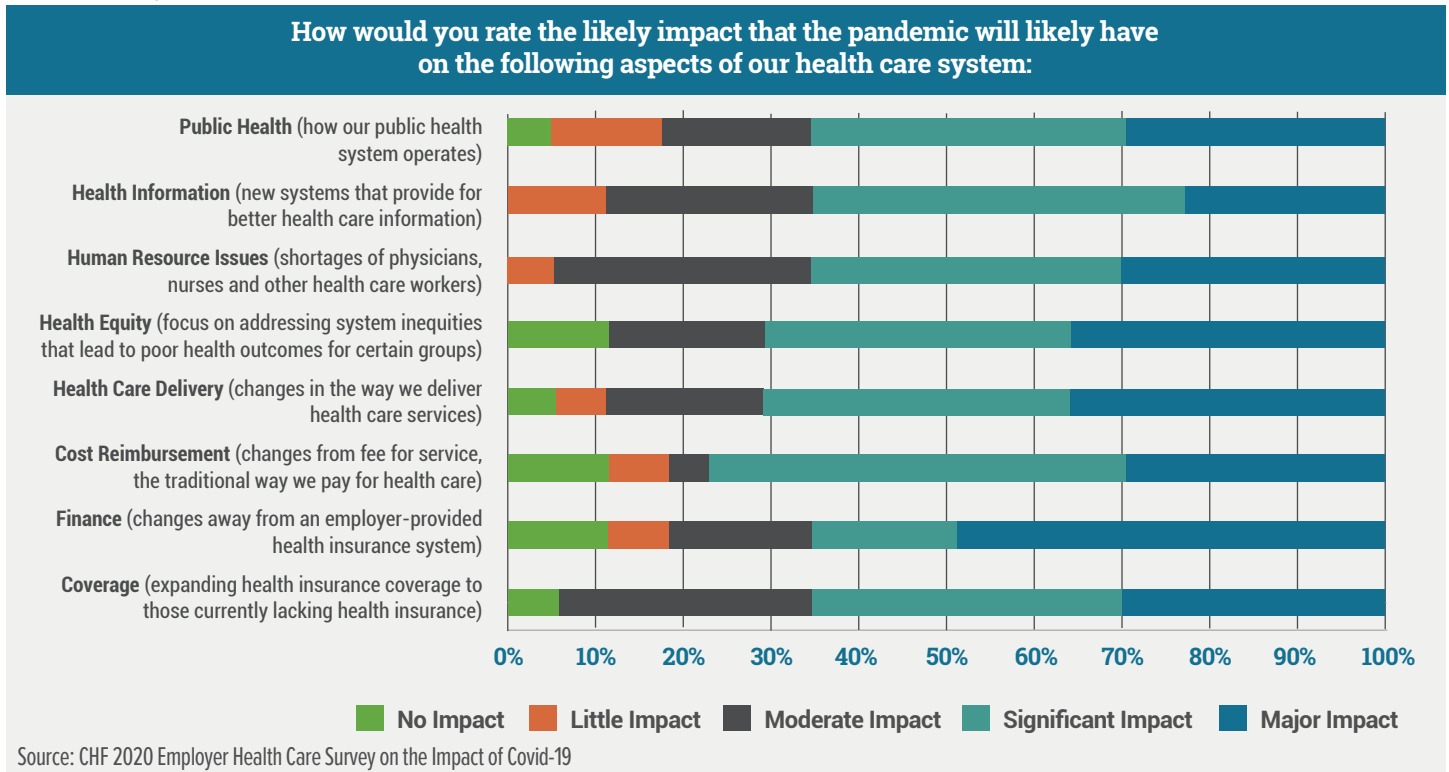


Impact on the business community

As already seen in the results of the employer survey presented earlier in the report, businesses are increasingly concerned about the effects of rising health care costs on their bottom lines. In September and October of 2020, the Center conducted a second survey of regional employers to assess how the pandemic has affected the business community’s perspective on health care issues. We gauged how Houston-area businesses are faring by surveying a ‘decision-maker’ pool of individuals with the title of human resources director or higher. Information on how the survey was conducted can be found in the methodology appendix. A summary of the findings follows.

The business community believes that the pandemic will lead to major transformations in our health care system.

Chart: AJ. Employer Perspective on the Pandemic’s Effect on Health Care



Survey respondents reported a high level of satisfaction with how the region’s health care system responded to the pandemic, with over 88 percent rating the performance as good or excellent. At the same time, respondents indicated that the pandemic has amplified existing vulnerabilities both with the health care system (76 percent in agreement) and with the current model employers use to provide health coverage to their workers. A strong consensus of survey participants agreed that the pandemic will have a significant or major impact across the entire spectrum of our health care system from finance to technology to insurance coverage and more.

Asked to predict which areas of the health care system will be most affected by the pandemic going forward, respondents identified changes in health care delivery, cost reimbursement and the priority placed on health equity as the three most likely areas that the pandemic will most impact.

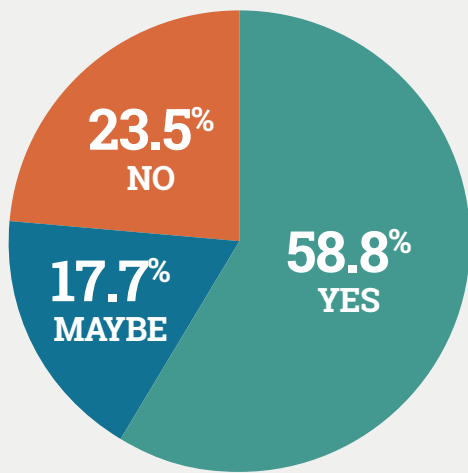


Employers agree that the pandemic has exposed vulnerabilities in our current system regarding the uninsured and issues of health equity.

The business community recognizes the value of our public health system and agrees that more investment is needed.

Chart: AK. Employer Perspective on Insurance Expansion

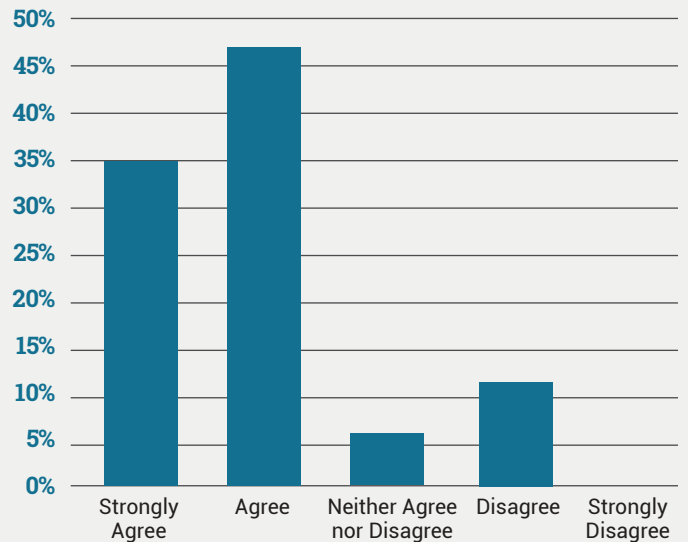
Has the pandemic impacted your feelings on whether the state of Texas should expand insurance to cover uninsured Texans?



Source: CHF 2020 Employer Health Care Survey on the Impact of Covid-19

Chart: AL. Employer Perspective on Public Health Investment

Do you believe that our public health system requires more investment to deal with future pandemics?



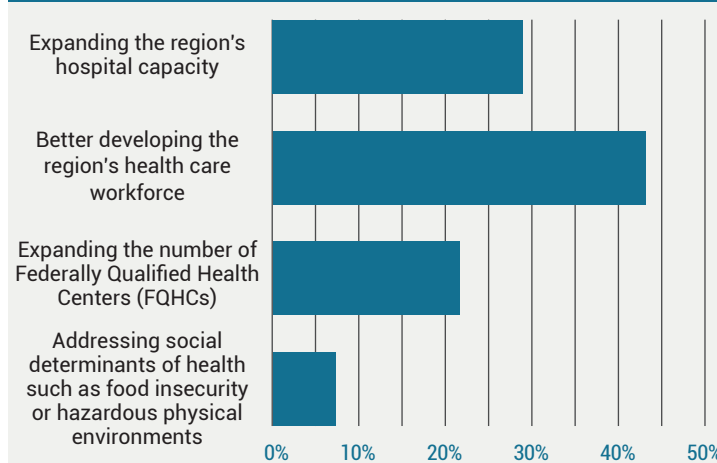
Source: CHF 2020 Employer Health Care Survey on the Impact of Covid-19

When asked how their perspective on expanding insurance in Texas has changed given the events over the past year, 59 percent of those surveyed indicated the pandemic has made them more likely to support an expansion of Medicaid in Texas. Moreover, three-quarters of respondents agreed the pandemic presents an opportunity for addressing existing racial and socioeconomic gaps in access to health care.

Yet, survey respondents suggested they were largely uncomfortable with the idea of Houston employers taking a leadership role in addressing the region's uninsured population. The survey results indicate a growing willingness to back efforts to expand health care coverage, even as 68 percent of respondents stated that employers should focus solely on providing insurance to their employees instead of working to address these priorities.

Chart: AM. Employer Perspective on How to Invest in Public Health

What public health investments should be made?



Source: CHF 2020 Employer Health Care Survey on the Impact of Covid-19

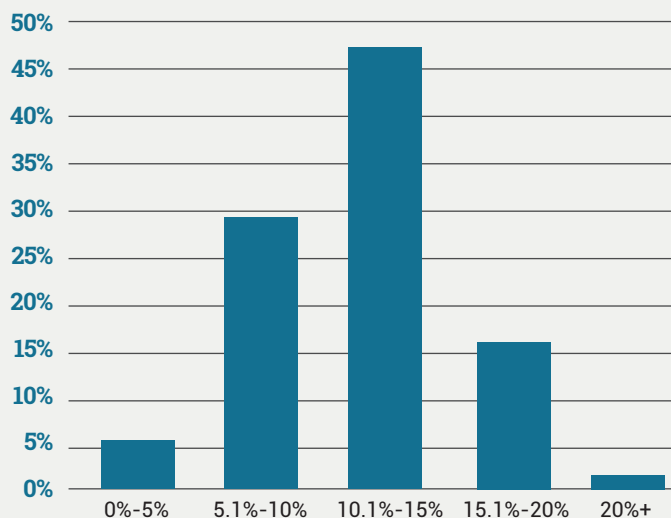
Survey participants expressed high levels of approval for the region's health care system, with over **80%** agreeing that more investments in public health are needed throughout the region.

When asked to which public health investments our region should prioritize, a plurality of 43 percent identified strengthening the region's health care workforce as the top concern. A roughly similar proportion of respondents identified physical investments as a priority in the form of expanding hospital capacity or instituting more Federally Qualified Health Centers (community-based health providers that provide care in underserved areas). Focusing more resources on addressing social determinants of health was selected as a top priority by just 7 percent of respondents.

Employers see the pandemic as a major disruptor for how health care will be financed going forward.

Chart: AN. Employer Expectation on Cost Increase

How much do you expect your overall (including employee share) health care costs, on average, to rise over the next five years as a result of the pandemic?

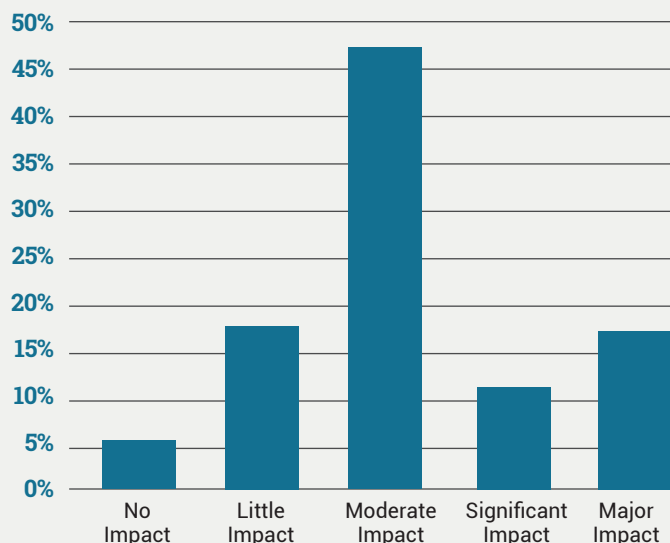


Source: CHF 2020 Employer Health Care Survey on the Impact of Covid-19

The pandemic has radically altered employers' projections for how the cost of providing health care coverage will increase over the coming years. When we surveyed regional employers in January of this year, 6 in 10 respondents expected overall health care costs to rise by less than 10 percent over the next 5 years. Nine months later, that figure has flipped, with 65 percent of respondents predicting a more than 10 percent average increase in their health care costs over the same period.

Chart: A0. Impact of Health Care Costs on Business

In the past 6 months, have increases in health care costs affected your company's core business operations?

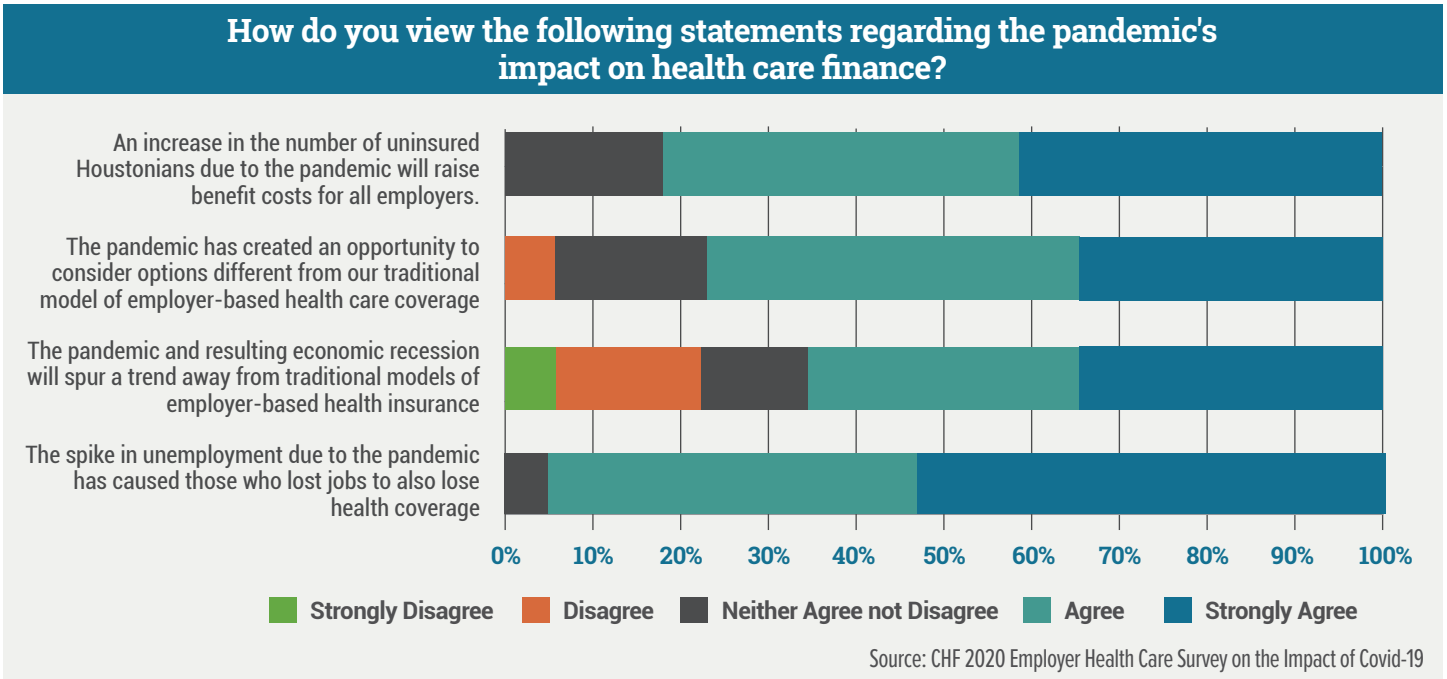


Source: CHF 2020 Employer Health Care Survey on the Impact of Covid-19

About half of those we surveyed reported that the pandemic's role in increasing health care costs has posed a moderate impact on their core business operations. Just shy of a quarter noted little to no impact, while roughly three in ten respondents reported a significant to major impact.

As seen in Chart AP, there was a strong overall consensus among survey respondents that the pandemic is having and will have a transformative role in reshaping how health care is paid for—and who pays for it.

Chart: AP. Employer Perspective on Health Care Finance Changes



Employers increasingly recognize that their leadership is needed to improve the region's health care system.

Chart: AQ. Employer Perspective on Business Leadership in Health Equity



While respondents expressed a reluctance for businesses to drive the charge for expanding public insurance programs (see page 52), there was widespread agreement—nearly nine in every ten respondents—that the region's business community should become involved in efforts to amend systemic inequality in our health care system. When asked to evaluate this question, not a single one of the survey's 59 respondents disagreed.

Chart: AR. Employer Perspective on Business Leadership in Health Care



We asked respondents their thoughts on one possible mechanism for increasing employers' role in improving Houston's health: the creation of a multi-stakeholder coalition spanning businesses, health care providers and other representatives to collaborate on solutions to our existing health care issues. Respondents expressed strong approval for this idea, with 76 percent agreeing such an effort would deliver value to the region.

Lessons learned

The Houston region, the nation and the world are still grappling with addressing COVID-19. It is clear we can take steps to ensure that we will be better equipped to address a public health crisis in the future. Below, we detail items that the region can address so that our health care system is more resilient and better able to absorb a shock like COVID-19.

Addressing health equity is critical

According to The University of Texas Health Science Center's Survey, one-fifth of our population's health is fair to poor. This percentage rises drastically, however, when looking at the health of minority or disadvantaged groups.⁴⁴ One of the central features of the pandemic has been its disproportionate impact on minority groups and disadvantaged populations, who experience more negative social determinants of health. A primary risk factor that has emerged for COVID-19 is a person's insured status. Moreover, data from providers suggest that Black and Hispanic COVID-19 patients are experiencing poor health outcomes not because of a provision of inferior care, but because of the existence of poor social determinants of health or pre-existing conditions such as untreated diabetes. Reducing the number of uninsured individuals in our region would improve our pandemic response.

Adopting non-traditional models of health care could strengthen our region's health care resilience

The majority of health care provided across our region is delivered according to a fee-for-service model, leaving the financial viability of health care providers tied to the volume of patients they treat. Over the past six months, this model has economically stressed hospitals and physician practices as their revenues collapsed and significant layoffs occurred across the health care sector. Alternative models such as value-based care could help transfer financial risk from providers to payors.

Houston, however, lags behind other areas of the country on this front. For example, Los Angeles is considered a leader in implementing the use of value-based care. In large part this is because the state of California led a state-wide effort, including its 21 public health care systems, to implement value-based care over the past decade by taking advantage of Section 1115 Medicaid waivers, which provides states with flexibility in how they operate their programs.⁴⁵

In addition, because a value-based care system entails centralized data recording, experts noted that the implementation of value-based care could have allowed the region to develop a more comprehensive, personalized approach to support COVID-19 initiatives. California, for instance, possesses a relatively high level of adoption of value-based purchasing and was accordingly able to easily identify high-risk populations (like the homeless) and target care toward them. The value-based care framework has also enhanced the health care systems' ability to conduct contact tracing by ensuring that patient data is standardized and accessible.

Interviewees noted several obstacles that must be addressed in order to achieve this transition to greater adoption of value-based care. First, a higher level of centralization is needed to bridge the silos in our fragmented network of health care providers. Experts note that Houston is behind in terms of having large hospital networks directly hire physicians into their systems, allowing for more comprehensive coordinated care.

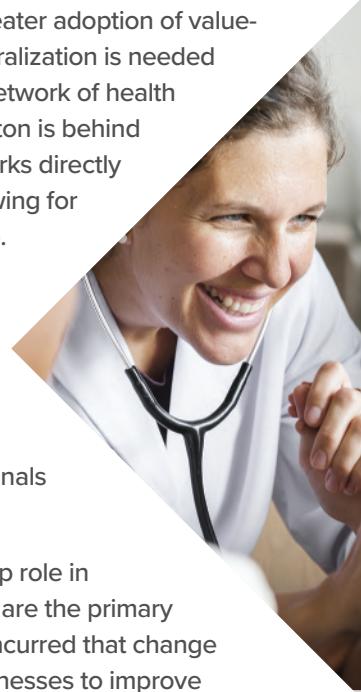
Second, changes in the workforce are needed to transition to a new model of providing care: It will require greater use of physician extenders and changes to state licensing laws to allow health professionals to practice at the top of their licenses.

Third, employers must take a leadership role in calling for this transition. As employers are the primary payers of health care, interviewees concurred that change will not occur without a push from businesses to improve health outcomes and lower the cost of care.

Lastly, interviewees noted that this transition will likely require a top-down approach. They remarked that in areas that have successfully implemented wide-spread use of value-based care, the resulting system has been a result of government leadership, often the product of taking advantage of Medicaid waivers allowing for experimentation.

Adopting a greater focus on social determinants of health will improve health outcomes


It is likely that the health outcomes for those stricken with the novel coronavirus would have been significantly better if the region increased investment not just in public health, but also in initiatives to strengthen communities. Given that the



individuals most likely to die from the virus have been those with pre-existing conditions or poor social determinants of health, improving health in the Houston region will necessarily require efforts aimed at boosting the socioeconomic status of the region's most disadvantaged inhabitants. For example, several insurers have begun to pay for home remediation for asthmatic individuals in homes that contribute to their inhabitants' disease.

Addressing social determinants of health will require work to create better, more robust data sets as well as the buy-in of all stakeholders in our health care system. This calls for the creation of multi-sector partnerships with payors, community members and nonprofits.

A coordinated public health response requires reliable, standardized data



The ability to provide timely information to the public about risk levels is central to combating the novel coronavirus. This requires data and data-sharing arrangements across all the stakeholders in our health care system. The region still lacks the formal infrastructure, however, to provide reliable, standardized data amalgamated across different providers and hospitals in the region. For example, as of September of 2020, Harris County was publishing summarized testing results and positivity rates, while the City of Houston was publishing its own separate set of data dealing with testing and contact tracing. There is currently not adequate data coordination to craft a regional public health strategy and achieve risk mitigation.

Many health care experts we interviewed lamented that the failure to create a centralized data repository represents a missed opportunity to accelerate data reporting. While the creation of the Harris County Commissioners Court Office for Data this year represents a significant step, our experts called for a neutral, centralized and empowered organization to coordinate health data for the entire region. A possible model is the Center for Health Information and Analysis in Massachusetts, which serves as the state agency responsible for health care statistics. One potential solution is to empower our existing health information exchange, Greater Houston HealthConnect, to expand its role beyond ensuring the transfer of electronic medical records to serving as the hub where this data is collected and analyzed.

A need for greater leadership and institutional collaboration

Clear and consistent messaging, established guidelines and protocols and a shared strategic plan are critical pillars of our pandemic response. What these all require is effective coordination among the region's myriad hospital systems and health nonprofits. This is no easy task, considering that many of these entities are competitors who must collaborate with research and implementing evidence-based protocols.

This collaboration should extend to better integration of the health care and public health system. One of the lessons that emerged from the pandemic is the need to prepare for catastrophic scenarios and ensure that the infrastructure and logistic pathways needed to mount a robust response are ready. The gap between clinical medicine and public health has impeded the region's ability to combat Covid-19. A more resilient health system will integrate clinical practices with community response protocols like contact tracing and public health communications.⁴⁶

Early in the pandemic, TMC institutions established data-sharing agreements to coordinate their response—a promising step that we should build upon to further institutionalize collaboration. Some potential options include reviving the Harris County Health Authority or creating a regional planning organization modeled on the coordination model established by the Houston-Galveston Area Council, which focuses on transportation and air quality issues.

In addition, businesses have a critical role to play in this area. The state of our health care sector and the region's health is undoubtedly a core business issue: employers more often than not shoulder the burden of health care costs. Moreover, the pandemic has made painfully evident the disruption that a public health crisis can pose on the workforce and greater economy. The pandemic has demonstrated that businesses played a key role in promoting health practices such as encouraging the use of masks and social distancing among their employees. It is likely that meaningful progress and collaboration throughout the health care sector will require leadership from the region's business community.

⁴⁴ Health Sciences Center at Houston, UTHealth, "2018 Health of Houston Survey." <https://sph.uth.edu/research/centers/ihp/index.htm#TID-e1bc0d84-d308-4213-9931-c667967d8c23-3>.

⁴⁵ California Association of Public Hospitals and Health Systems. "California's Public Health Care Systems' Journey to Value-Based Care." March 2019. <https://caph.org/2019/03/07/issue-brief-californias-public-health-care-systems-journey-to-value-based-care/>.

⁴⁶ Ariande Labs. "Dr. Asaf Bitton on Ariande Labs' Response to the Covid-19 Pandemic." 2020. <https://www.ariandelabs.org/resources/videos/dr-asaf-bitton-on-ariadne-labs-response-to-the-Covid-19-pandemic/>.

V. Conclusions and Next Steps

The health care sector is an essential pillar of Greater Houston's economy, generating more new jobs than any other industry and ensuring the vitality of our region.

As this report discusses, there is a pressing need to continue improving our population's health, ability to access and pay for care as well as to magnify the economic footprint of the health care sector.

Our health care sector is grappling with how to best position itself as we enter a period of upheaval with new technologies and novel models of delivering care. Effectively navigating these shifts has the potential to unlock major growth for both our region's economy and population health.

Our findings indicate that capitalizing on the changes transpiring in health care over the next few decades will require cooperation among all the stakeholders in our health care system—employers, patients, providers, insurers and more.

In the focus groups and interviews we conducted for this report, leaders in health care and the overall business community repeatedly warned that our region is rapidly approaching a tipping point where the impact of health care costs on business' bottom line is becoming untenable. They stressed that employers must become more involved in health care discussions and demands for change.

Achieving better health outcomes and building a better health care system will require collective action from the health care sector and the Greater Houston business community. We believe that our community can employ the "Triple Aim" approach described in the introduction to set goals and begin to cooperate in a more coordinated manner.

As such, we encourage the region's business and civic leaders to collaborate with health care stakeholders to address the following:

The need for greater collaboration between the region's health care system and employers

- ▶ One promising idea is the creation of an employer-health care sector coalition to work on the issues raised in this report. A possible model to consider is the Dallas Medical Resources organization. Dallas Medical Resources connects business, community, and health care leaders to inform and educate members about the region's health care infrastructure and services.
- ▶ We can strengthen our health care system across the entire region by thinking expansively and involving institutions outside the Medical Center.

Ensuring an adequate supply of qualified health care workers

- ▶ With demand for non-primary care physicians expected to grow faster than supply, the region must devise a strategy to continue to attract and train specialists such as gerontologists, psychiatrists, and surgeons.
- ▶ Nurses are one of the fastest-growing occupations in the region, but we suffer from a serious shortage of nursing instructors at the college level—the number of nursing teachers in the region is actually declining as more nursing jobs are created. One idea might be to work with health care providers to fund their senior nursing employees to teach on a per semester basis.

Addressing the specific health needs of our region's population

- ▶ Promote an ecosystems approach, in which instead of operating in silos that create structural and cultural barriers to care, governments, providers, payers, and other community partners work together to coordinate care and services for the most vulnerable people in the population.
- ▶ To address our sizable undocumented and uninsured populations that lack proper access to health care, the region should explore developing capitated models of delivering health care. Capitation is a type of a health care payment system in which a doctor or hospital is paid a fixed amount per patient.
- ▶ Diabetes is one of the most serious and prevalent diseases impacting public health in the region. To move the needle on reducing the incidence of diabetes in our community, the region should expand the collaborative model advanced by Cities Changing Diabetes-Houston that is detailed in the report and expand the stakeholder coalition that has been mobilized to combat diabetes.
- ▶ The gap between our residents' need for mental health care and their ability to access these services is growing. The region should prioritize efforts aimed at increasing access to mental health services and ensuring continuity of care. This might include initiatives that address the need for a greater supply of mental health workers, the expansion of telehealth services to improve access—something already happening during the pandemic—and the importance of mobilizing early interventions to produce better mental health outcomes.

Addressing social determinants of health from a policy perspective

- ▶ Adopt a coordinated approach to funding and assessing impact from health care, public health, social services, and other sectors, which function and are usually funded and managed in silos with different funding requirements and often-incompatible data collection and information systems.
- ▶ Given that public health is inextricably tied to the socioeconomic conditions that shape our residents' lives, we encourage regional policymakers to conduct a health impact assessment when crafting new public policy. Housing, environmental regulation, education and public safety all have a role in determining our residents' health,

and our policymaking process in these areas should adopt health impact as a routine metric.

Expanding the region's health care research and action agenda to address issues raised in this report along with other key issues not covered here in detail

- ▶ The region should consider how to develop a cross-sector push for innovation that includes effectively scaling the research catalyzed by the Cancer Prevention and Research Institute of Texas (CPRIT).
- ▶ One of the gaps identified in ensuring that our burgeoning life sciences sector continues to grow is a deficit of venture capital. Initiatives are needed to attract investment to facilitate the growth of our existing biotech firms and boost the rate of startup formation.
- ▶ By adopting a common vision—and becoming jointly responsible for improving the quality and lowering costs of health care—we can achieve significant health care improvements in our community.

A central theme that has recurred throughout this report is a lack of coordination within our health care system—geographically, across all stakeholder groups, between provider networks and more. In addition, there are myriad health care initiatives ongoing throughout the region with more being developed every day. The region needs an inventory of ongoing initiatives both to identify gaps and to seek efficiencies by reducing duplicative efforts. In addition, more work is needed to analyze how to best encourage collaboration among health care stakeholders across the 9-county region and aligning the aims of TMC core institutions with our suburban hospitals.

By adopting a common vision—and becoming jointly responsible for improving the quality and lowering costs of health care—we can achieve significant health care improvements in our community.



METHODOLOGY

Geography: When discussing metropolitan areas, this report refers to the 2013 Office of Management and Budget definitions of metropolitan statistical areas (MSAs). Unless specifically noted, those MSAs are referred to by the city that anchors them (e.g., “Los Angeles” for Los-Angeles-Long Beach-Santa Ana, CA).

Race/ethnicity: All mentions of race and ethnicity in this report refer to the population sorted into the “single-race” race categories as specified in the 1997 U.S. Office of Management and Budget standards for collection of data on race and ethnicity. References to “Anglo” denote non-Hispanic individuals who identify as white.

MODEL METHODOLOGY

- ▶ Identify baseline economic data and trends: We examined historical data on employment from 2007 to 2019 for selected health care industries from the Quarterly Census of Employment and Wages to assess how the different industries comprising Houston’s health care sector have grown over the past dozen years.⁴⁷ Compound annual growth rates for employment were calculated for each health care sub-industry.
- ▶ Assess economic impact: CHF sourced economic multiplier data for Greater Houston’s health care workers and industries from IMPLAN to calculate a figure for average economic output generated per worker by industrial sector. An employment multiplier measures the amount of direct, indirect (those that are generated to support the industry) and induced (originating from the additional spending from new direct and indirect employees) jobs that increased employment in a particular industry will produce.
- ▶ Analyze historical data to determine base case growth rate: The Center analyzed growth rates for the period of 2007 to 2019. This period was chosen due to data availability and because 2007 and 2016 are representative of the long-term performance of the regional economy (both years did not feature boom/bust periods that would skew the projections). In terms of this model, ‘base case’ represents historical growth.

- ▶ Define alternate scenarios and forecast employment: In addition to the base case, we designed three scenarios: a ‘life sciences thrive’ scenario with growth in the life sciences increased by 50 compared to the historical rate, a ‘rapid technology adoption’ scenario wherein worker productivity would improve by 70 percent and subsequently diminish employment growth by 20 percent, and a ‘workforce shortage’ scenario where annual growth in health care jobs would decrease 20 percent.

SURVEY METHODOLOGY

Center for Houston’s Future conducted two online surveys of human resource directors and chief operating officers working at firms in the Houston region. Information on how the first survey was conducted is detailed on page 32.

CHF employed Qualtrics to conduct a second survey in September and October of 2020. This survey targeted a new pool of “HR Decisionmakers” in the region (different from that of the first survey) with a title of human resources director or greater. It received 58 responses. Respondents spanned all of Houston’s major industries, including nonprofit organizations and represented organizations whose workforce exceeded 50 employees.

⁴⁷ NAICS codes of industries examined include 3254 (Pharmaceutical and medicine manufacturing), 334510 (Electromedical and Electrotherapeutic Apparatus Manufacturing), 3391 (Medical equipment and supplies manufacturing), 4242 (Drugs and Druggists’ Sundries Merchant Wholesalers), 42345 (Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers), 42346 (Ophthalmic Goods Merchant Wholesalers), 44611 & 44613 (Pharmacies, Drug Stores & Optical Goods Stores), 5112 (Software Publishers), 5415 (Computer systems design and related services), 524114 (Direct Health and Medical Insurance Carriers), 525120 (Health and welfare funds), 532291 & 532283 (Home Health Equipment Rental), 54171 (Research and development in the physical engineering and life sciences), 6211 (Offices of physicians), 6212 (Offices of dentists), 6213 (Offices of other health practitioners), 6214 (Outpatient care centers), 6215 (Medical and diagnostic laboratories), 6216 (Home health care services), 6219 (Other ambulatory health care services), 622 (Hospitals), 623 (Nursing and residential care facilities), and 813212 (Voluntary Health Organizations).

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