Impact of COVID-19 on Vulnerable Populations in Texas

Phase 2 Report

Texas Health and Human Services Commission

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Executive Summary

This report presents findings from a large-scale study on the impacts of coronavirus disease 2019 (COVID-19) on vulnerable populations in Texas during the first year of the pandemic. The report was produced by the Texas Health and Human Services Commission (HHSC), in collaboration with the Department of State Health Services (DSHS), at the direction of the Office of the Governor. Phase 1 of the report, which described major demographic trends and identified data sources for further study, was released in January 2021. This report presents findings from Phase 2.

Drawing on disease surveillance data, hospital discharge data, death certificates, administrative health records, and program enrollment data, HHSC and DSHS analysts examined the impact of COVID-19 on vulnerable populations in Texas during the first year of the pandemic. Most studies in this report examine the impact of COVID-19 from March 1, 2020, through March 31, 2021, however, some studies depart from this time frame to answer specific research questions, such as how COVID-19 impacted pre-existing trends in Texas Medicaid and the Children's Health Insurance Program (CHIP) enrollment and service utilization. The results are organized by data source, population, and research question; in total, this report includes some 30 distinct studies. Though the methods and data sources vary, each study explores how the pandemic affected Texans of different ages, race/ethnicities, and geographies. Where possible, studies also examined the role of individual sex, comorbid conditions, Medicaid/CHIP population group, and community-level social vulnerability. Across studies, analysts employed statistical techniques to account for population-level differences to better understand the underlying patterns across subgroups.

Part 1 begins with a descriptive epidemiology study examining trends in COVID-19 outcomes and HHSC program enrollment across major demographic categories over time, including age, race/ethnicity, and geography. Part 2 presents a series of in-depth studies to better understand why certain vulnerable populations experienced elevated rates of diagnoses, hospitalizations, and deaths; studies in this section consider the role of individual sex, comorbid conditions, community-level social vulnerability maintained by the Centers for Disease Control and Prevention (CDC), and other explanatory factors. Part 3 considers the indirect impacts of COVID-19 on HHSC programs, including program enrollment and health care utilization.

Due to the large number of data sources, populations, and methodologies, findings in this report are often nuanced and population-specific, complicating efforts to draw broad, sweeping conclusions. Still other factors were left unexamined due to data and resource constraints relative to the breadth of topics already included in the Phase 2 studies. The purpose of this report is to provide in-depth information about the impacts of COVID-19 on vulnerable populations in Texas during the first year of the pandemic in order to help guide legislative decision-making. Though findings in this report are specific to COVID-19 and may not be generalizable to other emergent pandemics, certain health disparities and social vulnerabilities are likely to persist. Ultimately, further research by academics and policy experts is needed to better understand the underlying causes and policy implications associated with trends in this report.

The summary below differs from the layout of the report but is structured in a format that highlights the most important takeaways and key findings.

Findings

From March 1, 2020, through March 31, 2021, there were more than 11 million people tested, 2.7 million cases, 157,000 people hospitalized, and 48,000 deaths associated with the COVID-19 pandemic in Texas, making it the third leading cause of death among Texas residents during this time.[1]

Though rates of COVID-19 cases and tests were often highest among individuals ages 21-64, Texans 65 and older accounted for a disproportionate share of COVID-19 hospitalizations and deaths during the first year of the pandemic. Death rates among individuals ages 65 and older, for example, were often ten times higher than rates among 21–64-year-olds of the same race/ethnicity and county type.

Because age is often correlated with prevalence of comorbidities and other medical conditions, analysts examined the role of comorbid conditions (such as diabetes, heart conditions, and chronic lung disease) in COVID-19-related hospitalizations, intensive care unit (ICU) admissions, and deaths. Among the general population and individuals enrolled in Texas Medicaid/CHIP, high numbers of comorbidities and other medical conditions were often the strongest predictor of poor outcomes, surpassing other factors like age, sex, race/ethnicity, and geography. Hospital data, for example, shows that having condition(s) in one comorbidity category raises the odds of in-hospital mortality nearly threefold, while individuals with conditions in

[1] The timeframe from March 1, 2020 to March 31, 2021, was segmented into four distinct study periods based on patterns of increasing and decreasing cases. Cases and individuals hospitalized were counted once per person per period, but could be counted again in a new period. Individuals tested were unduplicated across the full timeframe from March 1, 2020 to March 31, 2021.

five or more comorbidity categories had 13 times higher odds of dying in the hospital than similar individuals without comorbidities.

COVID-19 spread through different areas of the state at different times. Case rates generally shifted from lower east Texas to west Texas over the course of the first year, while surges in the Rio Grande Valley, El Paso, and Panhandle areas may have contributed to disproportionate case rates, hospitalizations, and deaths among different populations at different times. During the first year of the pandemic, COVID-19 emerged as the leading cause of death in Public Health Regions 1, 10, and 11 (High Plains, Upper Rio Grande, and Lower South Texas, respectively). Counties with a higher-than-expected number of COVID-19 deaths based on their county-specific age distribution included clusters along the Texas-Mexico border, counties across the west, far west, and Panhandle regions of the state, as well as some parts of east and central Texas. These same counties tended to have higher poverty rates, a greater proportion of Hispanics, and higher levels of social vulnerability as defined by the CDC. Indeed, across studies counties with higher rankings on the CDC's Social Vulnerability Index (SVI) were nearly always associated with higher odds of ICU admission and death. Among clients enrolled in Texas Medicaid/CHIP, those living in micropolitan (micro) and rural counties had significantly higher odds of hospitalization than those in metropolitan (metro) counties, after controlling for demographic and medical characteristics. These patterns were echoed among populations receiving long-term services and supports (LTSS) in Medicaid, where micro and rural counties tended to log disproportionate rates of diagnoses and hospitalizations. Rural counties also had the highest age-adjusted death rates (AADRs) among the general population.

In general, males were more heavily impacted than females across COVID-19 outcomes and study populations. Among those hospitalized for COVID-19, for example, males had 46 percent higher odds of in-hospital mortality after controlling for age, race/ethnicity, comorbidities, and community-level social vulnerability.

Analysts also observed differences in COVID-19-related outcomes by race/ethnicity. Prior research has shown that health disparities by race/ethnicity are often driven by underlying factors, such as the prevalence of comorbid conditions and social circumstances like socioeconomic status, access to health care, housing, and transportation (World Health Organization, 2021). Where possible, analysts controlled for the number of comorbid conditions and community-level social vulnerability to better illuminate the association between COVID-19 and demographic characteristics. However, studies in this report did not have reliable individual-level data on frontline employment, health insurance status, education level, food security, housing stability, access to transportation, incarceration, or myriad other factors that may have impacted COVID-19 outcomes.

Overall, the impact of COVID-19 during the first year of the pandemic was felt most acutely by Hispanic populations in the state. In the summer of 2020, Hispanic populations began to experience disproportionately high case rates, and within Medicaid and CHIP, registered high rates of emergency department (ED) visits and hospitalizations due to COVID-19—a trend that would persist into the fall and winter. Multivariate analysis shows that among clients diagnosed with COVID-19 in Medicaid/CHIP, Hispanics were significantly more likely than White clients to have a COVID-19-related hospitalization, ICU admission, or in-hospital death after controlling for age, sex, county type, and comorbid conditions. Among LTSS populations in Medicaid, Hispanic clients also logged disproportionate rates of COVID-19 diagnoses and hospitalizations. These outcomes were echoed in the general population, where Hispanics hospitalized for COVID-19 had significantly higher odds of ICU admission and in-hospital mortality than White individuals, after controlling for age, sex, comorbid conditions, and community-level social vulnerability.

In the winter of 2020, coinciding with surges in the West Texas and Panhandle regions, middle-aged Hispanic populations suffered some of the highest case rates in the first year, surpassing all race/ethnicities except for Other. COVID-19-related fatalities also peaked during the winter period, with the highest death rates among older Hispanic populations in rural counties. AADRs were also highest among Hispanics, particularly in micro and rural counties where Hispanic AADRs were more than twice the state rate. When looking at the cause of death on state death certificates, Hispanic ethnicity emerged as the strongest predictor of having a COVID-19-related death after controlling for the influence of age, sex, and community-level social vulnerability. In total, Hispanic populations suffered more than 22,000 COVID-19-related fatalities during the first year of the pandemic, accounting for nearly half of the state total.

Though Hispanic populations were most impacted overall, Black populations in metro and micro counties recorded the highest rates of cases, hospitalizations, and deaths during the early months of the virus. Similar outcomes were observed among Black clients in Medicaid/CHIP. However, early rates of cases, hospitalizations, and deaths were relatively low compared to later months. Like other groups, Black populations generally experienced the most cases and hospitalizations from June 2020 to January 2021, though rates for Black individuals were surpassed by increases among other groups during this period. In general, Black populations tended to have higher rates of COVID-19 testing and hospitalizations than other groups, but were less likely to experience ICU admission and in-hospital mortality after entering the hospital. Black patients admitted to the hospital, for example, had 25 percent lower odds of in-hospital mortality than White patients, controlling for age, sex, comorbidities, and community-level social vulnerability. Nevertheless, Black populations suffered higher AADRs than all other race/ethnicities except for Hispanics, regardless of county type.

Asian and White populations tended to have more favorable outcomes than other racial/ethnic groups, though Asian children in rural counties had the highest case rate during the summer of 2020, and Asian clients in Medicaid/CHIP had higher odds of COVID-19-related hospitalization and death during the pandemic's first year. The odds of hospitalization among Asian clients diagnosed with COVID-19, for example, was twice that of White clients in Medicaid (and higher than any other race/ethnicity) after controlling for age, sex, comorbidities, and county type.

White populations in Texas were relatively underrepresented in cases, hospitalizations, and deaths throughout the first year; they also had lower rates of testing, lagging behind other groups until the fall of 2020. White clients in Medicaid, however, experienced the highest rate of COVID-19 diagnoses for much of the year, and logged similarly high levels of testing over the same period. In the winter of 2020, White rural clients ages 65 and older had 450 cases of COVID-19 per 10,000 population, the highest rate in Medicaid during the first year. Similarly, White Medicaid clients in rural residential facilities, such as nursing facilities and Intermediate Care Facilities for Individuals with an Intellectual Disability or Related Condition (ICFs/IID), saw a rise in COVID-19 diagnoses during the first winter.

The pandemic also had an indirect impact on HHSC program enrollment and health care utilization. New program enrollment increased during the early months of the pandemic as programs like Medicaid, CHIP, Supplemental Nutrition Assistance Program (SNAP), and Temporary Assistance for Needy Families (TANF) absorbed an influx of newly eligible clients. New program enrollment was heavily concentrated among Hispanic and Black children across programs and periods. In March 2020, Congress passed the Families First Coronavirus Response Act (FFCRA), which included maintenance of eligibility requirements for individuals enrolled in Medicaid in order for states to qualify for enhanced federal matching funds. Designed to prevent coverage losses during the pandemic, the policy suspended disenrollment from Medicaid during the term of the public health emergency (PHE). In total, the combined Medicaid/CHIP population grew by almost 820,000 clients between March 2020 and March 2021.

The pandemic also drove down health care utilization across a range of services in Medicaid and CHIP, though some vulnerable populations continued to seek mental health (MH) care, therapies, well-child visits, and other necessary services. Utilization of teleservices, however, played a crucial role in maintaining access to care, increasing for all client groups during the first year of the pandemic—and especially for those with complex medical needs. Notably, individuals with conditions in six or more comorbidity categories had 13 times higher odds of utilizing teleservices than individuals without comorbidities, after controlling for a series of demographic and geographic characteristics, as well as prior utilization patterns. Individuals enrolled in STAR Health, the Medicaid program for Texas children and youth in the foster care system, also substantially increased their utilization of teleservices; after controlling for relevant factors, children in STAR Health had 2.5 times higher odds of utilizing teleservices than individuals in STAR, the state's primary Medicaid program serving primarily non-disabled children and pregnant women. Increased teleservice utilization among STAR Health clients may have been linked to increased utilization of mental health services; while many client groups sought fewer MH visits during the first year of COVID-19, individuals continuously enrolled in STAR Health from March 2019 to February 2021 increased their MH utilization by 5 percent.

Taken together, results from this report make clear the impacts of COVID-19 were not borne equally by different populations and areas of the state during the first year of the pandemic. In early 2021, a large-scale vaccine distribution effort dramatically altered the landscape of viral transmission, reducing case rates and curtailing the most severe outcomes of the virus for a time. Texas DSHS continues to monitor COVID-19 trends and provide relevant public health information to the public. HHSC continues to monitor program enrollment, health care utilization, and federal policies related to the PHE declaration.

Introduction

Background and Phase 1

This report presents findings from a large-scale research study on the impacts of coronavirus disease 2019 (COVID-19) on vulnerable populations in Texas during the first year of the pandemic. The report was produced by the Texas Health and Human Services Commission (HHSC), in collaboration with the Department of State Health Services (DSHS), at the direction of the Office of the Governor. The study was conducted in two phases.

In January 2021, HHSC released Phase 1 which included a preliminary report that provided a foundational exploration of existing research on pandemic-related public health data and identified various data sources that could be used to describe the impacts of COVID-19 on Texans. As part of this phase, HHSC launched a series of dashboards that provided descriptive information about COVID-19 cases, social vulnerability, fatalities due to COVID-19, and the demographic characteristics of Texas Medicaid and the Children's Health Insurance Program (Medicaid/CHIP) clients who have been tested for, had a diagnosis of, and/or received certain services due to COVID-19. Since releasing Phase 1 of the report, HHSC has regularly updated these publicly available dashboards and worked to expand its analysis as additional data become available. Throughout, HHSC has collaborated extensively with DSHS and specific subject matter experts with medical and epidemiological backgrounds. To facilitate this coordination, HHSC established a Clinical Resource Expertise Group, comprised of clinical, public health, and policy experts from HHSC and DSHS. This group provided continual guidance and feedback on both phases of the project.

The goal of the Phase 2 study is to examine the impact of COVID-19 on Texas' vulnerable populations in the first year of the pandemic. This report provides an in-depth examination of the specific outcomes and patterns observed during the early stages of the COVID-19 pandemic and associated response. Where data allow, this study also attempts to identify explanatory factors and trends to support public policy decision-making.

Defining Vulnerability

Previous research has shown that multiple demographic, socioeconomic, and medical factors are associated with increased risk of morbidity and mortality due to

COVID-19. These include characteristics such as age, race/ethnicity, comorbid conditions, and where people live. This section outlines some of the key dimensions of vulnerability that are most associated with elevated disease burden and mortality risk from COVID-19.

Age

Numerous studies have highlighted the relationship between age and severe outcomes due to COVID-19. National data show the risk of hospitalization and death consistently increases with age, despite similar case rates across age cohorts throughout the pandemic. For example, in comparison to individuals ages 18 to 29, those in their thirties have death rates four times as high, while those in their forties have death rates 10 times as high. At the top of the age distribution, individuals ages 85 and older have hospitalization rates 15 times higher and death rates 340 times higher than individuals ages 18 to 29 (CDC, 2022a).

Race/Ethnicity

Phase 1 of this report published in January 2021 established race/ethnicity as an important marker of vulnerability across different COVID-19 outcomes. Other studies have also noted the disproportionate impacts of COVID-19 by race/ethnicity (Anyane-Yeboa, Sato, & Sakuraba, 2020; Artiga, Garfield, & Orgera, 2020; Azar, et al., 2020; Fortuna, Tolou-Shams, Robles-Ramamurthy, & Porche, 2020; Haynes, Cooper, & Albert, 2020; Khose, Moore, & Wang, 2020; Kim & Bostwick, 2020; Knittel & Ozaltun, 2020; Moore, Langston, & George, 2020).

Much of this research is echoed by the Centers for Disease Control and Prevention (CDC), which has highlighted the unequal toll of the pandemic on Hispanic, Black, and other minority populations (Rossen, et al., 2021). Since the onset of the pandemic, age-adjusted rates from the CDC show Black individuals have been hospitalized at 2.3 times the rate and died at 1.7 times the rate of White individuals; similarly, Hispanic individuals have been hospitalized at 2.0 times the rate and died at 1.8 times the rate of their White counterparts. Hospitalization and death rates among American Indian and Alaska Native communities have been even higher (2.7 and 2.1 times higher than White populations, respectively), though Asian individuals have tended to fare better than their White counterparts (CDC, 2022b). In view of these disparities, the CDC has noted that “Race and ethnicity are risk markers for other underlying conditions that affect health, including socioeconomic status, access to health care, and exposure to the virus related to occupation, e.g., frontline, essential, and critical infrastructure workers” (CDC, 2022b). Several studies in this report incorporate an index of social vulnerability measures from the CDC as a proxy for these underlying conditions; these measures are described in more detail in the geography section below.

Defining Race/Ethnicity

Race and ethnicity are distinct concepts; however, taken together they generally refer to a set of shared physical characteristics, cultural identities, languages, and histories. To examine the role of race/ethnicity in COVID-19 outcomes among Texans, studies in this report draw on a series of administrative datasets with slight variations in how different racial/ethnic groups are defined. Table 8 in Appendix A provides an overview of race/ethnicity definitions by data source (data sources are described in additional detail in the following section). For simplicity, this report uses an abridged terminology for race and ethnicity in the remainder of the document: Asian, Black, Hispanic, White, and Other. In some studies, particularly those examining outcomes among Medicaid/CHIP clients, individuals with missing or unknown race/ethnicity[2] are combined with "Other" for a single group called "Other/Unknown."

Geography

Researchers have documented the disparate impacts of the pandemic on rural populations and noted how the virus exacerbated pre-existing health care challenges in rural settings. Though COVID-19 incidence was highest in large metropolitan areas during the early months of the pandemic, rural communities began to report higher rates of COVID-19 cases and deaths than urban areas in the summer and fall of 2020 (Duca, Coyle, McCabe, & McLean, 2020; Ullrich & Mueller, 2022). Both rates remained elevated in rural areas until January 2021, when they began to fall across urban and rural areas at a similar pace (Ullrich & Mueller, 2022). As cases and hospitalizations spread into rural communities, the growing strain on rural health care infrastructure compounded existing challenges in access to care (Lakhani, Pillai, Zehra, Sharma, & Sodhi, 2020). Studies show many rural communities have under-resourced health care delivery systems, such as fewer intensive care unit (ICU) facilities and ventilators (Lakhani, Pillai, Zehra, Sharma, & Sodhi, 2020). In a study estimating access to ICU services within hospital service areas, for example, researchers found a higher demand for ICU beds in rural areas than in urban areas; in fact, nearly 55 percent of rural, low-income hospital service areas had zero access to ICUs (Kanter, Segal, & Groeneveld, 2020). In Texas, shortages in the number of health care workers preceded the pandemic and

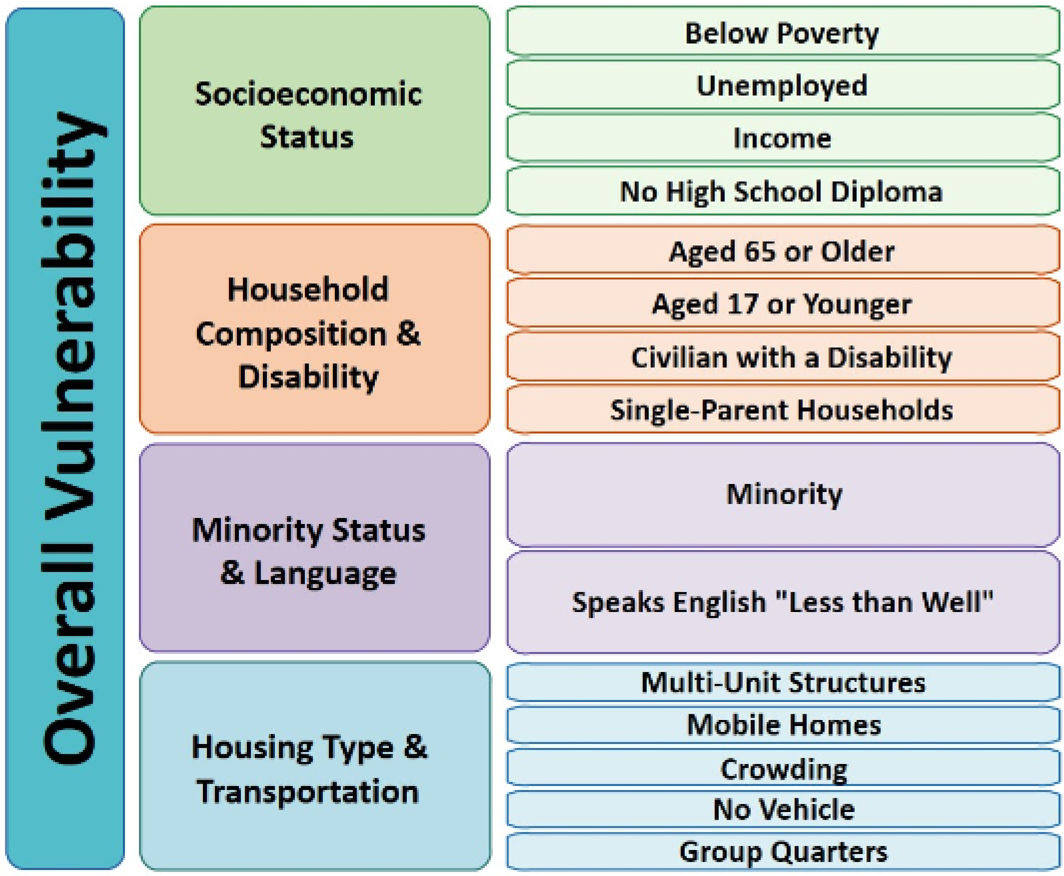
[2] Race and ethnicity are optional fields on the eligibility application for state benefits. These fields may not be uniformly collected across racial/ethnic groups.

continue to present challenges in micropolitan and rural counties of the state (Texas HHSC, 2021a). This report draws on county-level population density data to analyze COVID-19 outcomes across three county types: metropolitan (metro), micropolitan (micro), and rural. Definitions for each county type are provided in Appendix B.

In addition to county type, this report also draws on a geographic index of social vulnerability developed by the CDC and the U.S. Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR) prior to the COVID-19 pandemic. The CDC/ATSDR defines social vulnerability as "the potential negative effects on communities caused by external stresses on human health" (2022a). To measure these stressors, CDC/ATSDR constructed a Social Vulnerability Index (SVI) to help public health officials identify communities that may require support during emergencies. The SVI ranks census tracts[3] (or counties) based on socioeconomic status, housing composition and disability status, minority status and language, and housing type and transportation [Figure 1]. SVI scores are percentile rankings representing the proportion of census tracts (or counties) that are equal to or lower than a tract (or county) of interest in terms of social vulnerability. Higher percentile rankings indicate higher levels of social vulnerability. A variety of studies have shown a correlation between higher SVI rankings and more severe outcomes from COVID-19 (Karmakar, Lantz, & Tipirneni, 2021; Nayak, et al., 2020; Tipirneni, Karmakar, O'Malley, Prescott, & Chopra, 2022). Given the association between social vulnerability and COVID-19 outcomes, several studies in this report incorporate SVI rankings to better understand the disparate impacts of COVID-19 across subgroups. Though the SVI offers a robust measure of social conditions by census tract or county, it is important to note that studies in this report did not have access to reliable individual-level data on frontline employment, health insurance status, education level, food security, housing stability, access to transportation, incarceration, or myriad other factors that may have impacted COVID-19 outcomes.

[3] Census tracts are small, relatively permanent statistical subdivisions of a county.

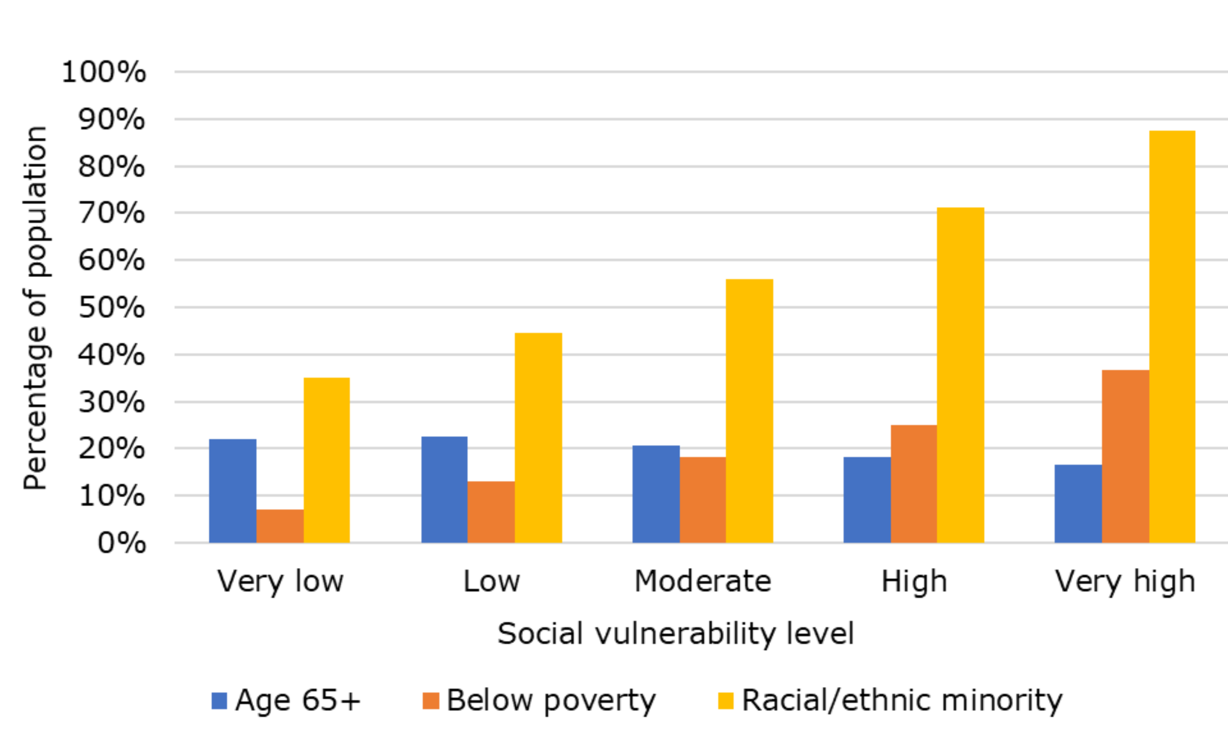
Figure 1. Components of Social Vulnerability



Source: CDC SVI Documentation 2018 (ATSDR, 2022b; retrieved 12/18/2020)

Because the SVI incorporates measures of age, race/ethnicity, and poverty status, the index is highly correlated with each of these characteristics. Figure 2 shows the percentage of the population that is over age 65, living below the poverty line, or a member of a racial/ethnic minority in census tracts with different levels of social vulnerability. In areas with very high levels of social vulnerability, almost 40 percent of the population is below the poverty line and nearly 90 percent are a member of a racial or ethnic minority (i.e., all groups except non-Hispanic White).

Figure 2. Percentage of population with selected characteristics by community social vulnerability level, Texas 2014-2019 period estimates



Data Source: CDC-ATSDR; US Census Bureau. 5-Year 2018 American Community Survey for Texas (ACS) covering the 2014-2018 period. Analysis by HHSC-DAP.

Comorbid Conditions

Comorbidities and other medical conditions can also increase a person's risk of severe outcomes from COVID-19. Based on a scientific review of the literature, the CDC has published a list of medical conditions that increase the risk of hospitalization, ICU admission, intubation or mechanical ventilation, or death due to COVID-19 (CDC, 2022c).[4] The prevalence of these conditions is not equally

[4] According to the CDC, people with asthma, bronchiectasis, cancer, cerebrovascular disease, chronic kidney disease, chronic obstructive pulmonary disease (COPD), chronic liver disease, cystic fibrosis, type 1 diabetes, type 2 diabetes, disabilities (including Down syndrome), HIV, serious heart conditions (such as heart failure, coronary artery disease or cardiomyopathies), interstitial lung disease, mental health conditions (such as mood disorders, including depression, and schizophrenia spectrum disorders), neurologic conditions (dementia), obesity (Body Mass Index [BMI] greater than 30), a pregnancy or recent pregnancy, primary immunodeficiencies, pulmonary hypertension and pulmonary embolism, solid organ or blood stem cell transplantation, tuberculosis, who use corticosteroids or other immunosuppressive medications, who are physically inactive, and/or who smoke (currently and formerly), are at higher risk for severe illness due to COVID-19.

distributed among demographic subgroups. Using data from the Behavioral Risk Factor Surveillance System, for example, one study found that among those over age 65, 69 percent of American Indian and Alaska Native individuals, 61 percent of Black individuals, 59 percent of Hispanic individuals, and 54 percent of White individuals had at least one of the CDC risk factors besides age that contribute to severe COVID-19 illness. Similar disparities emerged for those under age 65, where minority groups were also more likely than White individuals to have multiple risk factors (Raifman & Raifman, 2020). Together, these findings suggest minority populations may be at higher risk for severe COVID-19 outcomes in part because of the higher prevalence of comorbid conditions among these populations.

Analysts with HHSC and DSHS used the CDC guidance to identify a list of diagnosis codes for quantifying comorbid conditions that increase the risk of severe outcomes from COVID-19 [Appendix C]. Several studies in this report draw on this list of comorbid conditions to examine the association between complex medical conditions and COVID-19 outcomes. Importantly, however, there are several limitations to the way comorbid conditions are identified in this report. In studies drawing on general population hospitalization data, comorbid conditions were limited to relevant diagnoses filed on hospital claims at the time of hospitalization. In studies drawing on Medicaid/CHIP data, comorbid conditions were identified through clients' medical claims history. Nevertheless, certain diagnoses, such as substance use disorder or tobacco use, may be underreported due to reluctance to disclose or seek treatment, resulting in lower prevalence rates for analysis.

Disability

The CDC describes disability as "any condition of the body or mind that makes it more difficult for the person with the condition to do certain activities and interact with the world around them" (CDC, 2020). Disability has a large impact on Texans, with roughly one in six children (Child and Adolescent Health Measurement Initiative, n.d.) and one in four people 18 years and older reporting a disability (Division of Human Development and Disability, 2022).

Prior research has shown that the COVID-19 pandemic disrupted health care access and treatment among adults with disabilities. For instance, one survey found that almost half of adults with disabilities encountered new challenges to obtaining

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Children with certain underlying conditions, along with people with sickle cell disease, substance use disorders and/or who are overweight (BMI between 25 and 30) have a "suggestive higher risk," while the conditions with more mixed evidence include alpha 1 antitrypsin deficiency, bronchopulmonary dysplasia, hepatitis B, hepatitis C, hypertension, and thalassemia.

health care access and treatment during the pandemic. Additionally, the study found that the pandemic resulted in a reduction of direct care worker home visits, an inability to maintain a safe distance from their health care provider, and an inability to obtain regular health care treatment and services (Drum, Oberg, Cooper, & Carlin, 2020). Other national studies have shown that when compared to nondisabled adults, disabled adults had significantly higher prevalence ratios of delayed medical care, not getting needed medical care for something other than COVID-19, and not getting needed medical care at home from a nurse or other health professional during the pandemic (Akobirshoev, Vetter, Iezzoni, Rao, & Mitra, 2022). Among individuals under the age of 18, one study found that caregivers of children with special healthcare needs experienced more emotional distress and their children experienced more behavioral problems during the first year of the pandemic; in total, more than one in three of these families missed preventative health care visits during this time, with the majority citing concerns about COVID-19 exposure as the primary reason (Liu, Lombardi, & Fisher, 2022).

To examine the impact of COVID-19 on populations with disabilities or those requiring long-term care, this study analyzes COVID-19 outcomes among Medicaid beneficiaries receiving LTSS through various state programs. The study population includes those ages 65 and older and individuals of all ages with physical, intellectual, or developmental disabilities who require nursing care or need help with tasks of daily living.

Other Vulnerabilities

Many other factors may increase a person's risk of severe outcomes due to COVID-19, including occupational category, worker safety, incarceration, housing stability, and mental health conditions (World Health Organization, 2021).

During the first year of the pandemic, essential workers were subject to higher risk of COVID-19 exposure. Studies have shown, for example, a higher risk of COVID-19 infection among frontline health care workers than among the general population (Nguyen, et al., 2020). Compounding the risk of COVID-19 exposure in these settings was the lack of health care resources early in the pandemic, such as testing supplies and personal protective equipment (U.S. Department of Health and Human Services Office of Inspector General, 2020). Other studies conducted during the first year of the pandemic have shown that COVID-19 outbreaks varied by industry sector, and disproportionately occurred among Hispanic and nonwhite populations (Bui, et al., 2020).

Incarcerated populations were also at greater risk of COVID-19 outcomes during the early stages of the pandemic. A 2020 study found that, nationally, the COVID-19 incidence among the U.S. prison population was over three times that of the general population (Marquez, Ward, Parish, Saloner, & Dolovich, 2021); however, COVID-19 outcomes are not distributed equally among race/ethnicities within carceral settings. During the first year of the pandemic, for example, adjusted COVID-19 mortality risk for Black and Hispanic individuals in Texas prisons were 1.7 and 2.0 times higher, respectively, than for their White counterparts (Marquez, Moreno, Klonsky, & Dolovich, 2022).

Housing status also appeared to play a role in COVID-19 infections. To explore COVID-19 outbreaks among persons experiencing homelessness, a 2020 study conducted in Georgia found that those living in shelters had higher COVID-19 rates than those living unsheltered (Yoon, et al., 2021). A separate study of COVID-19 patients treated at an urban safety-net hospital found that nearly one in six of hospitalized patients were experiencing homelessness (Hsu, et al., 2020).

Though some of these factors are related to measures included in the SVI rankings used in this report, HHSC did not have access to individual-level data on many of these topics. In other cases, time and resource constraints prevented HHSC from examining all populations served by the agency, such as those with special mental health needs. Though mental health conditions are included in the list of comorbid conditions used in several studies in this report, analysts did not examine specific populations with mental illness, such as those receiving services in state psychiatric hospitals or through the 1915(c) Youth Empowerment Services (YES) waiver. Populations with mental health needs were at elevated risk during the pandemic, as demonstrated by U.S. Census Bureau data showing an increasing trend in the percentage of Texas adults reporting symptoms of anxiety disorder or depression disorder during the summer of 2020. By June of that year, roughly one-third of Texas adults reported symptoms of anxiety or depression, exceeding the national average by several percentage points, and Texans with a prior mental health diagnosis were even more likely to report these symptoms (Smith, Barge, & Jones, 2020). In view of these challenges, HHSC launched a mental health support line to help Texans gain access to mental health services. As of November 2021, the COVID-19 Mental Health Support Line had handled more than 17,000 calls from Texans in 209 of the state's 254 counties (Texas HHSC, 2021b).

Measuring COVID-19 Impacts

No single data source can provide a complete picture of the pandemic's effect on vulnerable populations in Texas. DSHS and HHSC analyzed multiple data sources to identify the trends in COVID-19 cases, COVID-19 testing, and COVID-19–related hospitalizations and deaths among Texas residents; similar COVID-19–related outcomes among Texas Medicaid and CHIP recipients; and new enrollment in HHSC assistance programs. Briefly, the data sources include:

- **COVID-19 Case and Test Data:** DSHS defines a confirmed COVID-19 case as a person who has tested positive through a molecular test that looks for the virus’s genetic material, and a probable case as a person who has either tested positive through an antigen test or has a combination of symptoms and a known exposure to someone with COVID-19 without a more likely diagnosis. Texas uses the confirmed and probable case definitions adopted by the U.S. Centers for Disease Control and Prevention. DSHS included both probable and confirmed cases in this analysis. The Texas National Electronic Disease Surveillance System (NEDSS) is the primary statewide integrated infectious disease surveillance system utilized by public health epidemiologists and surveillance staff across Texas to monitor and respond to most notifiable infectious disease conditions. It serves as the primary system for processing and distributing electronic laboratory reports. The COVID-19 pandemic was unique in the speed and volume of data collection required. Throughout the pandemic, DSHS worked with local health departments, hospitals and health care facilities, regional advisory councils and testing laboratories to continuously improve COVID-19 data submission, uniformity, and quality (Texas DSHS, 2022).
- **The Texas Hospital Inpatient Discharge Dataset:** DSHS collects data on health care activity in Texas hospitals.[5] DSHS requires all hospitals except those that are statutorily exempt[6] to submit a standardized administrative claims dataset on inpatient and outpatient discharges to Texas Health Care Information Collection (THCIC). The inpatient and outpatient datasets include admission and discharge dates, discharge status, diagnosis and procedure codes, demographics, and payer type.[2]

[5] Chapter 108 of the Texas Health and Safety Code; Chapter 421 of Title 25, Part 1 of the Texas Administrative Code.

[6] Exempt hospitals include those located in a county with a population less than 35,000, or those located in a county with a population more than 35,000 and with fewer than 100 licensed hospital beds and not located in an area that is delineated as an urbanized area by the United States Bureau of the Census (Section 108.0025). Exempt hospitals also include hospitals that do not seek insurance payment or government reimbursement (Section 108.009). Type of hospitals included in the data are community hospitals, acute care facility, rehabilitation hospitals, psychiatric hospitals, cancer hospitals, children's or pediatric hospitals, and long-term care hospitals.

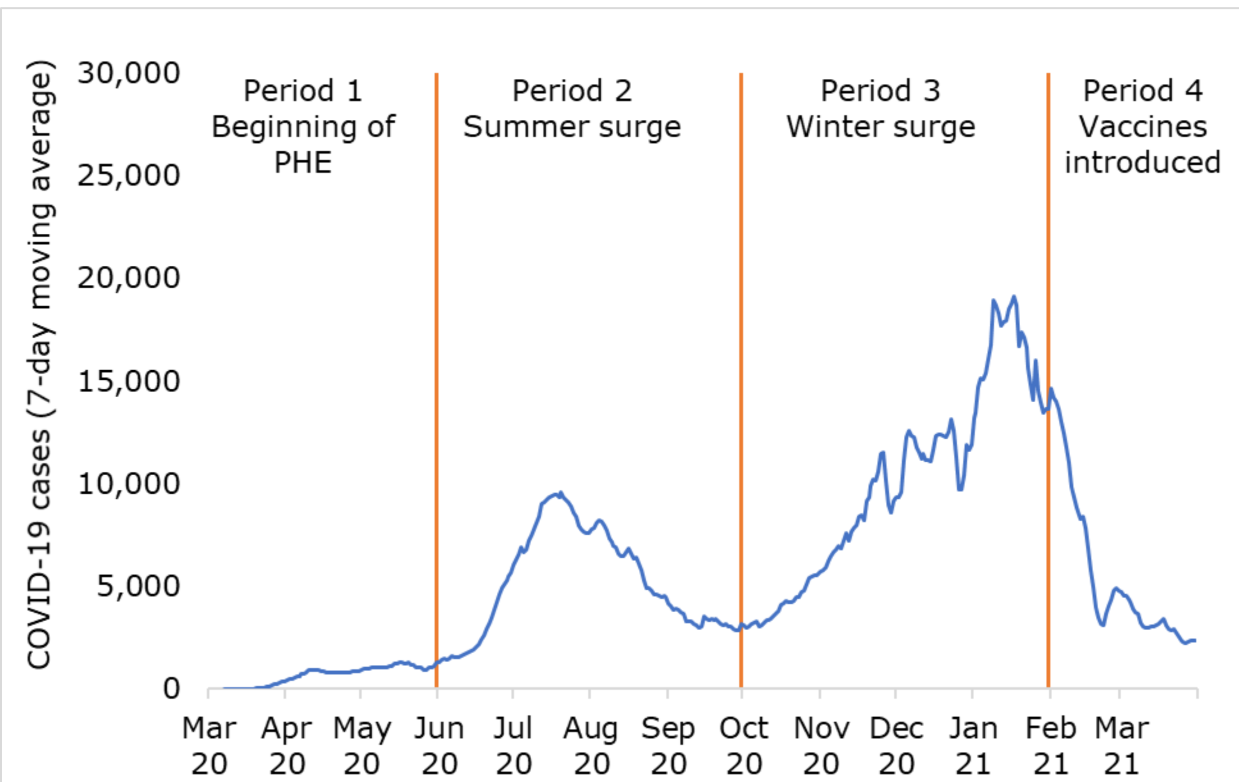
- **Texas Death Certificates:** Death certificate information is collected by the DSHS Vital Statistics Section (VSS). While its primary purpose is legal and administrative documentation, death certificate data can also be used for public health surveillance and is dependent on a certifier stating the cause of death. The data include demographics, information on the primary cause of death, and information on underlying causes of death.
- **Fee-for-service (FFS) claims and Managed Care Organization (MCO) Encounter Data:** Claims and encounters record information about services provided to Texans participating in the Medicaid or CHIP programs. From these data, HHSC can identify individuals who received services related to COVID-19 testing and treatment and examine the impact of COVID-19 on service utilization within the Medicaid/CHIP population.
- **Member-level eligibility files:** The Texas Integrated Eligibility Redesign System (TIERS) is the system of record for HHSC. It utilizes an integrated application to determine the financial eligibility status of people applying for or currently receiving services through HHSC programs such as the Supplemental Nutrition Assistance Program (SNAP), and Temporary Assistance for Needy Families (TANF), Medicaid, and CHIP (See Appendix D for HHSC program definitions). Through its Eligibility Determination Benefit Calculation process, TIERS applies program policy to household, non-financial, resource, income, and deduction information entered in the Data Collection functional area to determine household/individual eligibility for the specific type(s) of assistance offered.
- **Minimum Data Set (MDS) and the Quality Assurance and Improvement (QAI) Datamart:** Data on individuals receiving long-term services and supports (LTSS) is derived from two primary sources. MDS is administered by the Centers for Medicare & Medicaid Services (CMS) and provides information on nursing facility residents. The QAI Datamart is maintained by HHSC and contains data about individuals with intellectual and developmental disabilities (IDD) and people with physical disabilities.

One Year of COVID-19 in Texas

The Phase 2 analyses in this report examine COVID-19 outcomes across a period of approximately one year from March 1, 2020, through March 31, 2021. This time period corresponds with the initial emergency response phase of the pandemic, and was selected to allow analysts from different agencies to collaborate on a series of in-depth studies drawing on different data systems with different data lags and reporting cycles. The study period can be divided into four distinct periods based on patterns of increasing and decreasing cases [Figure 3].

The first period began in March 2020 when the public health emergency (PHE) was first declared. In response to the PHE, Texans were called upon to slow the spread of COVID-19. Temporary health and safety measures were enacted asking Texans to avoid social gatherings, limit movement to essential services, and to avoid visiting nursing homes.[7,8] All licensed health care professionals and licensed health care facilities were required to postpone elective surgeries and procedures.[9] Texas health officials used this period to ensure health care facilities had the supplies and resources needed to respond to COVID-19. A critical component to responding to the PHE involved increasing Texans' ability to receive assistance by enacting enrollment flexibilities in HHSC programs and expanding access to teleservices.

Figure 3. Daily COVID-19 confirmed cases (7-day moving average) in Texas, March 2020 through March 2021



Data Source: DSHS, NEDSS. Analysis by DSHS. See Appendix E for COVID-19 case definitions in DSHS NEDSS data.

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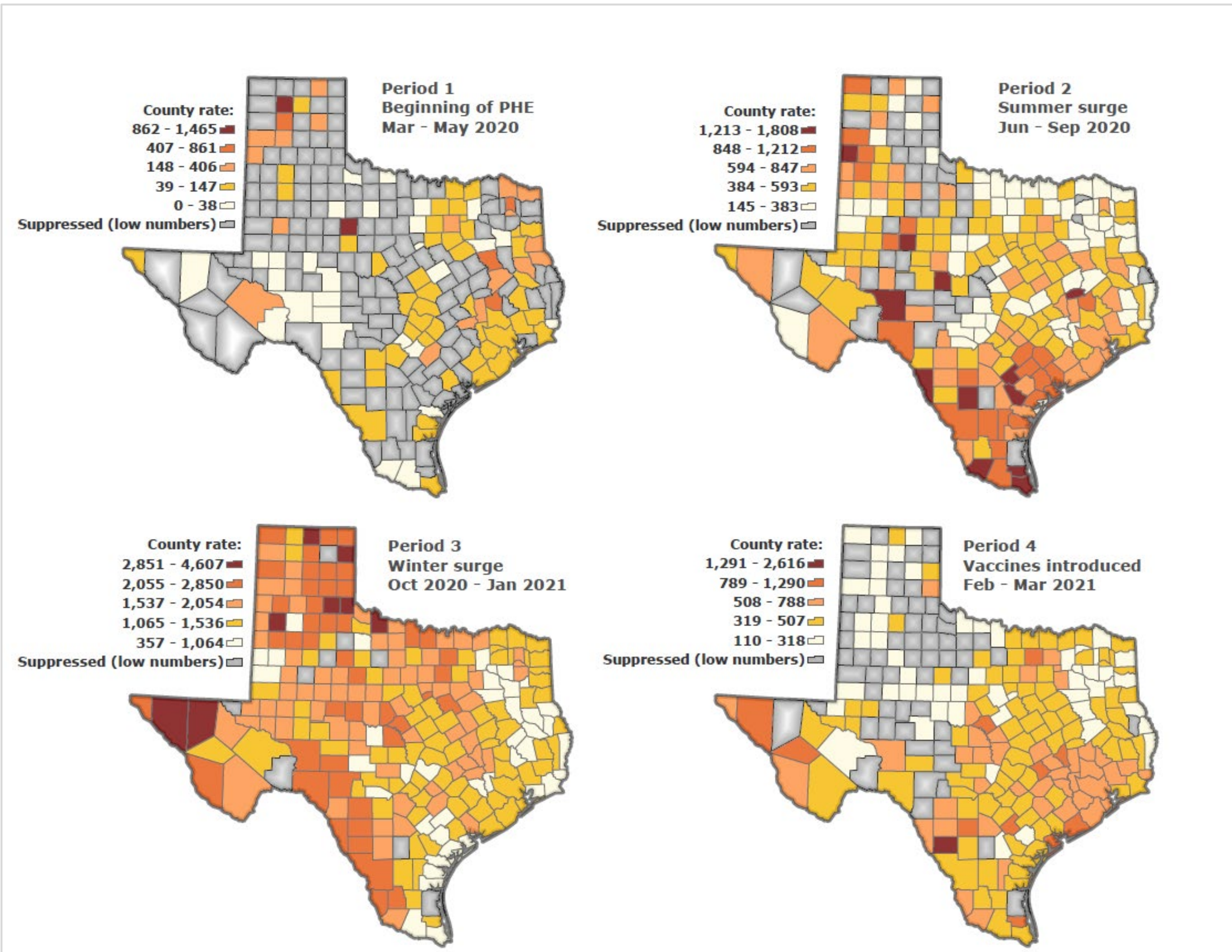
7 Executive Order GA-08
8 Executive Order GA-14
9 Executive Order GA-09

Two distinct surges in COVID-19 cases—one in the summer of 2020, and one in the fall of 2020—mark the second and third periods of the study. The second period began in June 2020 and lasted through September 2020. The third period began in October 2020 and lasted through January 2021. The areas of the state with the highest case rates during each surge shifted from lower east Texas to west Texas [Figure 4].

Figure 4. COVID-19 case rates (per 100,000) in Texas counties, by period



Data Source: DSHS, NEDSS. Analysis by HHSC-DAP. See Appendix E for COVID-19 case definitions in DSHS NEDSS data.

The fourth phase occurred after the introduction of COVID-19 vaccines among at-risk populations and corresponds to a decline in the number of cases statewide. Studies on vaccine uptake are not addressed in this paper, but data related to COVID-19 vaccinations are reported by DSHS. Table 1 defines the four study periods used in Part 1 of this report.

Table 1. Four study periods during the first year of COVID-19

Period #	Description	Time period
1	Beginning of PHE	March 2020 through May 2020
2	Summer surge	June 2020 through September 2020
3	Winter surge	October 2020 through January 2021
4	Vaccines introduced	February 2021 through March 2021

Part 1 examines the populations in Texas who were impacted by COVID-19 in each of the four periods described above, focusing on age, race/ethnicity, and rurality.

Part 2 conducts a series of in-depth studies to better understand why certain vulnerable populations experienced elevated rates of diagnoses, hospitalizations, and deaths; studies in this section consider the role of individual sex, comorbid conditions, community-level social vulnerability, and other explanatory factors. Some analyses in this section examine outcomes over the four study periods described above, while others focus on calendar year (CY) 2020 in order to calculate annual population rates.

Part 3 examines the indirect impacts of the pandemic on vulnerable populations served by HHSC, including program enrollment and health care utilization. Studies in this section depart from the one-year time period to examine Medicaid/CHIP clients' experiences before and after the onset of COVID-19 in Texas.

Part 1. Impacts on Demographic Subgroups During the First Year

To better illustrate the impact of COVID-19 on different demographic subgroups, this report relies on demographic typologies. For the purposes of this report, a typology represents a population by three dimensions of demographic characteristics: age, race/ethnicity, and whether a person resided in a metro, micro, or rural county. Table 2 shows the 45 distinct typologies included in this report. Appendix B lists the population and density parameters applied to determine county type designations. The rates of selected outcomes related to the COVID-19 pandemic are presented below in heatmap tables. Within each heatmap, darker shades of blue correspond to higher rates.

Table 2. Framework for demographic typology heatmaps

Age / county type	White (W)	Black (B)	Hispanic (H)	Asian (A)	Other (O)
0-20 / Metro	White Metro <21 Years	Black Metro <21 Years	Hispanic Metro <21 Years	Asian Metro <21 Years	Other Metro <21 Years
0-20 / Micro	White Micro <21 Years	Black Micro <21 Years	Hispanic Micro <21 Years	Asian Micro <21 Years	Other Micro <21 Years
0-20 / Rural	White Rural <21 Years	Black Rural <21 Years	Hispanic Rural <21 Years	Asian Rural <21 Years	Other Rural <21 Years
21-64 / Metro	White Metro 21-64 Years	Black Metro 21-64 Years	Hispanic Metro 21-64 Years	Asian Metro 21-64 Years	Other Metro 21-64 Years
21-64 / Micro	White Micro 21-64 Years	Black Micro 21-64 Years	Hispanic Micro 21-64 Years	Asian Micro 21-64 Years	Other Micro 21-64 Years
21-64 / Rural	White Rural 21-64 Years	Black Rural 21-64 Years	Hispanic Rural 21-64 Years	Asian Rural 21-64 Years	Other Rural 21-64 Years
65+ / Metro	White Metro 65+ Years	Black Metro 65+ Years	Hispanic Metro 65+ Years	Asian Metro 65+ Years	Other Metro 65+ Years
65+ / Micro	White Micro 65+ Years	Black Micro 65+ Years	Hispanic Micro 65+ Years	Asian Micro 65+ Years	Other Micro 65+ Years

Age / county type	White (W)	Black (B)	Hispanic (H)	Asian (A)	Other (O)
65+ / Rural	White Rural 65+ Years	Black Rural 65+ Years	Hispanic Rural 65+ Years	Asian Rural 65+ Years	Other Rural 65+ Years

Note: Analyses of Medicaid/CHIP clients combine individuals with missing or unknown race/ethnicity with "Other" race/ethnicity into a single group called "Other/Unknown (O/U)."

The figures in this section each contain a trendline and four heatmaps – one for each period in the 13-month study period. The first four figures [Figure 5 - Figure 8] use data from DSHS surveillance systems to show impacts among the Texas population at large. The trendlines show the seven-day moving average for the number of COVID-19 tests, cases, hospitalizations, and deaths reported in Texas. The heatmaps show the average monthly rate per 100,000 people in the Texas population.

The next four figures [Figure 9 - Figure 12] use HHSC administrative data (claims and encounters) to show similar events occurring among Medicaid and CHIP clients. The trendlines show the seven-day moving average of the daily number of unique clients who received COVID-19 tests, had a COVID-19 diagnosis, had an emergency department (ED) visit, or had an inpatient hospitalization for COVID-19. The heatmaps show the average monthly rate per 10,000 Medicaid/CHIP clients enrolled per month. All events are based on paid claims showing that a service has been provided. Note that testing and diagnosis information are calculated independently and cannot be directly compared to calculate a COVID-19 positivity rate.

The final four figures [Figure 13 - Figure 16] show the number and rates of new program enrollment for HHSC assistance programs. Early in the pandemic, many individuals turned to programs such as Medicaid, SNAP, and TANF. These programs provide support for low-income families. Texas Medicaid and CHIP provide health coverage to vulnerable populations including eligible low-income children, families, seniors, and people with disabilities. Newly enrolled clients were defined by entry into an assistance program among individuals who were not enrolled in that same program at any point during the prior six months (e.g., no renewal applications are included in the analysis). The trendlines in these graphs depict monthly numbers rather than seven-day moving averages because enrollment data are updated on a monthly cycle. The heatmaps show the average monthly rates of new enrollees per 10,000 people in Texas.

Impacts on the Texas Population

From March 1, 2020, through March 31, 2021, there were more than 11 million people tested, 2.7 million cases, 157,000 people hospitalized, and 48,000 deaths associated with the COVID-19 pandemic in Texas.[10] In general, trends across outcomes show an initial peak during the summer surge and a second peak in the winter. COVID-19 testing also climbed during the winter before peaking briefly in Period 4. Approximately 60 percent of COVID-19 cases and half of the individuals with COVID-19 tests, hospitalizations, and deaths were concentrated in Period 3 during the winter surge.

The impacts on specific demographic subgroups varied across outcomes and periods, but certain factors emerged as general trends. Black populations were more heavily impacted in Period 1, while Hispanic populations were more heavily impacted in later months. With regard to age, younger populations tended to have higher rates of testing and cases, but older populations suffered a disproportionate share of severe outcomes such as hospitalization and death.

COVID-19 Testing in the Texas Population

Figure 5 shows the COVID-19 testing rate in the Texas population was highest across all periods for individuals with Other race/ethnicity. Black individuals had the second highest testing rate, and Asian individuals had the lowest testing rate across all race groups during the first year, while White and Hispanic individuals had similar testing rates across periods.

Generally, individuals 21 to 64 years old had the highest COVID-19 testing rates of all age groups over the first year of the pandemic, except for the first period, when individuals 65 and older had the highest rate. High testing rates among older age groups at the beginning of the pandemic is consistent with CDC guidance issued in March 2020, which prioritized testing among certain vulnerable populations and health care workers (Ward, Lindsley, Courter, & Assa'ad, 2020).[11] In periods 2 and

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[10] The timeframe from March 1, 2020 to March 31, 2021, was segmented into four distinct study periods based on patterns of increasing and decreasing cases. Cases and individuals hospitalized were counted once per person per period, but could be counted again in a new period. Individuals tested were unduplicated across the full timeframe from March 1, 2020 to March 31, 2021.

[11] CDC guidance issued on March 22, 2020 established four tiers for prioritizing COVID-19 testing: Tier 1: hospitalized patients and symptomatic health care workers; Tier 2: individuals at high risk of complications who also have symptoms, including residents in

3, the testing rate among individuals 65 and older was about twice the rate of individuals ages 20 and younger. Notably, however, testing among individuals ages 20 and younger rose dramatically during the fall of 2020, perhaps as a result of returning to school.

The highest rates of testing were concentrated in micro areas during the first period but shifted to metro areas for the remainder of the first year. Testing rates increased from Period 1 to Period 3. Despite a brief spike in the daily number of tests in February 2021, the average monthly testing rate fell during Period 4.

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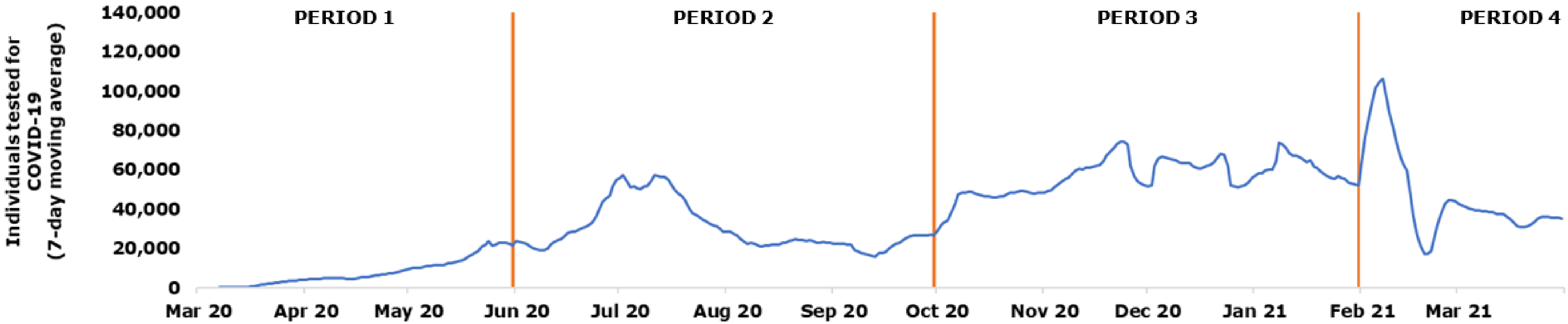
long-term care facilities, people ages 65 and older, people with underlying conditions, and first responders; Tier 3: critical infrastructure workers with symptoms, health care workers and first responders without symptoms, people with mild symptoms in communities with high COVID-19 hospitalizations, other people with symptoms; Tier 4: individuals without symptoms.

Figure 5. Daily COVID-19 tests (7-day moving average) and average monthly testing rates (per 100,000), by race/ethnicity, age, county type, and study period



Testing rates per 100,000*

PERIOD 1

Age / county type	W	B	H	A	O
0-20 / Metro	135	151	153	75	198
0-20 / Micro	108	240	122	—	178
0-20 / Rural	110	184	100	—	235
21-64 / Metro	584	996	557	426	1,587
21-64 / Micro	789	3,035	777	521	2,973
21-64 / Rural	540	1,671	578	569	3,188
65+ / Metro	753	1,255	669	418	2,645
65+ / Micro	534	1,182	703	—	1,745
65+ / Rural	630	1,003	630	—	2,144

PERIOD 2

Age / county type	W	B	H	A	O
0-20 / Metro	1,118	958	1,157	696	1,318
0-20 / Micro	890	1,590	1,335	1,024	1,168
0-20 / Rural	1,056	1,573	1,305	1,020	1,753
21-64 / Metro	2,132	2,816	2,655	1,629	5,771
21-64 / Micro	2,085	5,068	3,308	1,825	8,297
21-64 / Rural	1,992	5,250	2,834	2,265	10,700
65+ / Metro	2,131	2,951	2,358	1,360	7,289
65+ / Micro	1,544	2,514	2,906	1,301	4,919
65+ / Rural	1,767	2,326	2,218	1,694	5,986

PERIOD 3

Age / county type	W	B	H	A	O
0-20 / Metro	3,593	3,130	3,291	2,688	9,330
0-20 / Micro	2,440	2,781	2,978	2,568	8,816
0-20 / Rural	2,765	2,871	3,081	3,299	12,439
21-64 / Metro	5,323	5,610	5,413	4,729	26,137
21-64 / Micro	3,735	4,585	4,685	3,736	28,927
21-64 / Rural	4,034	4,351	4,294	5,639	40,013
65+ / Metro	4,753	5,387	4,533	3,415	33,151
65+ / Micro	3,629	4,355	4,569	2,163	21,808
65+ / Rural	3,950	3,936	4,123	3,194	27,905

PERIOD 4

Age / county type	W	B	H	A	O
0-20 / Metro	3,226	2,870	3,117	2,697	7,400
0-20 / Micro	2,136	2,510	2,489	2,645	6,620
0-20 / Rural	2,394	2,790	2,924	3,330	6,375
21-64 / Metro	4,272	5,416	4,122	4,117	19,082
21-64 / Micro	3,388	5,101	3,495	3,484	23,798
21-64 / Rural	3,604	5,595	2,835	4,903	28,065
65+ / Metro	4,200	4,935	3,499	3,057	26,613
65+ / Micro	3,299	3,941	3,228	2,464	18,900
65+ / Rural	3,336	3,616	2,579	2,706	17,372

Data Source: DSHS NEDSS. Analysis by DSHS.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, non-Hispanic; O=Other. Individuals were counted once per period, but could be counted again in a new period. Darker shades of blue correspond to higher rates.

*Rates are calculated as the average of monthly testing rates (number of tests per 100,000 population per month) for each period. Rates are suppressed (—) if the average number of COVID-19 tests for a period was between 1 and 4. See Appendix E for definitions of COVID-19 testing in DSHS NEDSS data.

COVID-19 Cases in the Texas Population

As noted previously, COVID-19 case counts in the general Texas population had an initial peak in Period 2 before reaching their highest level in January 2021 [Figure 6]. Despite a dramatic decrease at the beginning of Period 4, cases remained elevated compared to the beginning of the pandemic.

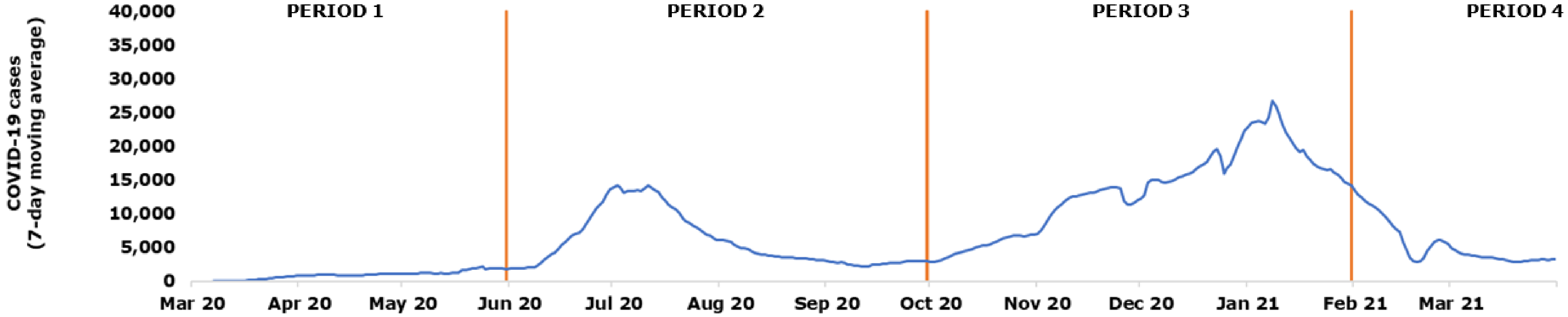
At the beginning of the PHE, Black individuals ages 21 to 64 years old living in micro counties had the highest average monthly case rate, followed by Asian individuals in the same age group living in rural counties. The rate of COVID-19 in the youngest age group, 0 to 20 years old, was lower than those in the older age groups. Generally, individuals living in metro areas had higher rates than those living in micro or rural counties.

In Period 2, Asian individuals ages 20 and younger living in rural counties had the highest average monthly case rates. Risk also began to shift toward Hispanic individuals during this period, though Black individuals ages 21 to 64 continued to log some of the highest case rates in Period 2.

In Period 3, individuals with Other race/ethnicity had the highest case rates across all age and county subgroups, peaking among those ages 21 to 64 in rural counties at 5,440 cases per 100,000. This rate is the highest for any population across all four periods in the report. Hispanic individuals ages 21-64 also sustained high case rates across all county types during Period 3. The notable increase among Hispanic populations may be attributable in part to the high rate of COVID-19 cases in the El Paso area during that period (City of El Paso).

In Period 4, individuals with Other race/ethnicity ages 21 to 64 living in rural counties continued to experience the highest COVID-19 rates, followed by individuals ages 65 and older living in metro counties. Asian individuals had the lowest rates of COVID-19 across all age and county type categories during this period. The rate of COVID-19 was usually highest among individuals living in metro counties, similar to trends seen in prior periods.

Figure 6: Daily COVID-19 case counts (7-day moving average) and average monthly case rates (per 100,000), by race/ethnicity, age, county type, and study period



Case rates per 100,000*

PERIOD 1

Age / county type	W	B	H	A	O
0-20 / Metro	21	20	26	13	7
0-20 / Micro	—	—	13	—	—
0-20 / Rural	8	—	18	—	—
21-64 / Metro	80	131	105	84	52
21-64 / Micro	86	381	115	75	—
21-64 / Rural	55	181	97	364	—
65+ / Metro	68	157	84	79	63
65+ / Micro	45	201	63	—	—
65+ / Rural	42	140	62	—	—

PERIOD 2

Age / county type	W	B	H	A	O
0-20 / Metro	193	157	276	76	104
0-20 / Micro	117	180	282	—	72
0-20 / Rural	150	216	278	1,020	154
21-64 / Metro	342	444	682	186	410
21-64 / Micro	273	637	715	212	338
21-64 / Rural	315	728	661	279	691
65+ / Metro	238	404	607	182	368
65+ / Micro	163	362	713	—	254
65+ / Rural	225	354	508	—	314

PERIOD 3

Age / county type	W	B	H	A	O
0-20 / Metro	649	527	755	425	1,131
0-20 / Micro	440	444	670	461	1,089
0-20 / Rural	583	524	692	399	1,751
21-64 / Metro	1,041	965	1,372	777	3,125
21-64 / Micro	869	956	1,233	745	3,524
21-64 / Rural	1,068	1,060	1,219	856	5,440
65+ / Metro	870	863	1,119	648	3,682
65+ / Micro	760	869	1,188	602	2,702
65+ / Rural	971	892	1,105	451	3,414

PERIOD 4

Age / county type	W	B	H	A	O
0-20 / Metro	320	274	318	242	469
0-20 / Micro	196	223	273	—	445
0-20 / Rural	199	229	273	—	405
21-64 / Metro	412	415	481	344	1,044
21-64 / Micro	318	334	414	278	966
21-64 / Rural	299	306	313	296	1,423
65+ / Metro	266	368	370	240	1,173
65+ / Micro	230	249	352	—	897
65+ / Rural	236	244	235	—	875

Data Source: DSHS NEDSS. Analysis by DSHS.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, non-Hispanic; O=Other. COVID-19 cases were counted once per person per period, but could be counted again in a new period. Darker shades of blue correspond to higher rates.

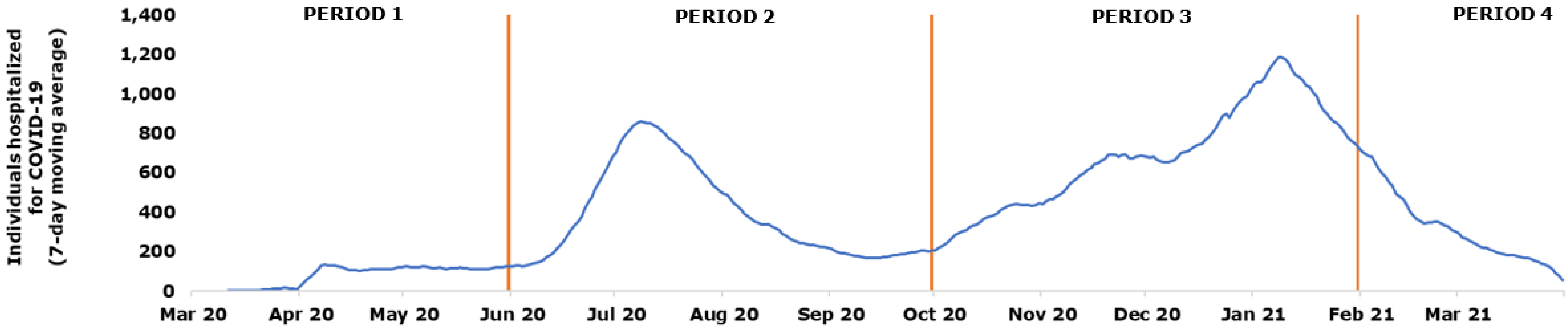
*Rates are calculated as the average of monthly case rates (cases per 100,000 population per month) for each period. Rates are suppressed (—) if the average number of COVID-19 cases for a period was between 1 and 4. See Appendix E for COVID-19 case definitions in DSHS NEDSS data.

COVID-19 Hospitalizations in the Texas Population

Figure 7 shows trends and monthly average rates of individuals with COVID-19-related hospital admissions in the general Texas population, with increases in July 2020 and January 2021 corresponding to elevated case rates during the same months. The highest average monthly rates of inpatient hospitalizations for COVID-19 in all periods were among individuals with Other race/ethnicity who were 65 and older. The lowest rates of inpatient hospitalization were generally among Asian individuals. Overall, the rate of hospitalizations for COVID-19 increased with age.

In Period 1, individuals living in micro areas typically had higher rates than those living in metro or rural areas. Unlike the early months of the pandemic in which there was more variability, the rates of hospitalization for COVID-19 during Period 2 were consistently lower for White and Asian individuals compared to individuals with Black, Hispanic, and Other race/ethnicity within each age group and county type. In Period 3, the highest rates of COVID-19 hospitalization for individuals ages 21 to 64 and 65 and older were most often in rural counties. Hospitalization rates generally decreased in Period 4, though they remained higher than Period 1 for most demographic groups.

Figure 7. Daily COVID-19 hospital admissions (7-day moving average) and average monthly hospital admission rates (per 100,000), by race/ethnicity, age, county type, and study period



Hospital admission rates per 100,000*

PERIOD 1

Age / county type	W	B	H	A	O
0-20 / Metro	0	0	0	0	1
0-20 / Micro	1	—	—	0	0
0-20 / Rural	—	0	—	0	0
21-64 / Metro	5	14	12	4	39
21-64 / Micro	7	41	16	0	22
21-64 / Rural	4	15	4	—	41
65+ / Metro	17	46	31	16	148
65+ / Micro	23	123	27	—	40
65+ / Rural	12	46	13	0	55

PERIOD 2

Age / county type	W	B	H	A	O
0-20 / Metro	2	2	3	0	3
0-20 / Micro	1	—	2	0	—
0-20 / Rural	1	—	2	0	9
21-64 / Metro	25	46	52	11	168
21-64 / Micro	36	79	55	—	97
21-64 / Rural	33	67	44	28	281
65+ / Metro	86	159	206	63	741
65+ / Micro	116	262	224	—	406
65+ / Rural	106	198	161	110	617

PERIOD 3

Age / county type	W	B	H	A	O
0-20 / Metro	3	3	3	1	5
0-20 / Micro	3	—	3	—	—
0-20 / Rural	4	3	2	0	13
21-64 / Metro	50	65	62	26	215
21-64 / Micro	73	92	69	50	166
21-64 / Rural	81	81	84	61	572
65+ / Metro	248	281	299	159	1,406
65+ / Micro	314	413	330	288	739
65+ / Rural	339	344	370	451	1,627

PERIOD 4

Age / county type	W	B	H	A	O
0-20 / Metro	2	2	2	1	4
0-20 / Micro	2	—	1	0	—
0-20 / Rural	1	—	—	0	—
21-64 / Metro	24	31	27	15	100
21-64 / Micro	28	38	30	—	63
21-64 / Rural	32	32	26	—	151
65+ / Metro	85	115	104	52	505
65+ / Micro	94	112	103	—	242
65+ / Rural	95	114	100	—	366

Data Source: DSHS, THCIC, Research Data File, March 1, 2020 to March 31, 2021. Analysis by DSHS.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, non-Hispanic; O=Other. Individuals were counted once per period, but could be counted again in a new period. Darker shades of blue correspond to higher rates.

*Rates are calculated as the average of monthly hospital admission rates (hospital admission per 100,000 population per month) for each period. Rates are suppressed (—) if the average number of COVID-19 hospital admissions for a period was between 1 and 4. See Appendix F for COVID-19 hospitalization definitions in DSHS THCIC data.

COVID-19 Fatalities in the Texas Population

There were more than 48,000 deaths due to COVID-19[12] from March 2020 to March 2021, making it the third leading cause of death among Texas residents during the study period. Of these, over 31,000 occurred in CY 2020. Figure 8 shows the 7-day moving average of the daily number of COVID-19-related deaths. The first death due to COVID-19 in Texas was recorded on March 15, 2020, after which the number of COVID-19 deaths began to slowly climb through April and May. In the second period, the number of COVID-19 deaths rose to over 6,000 in July 2020 and fell to around 2,100 in September 2020. In the third period beginning October 2020, the number of COVID-19 deaths started to rise again, peaking at over 9,000 COVID-19 deaths in January 2021, the highest of the pandemic's first year in Texas.

Figure 8 also shows the average monthly COVID-19 death rates for each study period. Note that the demographic subgroup with the highest rate did not remain the same in each period during the first year of the pandemic. In Period 1, Black individuals ages 65 and older in micro areas had the highest death rate due to COVID-19. In Periods 2 and 4, Hispanics ages 65 and older in micro areas had the highest COVID-19 death rates. In Period 3, Hispanics in rural areas ages 65 and older had the highest rate.

Overall, there were relatively few deaths due to COVID-19 among Texas residents ages 0 to 20, regardless of race/ethnicity and county type [Figure 8]. Among 21 to 64-year-olds, the highest COVID-19 death rates were observed among Black individuals in metro counties in Period 1, Hispanics in micro counties in Period 2 and 4, and Hispanics in rural counties in Period 3. This pattern was the same for Hispanics ages 65 and older. Death rates were consistently higher among Hispanic individuals 65 and older in all subgroups across the study period, except for Period 1, when Black individuals ages 65 and older had the highest COVID-19 death rate in micro counties.

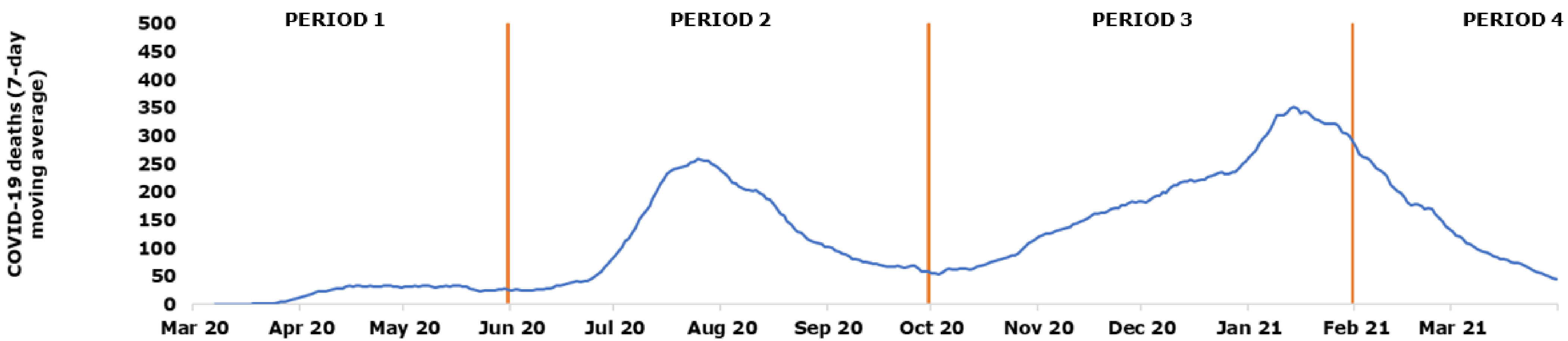
The COVID-19 death rate for Hispanic individuals ages 65 and older in rural counties in Period 3 was the highest rate observed in the study period. At a rate of 236.2 per 100,000 people, Hispanics ages 65 and older in rural counties had a death rate approximately 1.6 times higher than similar White decedents and nearly

[12] COVID-19 deaths were identified by the DSHS Emerging and Acute Infectious Disease Unit (DSHS-EAIDU). Decedents were included if COVID-19 was listed in cause A-D on the death certificate. A medical certifier, usually a doctor, determines the cause(s) of death. Decedents who had COVID-19 but died of an unrelated cause were excluded.

twice as high as similar Black decedents in the same period. In contrast, the low number of COVID-19 deaths among Asian individuals prevented analysts from calculating reliable death rates for some subgroups throughout the year. Both White and Asian individuals had lower COVID-19 death rates compared to Black and Hispanic individuals ages 65 and older in nearly all study periods and county types. One exception was Period 3, when White individuals ages 65 and older in rural counties had a death rate that was higher than Black individuals in these areas.

Analysts also examined COVID-19 fatalities by public health region [See Appendix I, Figure 60]. In general, regional patterns in the number of COVID-19 deaths over the study period were similar to the state pattern, surging during Periods 2 and 3 and receding during Period 4. However, there were some exceptions. In Region 11 (Lower South Texas), for example, there were more COVID-19 deaths in Period 2 than Period 3; in contrast to other regions, the deadliest month of the pandemic in Region 11 was July 2020 with over 3,800 COVID-19 deaths. Across the study period, COVID-19 emerged as the leading cause of death in Regions 1, 10, and 11 (High Plains, Upper Rio Grande, and Lower South Texas, respectively).

Figure 8. Daily COVID-19 deaths (7-day moving average) and average monthly death rates (per 100,000), by race/ethnicity, age, county type, and study period



Death rates per 100,000*

PERIOD 1

Age / county type	W	B	H	A	O
0-20 / Metro	—	—	—	0	0
0-20 / Micro	0	0	0	0	0
0-20 / Rural	0	0	0	0	0
21-64 / Metro	1	2	1	—	—
21-64 / Micro	—	—	—	0	—
21-64 / Rural	—	—	1	—	0
65+ / Metro	9	25	16	9	—
65+ / Micro	11	43	—	—	—
65+ / Rural	7	—	11	0	—

PERIOD 2

Age / county type	W	B	H	A	O
0-20 / Metro	—	—	0	0	0
0-20 / Micro	0	0	—	0	0
0-20 / Rural	—	0	—	0	0
21-64 / Metro	2	5	13	1	—
21-64 / Micro	3	11	18	—	0
21-64 / Rural	4	13	13	—	—
65+ / Metro	37	66	156	38	29
65+ / Micro	38	89	210	—	—
65+ / Rural	41	99	149	—	—

PERIOD 3

Age / county type	W	B	H	A	O
0-20 / Metro	0	—	—	0	0
0-20 / Micro	—	0	0	0	0
0-20 / Rural	0	0	—	0	0
21-64 / Metro	5	8	13	3	3
21-64 / Micro	8	15	15	0	—
21-64 / Rural	11	15	22	—	—
65+ / Metro	96	102	170	70	41
65+ / Micro	119	166	183	—	—
65+ / Rural	150	128	236	—	—

PERIOD 4

Age / county type	W	B	H	A	O
0-20 / Metro	—	0	—	0	0
0-20 / Micro	—	0	—	0	0
0-20 / Rural	—	0	0	0	0
21-64 / Metro	4	7	10	3	—
21-64 / Micro	6	9	12	0	—
21-64 / Rural	6	9	11	—	—
65+ / Metro	50	72	117	57	47
65+ / Micro	53	92	150	0	0
65+ / Rural	56	75	119	0	0

Data Source: DSHS, Center for Health Statistics. Analysis by DSHS.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, non-Hispanic; O=Other. Darker shades of blue correspond to higher rates. Includes all COVID-19 deaths reported to DSHS as of June 2021. Death data were considered provisional as of that date. HHS excluded 97 decedents who were missing information on sex, race/ethnicity, residence county, or multiple cause of death codes. *Rates are calculated as the average of monthly death rates (deaths per 100,000 population per month) for each period. Rates are suppressed (—) if the average number of COVID-19 deaths for a period was between 1 and 4. See Appendix I for COVID-19 fatality definitions.

Impacts on Medicaid/CHIP Populations

This section traces COVID-19 trends among the Medicaid/CHIP population. Due to differences in population size, figures in this section present rates per 10,000 rather than rates per 100,000. This distinction results in rates of different magnitudes and should be kept in mind whenever comparing rates across populations. It should also be noted that, in contrast to the general population, the Medicaid/CHIP population grew substantially over the study period. In order to facilitate comparisons over time, analysts used average monthly rates to account for differences in caseloads during the study period. Changes to Medicaid/CHIP caseloads are discussed in more detail in Part 3 of this report. Additional technical information regarding measure definitions and methodologies used in this section are included in Appendix E.

Overall, trends among Medicaid/CHIP clients were similar to trends in the general population. After an initial peak during the summer surge, COVID-19 tests, cases, ED visits, and hospitalizations reached their highest volume during the winter surge of 2020. Tests were relatively evenly distributed in Medicaid and CHIP, but cases, ED visits, and hospitalizations were often more common among older Black, Hispanic, and White populations. Note that testing and diagnosis information are calculated independently and cannot be directly compared to calculate a COVID-19 positivity rate.

COVID-19 Testing in Texas Medicaid/CHIP

Figure 9 shows testing trends for Texas Medicaid and CHIP clients. Similar to other COVID-19 trends, testing among Medicaid/CHIP clients peaked in both the summer and winter of 2020.

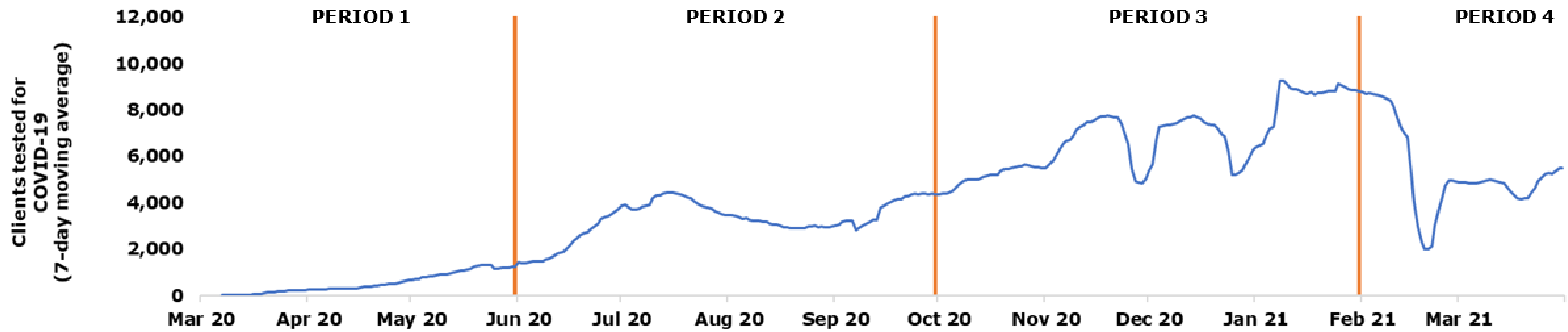
In Period 1, the average monthly testing rate was highest among White clients 65 and older residing in micro areas, followed by similar individuals in rural counties. Black adults ages 21 and older generally had lower rates of testing than their White counterparts, regardless of county type. In contrast, the testing rate for clients ages 0 to 20 living in micro and rural counties was higher for Black clients than White clients. In almost all cases, Hispanic clients were tested at lower rates than White clients. The testing rate for Hispanic clients 65 and older was half the rate of testing for White clients in metro areas and roughly 2/3 of the rate of White clients in micro areas. In metro counties, clients between 21 and 64 years of age had a higher testing rate than those in the younger and older age groups. In micro and rural counties, testing often increased with age. For all age and county groups, Asian clients had the lowest testing rate.

As with Period 1, the average monthly testing rate was higher among White individuals 65 and older living in micro and rural counties in Period 2. Black clients were less likely to be tested than White clients in most age and county type groups. Hispanic clients under age 65 were usually more likely to be tested than their non-Hispanic counterparts. Asian clients again had the lowest testing rate across almost all age and county groups. Clients in micro and rural counties had higher testing rates than similar clients in metro counties in both the youngest and oldest age groups.

During Period 3, the average monthly testing rate was highest among White clients 65 and older living in rural counties. Black clients had a lower testing rate than White clients, regardless of age or county type. Hispanic clients were often tested at lower rates than White clients in similar age and county categories. Testing rates were higher in micro and rural counties for most age and race/ethnicity groups.

In Period 4, the average monthly testing rates among Medicaid/CHIP clients largely leveled out. Clients in the Hispanic, White, and Other/Unknown populations ages 20 and younger were tested at slightly higher rates than similar individuals in older age categories.

Figure 9. Daily count (7-day moving average) and average monthly rates (per 10,000) of Texas Medicaid/CHIP clients tested for COVID-19, March 2020 – March 2021



Testing rates per 100,000*

PERIOD 1

Age / county type	W	B	H	A	O/U
0-20 / Metro	22	17	21	15	26
0-20 / Micro	18	20	23	—	26
0-20 / Rural	21	21	20	—	24
21-64 / Metro	69	56	53	47	71
21-64 / Micro	58	59	54	—	65
21-64 / Rural	68	56	57	—	70
65+ / Metro	59	45	30	28	36
65+ / Micro	129	75	53	—	70
65+ / Rural	79	59	58	—	62

PERIOD 2

Age / county type	W	B	H	A	O/U
0-20 / Metro	154	107	164	86	158
0-20 / Micro	157	156	183	92	177
0-20 / Rural	165	164	208	129	178
21-64 / Metro	233	194	250	190	254
21-64 / Micro	203	202	264	190	224
21-64 / Rural	235	239	261	218	246
65+ / Metro	243	160	123	102	143
65+ / Micro	315	211	227	183	207
65+ / Rural	315	249	258	270	275

PERIOD 3

Age / county type	W	B	H	A	O/U
0-20 / Metro	354	249	345	231	324
0-20 / Micro	368	314	358	263	343
0-20 / Rural	347	337	401	178	329
21-64 / Metro	342	260	300	253	337
21-64 / Micro	349	342	346	364	367
21-64 / Rural	374	355	370	296	400
65+ / Metro	380	232	149	147	211
65+ / Micro	503	391	280	271	349
65+ / Rural	551	462	336	324	453

PERIOD 4

Age / county type	W	B	H	A	O/U
0-20 / Metro	273	200	281	202	283
0-20 / Micro	267	228	269	241	276
0-20 / Rural	216	201	233	148	228
21-64 / Metro	232	204	217	205	252
21-64 / Micro	230	233	205	238	236
21-64 / Rural	238	222	223	204	237
65+ / Metro	208	154	105	105	136
65+ / Micro	267	259	175	—	192
65+ / Rural	265	236	197	—	251

Data Source: Analytical Data Store (ADS), Texas Medicaid Administrative System-Production (TMASP) Oracle server, Texas Medicaid & Healthcare Partnership (TMHP). Analysis by HHSC-Data Analytics and Performance (DAP).

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, Pacific Islander; O/U=Other/Unknown. Clients only counted once per day. Darker shades of blue correspond to higher rates.

*Rates per 10,000 are calculated as the average of monthly utilization per average monthly member enrollment. Rates are suppressed (—) if the average number of COVID-19 tests for a period was between 1 and 4. See Appendix E for COVID-19 testing definitions in Medicaid/CHIP.

COVID-19 Diagnoses in Texas Medicaid/CHIP

Figure 10 shows Medicaid and CHIP COVID-19 diagnoses followed a similar pattern to statewide trends, with peaks occurring in Periods 2 and 3. Across all periods, Medicaid/CHIP clients ages 65 and older had higher diagnosis rates than younger clients. This pattern contrasts with case rates in the general population, where individuals 21 to 64 years old had higher case rates [Figure 6]. However, readers should exercise caution in making direct comparisons between case rates in the general population and COVID-19 diagnoses in Medicaid/CHIP due to differences in population composition and underlying data. COVID-19 diagnoses in Medicaid are based on information listed on medical claims and encounters for services billed through the Medicaid and CHIP programs. As a result, they do not capture broader information on COVID-19 diagnoses or services received outside of the programs, or cases which did not require medical attention. In addition, characteristics of individuals enrolled in Medicaid/CHIP may differ from the general population due to program eligibility criteria (e.g., clients enrolled in Medicaid may be more likely to reside in a long-term care facility, have a disability, or be pregnant than individuals in the same demographic subgroup of the general population).

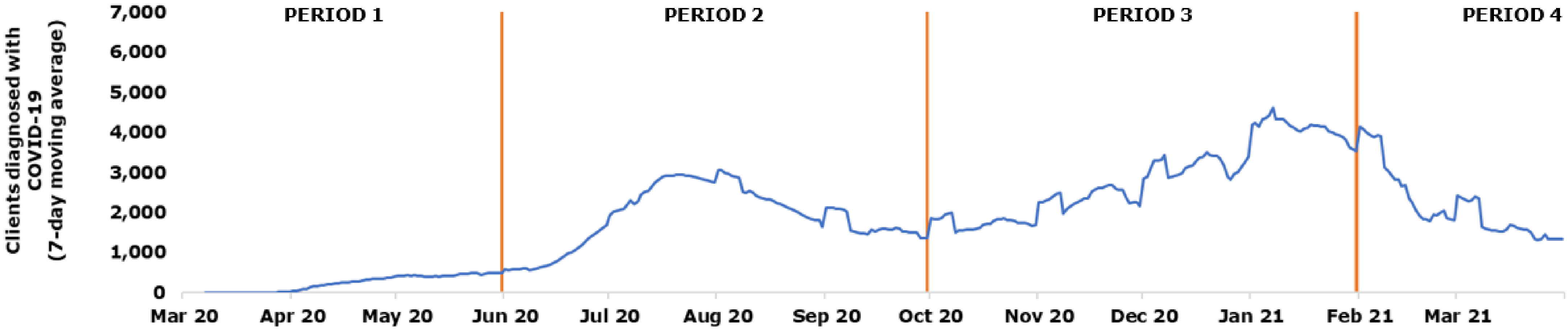
In Period 1, the average monthly rate of COVID-19 diagnosis was highest for Black clients ages 65 and older residing in micro areas. Compared to White clients, all race/ethnicities had higher diagnosis rates for clients aged 20 and younger living in metro counties. The same was true for clients ages 21 to 64 living in metro counties, although the differences were less pronounced. Apart from Asian clients, clients of all races/ethnicities ages 21 to 64 in micro counties had higher rates than White clients of similar ages and county types. The diagnosis rate for Hispanic clients was lower than for White and Black clients in the oldest age category, regardless of county type.

The average monthly diagnosis rate in Period 2 was highest for White clients 65 and older residing in metro areas. The rates among Hispanic clients ages 0 to 20 were more than twice as high as the rate for White clients and, to a lesser degree, higher than Black clients. Black clients who lived in micro and rural counties had higher rates of COVID-19 diagnoses than Black clients in metro areas within each age group. Among White clients ages 65 and older, individuals living in metro counties had higher rates than individuals in micro and rural counties.

As with Period 2, older White clients had the highest monthly rate of COVID-19 diagnosis in Period 3. In contrast with Period 2, however, older White clients in rural areas had the highest rate overall. Black clients often had among the lowest average monthly diagnosis rates—except within the older age cohort, where diagnosis rates for Black clients were the second highest below White clients.

In Period 4, the highest average monthly diagnosis rate was among White clients ages 65 and older in rural areas. High diagnosis rates were also observed among older clients with Other/Unknown or Black race/ethnicity. Among the youngest age group, Hispanic clients had higher diagnosis rates than all other race/ethnicity groups, regardless of county type. This was also true for most Hispanic clients ages 21 to 64.

Figure 10. Daily count (7-day moving average) and average monthly rates (per 10,000) of Texas Medicaid/CHIP clients diagnosed with COVID-19, March 2020 – March 2021



Diagnosis rates per 10,000*

PERIOD 1

Age / county type	W	B	H	A	O/U
0-20 / Metro	1	1	2	2	2
0-20 / Micro	—	—	1	0	—
0-20 / Rural	—	—	2	0	—
21-64 / Metro	9	12	9	14	13
21-64 / Micro	6	20	7	0	17
21-64 / Rural	13	11	9	—	11
65+ / Metro	37	31	13	12	18
65+ / Micro	52	86	10	0	31
65+ / Rural	28	31	20	—	30

PERIOD 2

Age / county type	W	B	H	A	O/U
0-20 / Metro	16	14	39	10	25
0-20 / Micro	11	24	32	—	19
0-20 / Rural	14	28	33	—	20
21-64 / Metro	51	53	101	56	70
21-64 / Micro	38	77	88	—	53
21-64 / Rural	45	71	82	—	47
65+ / Metro	233	148	130	63	112
65+ / Micro	201	222	175	—	125
65+ / Rural	185	182	148	—	149

PERIOD 3

Age / county type	W	B	H	A	O/U
0-20 / Metro	44	30	62	39	44
0-20 / Micro	44	41	64	—	42
0-20 / Rural	52	59	83	34	46
21-64 / Metro	95	70	105	81	102
21-64 / Micro	83	105	116	176	102
21-64 / Rural	104	115	145	126	116
65+ / Metro	424	236	153	113	185
65+ / Micro	383	309	253	296	278
65+ / Rural	450	348	289	287	315

PERIOD 4

Age / county type	W	B	H	A	O/U
0-20 / Metro	24	18	32	26	25
0-20 / Micro	21	23	39	—	24
0-20 / Rural	20	23	29	—	20
21-64 / Metro	65	49	69	61	73
21-64 / Micro	54	58	71	—	66
21-64 / Rural	60	66	78	—	66
65+ / Metro	389	217	121	104	169
65+ / Micro	315	214	191	—	233
65+ / Rural	404	247	211	—	270

Data Source: Analytical Data Store, TMASP Oracle server, TMHP. Analysis by HHSC-DAP.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, Pacific Islander; O/U=Other/Unknown. Clients only counted once per day. Darker shades of blue correspond to higher rates.

*Rates per 10,000 are calculated as the average of monthly utilization per average monthly member enrollment. Rates are suppressed (—) if the average number of clients diagnosed for a period was between 1 and 4. See Appendix E for COVID-19 diagnosis definitions in Medicaid/CHIP.

COVID-19 ED Visits in Texas Medicaid/CHIP

The number of COVID-19-related ED visits among Texas Medicaid/CHIP clients is shown in Figure 11. Overall trends in this section align closely with case trends, peaking in July 2020 and January 2021. In general, older populations were more likely to visit the ED.

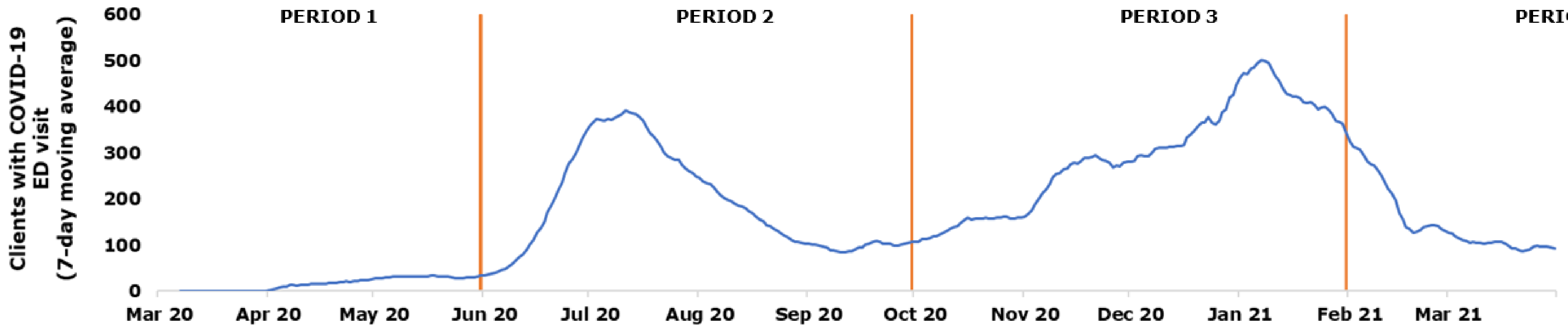
In Period 1, the average monthly rate of Medicaid/CHIP clients with COVID-19-related ED visits was suppressed for most groups due to low sample size. In metro areas, rates were higher for Black clients ages 65 and older and Other/Unknown clients in the 21 to 64 age group.

In Period 2, the highest average monthly rate of COVID-19-related ED visits was among older Hispanic clients in rural areas and older Black clients in micro areas. Among 21- to 64-year-olds, White clients had similar ED visit rates regardless of county type, while Black clients had higher rates in micro and rural areas and clients with Other/Unknown race/ethnicity had lower rates in micro and rural areas. A similar pattern was observed for younger clients.

In Period 3, older clients living in rural areas had the highest rates of COVID-19-related ED visits across all race/ethnicity groups. The highest rates were among Hispanic clients, followed by White, Black, and Other/Unknown. With some exceptions, micro and rural areas tended to have higher rates of ED visits than metro areas with otherwise similar populations.

In Period 4, the ED visit rates for COVID-19 dropped across all groups. The highest monthly average ED visit rate was among older Hispanic clients in rural areas. For clients with White and Other/Unknown race/ethnicity in the 21 to 64 age group, higher rates were recorded in metro areas.

Figure 11. Daily count (7-day moving average) and average monthly rates (per 10,000) of Texas Medicaid/CHIP clients having an ED visit with a COVID-19 diagnosis, March 2020 – March 2021



ED visit rates per 10,000*

PERIOD 1

Age / county type	W	B	H	A	O/U
0-20 / Metro	0.3	0.8	0.6	—	0.7
0-20 / Micro	—	—	—	0.0	—
0-20 / Rural	0.0	—	—	0.0	—
21-64 / Metro	2.2	4.2	3.3	—	4.7
21-64 / Micro	—	—	—	0.0	—
21-64 / Rural	—	—	—	0.0	—
65+ / Metro	4.1	5.7	2.7	—	2.9
65+ / Micro	—	—	—	0.0	—
65+ / Rural	—	—	—	0.0	—

PERIOD 2

Age / county type	W	B	H	A	O/U
0-20 / Metro	3.8	5.1	6.7	2.0	6.1
0-20 / Micro	2.8	10.3	4.9	0.0	5.2
0-20 / Rural	3.1	7.4	6.2	—	4.7
21-64 / Metro	10.9	17.4	25.9	13.9	19.6
21-64 / Micro	10.0	24.2	28.3	—	17.6
21-64 / Rural	10.3	25.5	24.6	—	11.3
65+ / Metro	16.5	14.5	17.2	8.7	13.1
65+ / Micro	18.7	32.5	28.1	—	14.1
65+ / Rural	21.2	30.1	32.3	—	24.4

PERIOD 3

Age / county type	W	B	H	A	O/U
0-20 / Metro	8.9	9.5	8.3	4.8	9.3
0-20 / Micro	11.9	15.6	8.2	—	10.2
0-20 / Rural	9.4	14.7	12.1	—	10.8
21-64 / Metro	23.3	24.9	26.9	24.5	31.7
21-64 / Micro	24.5	37.2	29.4	—	36.3
21-64 / Rural	25.5	35.5	41.8	—	31.5
65+ / Metro	28.0	23.9	19.0	18.1	20.8
65+ / Micro	35.5	40.9	41.9	—	32.0
65+ / Rural	53.3	51.9	58.4	—	51.1

PERIOD 4

Age / county type	W	B	H	A	O/U
0-20 / Metro	4.1	5.1	3.9	3.0	4.9
0-20 / Micro	3.7	7.6	4.9	0.0	5.2
0-20 / Rural	3.5	5.6	4.4	0.0	3.9
21-64 / Metro	10.7	12.6	12.5	10.7	15.9
21-64 / Micro	9.7	12.4	14.6	—	10.3
21-64 / Rural	9.2	12.7	17.0	0.0	9.8
65+ / Metro	7.8	8.7	6.6	7.1	7.0
65+ / Micro	8.1	—	16.0	0.0	—
65+ / Rural	12.4	—	18.8	0.0	—

Data Source: Analytical Data Store, TMASP Oracle server, TMHP. Analysis by HHSC-DAP.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, Pacific Islander; O/U=Other/Unknown. COVID-19-related ED visits are based on date of admission; ED visits spanning multiple days are only counted once. Individuals with multiple COVID-19 ED visits are counted for each distinct visit. Darker shades of blue correspond to higher rates. *Rates per 10,000 are calculated as the average of monthly utilization per average monthly member enrollment. Rates are suppressed (—) if the average number of COVID-19 ED visits for a period was between 1 and 4. See Appendix E for COVID-19 ED visit definitions in Medicaid/CHIP.

COVID-19 Hospitalizations in Texas Medicaid/CHIP

Figure 12 shows the number of COVID-19-related hospitalizations among Texas Medicaid/CHIP clients. Consistent with trends in COVID-19-related ED visits, hospitalization patterns for COVID-19 peaked in July 2020 and January 2021 for clients enrolled in Medicaid/CHIP. In general, older populations were more likely to be hospitalized throughout all periods. Hospitalization rates for the youngest age group were consistently low across periods and county types, and Asian populations tended to have lower rates of hospitalizations than other groups in most categories.

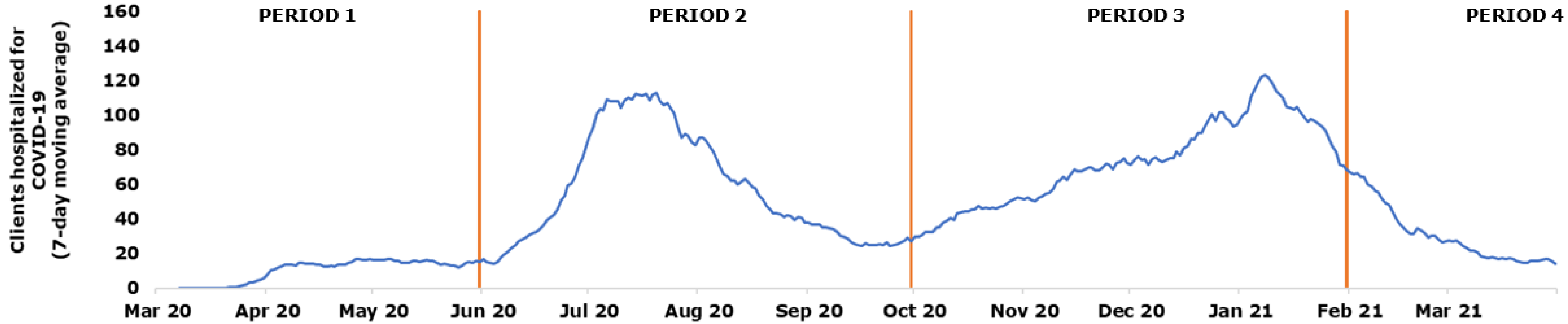
As with ED visits, the average monthly rate of hospitalizations for COVID-19 was suppressed for most groups due to low sample size during Period 1. In metro areas, the highest rate of hospitalization was among Black clients ages 65 and older followed by White clients in the same age group. Black clients also had the second highest COVID-19 hospitalization rate among those 21 to 64 years old, surpassed only by clients with Other/Unknown race/ethnicity.

In Period 2, among clients 21 years and older, micro areas usually had higher hospitalization rates than metro or rural areas. The average monthly hospitalization rates for Hispanic and Black clients were similar to White clients in the same age or county category.

In Period 3, the highest rate of hospitalization was among older Hispanic clients in rural counties. Rates were highest in micro and rural areas across race/ethnicity groups for clients ages 21 and above. In metro areas, Hispanic clients had higher rates than White or Black clients if they were ages 64 or under. In contrast, Hispanic clients ages 65 and older had hospitalization rates similar to Black clients and lower than White clients. Among clients ages 20 and younger, individuals with Other/Unknown race/ethnicity had the highest hospitalization rates in metro areas.

In Period 4, the average monthly hospitalization rates dropped across all groups but remained somewhat elevated among older Hispanic clients living in rural or micro areas.

Figure 12. Daily count (7-day moving average) and average monthly rates (per 10,000) of Texas Medicaid/CHIP clients hospitalized for COVID-19, March 2020 – March 2021



Hospitalization rates per 10,000*

PERIOD 1

Age / county type	W	B	H	A	O/U
0-20 / Metro	—	—	0.1	0.0	—
0-20 / Micro	0.0	—	—	0.0	—
0-20 / Rural	0.0	0.0	0.0	0.0	0.0
21-64 / Metro	0.9	1.4	1.3	—	1.5
21-64 / Micro	—	—	—	0.0	—
21-64 / Rural	—	—	—	0.0	—
65+ / Metro	3.6	5.2	2.8	3.1	3.1
65+ / Micro	—	—	—	0.0	—
65+ / Rural	—	—	—	0.0	—

PERIOD 2

Age / county type	W	B	H	A	O/U
0-20 / Metro	—	0.2	0.4	—	0.5
0-20 / Micro	0.0	—	—	0.0	—
0-20 / Rural	—	—	0.3	0.0	—
21-64 / Metro	3.4	4.5	8.0	—	6.2
21-64 / Micro	3.6	12.1	10.1	—	4.8
21-64 / Rural	3.6	9.5	8.4	—	4.9
65+ / Metro	15.7	15.3	18.8	9.3	11.4
65+ / Micro	22.1	29.1	32.7	—	15.2
65+ / Rural	19.9	26.2	23.6	—	19.8

PERIOD 3

Age / county type	W	B	H	A	O/U
0-20 / Metro	0.2	0.2	0.4	—	0.6
0-20 / Micro	—	—	—	—	—
0-20 / Rural	—	—	0.3	0.0	—
21-64 / Metro	5.9	5.4	7.1	6.8	9.0
21-64 / Micro	5.5	10.4	8.5	—	12.3
21-64 / Rural	7.1	9.5	12.8	—	11.0
65+ / Metro	24.0	18.6	18.7	16.5	18.4
65+ / Micro	33.6	41.6	32.0	—	23.1
65+ / Rural	39.1	39.6	42.5	—	39.1

PERIOD 4

Age / county type	W	B	H	A	O/U
0-20 / Metro	—	—	0.3	—	0.3
0-20 / Micro	—	—	—	0.0	—
0-20 / Rural	—	0.0	—	0.0	—
21-64 / Metro	2.2	2.7	3.1	—	4.1
21-64 / Micro	—	—	—	0.0	—
21-64 / Rural	2.9	—	3.8	0.0	—
65+ / Metro	6.2	5.7	5.6	6.4	7.7
65+ / Micro	—	—	11.5	0.0	—
65+ / Rural	5.1	—	11.7	0.0	—

Data Source: Analytical Data Store, TMASP Oracle server, TMHP. Analysis by HHSC-DAP.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, Pacific Islander; O/U=Other/Unknown. COVID-19-related hospital stays are based on date of admission; hospital stays spanning multiple days are only counted once. Individuals with multiple COVID-19 hospitalizations are counted for each distinct hospital stay. Darker shades of blue correspond to higher rates. *Rates per 10,000 are calculated as the average of monthly utilization per average monthly member enrollment. Rates are suppressed (—) if the average number of COVID-19 hospitalizations for a period was between 1 and 4. See Appendix E for COVID-19 hospitalization definitions in Medicaid/CHIP.

Impacts on HHSC Assistance Programs

This section examines rates of new enrollment in four HHSC assistance programs, including SNAP, TANF cash assistance, Medicaid, and CHIP (See Appendix D for HHSC program definitions). For public assistance programs administered by HHSC, enrollment is determined monthly rather than daily. Trendlines in this section show the number of clients newly enrolled each month; for data on cumulative caseload growth in Medicaid/CHIP, please see Part 3 of this report. Heatmaps in this section depict the average monthly rates of new enrollees (excluding renewal applications) per 10,000 people in Texas.

Overall, trends were similar across programs. New enrollment increased during the beginning of the PHE, often peaking in April 2020 before declining and leveling off for the remainder of the study period. These patterns are consistent with unemployment trends in Texas, suggesting new program enrollment may have been related to widespread job losses at the beginning of the pandemic (Garza, et al., 2021). Across HHSC assistance programs, Hispanic and Black children were generally the most represented among new enrollees.

New SNAP Enrollment

Figure 13 shows that new SNAP monthly enrollment peaked in April 2020 before returning to near pre-pandemic levels in June. In general, individuals newly enrolled in SNAP were more likely to be younger and Black or Hispanic. The rate of new SNAP enrollment was usually lower for the oldest age group regardless of county type.

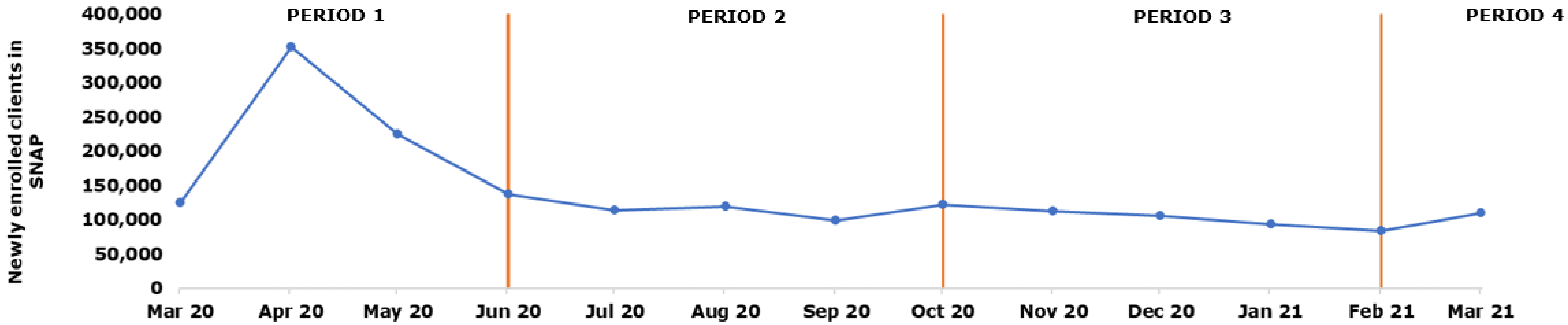
In Period 1, Black individuals ages 20 and younger residing in a metro county had the highest rate of new SNAP enrollment. The rate was highest among Black individuals for all but one age-county subgroup: Hispanic individuals in the youngest age group residing in micro areas had the highest rate of new enrollment compared to other race/ethnicities. Black individuals residing in metro areas had a higher rate than Black individuals residing in micro or rural counties, regardless of age. This pattern was not observed for other race/ethnicity groups, where the highest rates were seen in micro and rural areas.

The rate of new enrollment for SNAP benefits decreased across all subgroups from Period 1 to Period 2. In contrast to Period 1, Hispanic individuals 0 to 20 years old residing in micro and rural areas had the highest rates of new SNAP enrollment. For all age-county subgroups, new SNAP enrollment was highest among Black and Hispanic individuals. Within each race group, the highest rate of new enrollment was found in either micro or rural areas, irrespective of age. Within the 21 to 64 age group, Black individuals had the highest rate of new SNAP enrollment, and Asian individuals had the lowest rate, regardless of county type. Beginning in Period 2 and continuing throughout the study period, Asian individuals living in metro areas had a higher rate of new enrollment in the age 65 and older group than in the 21 to 64 age group.

During Period 3, rates of new enrollment for SNAP decreased across all age-county subgroups for White individuals and Hispanic individuals. This was not the case for Black individuals 64 and younger; like in Period 1, Black individuals in metro areas had the highest rates of new enrollment, with the highest rate occurring in the 0 to 20 age group. Among those 65 and older, Hispanic individuals in micro areas had the highest rate of new enrollment. Rates increased between Period 2 and Period 3 for several Asian subgroups, and a similar increase emerged among individuals with Other race/ethnicity in the 21 to 64 age group residing in metro counties.

In Period 4, Black individuals ages 20 and younger in metro areas continued to have the highest rate of new enrollment in SNAP. Within the younger age groups, rates increased only among Asian individuals residing in rural areas. In the 21-64 age group, rates remained highest among Black individuals living in rural areas. Like Periods 2 and 3, White individuals residing in rural areas had a higher rate than White individuals in metro areas, regardless of age.

Figure 13. Monthly count and average monthly rates (per 10,000) of newly enrolled clients in SNAP, March 2020 – March 2021



Rate per 10,000*

PERIOD 1

Age / County Type	W	B	H	A	O
0-20 / Metro	49.2	175.5	129.9	36.8	34.6
0-20 / Micro	83.8	126.2	145.2	69.4	39.6
0-20 / Rural	79.7	139.6	128.0	85.2	47.2
21-64 / Metro	34.2	157.8	72.3	19.9	33.5
21-64 / Micro	54.1	106.9	81.7	30.9	39.9
21-64 / Rural	51.9	114.0	81.0	46.1	38.3
65+ / Metro	4.3	41.2	25.9	12.6	5.4
65+ / Micro	5.3	35.4	32.7	—	—
65+ / Rural	5.1	32.1	24.9	—	—

PERIOD 2

Age / County Type	W	B	H	A	O
0-20 / Metro	26.0	73.2	71.4	13.3	19.2
0-20 / Micro	52.1	67.5	88.6	19.6	34.8
0-20 / Rural	53.9	76.3	88.5	50.4	28.2
21-64 / Metro	15.9	51.9	34.8	6.5	15.6
21-64 / Micro	30.5	47.2	44.8	11.3	27.0
21-64 / Rural	30.4	53.7	50.2	20.6	27.7
65+ / Metro	2.8	18.2	19.1	9.3	3.9
65+ / Micro	4.2	18.0	23.3	—	—
65+ / Rural	3.9	19.6	18.1	—	—

PERIOD 3

Age / County Type	W	B	H	A	O
0-20 / Metro	25.1	84.2	58.2	12.7	18.1
0-20 / Micro	47.3	61.9	72.8	34.1	24.1
0-20 / Rural	47.2	71.0	71.2	18.4	24.4
21-64 / Metro	15.3	57.4	31.1	6.9	16.7
21-64 / Micro	26.8	44.2	39.1	12.3	25.5
21-64 / Rural	27.4	49.9	42.1	12.3	21.6
65+ / Metro	2.6	12.4	13.4	10.0	3.7
65+ / Micro	3.9	14.0	16.1	—	—
65+ / Rural	3.5	12.3	14.3	—	—

PERIOD 4

Age / County Type	W	B	H	A	O
0-20 / Metro	19.3	70.8	55.1	12.2	16.9
0-20 / Micro	35.1	58.3	66.7	22.2	23.1
0-20 / Rural	38.0	70.4	59.4	39.3	23.8
21-64 / Metro	12.5	49.6	28.5	6.4	14.2
21-64 / Micro	22.1	42.8	35.7	7.3	23.9
21-64 / Rural	22.5	42.8	35.3	17.3	16.7
65+ / Metro	2.5	14.4	16.6	10.4	3.6
65+ / Micro	3.4	16.7	21.7	—	—
65+ / Rural	3.8	15.3	18.7	—	—

Data Source: Texas Integrated Eligibility Redesign System. Analysis by HHSC-DAP.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, non-Hispanic; O=Other. Darker shades of blue correspond to higher rates.

*Rates per 10,000 are calculated as the average monthly rates of new enrollees per 10,000 people in Texas. An individual was considered a new enrollee for SNAP if they had been absent from that same program in the monthly, member-level eligibility file for at least 6 successive months. A SNAP enrollee is defined as a member of the household's certified group. Rates are suppressed (—) if the average number of newly enrolled clients for a period was between 1 and 4.

New TANF Enrollment

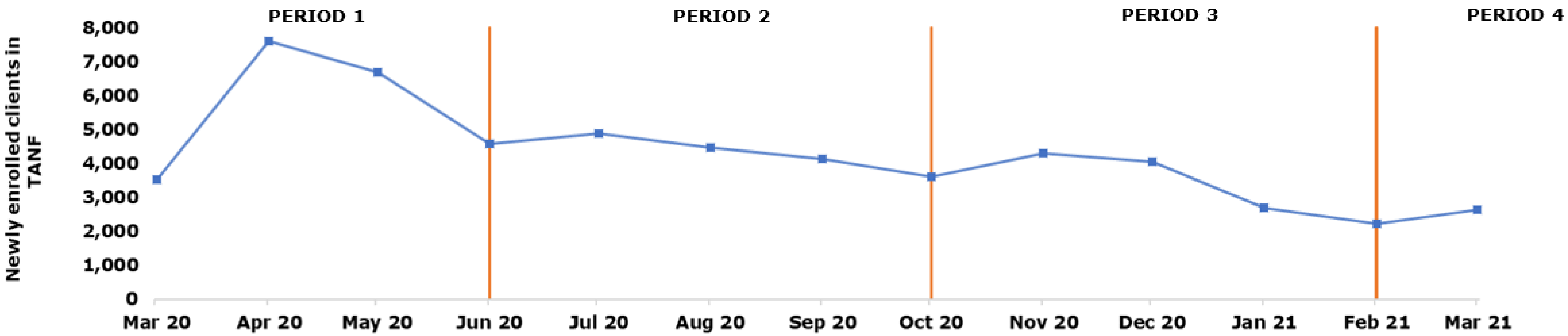
Figure 14 shows new enrollment in the TANF cash assistance program administered by HHSC. New enrollment in TANF peaked in April 2020, then generally declined over the first year of the pandemic. Overall, the highest rate of new TANF enrollment was observed for Black individuals across all age and county groups. With regard to age, individuals ages 20 and younger had the highest rate of new enrollment across periods.

Like with SNAP, there was an overall decrease in new TANF enrollment between Period 1 and Period 2, with a few exceptions. Similar to Period 1, Black individuals had the highest rate of new enrollment across all age and county groups in Period 2. The rate remained highest for individuals ages 20 and younger, but in contrast to Period 1, the highest enrollment was observed in micro areas rather than metro areas.

In Period 3, rates of new TANF enrollment remained highest for Black individuals ages 20 and younger in micro and rural areas, despite an overall decrease from the previous two periods. Within the 21-64 age group, Black individuals continued to have the highest rate of new enrollment in TANF.

In Period 4, Black individuals ages 20 and younger residing in micro areas continued to have the highest rate of new TANF enrollment. Within the younger age groups, rates increased only for Asian individuals in rural areas. Among those 21 to 64, rates remained highest among Black individuals in rural areas. Like Periods 2 and 3, White individuals in rural areas had a higher rate than White individuals in metro areas, regardless of age.

Figure 14. Monthly count and average monthly rates (per 10,000) of newly enrolled clients in TANF, March 2020 – March 2021



Rate per 10,000*

PERIOD 1

Age / County Type	W	B	H	A	O
0-20 / Metro	2.1	9.2	4.0	0.7	2.1
0-20 / Micro	3.8	9.0	3.5	—	—
0-20 / Rural	3.3	8.2	4.6	—	—
21-64 / Metro	0.6	2.6	1.1	0.2	1.1
21-64 / Micro	1.1	2.3	1.1	—	—
21-64 / Rural	0.9	2.0	1.3	0.0	—
65+ / Metro	—	—	—	0.0	0.0
65+ / Micro	—	0.0	0.0	0.0	0.0
65+ / Rural	0.0	0.0	0.0	0.0	0.0

PERIOD 2

Age / County Type	W	B	H	A	O
0-20 / Metro	1.3	6.2	3.4	0.3	1.5
0-20 / Micro	2.6	7.9	4.4	0.0	—
0-20 / Rural	3.3	7.5	4.5	—	—
21-64 / Metro	0.3	1.5	0.8	0.1	0.5
21-64 / Micro	0.8	1.9	1.2	—	—
21-64 / Rural	0.9	1.6	1.3	—	—
65+ / Metro	—	—	—	0.0	0.0
65+ / Micro	0.0	0.0	0.0	0.0	0.0
65+ / Rural	—	0.0	0.0	0.0	0.0

PERIOD 3

Age / County Type	W	B	H	A	O
0-20 / Metro	1.0	6.0	2.6	0.3	1.2
0-20 / Micro	2.0	6.8	3.0	—	—
0-20 / Rural	2.2	6.8	3.9	—	—
21-64 / Metro	0.3	1.5	0.6	0.1	0.5
21-64 / Micro	0.6	1.2	0.8	—	—
21-64 / Rural	0.7	1.5	0.9	—	—
65+ / Metro	0.0	—	—	0.0	0.0
65+ / Micro	—	0.0	—	0.0	0.0
65+ / Rural	—	—	0.0	0.0	0.0

PERIOD 4

Age / County Type	W	B	H	A	O
0-20 / Metro	0.8	3.8	1.6	0.4	0.6
0-20 / Micro	1.6	4.0	2.3	0.0	—
0-20 / Rural	1.9	3.7	2.2	—	—
21-64 / Metro	0.2	1.0	0.4	0.1	0.4
21-64 / Micro	0.5	0.9	0.6	—	—
21-64 / Rural	0.5	1.1	0.7	—	—
65+ / Metro	0.0	0.0	0.0	—	0.0
65+ / Micro	0.0	0.0	0.0	0.0	0.0
65+ / Rural	0.0	0.0	0.0	0.0	0.0

Data Source: Texas Integrated Eligibility Redesign System. Analysis by HHSC-DAP.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, non-Hispanic; O=Other. Darker shades of blue correspond to higher rates. TANF enrollment refers to the TANF cash assistance program.

*Rates per 10,000 are calculated as the average monthly rates of new enrollees per 10,000 people in Texas. An individual was considered a new TANF enrollee if they had been absent from that same program in the monthly, member-level eligibility file for at least 6 successive months. A TANF enrollee is defined as a member of the household's certified group. Rates are suppressed (—) if the average number of newly enrolled clients for a period was between 1 and 4.

New Medicaid Enrollment

Figure 15 shows the number and average monthly rate of clients newly enrolled in Medicaid each month (for data on cumulative caseload growth in Medicaid/CHIP, please see Part 3 of this report). As shown in the trendline, Medicaid enrollment[13] peaked in April 2020 and again to a lesser extent in December 2020. Across periods, the highest rate of new enrollment in the Medicaid program was for Hispanic individuals living in micro areas. Rates were typically higher among Hispanic individuals across subgroups. Individuals ages 20 and younger were newly enrolled in Medicaid at a higher rate than adults. For Black individuals, the rate of new enrollment was higher in metro counties than in rural and micro counties. This pattern was not observed for any other race/ethnicity.

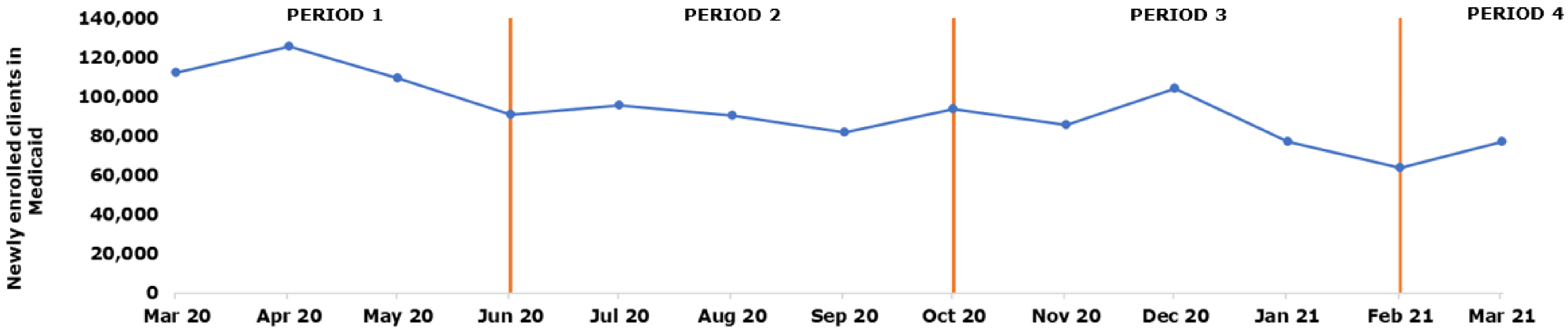
Aside from a decrease in new Medicaid enrollment, patterns observed in Period 1 also emerged in Period 2. One difference was observed among those 65 and older for both Black and Hispanic populations: the county type with the highest rate of new Medicaid enrollment shifted between Period 1 and Period 2, with the highest rates moving from rural to micro areas for Black individuals and from micro to metro areas for Hispanic individuals. For the youngest and oldest age groups, Other race/ethnicity had the lowest rate of new enrollment, and for the 21 to 64 age group, Asian individuals had the lowest rate of new enrollment regardless of county type.

Like prior periods, enrollment rates during Period 3 were typically highest among Hispanic individuals across subgroups. Rates among Black individuals in metro areas, however, surpassed their Hispanic counterparts in the 0 to 20 and 21 to 64 age groups. For both Asian and Other race/ethnicity, the highest rate of new enrollment was found in individuals ages 20 and younger residing in micro areas. For both subgroups, rates in Period 3 exceeded rates in prior periods.

Rates decreased from Period 3 to Period 4 across almost all subgroups. Within each age-county group, the race/ethnicity with the highest rate of new enrollment did not change between Period 3 and Period 4. The lowest rate of new enrollment for Medicaid was found among Asian individuals between ages 21 and 64 and White individuals 65 and older residing in metro counties.

[13] Medicaid provides services to low-income children and their families, pregnant women, former foster care youth, individuals with disabilities, and people ages 65 and older. Most Medicaid clients are children below the age of 18.

Figure 15. Monthly count and average monthly rates (per 10,000) of newly enrolled clients in Medicaid, March 2020 – March 2021



Rate per 10,000*

PERIOD 1

Age / County Type	W	B	H	A	O
0-20 / Metro	32.5	80.4	80.5	33.6	20.8
0-20 / Micro	54.2	57.1	96.7	52.3	23.9
0-20 / Rural	54.0	61.7	83.3	66.4	28.2
21-64 / Metro	10.6	34.5	25.3	6.2	11.4
21-64 / Micro	17.0	25.0	28.2	15.9	14.5
21-64 / Rural	17.2	26.1	28.2	16.0	14.9
65+ / Metro	6.4	19.6	24.0	14.8	6.2
65+ / Micro	7.8	17.8	26.4	—	—
65+ / Rural	9.1	21.0	25.4	—	—

PERIOD 2

Age / County Type	W	B	H	A	O
0-20 / Metro	23.9	57.4	63.2	23.3	16.9
0-20 / Micro	45.2	45.4	78.2	30.7	24.1
0-20 / Rural	45.2	50.9	71.0	55.9	24.3
21-64 / Metro	7.3	22.7	19.7	4.4	8.6
21-64 / Micro	12.8	17.0	22.2	10.6	11.9
21-64 / Rural	13.3	18.8	22.2	12.6	13.9
65+ / Metro	4.2	13.2	17.5	11.1	4.4
65+ / Micro	5.4	14.1	17.4	—	—
65+ / Rural	6.3	13.4	16.3	—	—

PERIOD 3

Age / County Type	W	B	H	A	O
0-20 / Metro	25.2	70.2	60.6	27.0	18.4
0-20 / Micro	41.9	52.4	72.5	57.2	24.7
0-20 / Rural	44.3	53.7	63.4	42.4	21.3
21-64 / Metro	6.8	23.0	18.0	4.0	8.6
21-64 / Micro	12.1	17.7	20.5	8.3	13.7
21-64 / Rural	11.8	18.0	19.8	10.0	11.2
65+ / Metro	4.2	13.1	18.7	13.2	3.8
65+ / Micro	5.9	12.7	21.1	—	—
65+ / Rural	6.2	13.7	18.8	—	—

PERIOD 4

Age / County Type	W	B	H	A	O
0-20 / Metro	19.2	52.5	54.2	21.2	14.6
0-20 / Micro	32.7	35.4	63.0	58.0	17.7
0-20 / Rural	34.3	45.1	55.7	39.3	21.8
21-64 / Metro	5.5	18.8	15.8	3.3	7.0
21-64 / Micro	9.5	14.4	17.2	7.3	7.2
21-64 / Rural	10.0	14.6	17.3	6.7	5.4
65+ / Metro	3.3	11.3	14.9	10.5	3.5
65+ / Micro	4.8	9.5	13.3	—	—
65+ / Rural	5.6	13.4	16.6	—	—

Data Source: Texas Integrated Eligibility Redesign System. Analysis by HHSC-DAP.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, non-Hispanic; O=Other. Darker shades of blue correspond to higher rates.

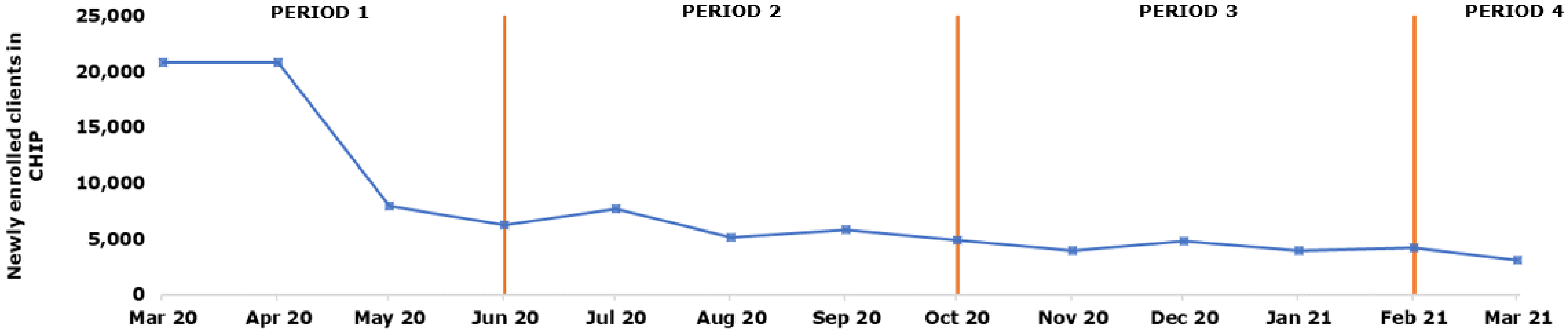
*Rates per 10,000 are calculated as the average monthly rates of new enrollees per 10,000 people in Texas. An individual was considered a new enrollee in Medicaid if they had been absent from that same program in the monthly, member-level eligibility file for at least 6 successive months. A Medicaid enrollee is defined as the recipient of the medical benefit assistance. Includes all full and partial benefit Medicaid clients. March 2020 does not include "new client enrollment" from HTW clients transferring into Medicaid. Rates are suppressed (—) if the average number of newly enrolled clients for a period was between 1 and 4.

New CHIP Enrollment

The rates of new CHIP enrollment showed a similar pattern to the rates of new Medicaid enrollment. The rate was typically highest among Hispanic individuals in micro areas [Figure 16]. Like SNAP, TANF, and Medicaid, new enrollment rates in CHIP generally decreased over time. In addition to falling rates of new enrollment, overall CHIP caseloads also declined over the period (not shown) due to federal PHE maintenance of eligibility (MOE) requirements in Medicaid. Federal MOE requirements retained clients in Medicaid, some of whom would have previously transferred to CHIP due to changes in eligibility status; this policy change contributed to declines in overall CHIP caseloads.

CHIP enrollment patterns in Period 1 and Period 2 were largely similar. The highest rate of new CHIP enrollment in both periods was found among Hispanic individuals in micro areas. In Period 3, the highest rate of new CHIP enrollment shifted to Hispanic individuals in rural areas before returning to Hispanic individuals in micro areas during Period 4. From Period 3 to Period 4, rates decreased across all race-county subgroups except Asian individuals in metro areas, which increased slightly. Across periods, White individuals tended to have the highest rates of new enrollment in rural areas while Black individuals tended to have the highest rates in metro areas.

Figure 16. Monthly count and average monthly rates (per 10,000) of newly enrolled clients in CHIP, March 2020 – March 2021



Rate per 10,000*

PERIOD 1

Age / County Type	W	B	H	A	O
0-20 / Metro	7.8	19.4	21.1	11.6	4.9
0-20 / Micro	12.8	13.7	25.0	20.5	4.3
0-20 / Rural	13.3	18.0	20.1	20.5	3.4
21-64 / Metro	0.0	0.0	0.0	0.0	0.0
21-64 / Micro	0.0	0.0	0.0	0.0	0.0
21-64 / Rural	0.0	0.0	0.0	0.0	0.0
65+ / Metro	0.0	0.0	0.0	0.0	0.0
65+ / Micro	0.0	0.0	0.0	0.0	0.0
65+ / Rural	0.0	0.0	0.0	0.0	0.0

PERIOD 2

Age / County Type	W	B	H	A	O
0-20 / Metro	2.7	7.1	8.4	4.0	1.8
0-20 / Micro	4.3	3.6	10.0	—	—
0-20 / Rural	4.5	4.8	8.9	—	—
21-64 / Metro	0.0	0.0	0.0	0.0	0.0
21-64 / Micro	0.0	0.0	0.0	0.0	0.0
21-64 / Rural	0.0	0.0	0.0	0.0	0.0
65+ / Metro	0.0	0.0	0.0	0.0	0.0
65+ / Micro	0.0	0.0	0.0	0.0	0.0
65+ / Rural	0.0	0.0	0.0	0.0	0.0

PERIOD 3

Age / County Type	W	B	H	A	O
0-20 / Metro	2.4	4.5	5.6	3.0	1.9
0-20 / Micro	3.7	3.6	5.8	—	—
0-20 / Rural	4.3	2.9	6.4	—	—
21-64 / Metro	0.0	0.0	0.0	0.0	0.0
21-64 / Micro	0.0	0.0	0.0	0.0	0.0
21-64 / Rural	0.0	0.0	0.0	0.0	0.0
65+ / Metro	0.0	0.0	0.0	0.0	0.0
65+ / Micro	0.0	0.0	0.0	0.0	0.0
65+ / Rural	0.0	0.0	0.0	0.0	0.0

PERIOD 4

Age / County Type	W	B	H	A	O
0-20 / Metro	2.0	3.8	4.1	3.4	1.2
0-20 / Micro	3.6	1.8	4.4	—	0.0
0-20 / Rural	3.3	2.4	4.0	—	—
21-64 / Metro	0.0	0.0	0.0	0.0	0.0
21-64 / Micro	0.0	0.0	0.0	0.0	0.0
21-64 / Rural	0.0	0.0	0.0	0.0	0.0
65+ / Metro	0.0	0.0	0.0	0.0	0.0
65+ / Micro	0.0	0.0	0.0	0.0	0.0
65+ / Rural	0.0	0.0	0.0	0.0	0.0

Data Source: Texas Integrated Eligibility Redesign System. Analysis by HHSC-DAP.

Notes: W=White, non-Hispanic; B=Black, non-Hispanic; H=Hispanic; A=Asian, non-Hispanic; O=Other. Darker shades of blue correspond to higher rates.

*Rates per 10,000 are calculated as the average monthly rates of new enrollees per 10,000 people in Texas. An individual was considered a new enrollee in CHIP if they had been absent from that same program in the monthly, member-level eligibility file for at least 6 successive months. A CHIP enrollee is defined as the recipient of the medical benefit assistance. Eligibility for CHIP is available through the month of a client's 19th birthday. Rates are suppressed (—) if the average number of newly enrolled clients for a period was between 1 and 4.

Part 2. Direct Impact Studies

This section presents results from a series of in-depth studies exploring the role of individual sex, comorbid conditions, community-level social vulnerability, and other explanatory factors on COVID-19 diagnoses, hospitalizations, ICU admissions, and deaths. The section begins with two studies focused on COVID-19-related hospital outcomes—one among the general population and one among individuals enrolled in Medicaid/CHIP. Next, this section presents a series of COVID-19-related studies among individuals receiving LTSS, such as those enrolled in nursing facilities and home and community-based services. Finally, this section considers the demographic and geographic characteristics of individuals who died from COVID-19.

COVID-19 Hospitalization Outcomes in the Texas Population

The heatmaps presented in Figure 7 of the previous section compared hospitalization rates in Texas by three demographic characteristics: age, race/ethnicity, and county type. This analysis uses multivariate techniques to examine individuals hospitalized for COVID-19 to understand which demographic groups were more likely to experience severe hospital outcomes, such as ICU admission and in-hospital mortality. In addition to age and race/ethnicity, this analysis examines the role of sex, medical conditions, and community-level social vulnerability.

Previous studies have shown that certain medical conditions are associated with greater risk of adverse COVID-19 outcomes. Using guidance provided by the CDC, a panel of subject matter experts from DSHS and HHSC generated a list of comorbidities and certain medical conditions to use in this analysis and others throughout this report [Appendix C].

Using hospital discharge data from THCIC, DSHS estimated a series of multivariate logistic regression models that examined: 1) factors associated with ICU admission and 2) factors associated with in-hospital mortality among patients hospitalized for

COVID-19 in Texas.[14] Additional details regarding the methodology can be found in Appendix F.

Results

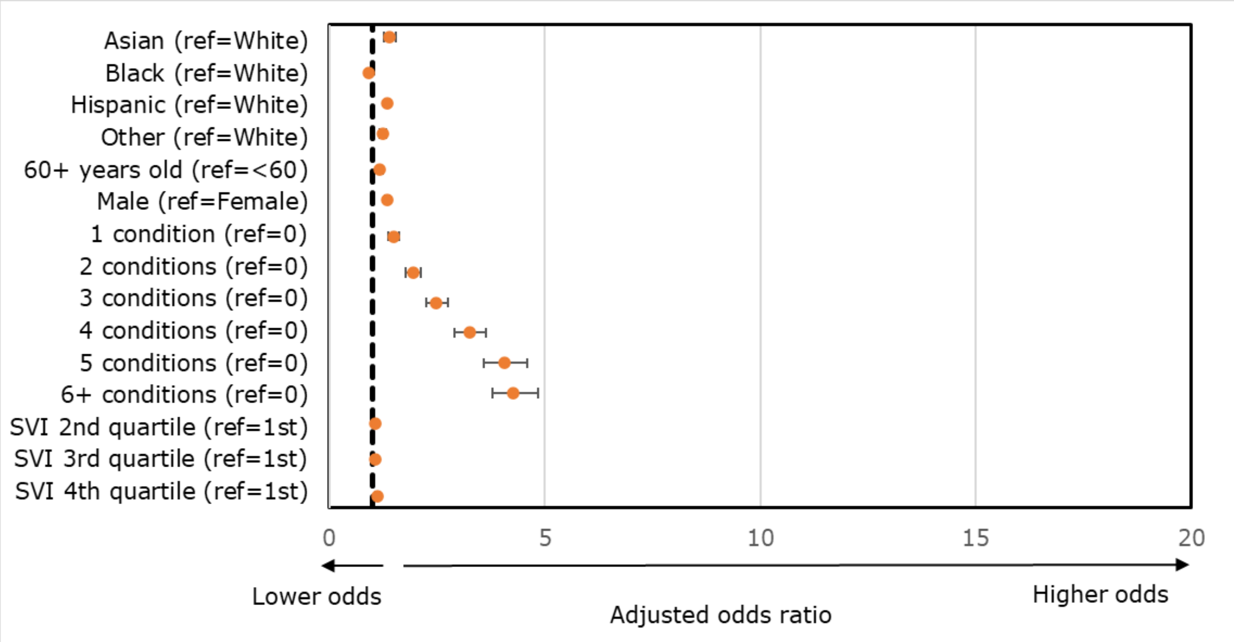
There were 156,991 hospital admissions due to COVID-19 in Texas from March 1, 2020 through March 31, 2021. Results from the ICU admission analysis are presented in Figure 17. Results indicate that being 60 years of age or older was associated with 17 percent higher odds of ICU admission compared to being less than 60 years of age, holding all other variables in the model constant. Additionally, being male was associated with 33 percent higher odds of ICU admission compared to being female, all else constant. Individuals with Asian, Hispanic, and Other race/ethnicity were associated with 40 percent, 34 percent, and 23 percent higher odds of ICU admission compared to White individuals, respectively, holding all other variables in the model constant. Being Black was associated with 9 percent lower odds of ICU admission compared to being White. Additionally, greater numbers of comorbidities and certain medical conditions were strongly and positively associated with the odds of ICU admission. Lastly, individuals living in census tracts in the highest SVI quartile were associated with 10 percent higher odds of ICU admission than individuals in census tracts in the lowest SVI quartile, holding all else constant.

Results from the in-hospital mortality analysis are presented in Figure 18. Results indicate that being 60 years of age or older was associated with 2.65 times higher odds of in-hospital mortality compared to being less than 60 years of age, holding all else constant. Additionally, being male was associated with 46 percent higher odds of in-hospital mortality compared to being female, controlling for all other variables in the model. Individuals with Asian, Hispanic, and Other race/ethnicity were associated with 30 percent, 41 percent, and 25 percent higher odds of in-hospital mortality compared to White individuals, respectively, holding all else constant. Interestingly, Black individuals had 25 percent lower odds of in-hospital mortality than White individuals. Additionally, greater numbers of comorbidities and certain medical conditions were strongly and positively associated with the odds of in-hospital mortality. Lastly, individuals living in census tracts in the highest SVI quartile were associated with 20 percent higher odds of in-hospital mortality than

[14] Hospitalized due to COVID-19 refers to the presence of an International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) diagnosis code of U07.1, J12.82, or B97.29 as the admitting or principal diagnosis. Please note that different codes were used at different times during the pandemic. See Appendix F for additional detail on when each code was used to define COVID-19-related hospitalizations.

individuals in census tracts in the lowest SVI quartile, holding all other variables in the model constant.

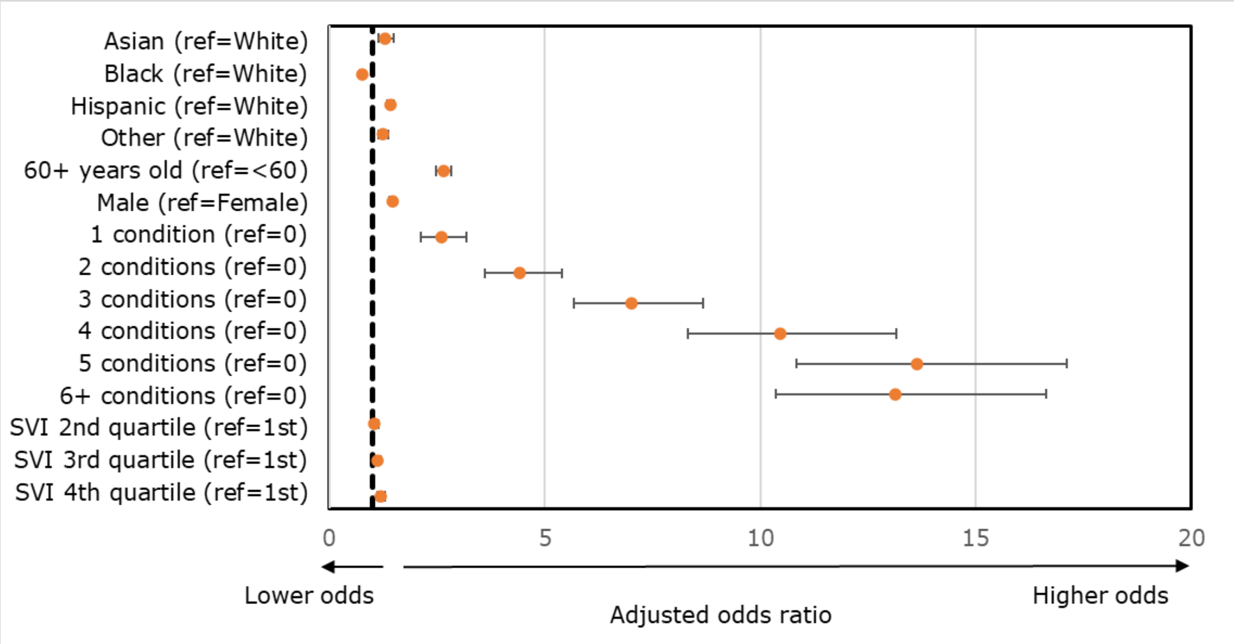
Figure 17. Factors associated with ICU admission among individuals hospitalized for COVID-19



Data Source: DSHS, THCIC. Analysis by DSHS.

Notes: Individuals in Texas hospitalized for COVID-19 between March 1, 2020 and March 31, 2021 (N=156,991). Excluded records from standalone psychiatric facilities, standalone rehabilitation facilities, standalone skilled nursing facilities, standalone long-term acute care facilities, standalone other long-term care facilities, standalone psychiatric acute care facilities, and pediatric rehabilitation centers. Multivariate logistic regression with hospital fixed effects and robust standard errors clustered on hospital identifier was used to model the association between ICU admission and individual factors including race/ethnicity, age, sex, SVI quartile ranking, and number of comorbidities. Adjusted odds ratios and 95% confidence intervals shown.

Figure 18. Factors associated with in-hospital mortality among individuals hospitalized for COVID-19



Data Source: DSHS, THCIC. Analysis by DSHS.

Notes: Individuals in Texas hospitalized for COVID-19 between March 1, 2020 and March 31, 2021 (N=156,991). Excluded records from standalone psychiatric facilities, standalone rehabilitation facilities, standalone skilled nursing facilities, standalone long-term acute care facilities, standalone other long-term care facilities, standalone psychiatric acute care facilities, and pediatric rehabilitation centers. Multivariate logistic regression with hospital fixed effects and robust standard errors clustered on hospital identifier was used to model the association between in-hospital mortality and individual factors including race/ethnicity, age, sex, SVI quartile ranking, and number of comorbidities. Adjusted odds ratios and 95% confidence intervals shown.

Discussion

Overall, the strongest predictor of both ICU admission and in-hospital mortality was a patient's number of comorbidities and certain medical conditions. Compared to individuals with zero comorbidities, those who had condition(s) in one comorbidity category were approximately 1.5 times as likely to have an ICU admission and more than 2.5 times as likely to die in the hospital. Individuals with conditions in six or more comorbidity categories were more than four times as likely to have an ICU admission and more than 13 times as likely to have had an in-hospital death than people with zero comorbidities. These regression models highlight the enormous influence of comorbidities and other medical conditions on COVID-19 hospitalization outcomes in Texas during the first year of the pandemic. Importantly, comorbidity measures used in this analysis only include conditions listed in the discharge data of the COVID-19 hospital visit. Only conditions that are present at the time of admission or during the COVID-19 hospital visit and impacted the care of the patient during that hospital stay are included in the discharge data used for this analysis. Analysis in the next section examines comorbid conditions through the lens of pre-existing conditions, including those identified in an individuals' claims history that may not be recorded at the time of hospitalization.

However, even when accounting for comorbidities, differences in hospital outcomes persist, including differences by race/ethnicity and community-level social vulnerability. As previously noted, Asian, Hispanic, and Other individuals all had higher odds of ICU admission and in-hospital mortality than White individuals. Only Black individuals showed lower odds of severe hospital outcomes. This pattern contrasts with other research showing how the pandemic disproportionately impacted Black individuals (Rossen, et al., 2021; Romano, et al., 2021). Additional research should be conducted to better understand why Black populations in Texas had lower odds of ICU admission and in-hospital mortality than other groups.

COVID-19 Outcomes in Texas Medicaid/CHIP

The previous analysis explored factors associated with ICU admission and in-hospital mortality among Texans hospitalized for COVID-19 using Texas hospital discharge data. This study uses claims and encounters data to perform a similar analysis among Texas Medicaid/CHIP clients. Two advantages of using Medicaid/CHIP claims and encounters data are 1) the opportunity to examine pre-existing conditions (rather than only those conditions noted during a hospital visit), and 2) the ability to compare clients who were hospitalized for COVID-19 with those who had COVID-19 but who were not hospitalized. This section examines the characteristics of Texas Medicaid/CHIP clients who received services related to COVID-19 testing and treatment. The analysis:

1. Examines approximately 150,000 clients continuously enrolled in Texas Medicaid/CHIP from March 2019 to February 2020 and who had a diagnosis of COVID-19 between March 2020 and March 2021, comparing those who were hospitalized at least once to those who were never hospitalized.
2. Calculates the odds of hospitalization due to COVID-19,[15] ICU admission (among hospitalized clients), and in-hospital death (among hospitalized clients), while accounting for multiple client demographic characteristics.

Note that individuals enrolled in Texas Medicaid who are receiving long-term services and supports are the focus of a subsequent study and will be explored in greater depth in the following section.

Results

Table 3 shows more than half of the group diagnosed with COVID-19 was aged 20 and younger (56.3 percent), while slightly more than half of the group hospitalized due to COVID-19 was over 65 (52.2 percent). A larger percentage of the diagnosed group were Hispanic compared to the group hospitalized due to COVID-19 (55.6 percent vs. 42.8 percent). In contrast, White and Black clients were overrepresented among those hospitalized due to COVID-19, with White clients accounting for 18.7 percent of those diagnosed and 24.0 percent of those hospitalized and Black clients accounting for 11.4 percent of those diagnosed and 15.9 percent of those hospitalized.

[15] Hospitalized due to COVID-19 refers to the presence of an ICD-10-CM diagnosis code of U07.1, J12.82 or B97.29 as the admitting or principal diagnosis.

A slightly smaller percentage of the group hospitalized for COVID-19 lived in a metro county than those diagnosed with COVID-19 (73.3 percent vs. 81.0 percent). About three percent of the group diagnosed with COVID-19 were pregnant during the study period compared to less than one percent of the group hospitalized for COVID-19. An opposite trend emerged for those in nursing facilities. The percentage of nursing facility clients in the group hospitalized for COVID-19 was more than twice the percentage in the group diagnosed with COVID-19 (35.3 percent vs. 16.7 percent).

Table 3. Demographic characteristics of Medicaid and CHIP clients who were diagnosed with COVID-19 between March 2020 and March 2021, by hospitalization status[1]

Domain	Client characteristic	Diagnosed with COVID-19 (n=149,332)[2]		Any hospitalization with COVID-19 (n=19,009)[3,4]		Hospitalized due to COVID-19 (n=11,591)[3,5]	
		n	%	n	%	n	%
Race/ethnicity	Asian	2,190	1.5	465	2.4	299	2.6
Race/ethnicity	Black	17,018	11.4	3,110	16.4	1,844	15.9
Race/ethnicity	Hispanic	83,057	55.6	8,361	44.0	4,960	42.8
Race/ethnicity	White	27,917	18.7	4,347	22.9	2,782	24.0
Race/ethnicity	Other/Unknown+	19,150	12.8	2,726	14.3	1,706	14.7
Age group	<21	84,068	56.3	1,876	9.9	660	5.7
Age group	21-64	35,655	23.9	8,107	42.6	4,877	42.1
Age group	65+	29,609	19.8	9,026	47.5	6,054	52.2
Sex	Female	85,500	57.3	11,214	59.0	6,718	58.0
Sex	Male	63,679	42.6	7,737	40.7	4,831	41.7
Sex	Unknown+	153	0.1	58	0.3	42	0.4
County type	Metro	120,048	80.4	14,547	76.5	8,501	73.3
County type	Micro	10,640	7.1	1,678	8.8	1,131	9.8
County type	Rural	18,488	12.4	2,724	14.3	1,918	16.5
County type	Missing	156	0.1	60	0.3	41	0.4
Diagnosis timing++	Period 1	4,599	3.1	1,126	5.9	705	6.1
Diagnosis timing++	Period 2	48,858	32.7	7,694	40.5	4,616	39.8
Diagnosis timing++	Period 3	79,228	53.1	8,693	45.7	5,482	47.3

Domain	Client characteristic	Diagnosed with COVID-19 (n=149,332)[2]		Any hospitalization with COVID-19 (n=19,009)[3,4]		Hospitalized due to COVID-19 (n=11,591)[3,5]	
Diagnosis timing++	Period 4	16,647	11.1	1,496	7.9	788	6.8
Subpopulation	Pregnant[6]	4,013	2.7	1,070	5.6	42	0.4
Subpopulation	Nursing facility resident[7]	24,963	16.7	6,550	34.5	4,096	35.3

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

Notes:

1 Clients included in this study were continuously enrolled for 12 months prior to the study period (March 2019-Feb 2020) to ensure diagnoses for comorbid conditions were identified for an equal period of time for all clients in the study population.

2 A COVID-19 diagnosis refers to the presence of a U07.1, J12.82, or B97.29 diagnosis code on a paid claim or encounter.

3 Fewer than two percent of clients included in this study (n=2,362) were enrolled in Healthy Texas Women (HTW) for at least one month during the study period (March 2020-March 2021). Inpatient hospitalizations are not a covered benefit under the HTW program. As a result, HHSC does not have hospitalization data for HTW clients diagnosed with COVID-19 who were admitted to the hospital. Accordingly, data presented in this table may slightly underrepresent the percentage of hospitalizations among certain subgroups (e.g., female, ages <21, or ages 21-64).

4 Any hospitalization mentioning COVID-19 refers to the presence of a U07.1, J12.82, or B97.29 in any diagnosis code position on a paid claim or encounter.

5 Hospitalized due to COVID-19 refers to the presence of a U07.1, J12.82, or B97.29 diagnosis code as the admitting or principal diagnosis on a paid claim or encounter. The remaining hospitalization records that listed COVID-19 did not meet this definition, resulting in the removal of 7,418 clients from the hospitalized due to COVID-19 group.

6 Pregnancy was defined as Medicaid for Pregnant Women (TP 40) enrollment or the presence of diagnosis code O00-O9A. COVID-19 diagnoses or hospitalizations may have occurred during pregnancy or postpartum coverage. Approximately 17,602 pregnant women in Medicaid/CHIP were diagnosed with COVID-19 during the study period but excluded from the analysis due to continuous enrollment criteria applied in this study.

7 Any Medicaid client that received an assessment in the MDS data was defined as a nursing facility resident.

+ Includes missing.

++Based on first date of service where COVID-19 is listed on a claim or encounter

Table 4 shows that while the characteristics of clients admitted to the ICU were similar to those hospitalized for COVID-19, clients who died in the hospital differed from the broader group of those who were hospitalized. Hispanic clients made up a larger proportion of those with a COVID-19-related hospital death relative to those with a COVID-19 hospitalization (50.9 percent vs. 42.8 percent), while Black clients made up a smaller proportion of those with a COVID-19-related hospital death relative to those with a COVID-19 hospitalization (10.6 percent vs. 15.9 percent). Additionally, the percentage of clients who were female was slightly smaller among those with a COVID-19-related hospital death than among those who were hospitalized due to COVID-19 (53.3 percent vs 58.0 percent). Age also appeared to play a role in in-hospital mortality; the percentage of clients who were ages 65 and older was larger among clients who died than among clients with a COVID-19 hospitalization (70.2 percent vs 52.2 percent).

Table 4. Demographic characteristics of Medicaid and CHIP clients who were hospitalized due to COVID-19 between March 2020 and March 2021, by hospital outcome[1]

Domain	Client characteristic	Hospitalized due to COVID-19 (n=11,591)[2]		ICU admission (n=5,834)[3]		In-facility deaths (n=1,996)[4]	
		n	%	n	%	n	%
Race/ethnicity	Asian	299	2.6	164	2.8	70	3.5
Race/ethnicity	Black	1,844	15.9	917	15.7	211	10.6
Race/ethnicity	Hispanic	4,960	42.8	2,583	44.3	1,015	50.9
Race/ethnicity	White	2,782	24.0	1,377	23.6	456	22.8
Race/ethnicity	Other/Unknown+	1,706	14.7	793	13.6	244	12.2
Age group	<21	660	5.7	281	4.8	10	0.5
Age group	21-64	4,877	42.1	2,299	39.4	585	29.3
Age group	65+	6,054	52.2	3,254	55.8	1,401	70.2
Sex	Female	6,718	58.0	3,298	56.5	1,063	53.3
Sex	Male	4,831	41.7	2,517	43.1	923	46.2
Sex	Unknown+	42	0.4	19	0.3	10	0.5
County type	Metro	8,501	73.3	4,447	76.2	1,401	70.2
County type	Micro	1,131	9.8	535	9.2	203	10.2
County type	Rural	1,918	16.5	833	14.3	383	19.2
County type	Missing	41	0.4	19	0.3	9	0.5
Diagnosis timing++	Period 1	705	6.1	373	6.4	117	5.9
Diagnosis timing++	Period 2	4,616	39.8	2,430	41.7	869	43.5
Diagnosis timing++	Period 3	5,482	47.3	2,682	46.0	909	45.5

Domain	Client characteristic	Hospitalized due to COVID-19 (n=11,591)[2]		ICU admission (n=5,834)[3]		In-facility deaths (n=1,996)[4]	
Diagnosis timing++	Period 4	788	6.8	349	6.0	101	5.1
Subpopulation	Pregnant[5]	42	0.4	20	0.3	3	0.2
Subpopulation	Nursing facility resident[6]	4,096	35.3	2,228	38.2	733	36.7

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

Notes:

1 Clients included in this study were continuously enrolled for 12 months prior to the study period (March 2019-Feb 2020) to ensure diagnoses for comorbid conditions were identified for an equal period of time for all clients in the study population.

2 Hospitalized due to COVID-19 refers to the presence of a U07.1, J12.82, or B97.29 diagnosis code as the admitting or principal diagnosis on a paid claim or encounter.

3 ICU admission refers to the presence of revenue codes 0200-0209 on a paid inpatient claim or encounter.

4 In-facility deaths were defined as having a discharge status code of 20, 40, 41 or 42.

5 Pregnancy was defined as Medicaid for Pregnant Women (TP 40) enrollment or the presence of diagnosis code O00-O9A. COVID-19 hospitalizations may have occurred during pregnancy or postpartum coverage.

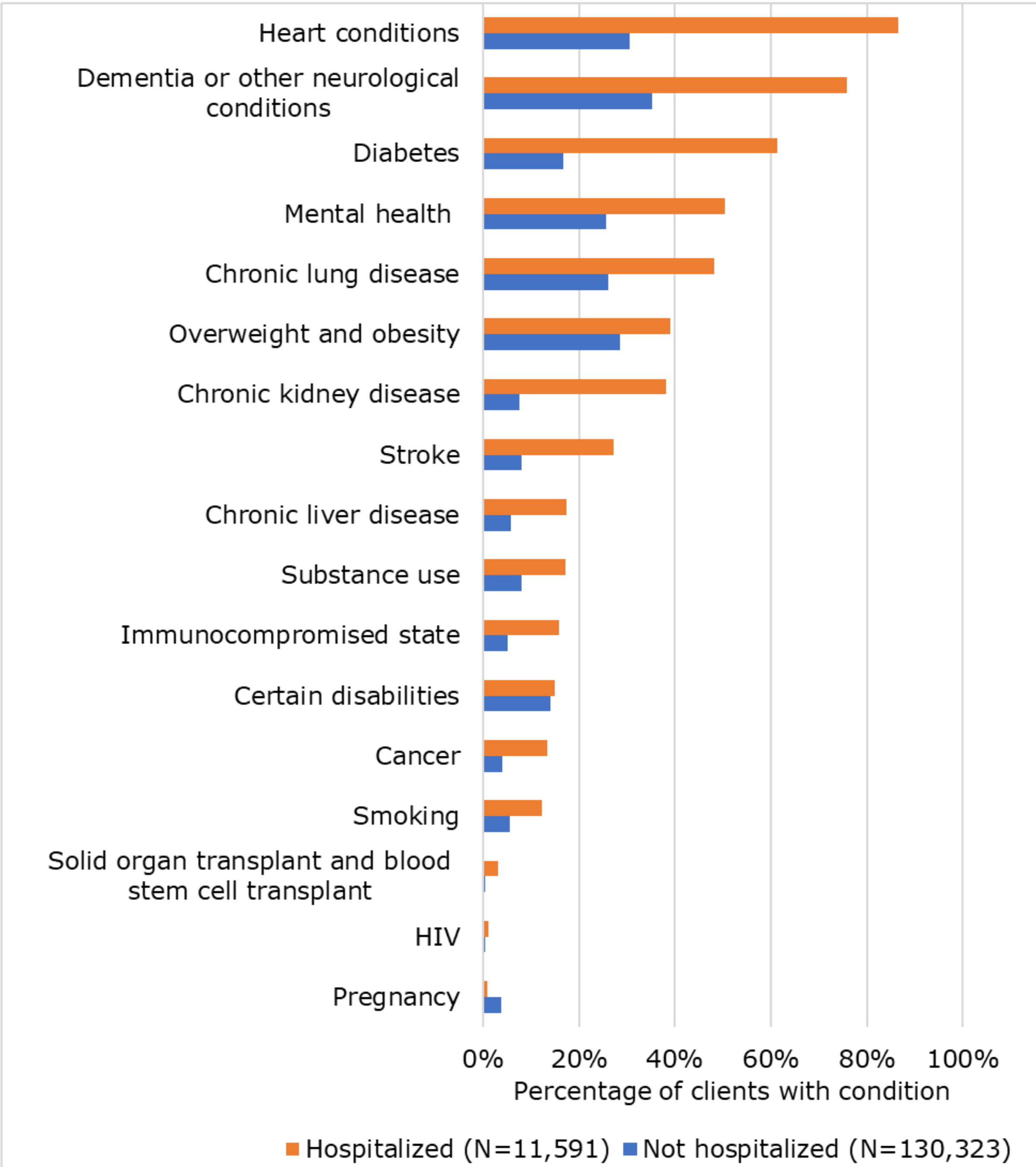
6 Any Medicaid client that received an assessment in the MDS data was defined as a nursing facility resident.

+ Includes missing.

++Based on first date of service where COVID-19 is listed on a claim or encounter.

To better understand the association between comorbidities and COVID-19 hospitalizations, Figure 19 presents the prevalence of pre-existing comorbidities among Medicaid/CHIP clients hospitalized due to COVID-19 and those never hospitalized with COVID-19. The five most common pre-existing comorbidity categories overall included dementia or other neurological conditions (38.6 percent), heart conditions (35.1 percent), being overweight or obese (29.3 percent), chronic lung disease (27.9 percent), and mental health conditions (27.7 percent). The five most common pre-existing comorbidity categories among clients hospitalized for COVID-19 were heart conditions (86.5 percent), dementia or other neurological conditions (75.8 percent), diabetes (61.4 percent), mental health conditions (50.4 percent), and chronic lung disease (48.1 percent).

Figure 19. Pre-existing comorbidity categories[1] and medical conditions among Medicaid/CHIP clients with a COVID-19 diagnosis between March 2020 and March 2021, by hospitalization status[2]



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

1 Pre-existing condition refers to the presence of a relevant diagnosis on a paid claim or encounter between March 2019 and the first COVID-related claim or encounter (not necessarily a hospitalization).

2 Hospitalized due to COVID-19 refers to the presence of a U07.1, J12.82, or B97.29 diagnosis code as the admitting or principal diagnosis on a paid inpatient claim or encounter.

Note: The prevalence of Cystic fibrosis, Thalassemia, Tuberculosis and Sickle cell disease was under 1 percent; not shown. Clients can have conditions in more than one category, as well as more than one condition within a category.

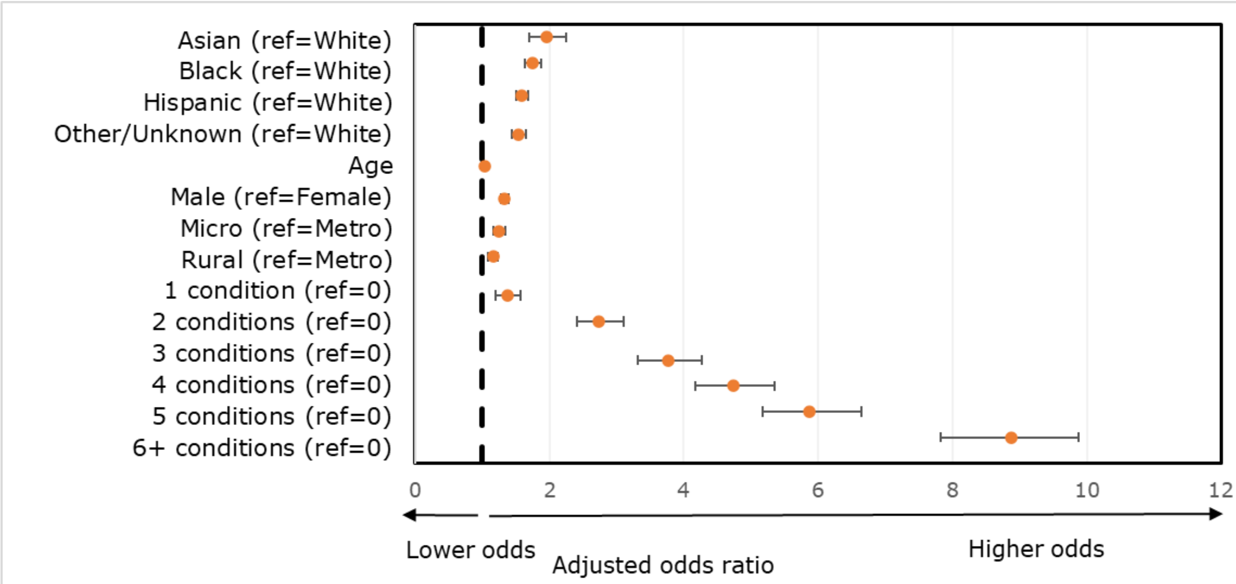
Logistic regression was used to model the association between each of the three outcomes (hospitalization, ICU admission, and in-hospital fatality) and a series of client characteristics, including race/ethnicity, age, sex, county type, and number of pre-existing comorbidities. Figure 20, Figure 21, and present visualizations of the final model results. The remainder of the model results and additional technical details are provided in Appendix G.

After adjusting for the additional variables, Black, Hispanic, and Asian clients diagnosed with COVID-19 had higher odds of being hospitalized for COVID-19 than White clients diagnosed with COVID-19 (74 percent, 59 percent, and 95 percent higher odds, respectively). Clients in micro counties had 25 percent higher odds and those in rural counties had 16 percent higher odds of being hospitalized for COVID-19 compared to clients living in metro counties. Male clients diagnosed with COVID-19 had 33 percent higher odds of being hospitalized than female clients. The factor most associated with COVID-19 hospitalization, however, was the presence of comorbid conditions; clients had increasingly higher odds of being hospitalized as their number of pre-existing comorbid conditions increased (compared to having no conditions). Clients with pre-existing condition(s) in one comorbidity category, for example, had 37 percent higher odds of being hospitalized than clients with no conditions, and clients with pre-existing conditions in six or more comorbidity categories had almost nine times higher odds of being hospitalized than clients with no conditions.

Among clients hospitalized for COVID-19, Hispanic clients had 19 percent higher odds of ICU admission than White clients, holding all other variables constant. Male clients had 29 percent higher odds of ICU admission than female clients. Clients in micro counties had 13 percent lower odds and rural counties had 28 percent lower odds of ICU admission than clients in metro counties.

Among clients hospitalized for COVID-19, Hispanic clients had 67 percent higher odds and Asian clients had 63 percent higher odds of in-facility death than White clients, holding all else constant. Also, male clients had 44 percent higher odds of death compared to female clients.

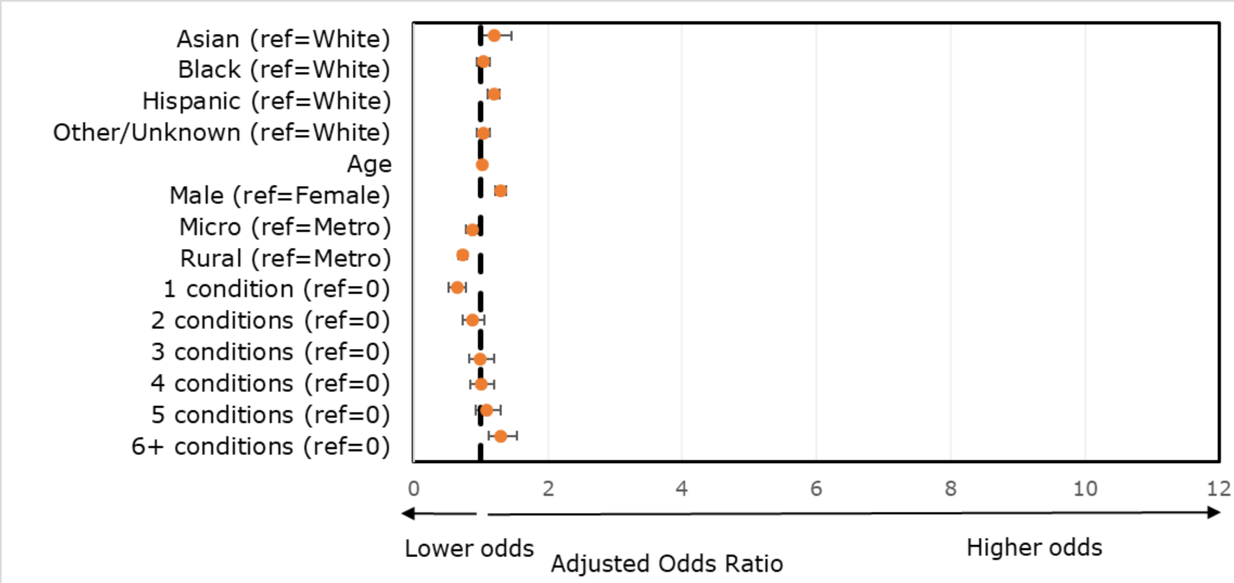
Figure 20. Adjusted odds ratios for factors associated with hospitalization due to COVID-19



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

Notes: Texas Medicaid and CHIP clients continuously enrolled from March 2019-February 2020 who were diagnosed with COVID-19 (N=141,914); model does not include 7,418 clients hospitalized with COVID-19 where the COVID-19 diagnosis was listed in a position other than the admitting or principal diagnosis. Multivariate logistic regression was used to model the association between COVID-19 hospitalization and client characteristics including race/ethnicity, age, sex, county type, and number of pre-existing comorbidities. Age included as a continuous variable. Adjusted odds ratios and 95% confidence intervals shown. Categorical levels for missing/unknown not shown for sex (n=153) and county type (n=156). Fewer than 1.5 percent of clients included in this model (n=2,113) were enrolled in HTW for at least one month during the study period (March 2020-March 2021). Inpatient hospitalizations are not a covered benefit under the HTW program. As a result, HHSC does not have hospitalization data for HTW clients diagnosed with COVID-19 who were admitted to the hospital. Accordingly, odds ratios may slightly underestimate the odds of hospitalization among certain subgroups in this model.

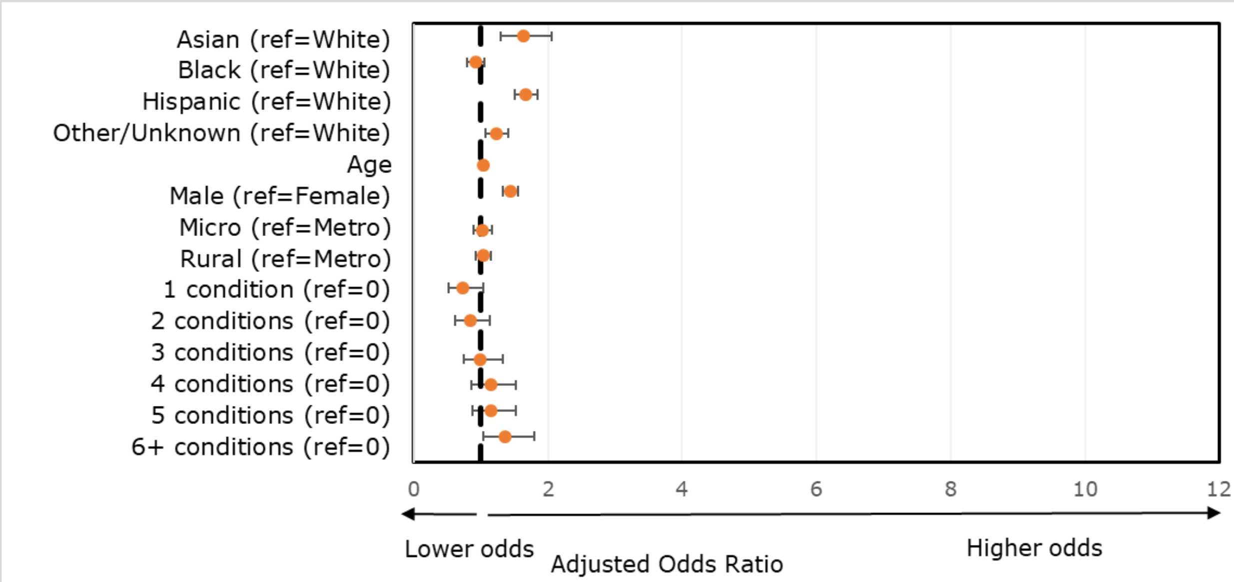
Figure 21. Adjusted odds ratios for factors associated with ICU admission among clients hospitalized due to COVID-19



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

Notes: Texas Medicaid and CHIP clients continuously enrolled from March 2019-February 2020 who were hospitalized for COVID-19 (N=11,591). Multivariate logistic regression was used to model the association between ICU admission and client characteristics including race/ethnicity, age, sex, county type, and number of pre-existing comorbidities. Age included as a continuous variable. Adjusted odds ratios and 95% confidence intervals shown. Categorical levels for missing/unknown not shown for sex (n=42) and county type (n=41).

Figure 22. Adjusted odds ratios for factors associated with in-facility deaths among clients hospitalized due to COVID-19



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

Notes: Texas Medicaid and CHIP clients continuously enrolled from March 2019-February 2020 who were hospitalized for COVID-19 (N=11,591). Multivariate logistic regression was used to model the association between in-facility deaths and client characteristics including race/ethnicity, age, sex, county type, and number of pre-existing comorbidities. Age included as a continuous variable. Adjusted odds ratios and 95% confidence intervals shown. Categorical levels for missing/unknown not shown for sex (n=42) and county type (n=41).

Discussion

The analysis discussed in the previous section focused on factors associated with ICU admission and in-hospital mortality among patients hospitalized for COVID-19 in the general Texas population while this study focused exclusively on Medicaid/CHIP clients. As noted, one advantage of using Medicaid/CHIP claims and encounters data to examine clients diagnosed with COVID-19 is the ability to include a comparison group of clients who were diagnosed with COVID-19 but not hospitalized. This allowed analysts to calculate the odds of hospitalization among Texas Medicaid and CHIP clients diagnosed with COVID-19, as well as the odds of ICU admission and in-facility death among those hospitalized. Another strength of this study is the ability to leverage pre-existing comorbidities identified in past Medicaid/CHIP claims and encounters rather than only those conditions identified during hospitalization. To ensure comorbid conditions were identified for an equal period of time for all clients in the study population, the study required all clients to be continuously enrolled for 12 months prior to the study period (March 2019-February 2020).

In this study, Hispanic clients had higher odds of COVID-19 hospitalization, ICU admission and in-facility death than White clients after adjusting for several other variables. This pattern is consistent with the results of a retrospective cohort study of Medicaid clients at a medical center in Northern California, although that study only examined hospitalization and death (not ICU admission), as well as the results of the Texas hospitalization outcomes analysis described in the previous section (Jacobson, Chang, Shah, Pramanik, & Shah, 2021). Both the California study and an additional study of Medicaid clients in Mississippi found that Black clients had higher odds of hospitalization but not death (Rong, et al., 2021). These findings are similar to our study, which found that Black clients had higher odds of hospitalization but lower odds of death (though the latter result was not statistically significant). The Texas hospitalization outcomes analysis presented in the previous section also found that Black Texans had lower odds of in-hospital mortality.

The strongest predictor of COVID-19 hospitalization in this study was the number of pre-existing comorbidities. As the number of comorbidities increased, the odds of hospitalization increased. This pattern is consistent with findings in the Mississippi study, which found that diabetes, hypertension, and heart failure were associated with higher odds of hospitalization (Rong, et al., 2021). Despite the strong link between comorbidities and COVID-19 hospitalization in this study, associations between the number of pre-existing comorbidities and severe hospital outcomes (ICU admission and in-facility death) were less pronounced. This stands in contrast to the Texas hospitalization outcomes analysis presented in the previous section, in which the odds of ICU admission and in-facility death increased as the number of comorbidities increased. Importantly, however, the Texas Medicaid study presented in this section and the Texas hospitalization outcomes analysis in the previous section examined comorbidities differently, making them difficult to compare. The Texas Medicaid study presented in this section identified pre-existing conditions through clients’ medical claims history, while the Texas hospitalization outcomes analysis identified conditions present at the time of, or during, the COVID-19 hospitalization.

This study is subject to several limitations. First, the identification of COVID-19 diagnosis is dependent on a Medicaid client receiving treatment. Asymptomatic or mild COVID-19 symptoms that did not require health care services were not measured. Second, a limited number of clients included in this study were enrolled in Healthy Texas Women (HTW) for at least one month during the study period (March 2020-March 2021); however, HHSC does not have hospitalization data for HTW clients diagnosed with COVID-19 because inpatient hospitalizations are not a covered benefit under the HTW program. As a result, some findings may slightly underestimate the percentage or odds of COVID-19 hospitalization among certain subgroups in the analysis (e.g., female). Finally, pre-existing conditions were more likely to be identified when they required regular monitoring (e.g., autoimmune diseases that require medication every few months) and more likely not to be included when they were easily managed without a provider (e.g., well-controlled asthma). Additionally, results may be subject to bias if there are undetected comorbidities due to a lack of access to care or care received outside of the Texas Medicaid system.

COVID-19 Outcomes Among Individuals Receiving Long Term Services and Supports

LTSS are provided to adults ages 65 and older and individuals of all ages with physical, intellectual, or developmental disabilities who require nursing care or need help with tasks of daily living. The types of LTSS individuals receive are largely related to where the services are delivered. The goal is to ensure individuals have seamless access to services and supports in the most appropriate, least restrictive settings. LTSS may be provided in long-term care facilities, community settings, or within an individual's home. Studies in this section assess the impact of COVID-19 on three distinct populations of Medicaid beneficiaries receiving LTSS:

1. Individuals enrolled in home and community-based services waiver programs,
2. Residents of small congregate living settings such as Home and Community-based Services (HCS) group homes and Intermediate Care Facilities for Individuals with an Intellectual Disability or Related Condition (ICFs/IID), and
3. Medicaid clients living in nursing facilities.

For each population, the rate of COVID-19 diagnoses and COVID-19-related hospitalizations among Medicaid beneficiaries are reported by race/ethnicity, county type, age, and the period in which the COVID-19 diagnosis occurred.

The final section of this study examines the average weekly rates of COVID-19 cases and deaths among Texas nursing facilities. Rates are reported by facility-level characteristics, such as resident demographics, population density, staffing shortages, and county-level SVI rankings.

Analyses in this section draw on health records from three data sources administered by HHSC and CMS: 1) Analytical Data Store, TMASP Oracle server, TMHP; 2) HHSC QAI Datamart; and 3) CMS COVID-19 Nursing Home Data.

Individuals Enrolled in Medicaid Home and Community-Based Services Waiver Programs

The home and community-based services waiver programs provide an alternative to living in an institution such as a nursing facility or ICF/IID. Recipients may live in their own home, their family home, a host home/companion home, or in a residence with other individuals with similar needs. Six programs have been included in this analysis:

- Home and Community-based Services (HCS),
- Texas Home Living (TxHmL),
- Community Living Assistance and Support Services (CLASS),
- Medically Dependent Children Program (MDCP),
- Deaf Blind with Multiple Disabilities (DBMD), and
- STAR+PLUS Home and Community-Based Services (STAR+PLUS HCBS).

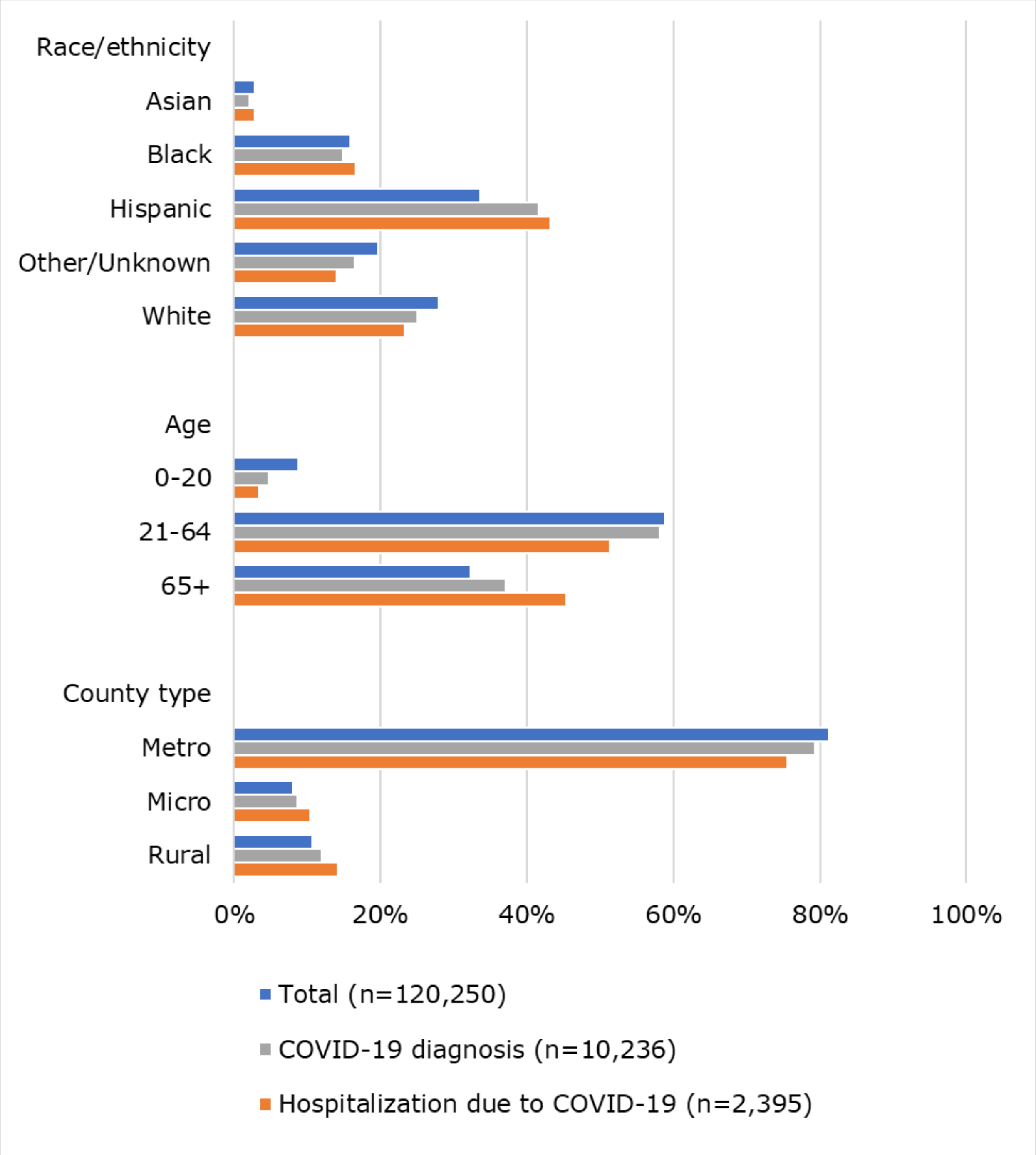
Brief descriptions of each program are provided in Appendix D. The types of services provided by waiver programs vary. For more detailed information on each program, please refer to Appendix B, page 133, of the Texas Medicaid and CHIP Reference Guide.

Results

Over 120,000 individuals were enrolled in Medicaid waiver programs during the study period (March 2020 through March 2021). Among them, 10,236 (8.5 percent) received a diagnosis of COVID-19 and 2,395 (2 percent) were hospitalized due to COVID-19. Figure 23 shows the demographic characteristics of the overall waiver population, the subgroup diagnosed with COVID-19, and the subgroup with a COVID-19-related hospitalization. Analysis included in Appendix H shows that apart from individuals in the 21-64 age group, significant differences emerged between the characteristics of individuals diagnosed with COVID-19 and those who were not diagnosed. Individuals who were over age 65, Hispanic, and/or living in non-metro counties were more likely to be in the COVID-19-diagnosed group. Waiver recipients who were under age 21, non-Hispanic, or who lived in metro counties had a lower likelihood of being in the COVID-19-diagnosed group.

The distribution of waiver recipients who were hospitalized due to COVID-19, as defined in previous sections, is also shown in Figure 23. The proportion of hospitalizations that occurred among Black and Hispanic individuals was higher than their share of the overall waiver population. Individuals who were ages 65 and older and/or living in non-metro counties were also overrepresented among the hospitalized group. See Appendix H for the full table comparing individuals who were hospitalized due to COVID-19 with those who were never hospitalized for or with COVID-19 during the study period.

Figure 23. Demographic characteristics of individuals in Medicaid waiver programs overall and by COVID-19 outcome, March 2020-March 2021



Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Notes: Includes individuals enrolled in HCS, TxHmL, CLASS, MDCP, DBMD, and STAR+PLUS HCBS. Individuals enrolled in more than one program during the year are only counted once; 70 individuals were missing county type (not shown).

Table 5. Demographic characteristics of individuals enrolled in Medicaid waiver programs who were diagnosed with COVID-19, by study period[1]

Domain	Recipient characteristic	Overall waiver population (%)	COVID-19 diagnosis in period 1 (%)	COVID-19 diagnosis in period 2 (%)	COVID-19 diagnosis in period 3 (%)	COVID-19 diagnosis in period 4 (%)
	All	*N=120,250*	*N=421*	*N=3,648*	*N=5,132*	*N=1,035*
Race/ethnicity	Asian	2.8	3.3	1.6	2.3	2.2
Race/ethnicity	Black	15.9	24.5	14.1	14.4	16.3
Race/ethnicity	Hispanic	33.6	25.4	50.1	36.9	40.8
Race/ethnicity	Other/Unknown	19.7	17.1	14.3	17.6	18.1
Race/ethnicity	White	27.9	29.7	19.9	28.9	22.6
Age group	<21	8.8	2.1	4.2	4.9	7.0
Age group	21-64	58.9	61.5	55.6	59.4	59.8
Age group	65+	32.4	36.3	40.2	35.7	33.2
County type	Metro	81.2	84.1	82.0	77.0	80.2
County type	Micro	8.1	7.1	7.9	9.3	7.8
County type	Rural	10.6	8.8	10.1	13.7	12.0

Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Notes: Includes individuals enrolled in HCS, TxHmL, CLASS, MDCP, DBMD, and STAR+PLUS HCBS. Individuals enrolled in more than one program during the year are only counted once; 70 individuals were missing county type (not shown).

1 Study period classification based on the date of service of the earliest claim or encounter listing COVID-19 as an accompanying diagnosis. Period 1 = March 2020 – May 2020; Period 2 = June 2020 – September 2020; Period 3 = October 2020 -January 2021; Period 4 = February 2021 – March 2021.

The distribution of age, race/ethnicity, and county type among individuals who had COVID-19 diagnoses differed throughout the four periods of the study [Table 5]. Individuals under age 21 were less likely to be in the COVID-19 group in all periods, however, their percentage grew from 2.1 percent in Period 1 to 7.0 percent in Period 4. Compared to the overall waiver population, individuals in the 21 to 64 age group were overrepresented in the COVID-19-diagnosed group in all but the second period. Individuals ages 65 and older were overrepresented in all periods. Hispanic individuals had a lower likelihood of being in the COVID-19-diagnosed group during Period 1 but were overrepresented in each of the next three periods. Though they only make up one-third of the waiver population, Hispanics accounted for half of the COVID-19 diagnoses occurring in Period 2. When comparing COVID-19 diagnoses in each period with the baseline waiver distribution, the percentage of the COVID-19-diagnosed population that resided in metro areas was higher in Periods 1 and 2. In Period 3, the risk shifted to micro and rural areas.

Residents of ICFs/IID and Group Homes

ICFs/IID provide ongoing evaluation and individual program planning, 24-hour supervision, coordination, and integration of health or rehabilitative services. The ICF/IID residential settings vary in size, from privately run community settings serving six to 12 individuals (currently 98 percent of ICFs/IID) to large state supported living centers (SSLCs) serving several hundred. People who qualify for ICFs/IID but prefer to live in the community may enroll in a 1915(c) IDD waiver program (i.e., HCS, TxHmL, CLASS, or DBMD) to receive services in a community-based setting.

HCS group homes are available for individuals who qualify for HCS. Approximately one third of individuals enrolled in the HCS waivers were living in a group home during the study period. The waiver analyses above did not distinguish between HCS individuals living in their own homes and those living in group homes. However, due to the experiences held in common among individuals living in small congregate settings, HCS group home residents are also included in this study with private ICFs/IID residents. Individuals residing in SSLCs are analyzed separately.

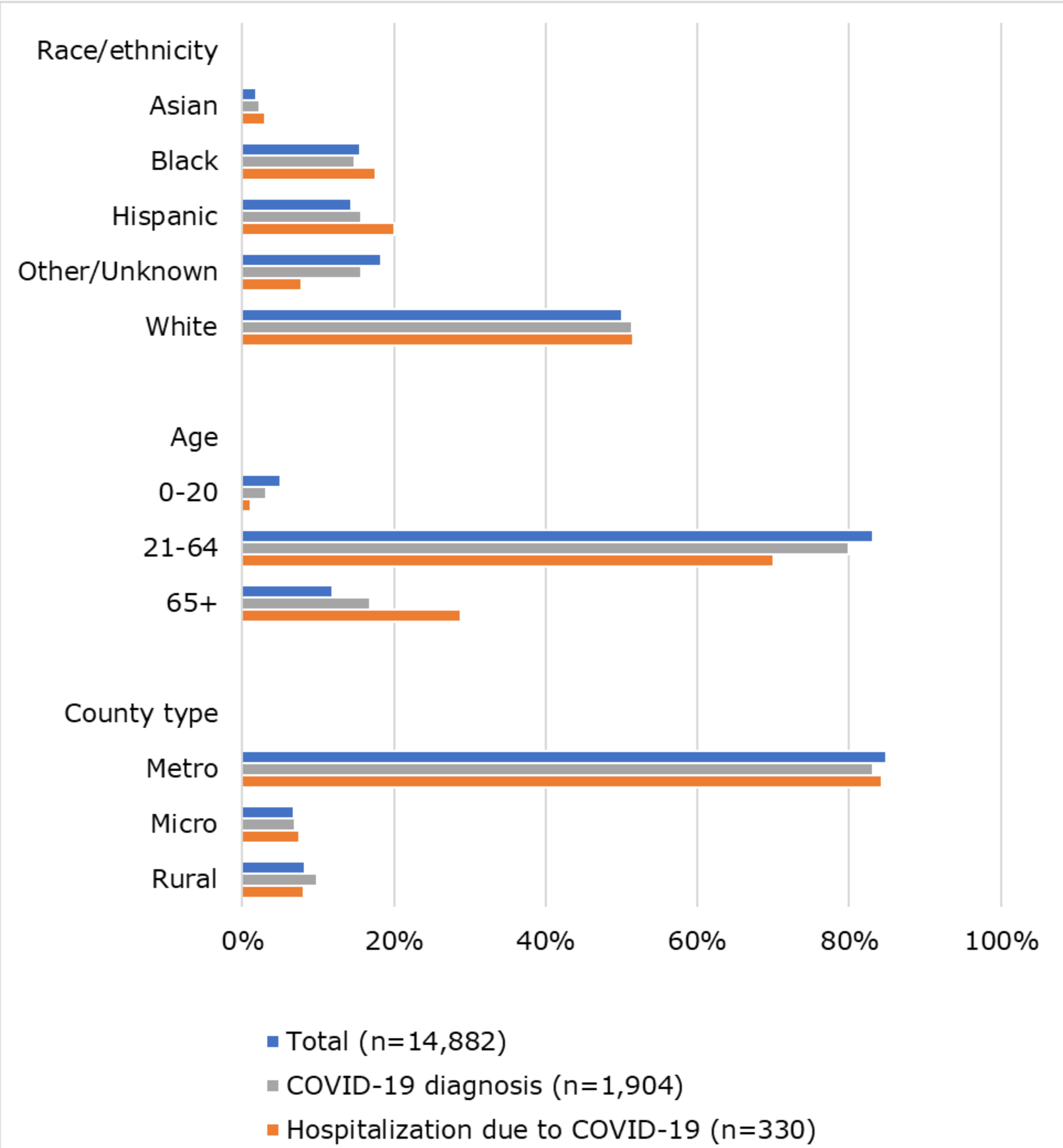
Results

Overall, individuals living in group homes or private ICFs/IID have a different demographic composition than most Medicaid programs. Half of this population is White and only about 5 percent are under age 21. Among the nearly 15,000 individuals residing in private ICFs/IID or group homes, nearly 13 percent (n=1,904) had a diagnosis of COVID-19 during the study period. The demographic distribution of the overall ICF/IID population compared to those with COVID-19 diagnoses is depicted in Figure 24. It shows individuals ages 65 and older and those living in rural counties were overrepresented among the COVID-19-diagnosed group when compared to the overall ICF/IID population. Individuals under 65 years old, Other/Unknown race/ethnicity, and those living in metro counties made up a smaller percentage of the COVID-19-diagnosed group than the overall population.

The demographic distribution of individuals who were hospitalized due to COVID-19 is also shown in Figure 24. Individuals who were over age 65, Asian, Black, Hispanic, and/or living in a non-metro county were disproportionately hospitalized due to COVID-19 compared to the overall ICF/IID population. In contrast, individuals who were under age 65, White or Other/Unknown race, and/or living in metro counties made up a smaller percentage of those hospitalized than the overall ICF/IID population. When comparing individuals who were hospitalized due to

COVID-19 with those who were never hospitalized for or with COVID-19 during the study period, the differences by county type were not statistically significant (see Appendix H for full table).

Figure 24. Demographic characteristics of individuals in private ICFs/IID and HCS group homes overall and by COVID-19 outcome



Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Notes: Includes individuals enrolled in HCS who lived in a group home at any time during the study period; 10 individuals were missing county type (not shown).

Table 6. Demographic characteristics of individuals residing in private ICFs/IID and group homes who were diagnosed with COVID-19 in each period[1]

Domain	Characteristic	Overall population (%)	COVID-19 diagnosis in period 1 (%)	COVID-19 diagnosis in period 2 (%)	COVID-19 diagnosis in period 3 (%)	COVID-19 diagnosis in period 4 (%)
	All	*N=14,882*	*N=64*	*N=640*	*N=1,052*	*N=148*
Race/ethnicity	Asian	1.8	–	2.0	2.3	–
Race/ethnicity	Black	15.5	9.4	15.5	14.4	17.6
Race/ethnicity	Hispanic	14.4	9.4	17.8	14.1	21.6
Race/ethnicity	Other/Unknown	18.3	18.8	15.0	16.7	10.8
Race/ethnicity	White	50.0	57.8	49.7	52.6	48.0
Age group	<21	5.0	0.0	3.3	3.0	4.7
Age group	21-64	83.1	76.6	77.7	81.6	79.7
Age group	65+	11.9	23.4	19.1	15.4	15.5
County type	Metro	84.9	85.9	86.6	80.9	83.8
County type	Micro	6.8	7.8	6.1	7.6	5.4
County type	Rural	8.3	–	7.3	11.4	10.8

Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Notes: Includes individuals enrolled in HCS who lived in a group home at any time during the study period; 10 individuals were missing county type (not shown).

Percentages are not reported (—) if the number of individuals in a cell is between 1 and 4.

1 Study period classification based on the date of service of the earliest claim or encounter listing COVID-19 as an accompanying diagnosis. Period 1 = March 2020 – May 2020; Period 2 = June 2020 – September 2020; Period 3 = October 2020 -January 2021; Period 4 = February 2021 – March 2021.

The distribution of age, race/ethnicity, and county type among individuals who had COVID-19 diagnoses differed throughout the four periods of the study [Table 6]. Though individuals ages 65 and older account for approximately 12 percent of the study population, they were disproportionately represented among those diagnosed with COVID-19 in all periods. In Periods 1 and 3, White individuals accounted for more than half of the COVID-19-diagnosed group despite making up only half of the population. Hispanic individuals were disproportionately represented in the COVID-19 diagnosed group during Periods 2 and 4. Black individuals were also more likely to be in the COVID-19 group in Period 4. Individuals residing in metro counties had a higher likelihood of being in the COVID-19 group during Periods 1 and 2. In Period 3, the risk shifted to micro and rural areas and remained elevated in Period 4 for persons living in rural counties.

A similar analysis of the demographic distribution of SSLC residents showed that among approximately 2,800 individuals residing in SSLCs, nearly 20 percent (N=536) had a diagnosis of COVID-19 during the study period. Individuals ages 65 and older, Hispanic, and White individuals made up a larger percentage of both the COVID-19-diagnosed and COVID-19-hospitalized groups when compared to the overall SSLC population. County type was based on the county where the facility is located. Individuals living in SSLCs in a micro county were overrepresented in the COVID-19 diagnosed group while those living in SSLCs in metro and micro counties were disproportionately hospitalized due to COVID-19. Note that SSLC residents with COVID-19 diagnoses were not analyzed by period due to small population numbers [Appendix H].

Nursing Facility Residents

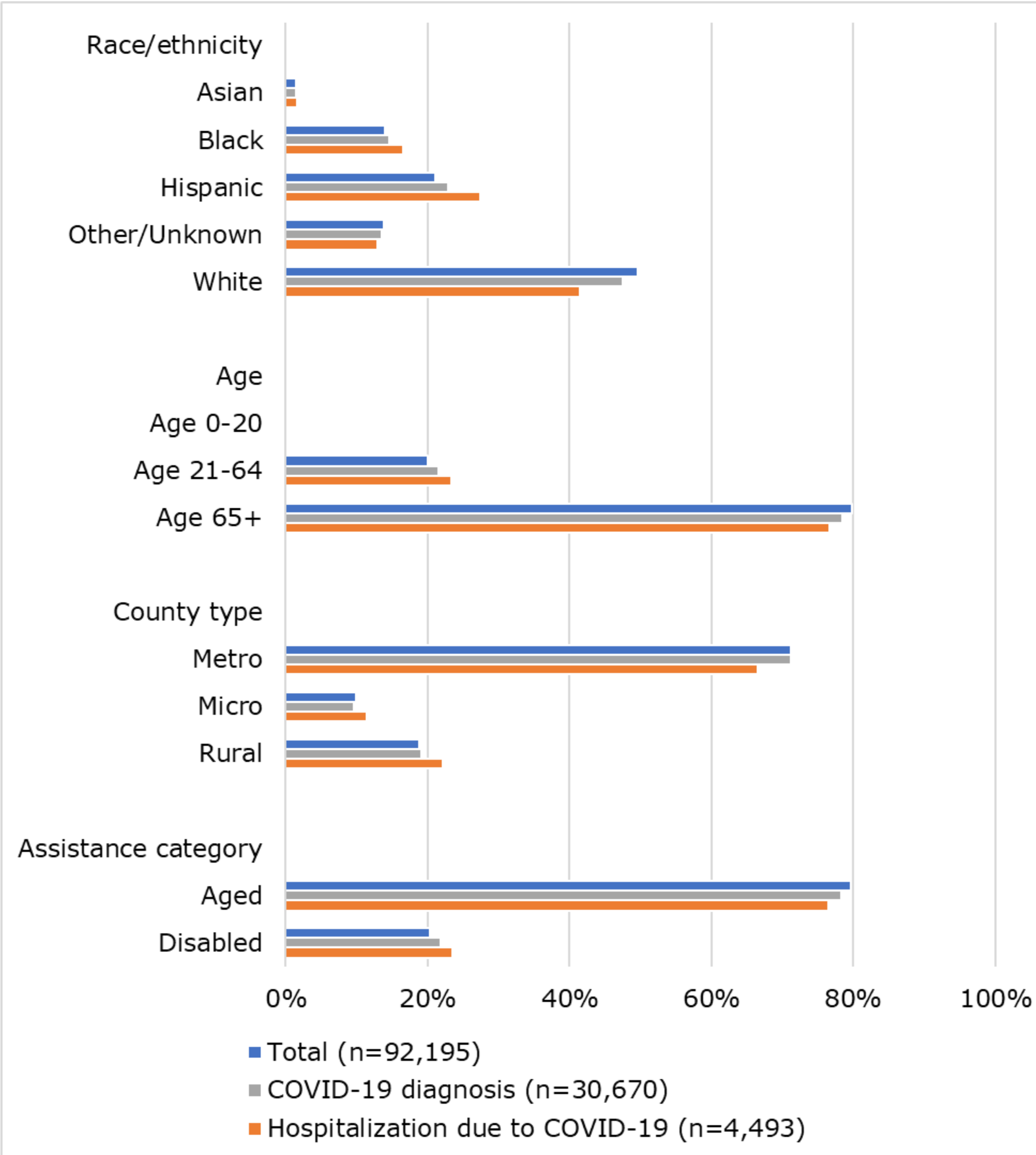
Nursing facilities provide institutional care to individuals whose medical conditions regularly require the skills of licensed nurses. The nursing facility must provide for the needs of each client, including room and board, social services, over-the-counter medications, medical supplies and equipment, and personal hygiene items. This study examines the characteristics of nursing facility clients in Texas Medicaid who were diagnosed with COVID-19 or hospitalized due to COVID-19 from March 2020 through March 2021.

Results

Figure 25 shows the demographic characteristics of nursing facility residents overall, those diagnosed with COVID-19, and those hospitalized due to COVID-19. Findings indicate that Black and Hispanic individuals were more likely to be diagnosed and hospitalized with COVID-19 than their share of the nursing facility population would suggest. Clients in metro facilities were less likely to be hospitalized due to COVID-19 while those in micro and rural facilities were more likely to have a COVID-19-related hospitalization.

Contrary to trends observed elsewhere, two patterns among nursing facility residents suggest age may not be the key driver of COVID-19-related outcomes among this group. The percentage of COVID-19-diagnosed nursing facility residents ages 21 to 64 is higher than their percentage in the overall nursing facility resident population. The distribution of residents by category of assistance (i.e., aged or disabled) matches this pattern. Approximately 20 percent of individuals in nursing homes are disabled; however, 22 percent of nursing facility residents who were diagnosed with COVID-19 were disabled, and 25 percent of the nursing facility residents who were hospitalized due to COVID-19 were disabled. While age remains a strong predictor of COVID-19 outcomes, the higher rates of COVID-19 diagnoses and hospitalizations among nursing home residents under age 65 suggest there are other factors influencing the risk of severe outcomes among this group. One possible explanation is the prevalence of comorbidities among nursing facility residents under age 65; analyses of national data show that younger nursing home residents tend to have a higher prevalence of serious mental illness, paralysis, traumatic brain injury, and multiple sclerosis than older residents (Ne'eman, Stein, & Grabowski, 2022). Individuals under age 65 are also more likely to reside in for-profit facilities and lower-quality facilities, which may hold implications for COVID-19 risk (Ne'eman, Stein, & Grabowski, 2022).

Figure 25. Demographic characteristics and category of assistance for nursing facility residents overall and by COVID-19 outcome



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

Note: Analysis includes a small number of individuals ages 0-20 (n=75). Of these, nine were diagnosed with COVID-19 and 0 were hospitalized due to COVID-19.

Table 7. Demographic characteristics and category of assistance for nursing facility residents who were diagnosed with COVID-19 in each period[1]

Domain	Characteristic	Overall nursing facility population (%)	COVID-19 diagnosis in period 1 (%)	COVID-19 diagnosis in period 2 (%)	COVID-19 diagnosis in period 3 (%)	COVID-19 diagnosis in period 4 (%)
	All	*N=92,195*	*N=2,409*	*N=12,326*	*N=14,332*	*N=1,603*
Race/ethnicity	Asian	1.4	1.6	1.5	1.5	1.3
Race/ethnicity	Black	14.0	19.6	13.8	14.3	14.9
Race/ethnicity	Hispanic	21.1	20.3	29.7	18.2	17.8
Race/ethnicity	Other/Unknown	13.9	13.5	12.4	14.1	16.4
Race/ethnicity	White	49.6	45.0	42.6	51.8	49.5
Age group	<20	0.1	0.0	–	0.0	0.0
Age group	21-64	20.1	25.3	21.1	21.4	20.1
Age group	65+	79.9	74.7	78.9	78.6	79.9
County type	Metro	71.3	76.6	74.7	67.4	71.0
County type	Micro	9.9	9.3	9.2	10.0	8.9
County type	Rural	18.9	14.1	16.1	22.6	20.0
County type	*missing*	0.1	0.0	–	–	0.1
Eligibility category	Aged	79.7	74.4	78.6	78.4	79.9
Eligibility category	Disabled	20.3	25.6	21.4	21.6	20.1

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

Percentages are not reported (—) if the number of individuals in a cell is between 1 and 4.

1 Study period classification based on the date of service of the earliest claim or encounter listing COVID-19 as an accompanying diagnosis.

Period 1 = March 2020 – May 2020; Period 2 = June 2020 – September 2020; Period 3 = October 2020 -January 2021; Period 4 = February 2021 – March 2021.

The distribution of age, race/ethnicity, and county type among individuals in nursing facilities who received a COVID-19 diagnosis differed across the four periods of the study [Table 7]. Individuals who were 21 to 64 years old or disabled had a higher likelihood of diagnosis during the first three periods, while individuals living in metro counties were overrepresented during the first two periods. In Period 4, differences by age and category of assistance leveled out while the risk of diagnosis increased among individuals living in rural counties. Differences in the likelihood of diagnosis by race/ethnicity shifted each period, with the following groups showing a higher likelihood of COVID-19 diagnosis: Black individuals in

Period 1, Hispanic individuals in Period 2, White individuals in Period 3, and Black and Other/Unknown individuals in Period 4.

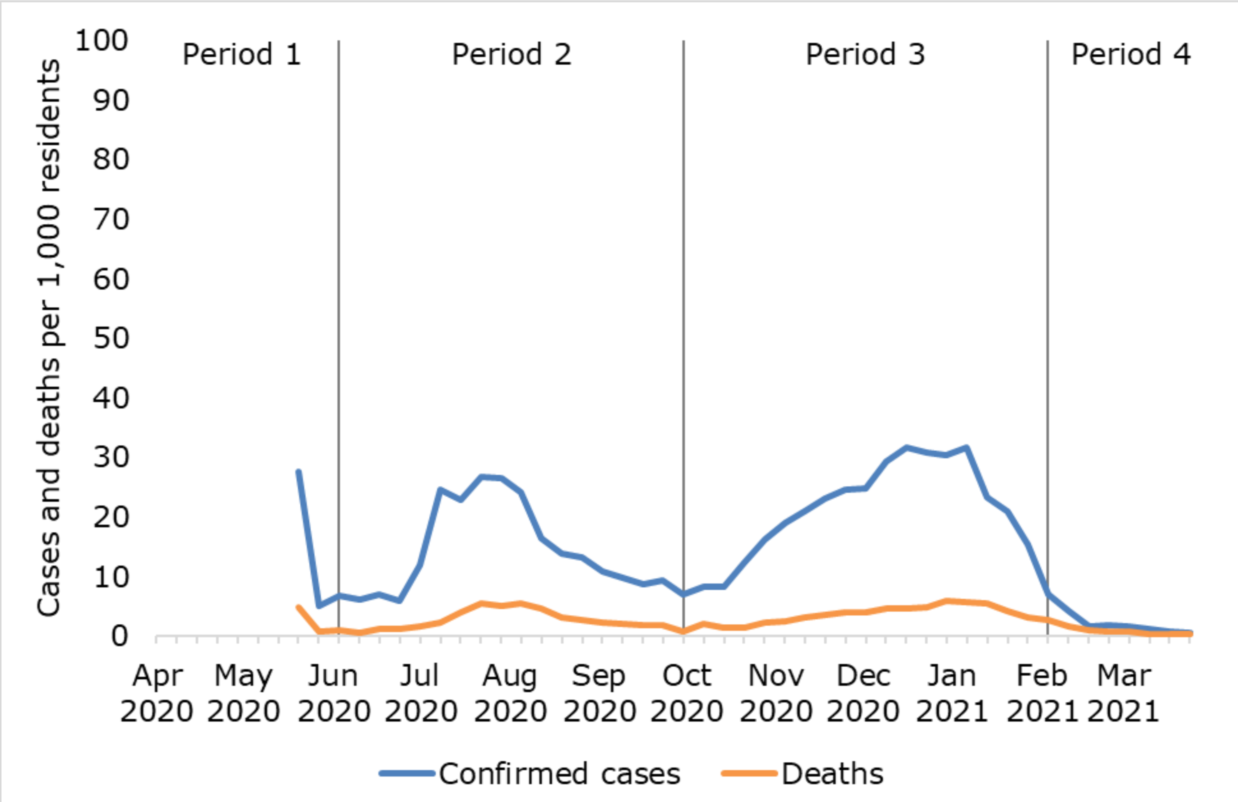
Nursing Facility Characteristics

The prior study examined COVID-19 outcomes among nursing facility residents. This study examines the prevalence of COVID-19 outcomes within nursing facilities themselves. The purpose of this analysis is to identify the characteristics of nursing facilities that are associated with higher and lower rates of COVID-19 cases and deaths in hopes of informing best practices and guidance for long-term care providers. One notable difference between this study and the previous study on nursing facility residents is that this section contains information about all nursing facility residents, regardless of payer source. The previous study of nursing facility residents only included individuals enrolled in Medicaid. Nationally, the majority of long-term nursing facility care is covered by Medicaid rather than Medicare (U.S. Centers for Medicare and Medicaid Services, 2022). In Texas, approximately 61 percent of residents in certified nursing facilities rely on Medicaid as the primary payer source (Kaiser Family Foundation, n.d.).

Results

Confirmed COVID-19 cases and deaths among individuals living in nursing facilities peaked in Periods 2 and 3. The highest rate of COVID-19 cases occurred in December 2020 and January 2021, with over 30 cases per 1,000 residents [Figure 26].

Figure 26. Average weekly COVID-19 cases and deaths per 1,000 nursing facility residents

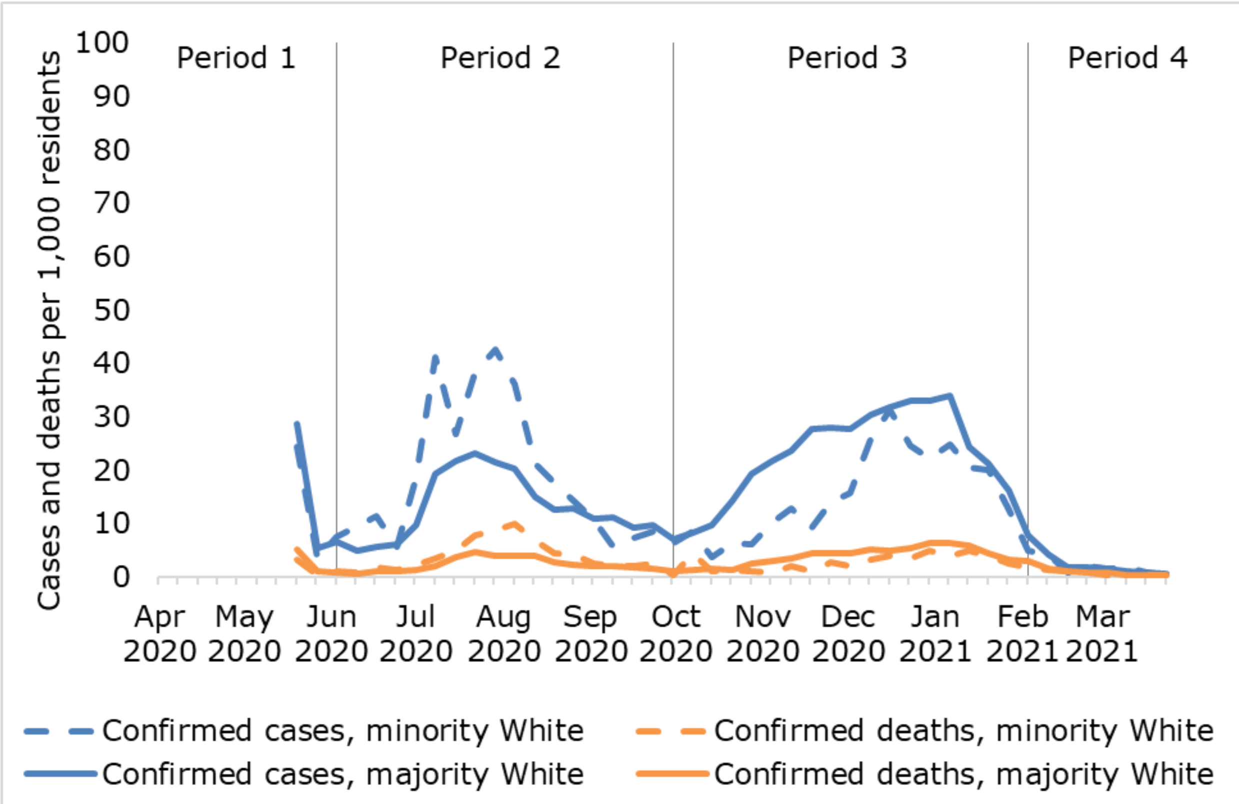


Data Source: CMS COVID-19 Nursing Home Data as of December 26, 2021. Analysis by HHSC-DAP.

Note: The number of facilities reporting per week ranged from 1210 to 1217.

Figure 27 shows the relationship between COVID-19 outcomes and facilities whose racial/ethnic composition is either majority or minority White. In Period 2, a higher rate of cases and deaths occurred among residents of nursing facilities where most residents were racial/ethnic minorities. However, in later periods this relationship reversed. In Period 3, nursing facilities with mostly White residents had higher rates of COVID-19 cases and deaths. There were no meaningful differences between facilities with different racial/ethnic compositions in Period 4.

Figure 27. Average weekly COVID-19 cases and deaths per 1,000 nursing facility residents, by White race/ethnicity composition

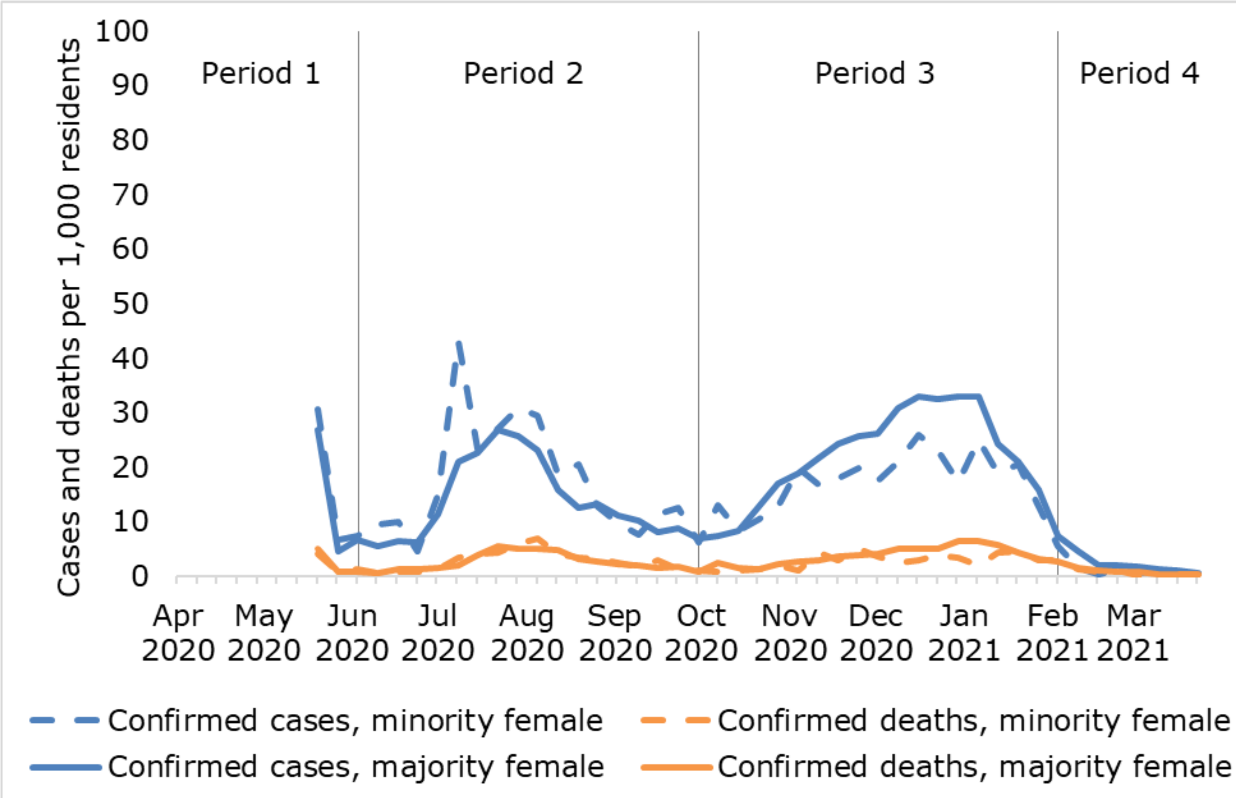


Data Source: CMS COVID-19 Nursing Home Data as of December 26, 2021. Analysis by HHSC-DAP.

Note: The number of facilities with a minority of White residents in a week ranged from 289 to 293. The number of facilities with a majority of White residents in a week ranged from 919 to 923.

Like race/ethnicity, the relationship between the predominant sex of a nursing facility's residents and COVID-19 changed over time [Figure 28]. In Period 2, COVID-19 case rates were higher in facilities with a majority of residents who were male. In Period 3, rates of COVID-19 cases and deaths were higher in facilities with a majority of residents who were female. Facilities with a majority of residents who were female also logged higher case rates during Period 4.

Figure 28. Average weekly COVID-19 cases and deaths per 1,000 nursing facility residents, by sex composition

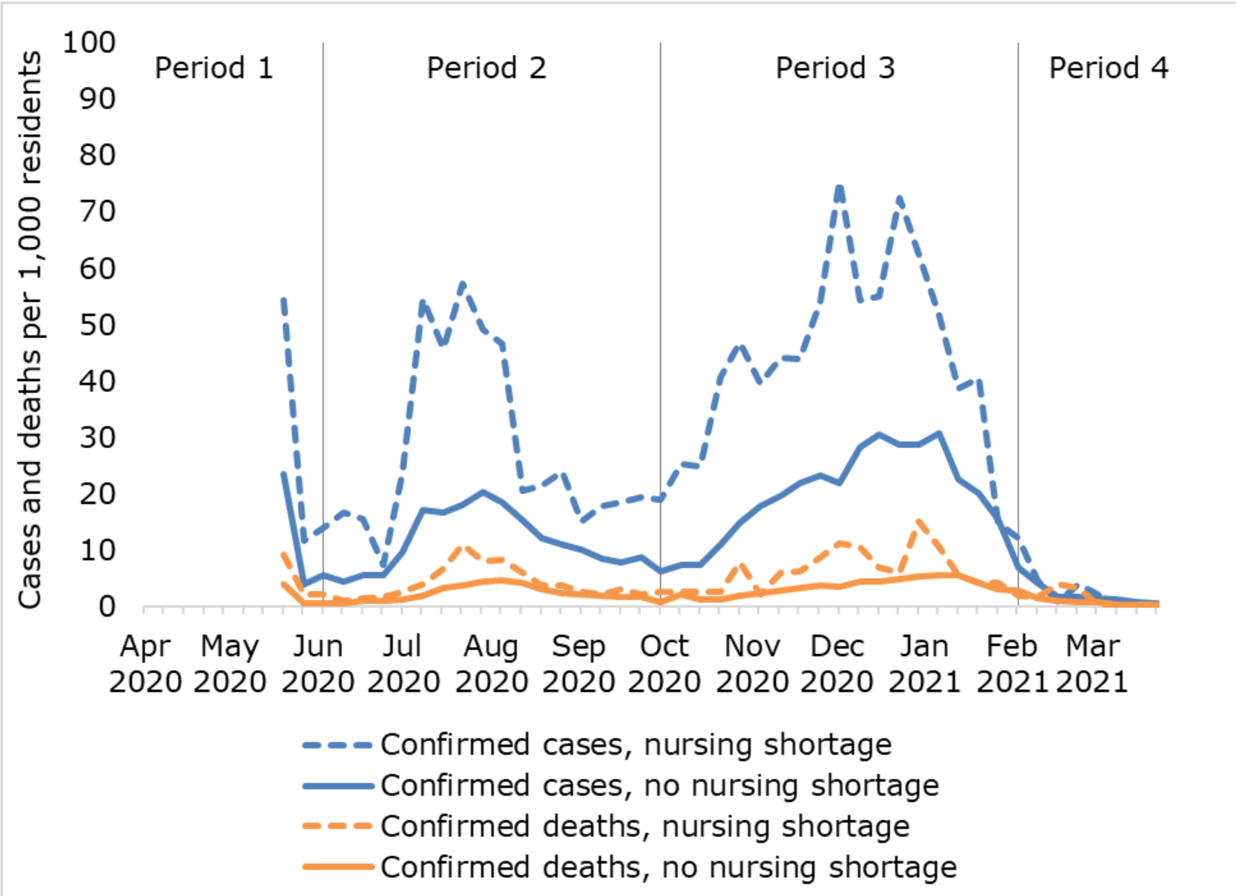


Data Source: CMS COVID-19 Nursing Home Data as of December 26, 2021. Analysis by HHSC-DAP.

Note: The number of facilities with a minority of female residents in a week ranged from 198 to 203. The number of facilities with a majority of female residents in a week ranged from 1,008 to 1,014.

Having an adequate number of nurse and aide staff was related to both COVID-19 cases and deaths [Figure 29 and Figure 30]. In Periods 2 and 3, weekly nursing and aide staff shortages were associated with higher rates of COVID-19 cases and deaths. In fact, facilities with nursing and aide shortages during this time often reported case rates more than twice as high as facilities without such shortages. Importantly, however, this analysis does not imply a causal link between staff shortages and COVID-19 cases, only that the two patterns tend to co-occur.

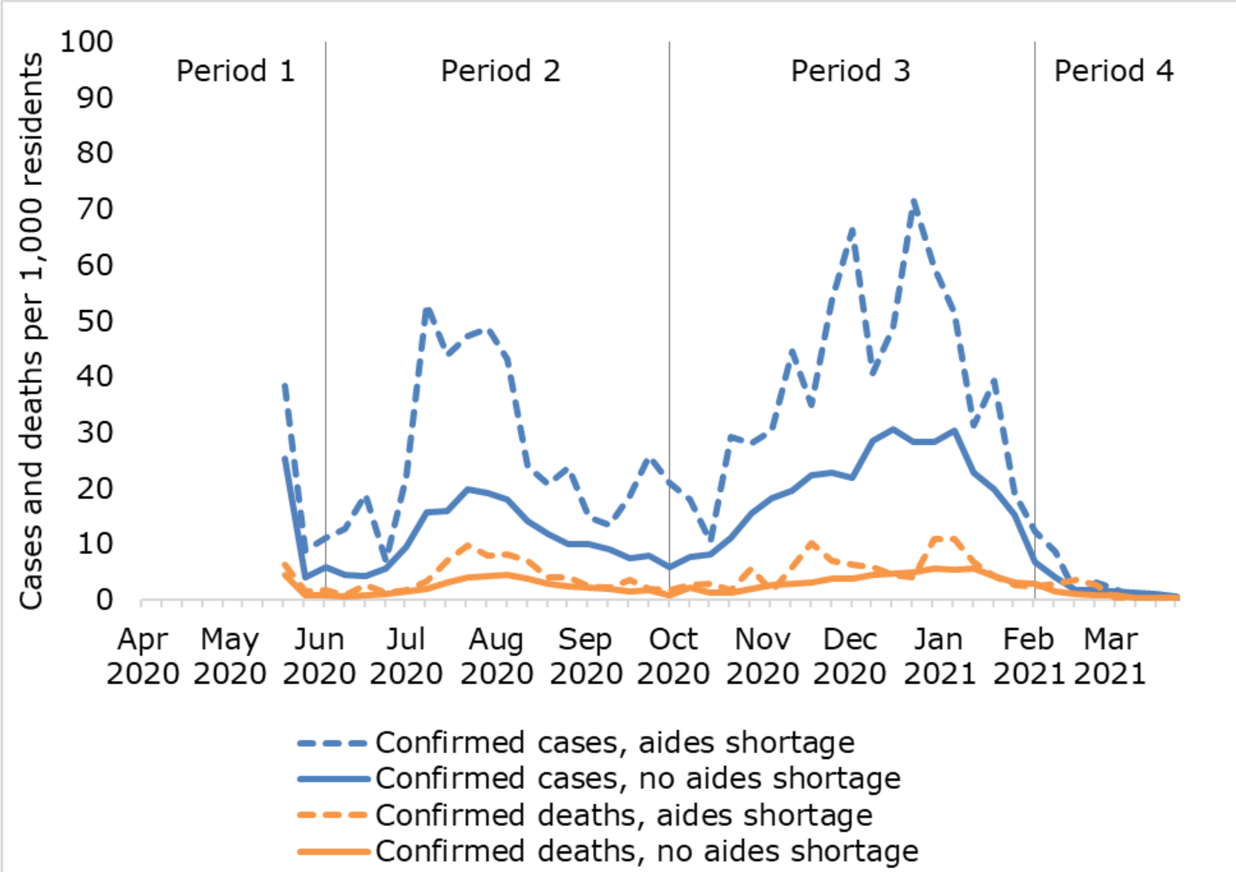
Figure 29. Average weekly COVID-19 cases and deaths per 1,000 nursing facility residents, by nursing shortage



Data Source: CMS COVID-19 Nursing Home Data as of December 26, 2021. Analysis by HHSC-DAP.

Note: The number of facilities with nursing shortages in a week ranged from 31 to 267. The number of facilities with no nursing shortages in a week ranged from 926 to 1150.

Figure 30. Average weekly COVID-19 cases and deaths per 1,000 nursing facility residents, by aides shortage

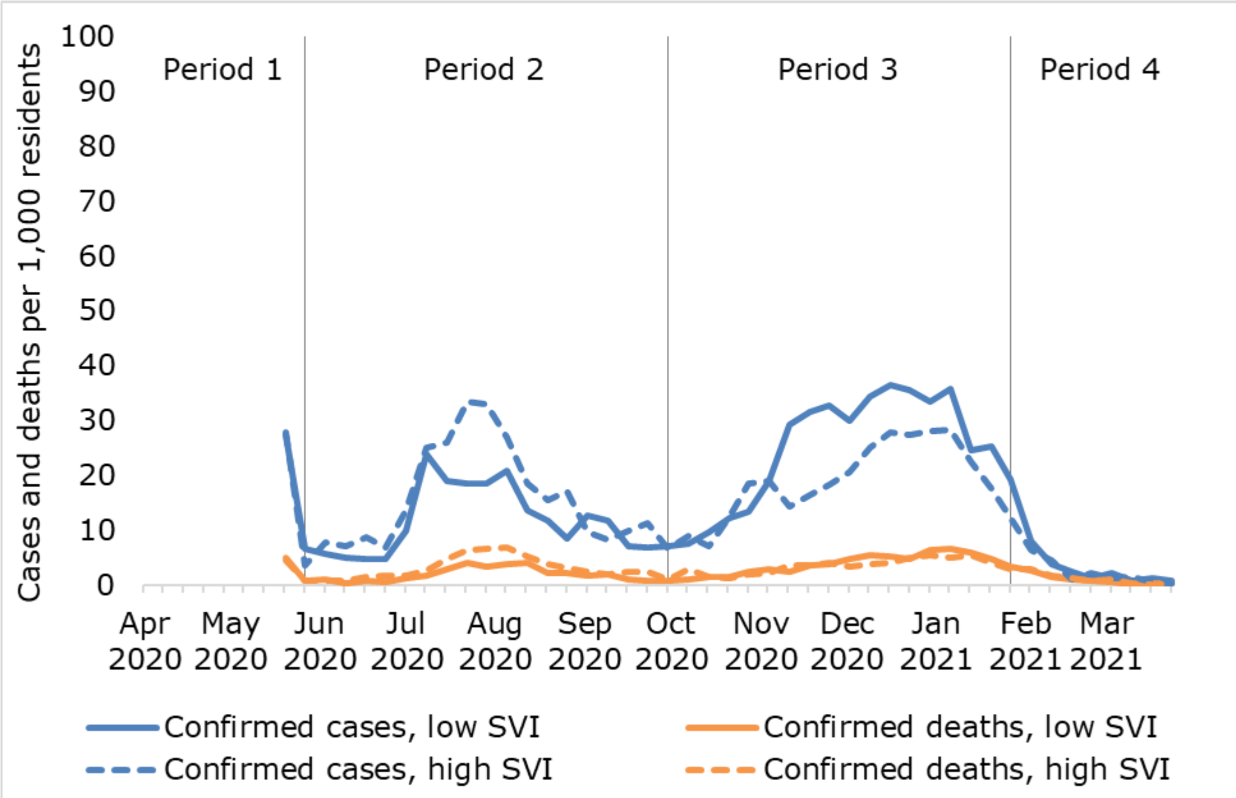


Data Source: CMS COVID-19 Nursing Home Data as of December 26, 2021. Analysis by HHSC-DAP.

Note: The number of facilities with aides staff shortages in a week ranged from 45 to 306. The number of facilities with no aides staff shortages in a week ranged from 883 to 1,136.

The relationship between the SVI ranking of a nursing facility’s location and COVID-19 changed over time [Figure 31]. In Period 2, there were higher rates of COVID-19 cases and deaths in nursing facilities located in counties with higher levels of social vulnerability. In Period 3, however, the rate of COVID-19 cases was higher in nursing facilities located in counties with lower levels of social vulnerability. There were no differences based on a facility’s SVI ranking in Period 4.

Figure 31. Average weekly COVID-19 cases and deaths per 1,000 nursing facility residents, by SVI ranking

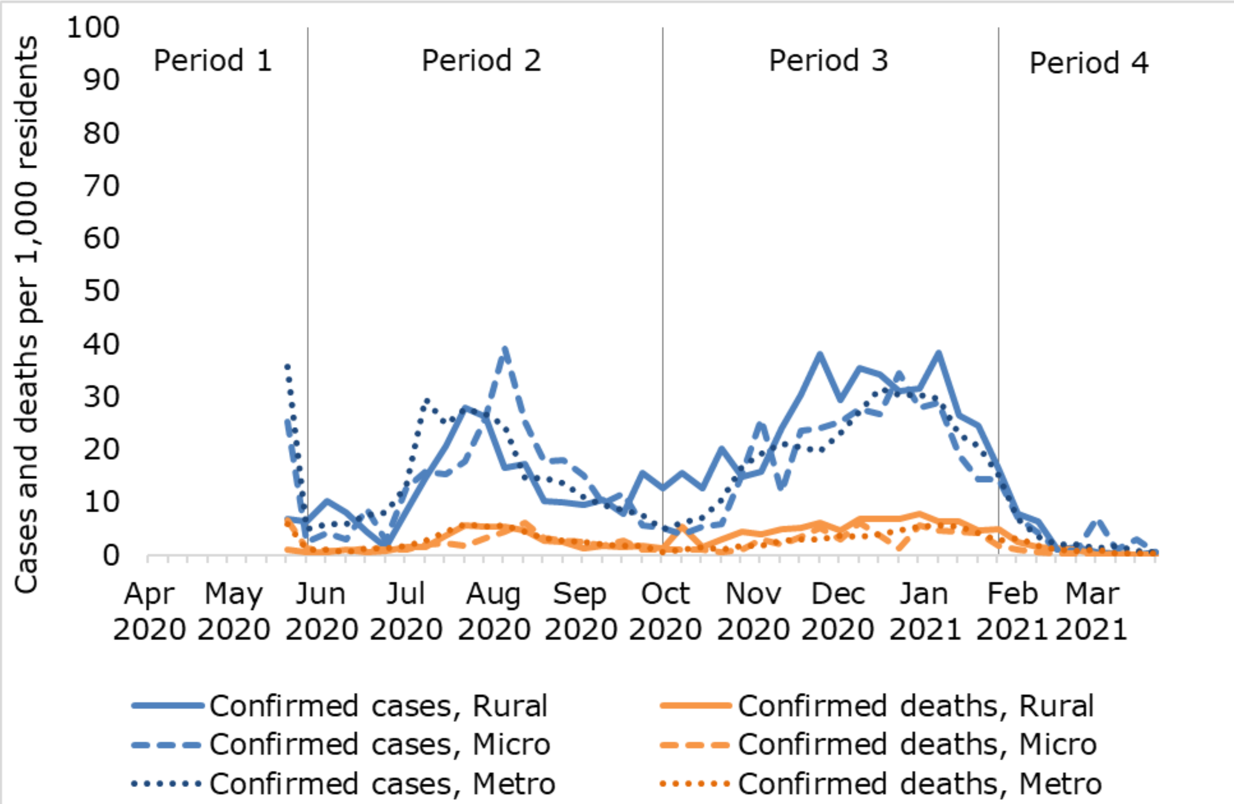


Data Source: CMS COVID-19 Nursing Home Data as of December 26, 2021; CDC-ATSDR. Analysis by HHSC-DAP.

Note: The number of facilities in counties with a rank above 50 percent on the SVI in a week ranged from 669 to 674. The number of facilities in counties with a rank at or below 50 percent on the SVI in a week ranged from 540 to 547; Low SVI = rank below 50th percentile, High SVI = rank 50th percentile and above. SVI is based on the facility's county.

No clear pattern emerged between the population density of nursing facility locations and COVID-19 outcomes [Figure 32]. In Period 3, nursing facilities located in rural areas had higher rates of COVID-19 cases, but in other periods there was no difference in outcomes between nursing facilities located in different county types.

Figure 32. Average weekly COVID-19 cases and deaths per 1,000 nursing facility residents, by county type



Data Source: CMS COVID-19 Nursing Home Data as of December 26, 2021. Analysis by HHSC-DAP.

Note: The number of facilities in rural counties in a week ranged from 295 to 299. The number of facilities in micro counties in a week ranged from 120 to 123. The number of facilities in metro counties in a week ranged from 793 to 797.

Discussion

The analyses above show an uneven distribution in COVID-19 diagnoses and hospitalizations among individuals receiving LTSS. Disparities in COVID-19 outcomes among LTSS recipients have been well documented. Nursing facility residents were among the first and hardest hit at the beginning of the pandemic (McMichael, et al., 2020). In addition to advanced age, researchers have found that people with IDD are at high risk for more severe outcomes from COVID-19. For example, COVID-19-associated hospitalization rates among disability-eligible Medicare beneficiaries were higher than rates among age-eligible beneficiaries across all living settings (Yuan, et al., 2022). One study from New York showed that COVID-19 case rates and mortality rates were higher among people with IDD living in residential group homes (Landes, Turk, Formica, McDonald, & Stevens, 2020). Studies from other countries have noted similar results. Researchers in Scotland found that adults with IDD were almost twice as likely to become infected with

COVID-19 and more than two times as likely to experience severe infection and mortality (Henderson, et al., 2022).

Mitigation strategies for COVID-19 are challenging for this already vulnerable population. For people requiring assistance with daily living, regular contact with home-health aids, nurses, and other persons entering their home is unavoidable. Social distancing efforts within congregate living settings may be difficult depending on the size of the residence and the number of staff on duty. For instance, individuals with increased behavioral needs are often staffed at a 1:1 ratio and dedicated staff must stay at a shoulder's distance. This requirement cannot be suspended, even by social distancing guidelines.

Analyses above also reiterate demographic disparities among those diagnosed and/or hospitalized due to COVID-19 within nursing facilities. Studies have shown that minorities (Shippee, et al., 2020) and individuals of advanced age (Panagiotou, et al., 2021) are at increased risk of poor health outcomes in general, and severe COVID-19 outcomes once diagnosed.

Some factors driving COVID-19 outcomes in nursing facilities are related to the characteristics of the facility itself. In a separate analysis by DSHS, analysts found major gaps in infection control strategies in a sample of Texas nursing facilities, assisted living facilities, ICFs/IID (including SSLCs), and other long-term care facilities (Singer, Rodriguez, Garcia, Nutt, & Merengwa, 2022). Some long-term care facilities, including nursing facilities, were not aware of best practices related to alcohol-based hand sanitizer and disinfectants. Other facilities failed to adequately decrease contact between residents, stop congregate dining, segregate people who were infected with COVID-19, and reduce contact with people outside of the facility.

Other studies have noted differences in COVID-19 outcomes among nursing facilities associated with the composition of the population, the location of the facility, and the presence of staffing shortages. Facility-level analyses similar to those included here have shown that staff shortages were associated with COVID-19-related outcomes (Xu, Intrator, & Bowblis, 2020; Gorges & Konetzka, 2020) while other studies have noted a link between nursing facility staffing shortages and mortality rates (Gupta, Howell, Yannelis, & Gupta, 2021).

Nevertheless, nursing facility analyses included here were not able to establish a causal relationship between inadequate staffing and COVID-19 cases and deaths. Because both residents and staff are susceptible to COVID-19 transmission, the correlation between COVID-19 case rates and inadequate staffing levels may simply reflect workforce challenges due to COVID-19 outbreaks among staff themselves.

Analyses of nursing facility data were also limited by inconsistent data collection across time. Within the CMS COVID-19 Nursing Home data, for example, information about testing was only available in some time periods, making it difficult to determine the relationship between testing, case rates, and deaths within facilities. Nevertheless, use of facility-level data makes clear that COVID-19 moved through facilities with different characteristics at different times, complicating efforts to draw clear conclusions between COVID-19 and the demographic/geographic characteristics of nursing facilities.

COVID-19-Related Deaths

This study examines the characteristics of Texas residents who died from COVID-19.[16] HHSC analyzed Texas death certificates to identify differences in COVID-19 death rates by race/ethnicity, age, geographic region, and contributing causes of death. The analysis is conducted in four parts:

1. Review general fatality trends and excess deaths[17] in CY 2020,
2. Calculate provisional CY 2020 age-adjusted death rates (AADRs) for COVID-19,
3. Conduct a spatial analysis to determine the social and community-level factors associated with COVID-19-related deaths in CY 2020, and
4. Examine COVID-19-related deaths by age group, sex, race/ethnicity, and the number of contributing causes of death present at the time of death (March 2020 – March 2021).

Several outcome measures are used in the descriptive analysis of COVID-19 deaths: crude death rates, AADRs, excess deaths, and odds of having COVID-19 listed on the death certificate as a cause of death. Crude death rates give a general estimate of mortality in a population (Texas Department of State Health Services, 2014). However, these rates do not take into consideration differences in population composition. AADRs provide unbiased comparisons that are not

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[16] COVID-19 deaths were identified by the DSHS Emerging and Acute Infectious Disease Unit (DSHS-EAIDU). Decedents were included if COVID-19 was listed in cause A-D on the death certificate. A medical certifier, usually a doctor, determines the cause(s) of death. Decedents who had COVID-19 but died of an unrelated cause were excluded.

[17] Estimating excess deaths is a common methodology for assessing emerging health problems in a population (Moy, Garcia, & Bastian, 2017).

influenced by differences in age distribution in subject populations. The direct method of age-adjustment was used to compute statewide death rates using the U.S. 2000 standard population as the benchmark population (Texas Department of State Health Services, 2014). Population data for Texas were based on 2019 estimates from the Texas Demographic Center, UT San Antonio. Excess deaths statewide were projected using an adaptation of conventional population projections methodology and the indirect method of age-adjustment was used for estimating COVID-19 death rates and excess deaths at the county level. Odds of having COVID-19 listed on the death certificate were analyzed using multivariate logistic regression. Technical details and methods for this section can be found in Appendix I.

General Fatality Trends and Excess Deaths in Texas

This section reviews past fatalities trends and analyzes the degree to which they were disrupted by COVID-19. It also discusses differences in COVID-19 mortality between different demographic groups and areas of the state.

Results

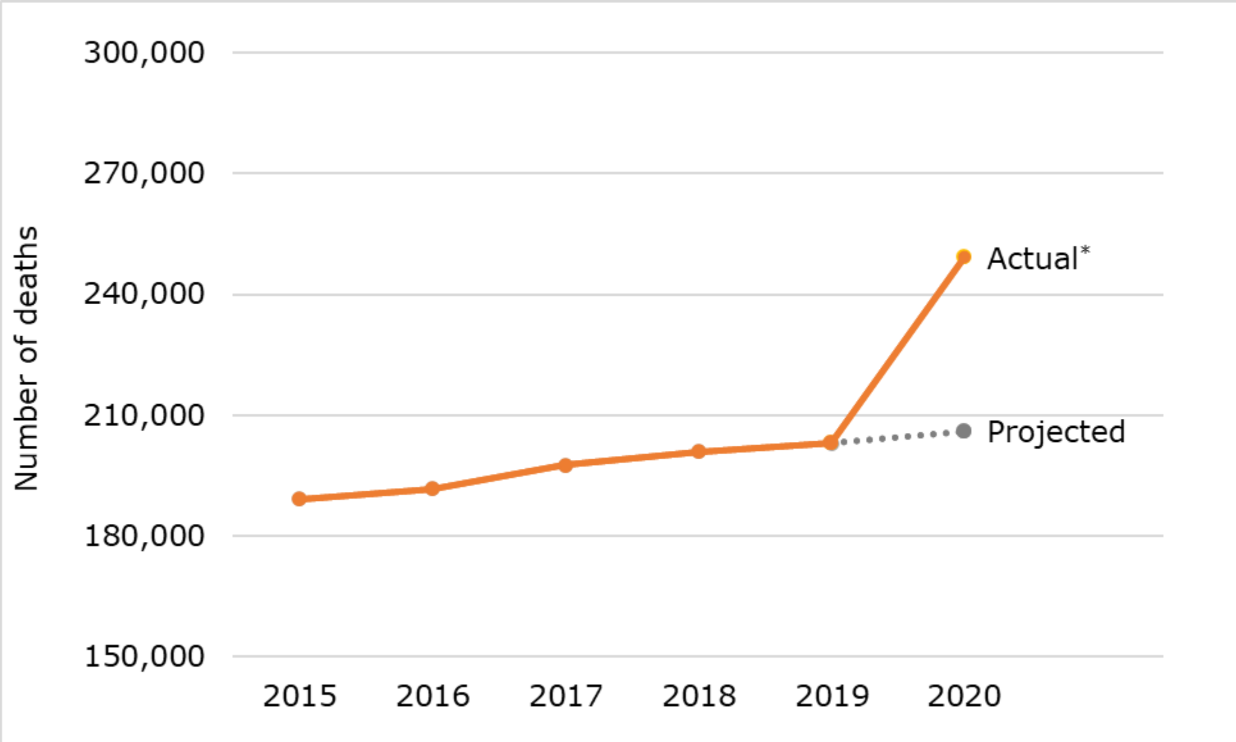
Prior to the COVID-19 pandemic, the average annual percentage increase in the number of deaths among Texas residents from CY 2015 to CY 2019 was around two percent [Figure 33]. However, between CY 2019 and CY 2020 the number of deaths among Texas residents increased by 22.7 percent. The substantial increase in fatalities occurring during this period was associated with the emergence of the COVID-19 virus and its related impacts.

To examine the degree to which COVID-19 disrupted the mortality trend in Texas, HHSC conducted an analysis of excess deaths using an adaptation of the demographic Cohort Component Method (The Texas Demographic Center). Details can be found in Appendix I. Estimating excess deaths is a common methodology for assessing the burden of mortality potentially related to the COVID-19 pandemic, including deaths that are directly or indirectly attributed to COVID-19 (Centers for Disease Control and Prevention, 2022d). In this study, the projected number of deaths that would have occurred in CY 2020 in the absence of COVID-19 was calculated and compared to the actual number of deaths that occurred in CY 2020 (provisional data).

Applying this method resulted in 206,005 projected deaths for Texas in CY 2020 in the absence of COVID-19, which is 2,906 more deaths (1.4 percent increase) than in 2019. The actual number of deaths in 2020 was 249,266 (provisional data); therefore, the difference between the number of actual and projected deaths is 43,261. The latter figure is interpreted as the number of excess deaths that occurred in 2020, which in this case account for 17 percent of all the deaths among Texas residents that occurred in 2020.

The finding that there were approximately 43,000 excess deaths in Texas during 2020 is consistent with other recently published studies conducted by academics, the federal government, and state public health agencies documenting the extent to which the COVID-19 pandemic disrupted long-standing mortality trends, resulting in elevated levels of excess mortality not seen in many years (California Department of Public Health - Fusion Center, 2022; NCHS, 2022a). For example, one study, by Paglino et al. examined all cause excess mortality across the U.S. from March 2020 through December 2021, with separate estimates developed for 2020 and 2021. Their analysis estimates approximately 41,000 excess deaths in Texas during 2020 (Paglino, et al., 2022). Another study estimates that the number of excess deaths in Texas during 2020 at just under 50,000 (Woolf, Chapman, Sabo, & Zimmerman, 2021). The CDC's U.S. National Center for Health Statistics (CDC-NCHS) developed and published estimates of excess mortality by state for the period starting March 2020. Based on this work, the estimated excess mortality for Texas is approximately 39,000 deaths (NCHS, 2022a). The average estimate for excess mortality in Texas across the three non-HHSC studies referenced above is approximately 43,000, which is consistent with HHSC's findings reported here.

Figure 33. Total deaths by calendar year, Texas CY 2015 to 2020

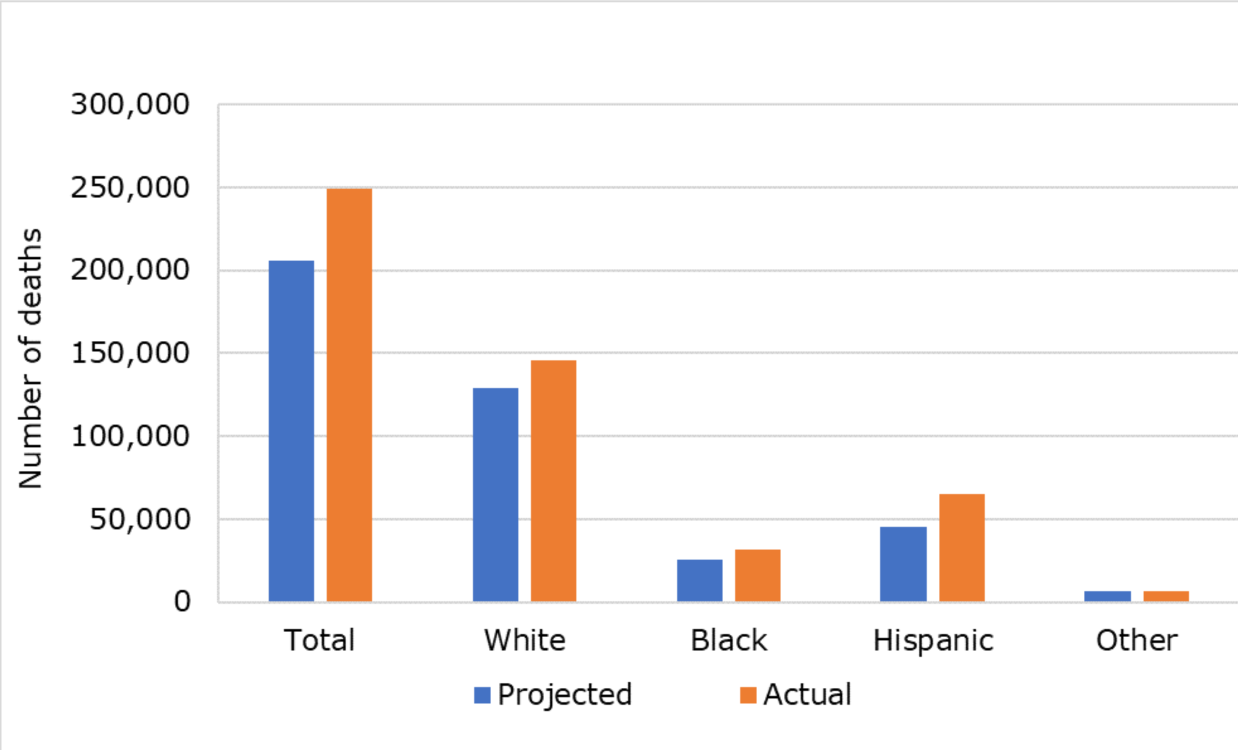


Data Source for number of actual deaths: DSHS, Center for Health Statistics. Estimates of projected deaths by HHSC-DAP.

* Data for number of actual deaths in 2020 are provisional.

Figure 34 shows the number of projected and actual deaths in CY 2020 by race/ethnicity in Texas. Although the actual number of deaths in CY 2020 was higher than the projected number of deaths for all race/ethnicity groups examined, the difference for Hispanics was almost 45 percent, the largest of any race/ethnicity. For the Black and White populations, the number of actual deaths exceeded the number of projected deaths by approximately 24 percent and 13 percent, respectively.

Figure 34. Comparison between projected and actual deaths in CY 2020 for Texas residents



Data Source for number of actual deaths: DSHS, Center for Health Statistics. Estimates of projected deaths by HHSC-DAP.

Includes all deaths to Texas residents reported to DSHS as of June 2021. Death data were considered provisional as of that date. "Other" includes deaths of Unknown race/ethnicity.

Provisional CY 2020 COVID-19 Age-Adjusted Death Rates

The heatmaps presented in Part 1 demonstrate that age is an important factor in mortality risk. This section presents AADRs to account for differences in the age distribution of study populations. AADRs can be calculated using direct and indirect age standardization methods. These methods allow analysts to control for the influence of populations with different age compositions to better understand the mortality burden across demographic and geographic subgroups.

Two analyses are presented:

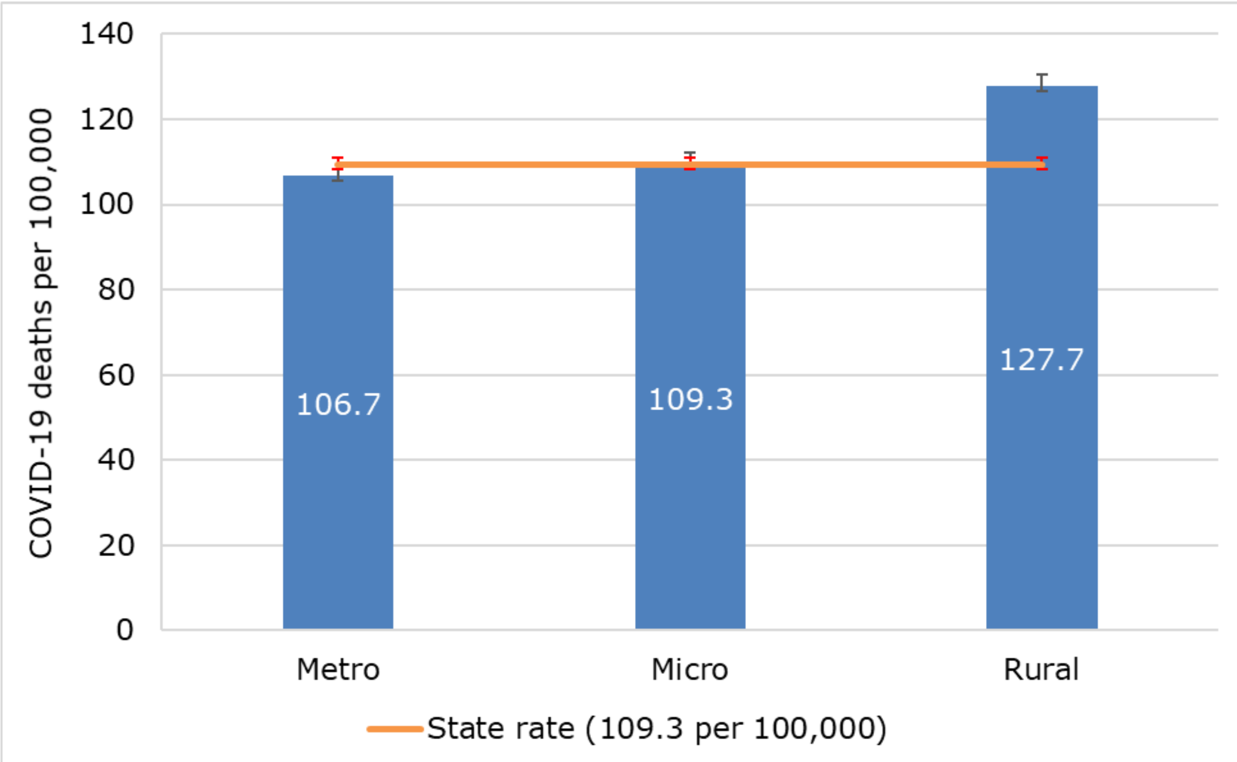
1. Statewide AADRs for CY 2020 by county type and race/ethnicity, and
2. County-level differences between the actual and expected number of COVID-19 deaths based on the application of standard, or national, age-specific COVID-19 death rates to the county population distributions

Results

Statewide Analysis

Figure 35 shows that, after accounting for age, COVID-19 death rates were highest in rural counties. The rural county AADR of 127.7 per 100,000 was significantly higher than the state rate of 109.3 per 100,000. Metro and micro county AADRs, however, were not significantly different from the state rate. Figure 36 shows that Hispanic and Black populations had higher AADR than other race/ethnicities, regardless of county type. Hispanic individuals living in micro and rural areas had AADRs more than twice the state rate and higher than any other subgroup.

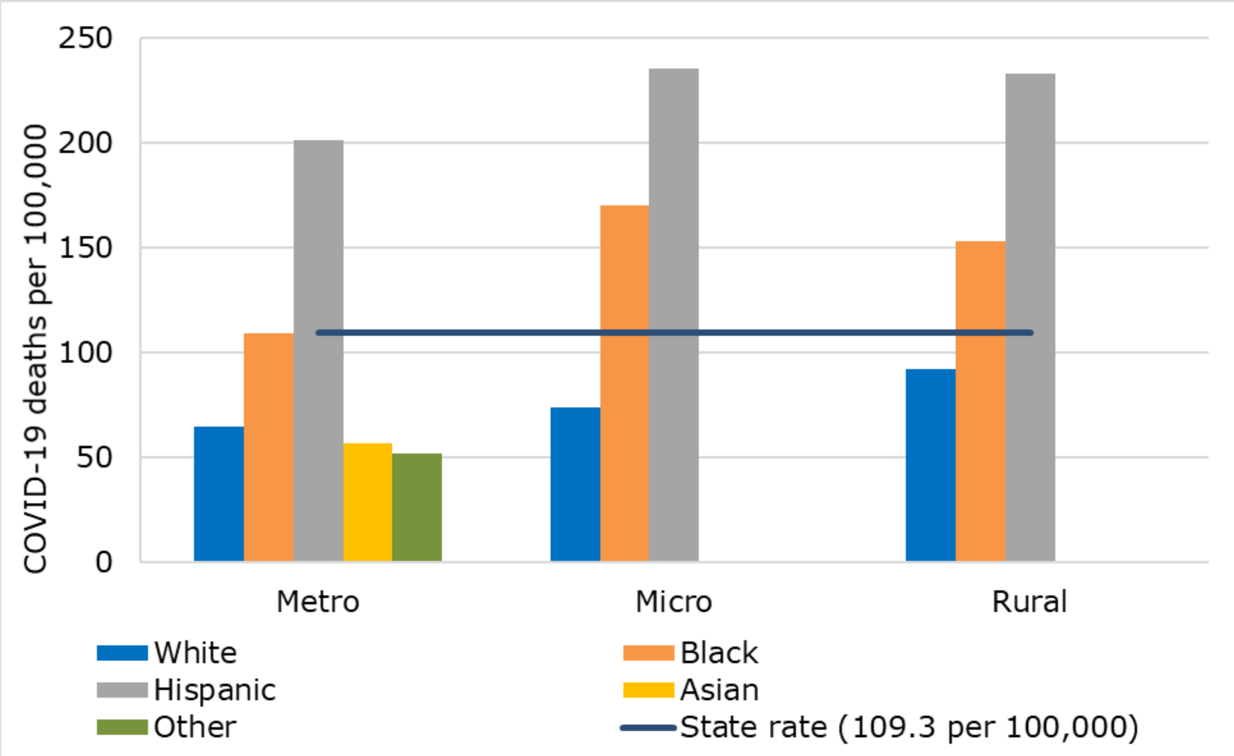
Figure 35. COVID-19 Age-adjusted death rate per 100,000, by county type (CY 2020)



Data Source: DSHS, Center for Health Statistics. Analysis by HHSC-DAP.

Notes: Includes all COVID-19 deaths reported to DSHS as of June 2021. Death data were considered provisional as of that date. County type is based on decedent's residence county (see Appendix B). Excluded 74 decedents who were missing information on sex, race/ethnicity, residence county, or multiple cause of death codes (for the March 2020 – December 2020 period). Data on rates are suppressed if the number of COVID-19 deaths was 25 or less. Population data for Texas are based on the 2019 estimates from the Texas Demographic Center, UT San Antonio.

Figure 36. COVID-19 age-adjusted death rate per 100,000, by race/ethnicity and county type (CY 2020)



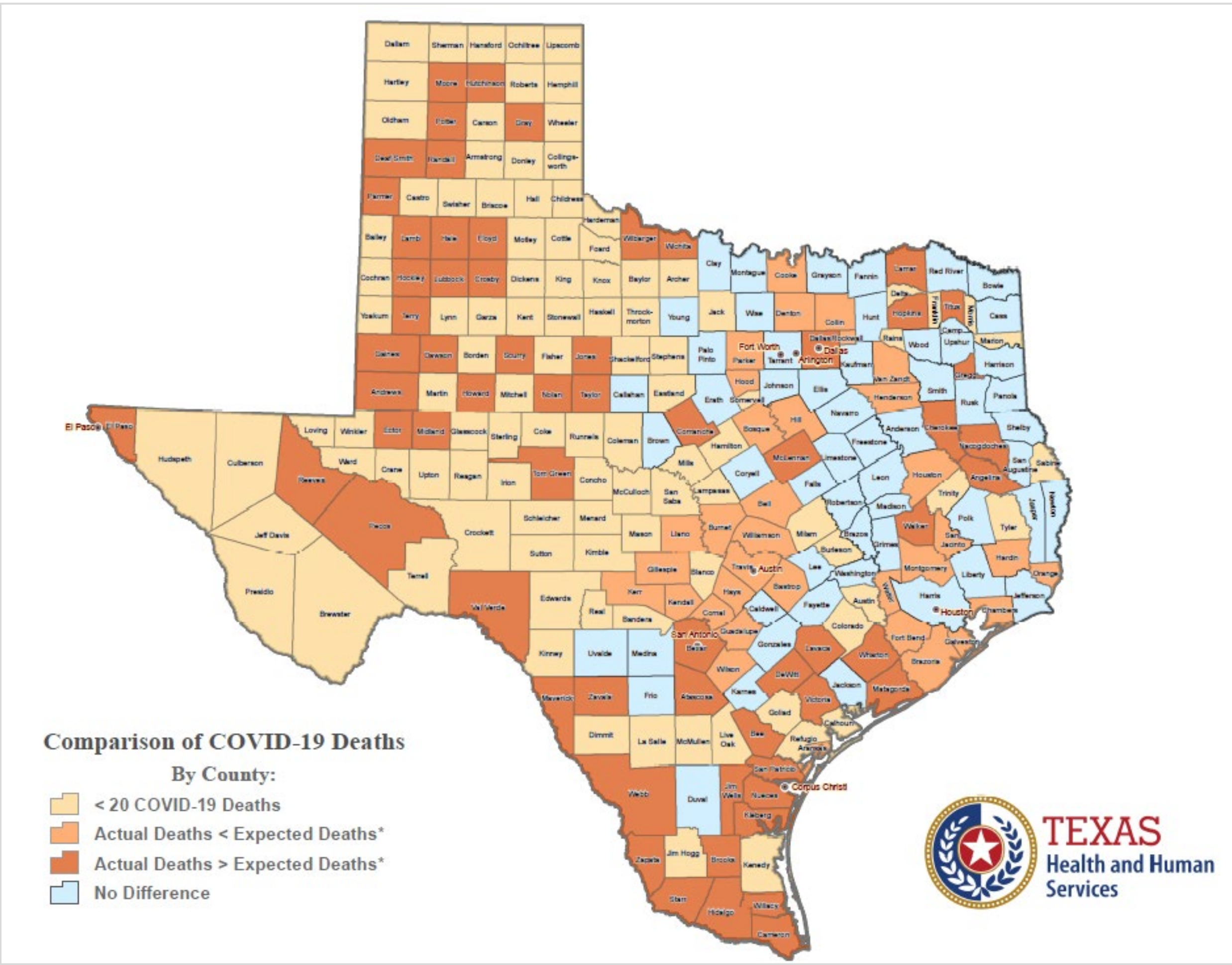
Data Source: DSHS, Center for Health Statistics. Analysis by HHSC-DAP.

Notes: Includes all COVID-19 deaths reported to DSHS as of June 2021. Death data were considered provisional as of that date. County type is based on decedent's residence county (see Appendix B). Excluded 74 decedents who were missing information on sex, race/ethnicity, residence county, or multiple cause of death codes (for the March 2020 – December 2020 period). Data on rates are suppressed if the number of COVID-19 deaths was 25 or less. Population data for Texas are based on the 2019 estimates from the Texas Demographic Center, UT San Antonio.

County-Level Analysis

To assess COVID-19 mortality among individual counties in CY 2020, HHSC used the indirect age standardization method to estimate the number of COVID-19 deaths that would have occurred in each county if the counties had experienced the age-specific COVID-19 death rates of the standard population (referred to as the "expected" number of COVID-19 deaths for that county). In this analysis, the age distribution of the standard population refers to the national population, excluding Texas. Details are provided in Appendix I. Figure 37 depicts counties in Texas where the difference between the actual and expected number of COVID-19 deaths was not statistically significant (i.e., "no difference"); counties where the actual number of COVID-19 deaths was significantly lower than expected; counties where the number of COVID-19 deaths was significantly higher than expected; and counties with fewer than 20 COVID-19 deaths. In line with data reporting protocols used by CDC-NCHS, the results from comparing the actual to the expected number of deaths are not reported for counties that had fewer than 20 COVID-19 deaths in 2020. Per the CDC's protocol, the estimated Standardized Mortality Ratios (SMRs) derived from populations that experienced fewer than 20 events (COVID-19 deaths) are regarded as unreliable (Kochanek, Murphy, Xu, & Arias, 2019; Xu, Murphy, Kochanek, & Arias, 2021).

Figure 37. Number of actual versus expected COVID-19 deaths by county in CY 2020 (Indirect Age Standardization Method*)



Data Source for number of actual deaths: DSHS, Center for Health Statistics. Estimates of expected deaths by HHSC-DAP. Includes all deaths to Texas residents reported to DSHS as of June 2021. Death data were considered provisional as of that date.

Notes: *p<0.05. Tests of statistical significance are based on the Standard Method for computing confidence interval and significance tests for standardized mortality ratios. See Confidence Interval and Significance Test for a Standardized Ratio. Corroboration of statistical significance results was performed using the Vandenbroucke Method.

Figure 37 shows that Texas counties with little difference between the actual and expected number of COVID-19 deaths were located primarily in the east, central east, and north central regions of the state. With some exceptions, counties where the actual number of COVID-19 deaths was less than the number of expected deaths tended to cluster around the central Texas region. In addition, the more heavily populated suburban counties in the Dallas-Fort Worth, Houston, and San Antonio areas also experienced fewer than expected COVID-19 deaths. The counties where the number of COVID-19 deaths exceeded the number of expected deaths included many of the counties along the Texas-Mexico border, clusters of counties scattered across the west, far west, and Panhandle regions of the state, and some parts of east and central Texas.

Taken as a whole, there were some substantive differences between the counties that experienced higher versus lower numbers of COVID-19 deaths than expected in CY 2020. Among the counties with fewer than expected COVID-19 deaths, 45 percent of the population was non-White, whereas among the counties with greater than expected COVID-19 deaths 71 percent of the population was non-White. Hispanics accounted for 79 percent of the non-White population across the counties that experienced more COVID-19 deaths than expected. The percentage of the population age 65 and over was about the same (13 percent) among the counties that experienced fewer than expected COVID-19 deaths and those that experienced more COVID-19 deaths than expected.

County-level death trends also appeared to correspond with community-level social vulnerability. In total, 76 percent of the counties with fewer than expected COVID-19 deaths had lower levels of social vulnerability (i.e., SVI ranking of less than 0.40). But among counties that experienced more COVID-19 deaths than expected, the trend was reversed; 76 percent of these counties had higher levels of social vulnerability (i.e., SVI ranking of 0.60 or higher).

Altogether, the counties where the number of COVID-19 deaths exceeded the number of expected deaths accounted for 36 percent of the state's population and 53 percent of all COVID-19 deaths. In general, counties with higher poverty rates experienced more deaths than their age distributions would otherwise predict. Counties where the number of COVID-19 deaths exceeded the number of expected deaths had a poverty rate of 19 percent while counties that experienced fewer than expected COVID-19 deaths had a poverty rate of 10 percent.

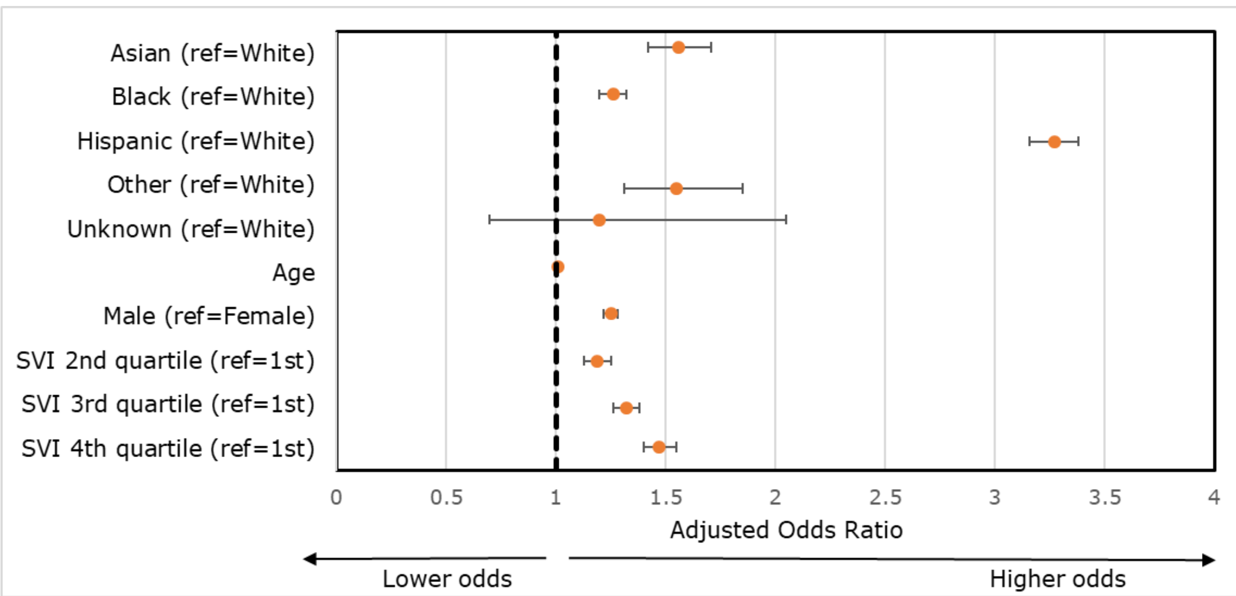
Individual and Community-Level Factors Associated with COVID-19-Related Deaths in CY 2020

This section analyzes the association between individual and social characteristics of decedents and the odds that COVID-19 was either the underlying or a contributing cause of death. Importantly, this analysis compares those who died from COVID-19 to those who died of other causes; other sections of this report consider the separate question of who did and did not die after contracting COVID-19.

Using DSHS Texas resident death certificate data from March 2020 to December 2020, analysts conducted a series of multivariate logistic regression models to examine the association between death due to COVID-19 and various factors, including race/ethnicity, age, sex, and social vulnerability at the census tract level. The results are presented in Figure 38. For full model results, see Appendix I.

Results

Figure 38. Factors predicting death due to COVID-19 among Texas residents, March 2020 – December 2020



Data Source: DSHS, Center for Health Statistics. Analysis by HHSC-DAP.

Notes: Includes deaths to Texas residents reported to DSHS as of June 2021 for the March 2020 - December 2020 period. Death data were considered provisional as of that date. Ninety-eight percent of the death certificates contained address of residence information that could be reliably geocoded to a census tract (N=209,143). Multivariate regression model predicting the odds of death due to COVID-19 versus death due to other causes. SVI ranking is a percentile rank variable divided into quartiles, with the 1st quartile being the lowest social vulnerability census tract and the 4th quartile being the highest. Odds ratio and confidence intervals shown. Categorical levels for missing not shown, including race/ethnicity (n = 135), Sex (n = 6), and SVI quartile (n = 84).

Hispanic ethnicity emerged as the strongest predictor of COVID-19 as a cause of death. After controlling for the effects of age, sex, and social vulnerability, the odds of a COVID-19-related death among Hispanic decedents were 3.3 times higher than among non-Hispanic White decedents.

COVID-19 was also more common as a cause of death in more socially vulnerable communities. Decedents in census tracts in the highest SVI quartile were associated with 47 percent higher odds of a COVID-19-related death than decedents in census tracts in the lowest SVI quartile, after controlling for race/ethnicity, sex, and age.

Sex also had a significant impact on the odds of deaths related to COVID-19. The odds that COVID-19 was a cause of death for male decedents were 25 percent higher than for female decedents after adjusting for race/ethnicity, age, and social vulnerability.

Age had the smallest impact on the odds that COVID-19 played a role in the cause of death. A possible explanation for this finding is that the general age profile of individuals who died from COVID-19 was very similar to the general age profile of decedents that died from other causes. During the study period, the median age at death among COVID-19 and non-COVID-19 decedents was the same, 74 years.

Impact of Contributing Causes of Death and Other Health Conditions

Previous studies in this section have considered the role of age, race/ethnicity, sex, county type, and community-level social vulnerability in COVID-19 deaths. Though these factors help explain differences in COVID-19 death rates, they do not account for the underlying health status of individuals who died from COVID-19. This section attempts to incorporate information on individual health status through a proxy measure available on Texas death certificates that records contributing causes of death. Contributing causes of death are medical conditions listed on the death certificate that are not selected as the underlying, or primary, cause of death (NCHS, 2022b).

Prior research has analyzed contributing causes of death in conjunction with COVID-19 deaths to better understand the impact of health conditions on mortality risk (Bhaskaran, et al., 2021; Paripa, et al., 2021). This section conducts a similar analysis of contributing causes of death listed on the death certificates of Texas residents from March 2020 to March 2021 for COVID-19 deaths identified by the DSHS Emerging and Acute Infectious Disease Unit (DSHS-EAIDU).[18] The medical conditions included in this analysis were based on an analysis of COVID-19 death

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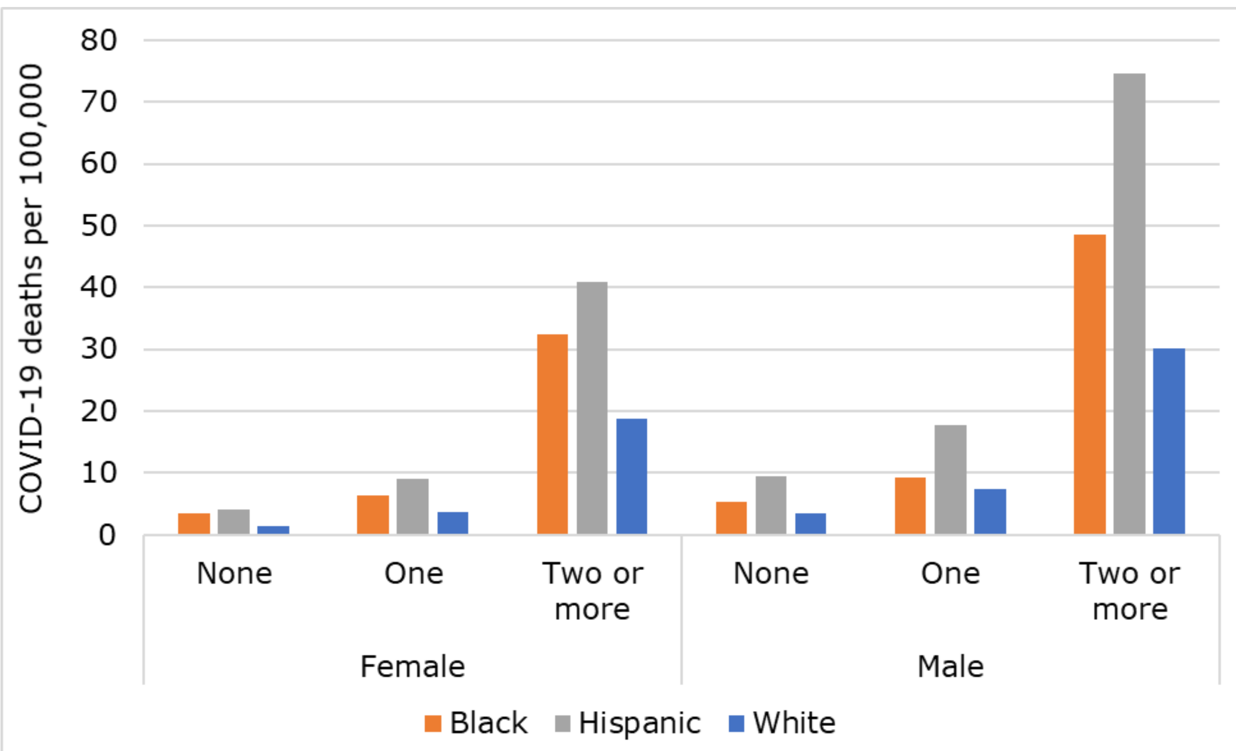
[18] Note previous sections have examined COVID-19 deaths in CY 2020 due to the need to calculate annual population rates. January 2021, however, had the highest number of COVID-19 deaths statewide at over 9,000. This analysis extends the study period to examine COVID-19 deaths from March 1, 2020 to March 31, 2021, consistent with the study period used in the fatalities analysis presented in Figure 8.

records by the CDC-NCHS [see Appendix I]. COVID-19 death rates presented in this section are stratified by age, race/ethnicity, sex, and the number of contributing causes of death listed on the death certificate, with each condition mentioned in Appendix I counted separately.

Results

Figure 39 presents COVID-19 crude death rates for different demographic subgroups under age 65. Males had higher crude death rates for COVID-19 in Texas than females, regardless of race/ethnicity and the number of contributing causes of death. Though the Hispanic population had higher death rates than Black and White populations in general, differences were especially pronounced among those with more contributing causes of death. Hispanic males under the age of 65 with two or more contributing causes had a death rate more than twice as high as their White counterparts with the same demographic characteristics.

Figure 39. COVID-19 death rates per 100,000 among individuals under age 65, by number of contributing causes of death, race/ethnicity, and sex



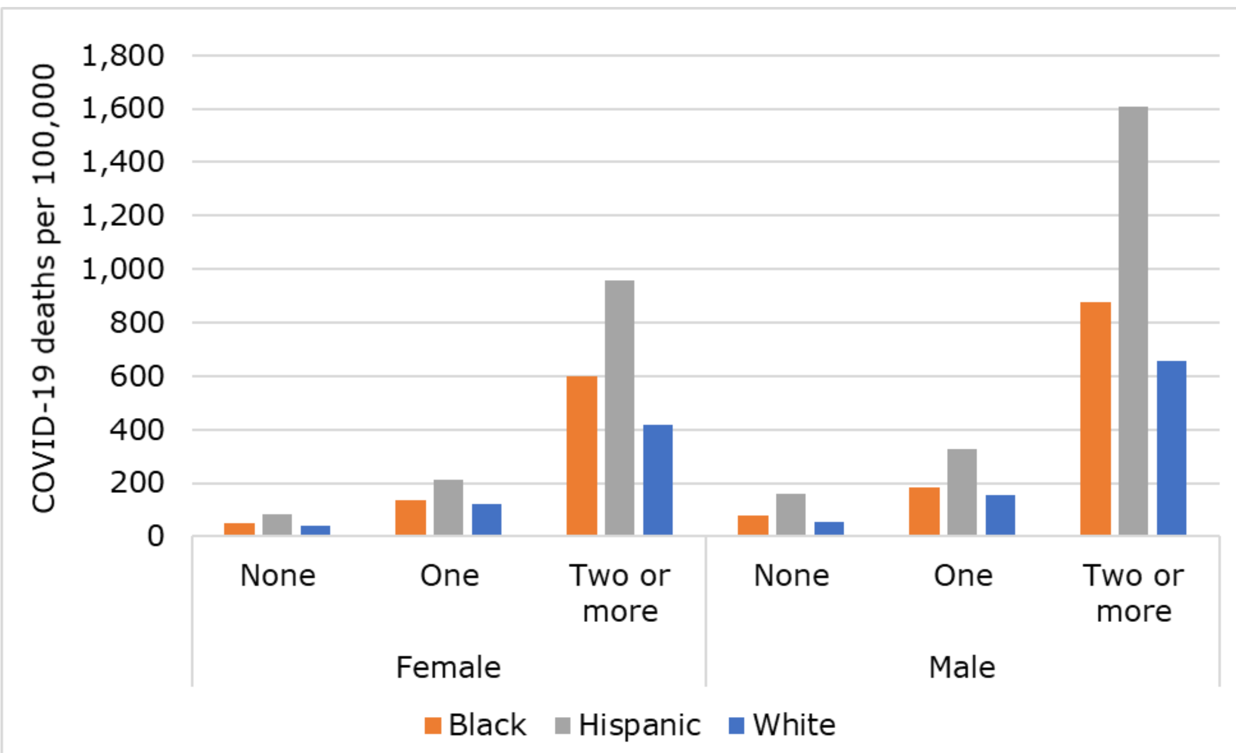
Data Source: DSHS, Center for Health Statistics. Analysis by HHSC-DAP.

Notes: Includes all COVID-19 deaths reported to DSHS as of June 2021. Death data were considered provisional as of that date. County type is based on decedent's residence county (see Appendix B). Excluded 97 decedents who were missing information on sex, race/ethnicity, residence county, or multiple cause of death codes (for the March 2020 – March 2021 period). No data were suppressed as the number of COVID-19 deaths for all cells was greater than 5. See Appendix I for details on contributing causes of death. Population data for Texas are based on the 2019 estimates from the Texas Demographic Center, UT San Antonio.

COVID-19 death rates among individuals 65 and older were higher than rates for younger individuals, regardless of race/ethnicity, sex, and the number of contributing causes of death. Figure 40 shows that among those 65 and older, males again had higher death rates than females for all race/ethnicity and contributing cause of death groups. Hispanic males over the age of 65 with two or more contributing causes had death rates almost twice as high as their Black counterparts and over 2.5 times as high as Whites with the same demographic characteristics.

Table 26 in Appendix I provides a breakdown of the number of COVID-19 deaths by contributing cause of death. Respiratory diseases, hyptertensive diseases, and diabetes were some of the most frequently listed contributing causes of death in conjunction with COVID-19 deaths.

Figure 40. COVID-19 death rates per 100,000 among individuals ages 65 and older, by number of contributing causes of death, race/ethnicity, and sex



Data Source: DSHS, Center for Health Statistics. Analysis by HHSC-DAP.

Notes: Includes all COVID-19 deaths reported to DSHS as of June 2021. Death data were considered provisional as of that date. County type is based on decedent's residence county (see Appendix B). Excluded 97 decedents who were missing information on sex, race/ethnicity, residence county, or multiple cause of death codes (for the March 2020 – March 2021 period). No data were suppressed as the number of COVID-19 deaths for all cells was greater than 5. See Appendix I for details on contributing causes of death. Population data for Texas are based on the 2019 estimates from the Texas Demographic Center, UT San Antonio.

Discussion

COVID-19 was not a known cause of death in Texas until 2020. Due to the rapid spread of the virus, COVID-19 became the third leading cause of death in the state in 2020. The findings presented in this section provide strong evidence that: 1) the COVID-19 pandemic played a major role in disrupting long-standing mortality trends; and 2) the burden of excess COVID-19 mortality was disproportionately borne by different populations and areas of the state.

Analysis of excess mortality illustrates the degree to which COVID-19 disrupted the mortality trend in Texas. Texas recorded over 43,000 excess deaths in CY 2020, a magnitude that is consistent with studies conducted at the national level by the CDC and by other states (California Department of Public Health - Fusion Center, 2022; NCHS, 2022a). A higher-than-expected number of deaths was observed for all major race/ethnicity groups in CY 2020 in Texas, but the difference among Hispanics was almost 45 percent, the largest of any race/ethnicity.

This section also analyzed COVID-19 fatalities at the state, county, and census tract level using Texas death certificate data from DSHS. This is the first publicly available analysis of COVID-19 deaths at the census tract level in CY 2020 for the state as a whole. Specifically, analysts examined excess deaths and COVID-19 death rates while considering the impact of age, race/ethnicity, county type, sex, contributing causes of death, and social vulnerability. A key takeaway from this analysis is that decedents living in socially vulnerable areas and Hispanics were more likely to have COVID-19 listed as a cause of death on their death certificates. Other analyses in this section found that Hispanic individuals who died from COVID-19, regardless of age group, were far more likely than White or Black decedents to have two or more contributing causes of death listed on the death certificate.

From March 1, 2020 to March 31, 2021, COVID-19 was the third leading cause of death in Texas, with the majority of deaths occurring in January 2021. After adjusting for age, death rates were highest in rural counties and among Hispanic and Black populations, regardless of county type. The AADR in rural counties was significantly higher than the state rate, highlighting the disproportionate mortality burden of the pandemic in these areas.

Due to data availability, a key limitation of this study is the inability to compare death certificate data with decedents' medical records or autopsy reports for end-of-life events and co-occurring diagnoses (Gundlapalli, et al., 2021). These data would provide a more complete understanding of the contributing factors associated with COVID-19 mortality and could be explored by future research.

Part 3. Indirect Impact Studies

Trends in Assistance Program Enrollment

This section describes PHE-related changes to program eligibility, enrollment, and service delivery in the Texas Medicaid program.

Program Eligibility Changes

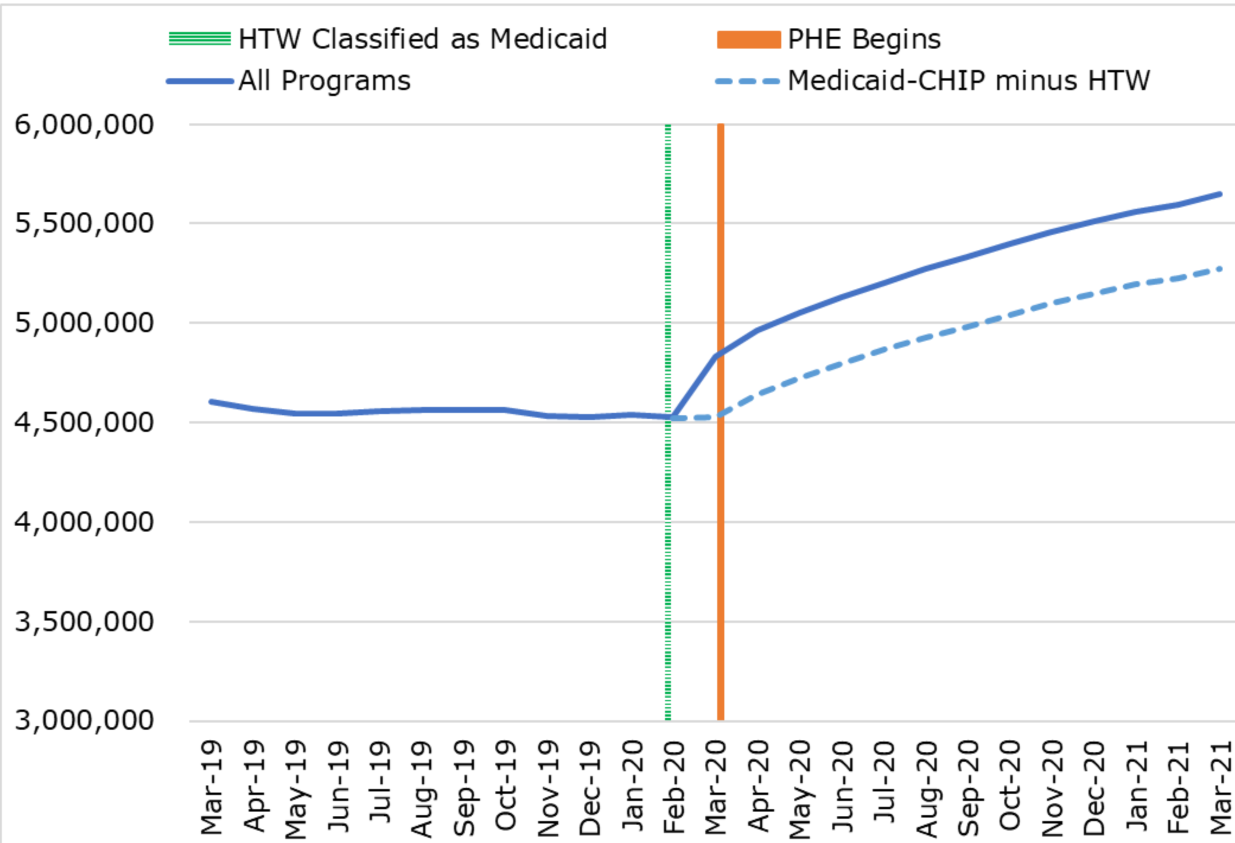
On March 18, 2020, Congress passed the Families First Coronavirus Response Act (FFCRA). The FFCRA required states to meet maintenance of eligibility (MOE) requirements, including continuous coverage of individuals enrolled in Medicaid, in order to qualify for enhanced federal matching funds. The MOE requirement was designed to prevent coverage losses during the pandemic and is set to expire at the end of the PHE.

The FFCRA MOE requirements, in combination with changing economic circumstances, resulted in higher Medicaid caseloads as new individuals continued to enroll in the program and fewer individuals were disenrolled. In addition, other state programs that typically serve specific eligibility groups transferring out of Medicaid experienced secondary caseload changes as a result. For example, prior to the implementation of federal MOE requirements in March 2020, Medicaid for Pregnant Women provided 60 days of postpartum coverage, after which women were automatically tested for other types of assistance without the requirement for a new application (a process known as "automatic eligibility determination"); many women who longer qualified for Medicaid or CHIP programs met eligibility requirements for HTW and were automatically enrolled in the HTW program, ensuring continuity of postpartum care. However, during the PHE, these clients were retained in Medicaid after 60 days postpartum, causing the HTW case mix to shift away from postpartum clients and toward newly enrolled individuals. A similar dynamic impacted the CHIP program, which has traditionally served certain eligibility groups who no longer qualify for Medicaid but continue to meet CHIP eligibility requirements; as these groups were retained in Medicaid, CHIP caseloads began to decline. For definitions of HTW, CHIP, and other HHSC programs, please see Appendix D.

Figure 41 shows the number of individuals enrolled in Medicaid/CHIP (combined) from March 2019 to March 2021. In January 2020, CMS approved an 1115 demonstration waiver allowing Texas to transition the HTW program into Medicaid.

Figure 41 shows the sudden increase in Medicaid enrollment in March 2020 as approximately 300,000 HTW clients were reclassified as Medicaid enrollees (note this change was primarily administrative; HTW clients did not experience meaningful changes in the provider network, service delivery, or eligibility criteria). In March 2020, Texas implemented federal MOE requirements to provide continuous coverage for all Medicaid enrollees.[19] Between March 2020 and March 2021, the combined Medicaid/CHIP caseload grew by almost 820,000 clients to a total of 5.65 million.

Figure 41. Medicaid/CHIP caseload growth, March 2019 - March 2021



Data Source: HHSC, 8-month eligibility file, 24-month, eligibility file, TT FFS file, and CHIP History file. Refreshed July 18, 2022. Analysis by HHSC-DAP. Note: "All Programs" includes Medicaid (Full and Partial benefits) and CHIP (traditional & perinate). Some women enrolled in CHIP-Perinate may be covered by Medicaid (Type Program 30) in the month that they deliver and may be duplicated. Duplicate records account for no more than 6,000 individuals in any month. Federal MOE requirements implemented in Texas Medicaid during the PHE apply to all full benefit Medicaid enrollees, as well as some partial benefit categories such as Qualified Medicare Beneficiaries (QMB) and Specified Low-Income Medicare Benefits (SLMB). "Medicaid/CHIP minus HTW" removes clients enrolled in the Healthy Texas Women Program from the "All Programs" total. See Appendix D for Medicaid/CHIP program definitions.

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[19] Federal MOE requirements in Texas Medicaid apply to all full benefit Medicaid enrollees, as well as some partial benefit categories such as Qualified Medicare Beneficiaries (QMB) and Specified Low-Income Medicare Benefits (SLMB).

Although SNAP and TANF experienced initial enrollment surges at the beginning of the PHE, these programs are not subject to the same MOE requirements as Medicaid; as a result, enrollment trends largely stabilized for SNAP and TANF after initial surges subsided in June 2020.

Service Delivery Changes

In addition to the implementation of continuous coverage requirements in Medicaid, the federal government implemented temporary measures to expedite the adoption of teleservices under the COVID-19 PHE. HHSC also expanded coverage of telemedicine, telehealth, and audio-only visits for many Medicaid services during this time. These efforts were furthered by House Bill (HB) 4 (87th Legislature, Regular Session, 2021), which requires HHSC to allow more services to be delivered via teleservices on a permanent basis after the end of the PHE, if clinically appropriate and cost-effective.

Finally, to ensure sufficient coverage for Medicaid beneficiaries hospitalized with COVID-19, Texas pursued additional federal coverage opportunities through an existing 1115(a) demonstration waiver. On September 3, 2020, CMS approved an 1115(a) demonstration amendment that allows HHSC to extend the 30-day spell of illness (SOI) limitation[20] in Texas Medicaid for an additional 30 days for inpatient hospital stays related to COVID-19 (i.e., a stay for which the COVID-19 diagnosis is listed anywhere on the claim). The amendment also allows certain Medicaid beneficiaries to exceed the $200,000 inpatient hospital benefit limitation for COVID-19-related inpatient hospital stays. The policy has a retroactive effective date of March 1, 2020, and will expire no later than 60 days after the end of the PHE.

Utilization of Emergency Care and Routine Services by Medicaid/CHIP Recipients

An analysis published in January 2022 by HHSC Medicaid CHIP Data Analytics Unit shows that COVID-19 impacted Medicaid/CHIP service utilization rates of

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[20] The 30-day SOI limitation described in the state plan only applies to clients 21 and older receiving services through fee-for-service, STAR+PLUS, or STAR Health. The $200,000 inpatient hospital benefit limitation described in the state plan only applies to clients 21 and older receiving services through fee-for-service or STAR Health. In compliance with House Resolution 6201, for the duration of the public health emergency, these limitations do not apply to clients who turned 21 on or after March 18, 2020. Under existing policy, these limitations do not apply to certain approved transplants and STAR+PLUS members with a severe and persistent mental illness.

emergency care and routine services in several ways (Texas Health and Human Services Commission, 2022). The PHE resulted in fewer clients receiving in-person health services; however, policies to expand teleservices mitigated the PHE's negative impact by offering opportunities for clients to access additional services safely from home. Policy changes related to teleservices, MOE requirements, and other elements of the Medicaid program impacted both caseloads and service utilization patterns. In order to remove the influence of external factors like policy changes, caseload growth, and gaps in individual enrollment, studies in this section draw on a large sample of clients who were continuously enrolled in Medicaid/CHIP from March 2019 to February 2021 in order to isolate changes in utilization for a stable population of clients.[21] These studies examine changes in clients' health care utilization by demographic subgroup before and after the onset of COVID-19 in Texas. Specifically, studies in this section analyze utilization of the following services in the period before COVID-19 (i.e., March 2019 – Feb 2020) and during the COVID-19 PHE (i.e., March 2020 – Feb 2021):

- Emergency Department (ED)
- Inpatient
- Mental health (MH)
- Occupational therapy (OT)
- Physical therapy (PT)
- Speech therapy (ST).
- Well-child visits[22]

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[21] The use of continuous enrollment criteria ensures all clients in the study have the same opportunity to receive services being analyzed. Clients enrolled at the beginning of the study period who experience a change in eligibility and become ineligible for Medicaid services before the implementation of MOE requirements are excluded, such as individuals enrolled in Medicaid for Pregnant Women whose 60-day postpartum coverage ended prior to March 2020, individuals who "aged out" of an eligibility group, or individuals who experienced a change in income or other eligibility criteria that resulted in the loss of Medicaid eligibility. Individuals who lost CHIP eligibility at any point during the study period were also excluded, as CHIP is not subject to federal MOE requirements. Likewise, individuals who were newly enrolled in Medicaid/CHIP during the middle of the study period are excluded. The exclusion of these groups ensures a stable study population of clients exposed to the same external factors with the same opportunity to receive services being measured.

[22] Methods for analyzing well-child visits differ from other services in this section due to the nature of the outcome measure. For well-child visits, HHSC adapted the methodology prescribed by CMS in the annual CMS-416 report on Early Periodic Screening, Diagnostic, and Treatment (EPSDT) participation in Medicaid, expanding it to include both Medicaid and

For each service, the analysis presents descriptive statistics summarizing utilization before and after the onset of COVID-19 by demographic subgroup, as well as the percentage change in utilization for each group.

Results

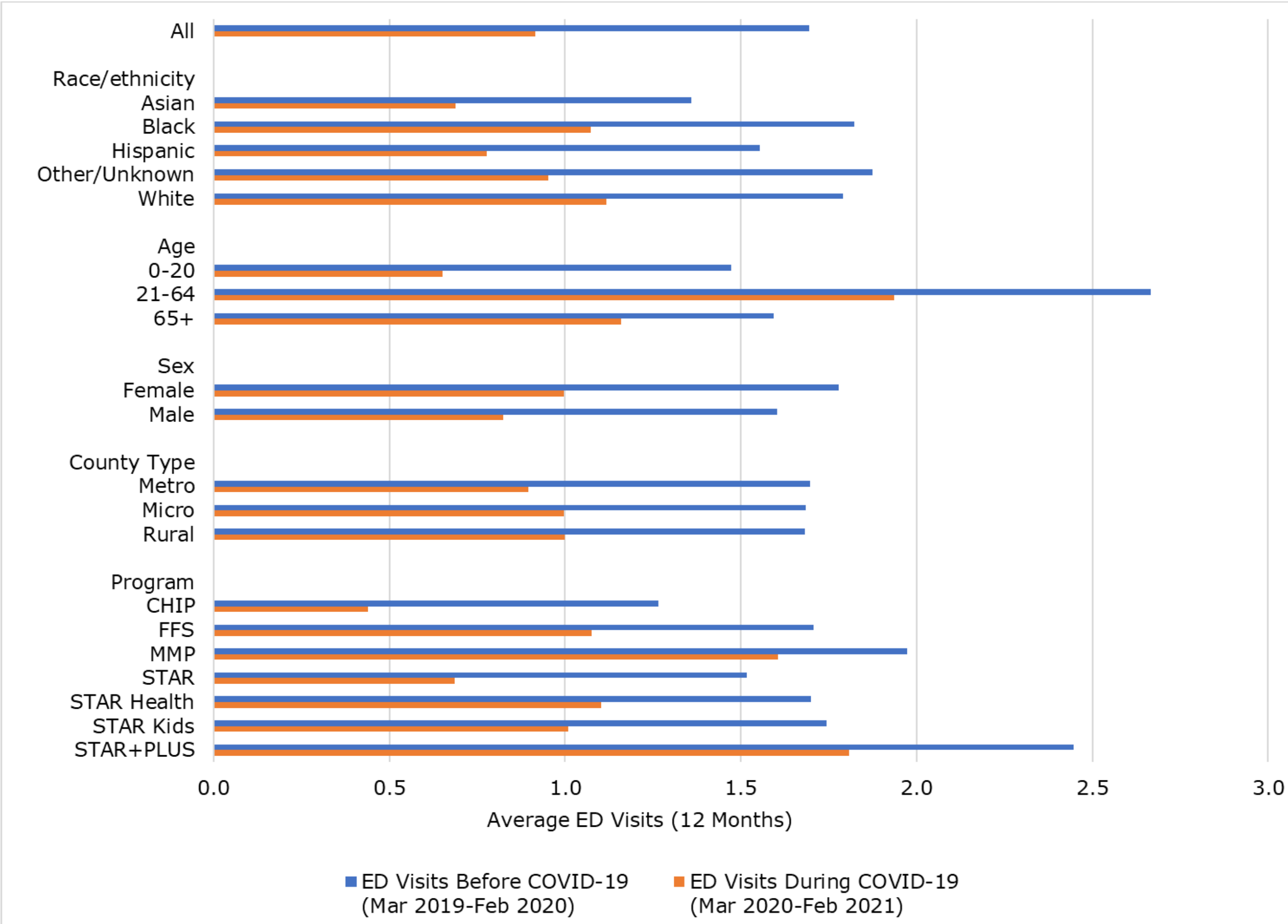
Emergency Department Visits

This study examines ED utilization for continuously enrolled Texas Medicaid and CHIP clients with at least one ED visit (N=1,248,390) for any reason (including COVID-19) from March 2019 to February 2021. Figure 42 shows the average number of ED visits for each client group one year before and one year after the arrival of COVID-19 in Texas. Overall, ED utilization declined after the onset of COVID-19. From the year before the pandemic through the end of its first year, the average number of ED visits among clients with an ED visit fell from 1.69 to 0.91 (statistically significant; $p<0.001$).

Utilization of ED visits decreased among all client groups. These changes can be seen in the average number of ED visits per group [Figure 42] as well as in the percentage change in ED utilization per group [Figure 43]. Within each domain, the largest percentage decline in average number of ED visits was seen among individuals with Hispanic, Asian, and Other/Unknown race/ethnicity; individuals under age 21; males; individuals living in metro counties; and individuals enrolled in CHIP and STAR [Figure 43]. In percentage terms, CHIP clients experienced the largest decline in ED visits, reducing their utilization by over 65 percent. See Appendix J for detailed results.

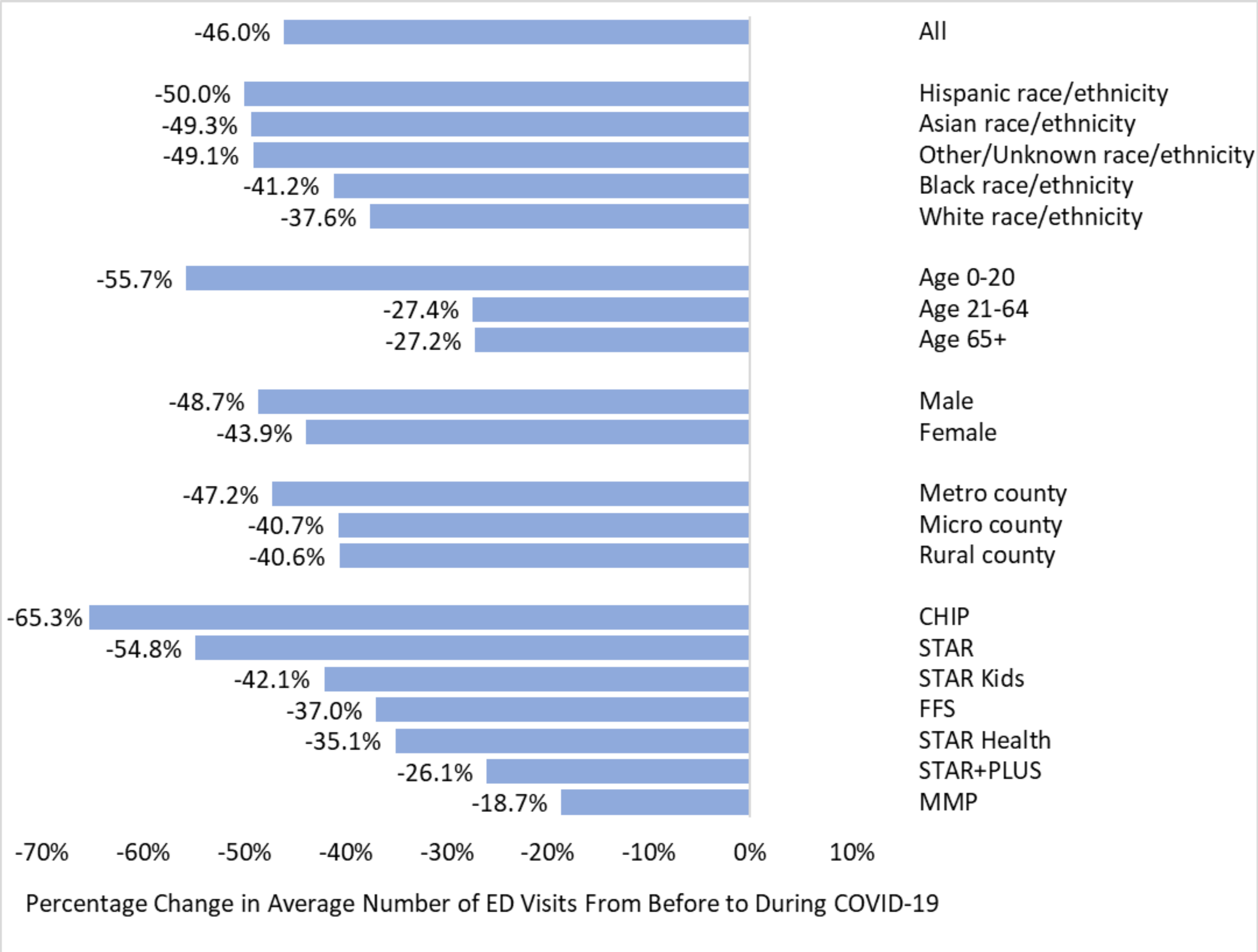
CHIP clients. These methods require 90-day continuous enrollment rather than continuous enrollment throughout the full study period. In addition, because the recommended number of well-child visits differs by age, rather than following the same clients over time, this analysis compares two similar cohorts of children before and after COVID-19. Additional details are provided in Appendix J.

Figure 42. Average number of ED visits before and during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28, 2021 with at least one ED visit (N=1,248,390). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

Figure 43. Percentage change in average number of ED visits from before to during COVID-19, by client characteristics



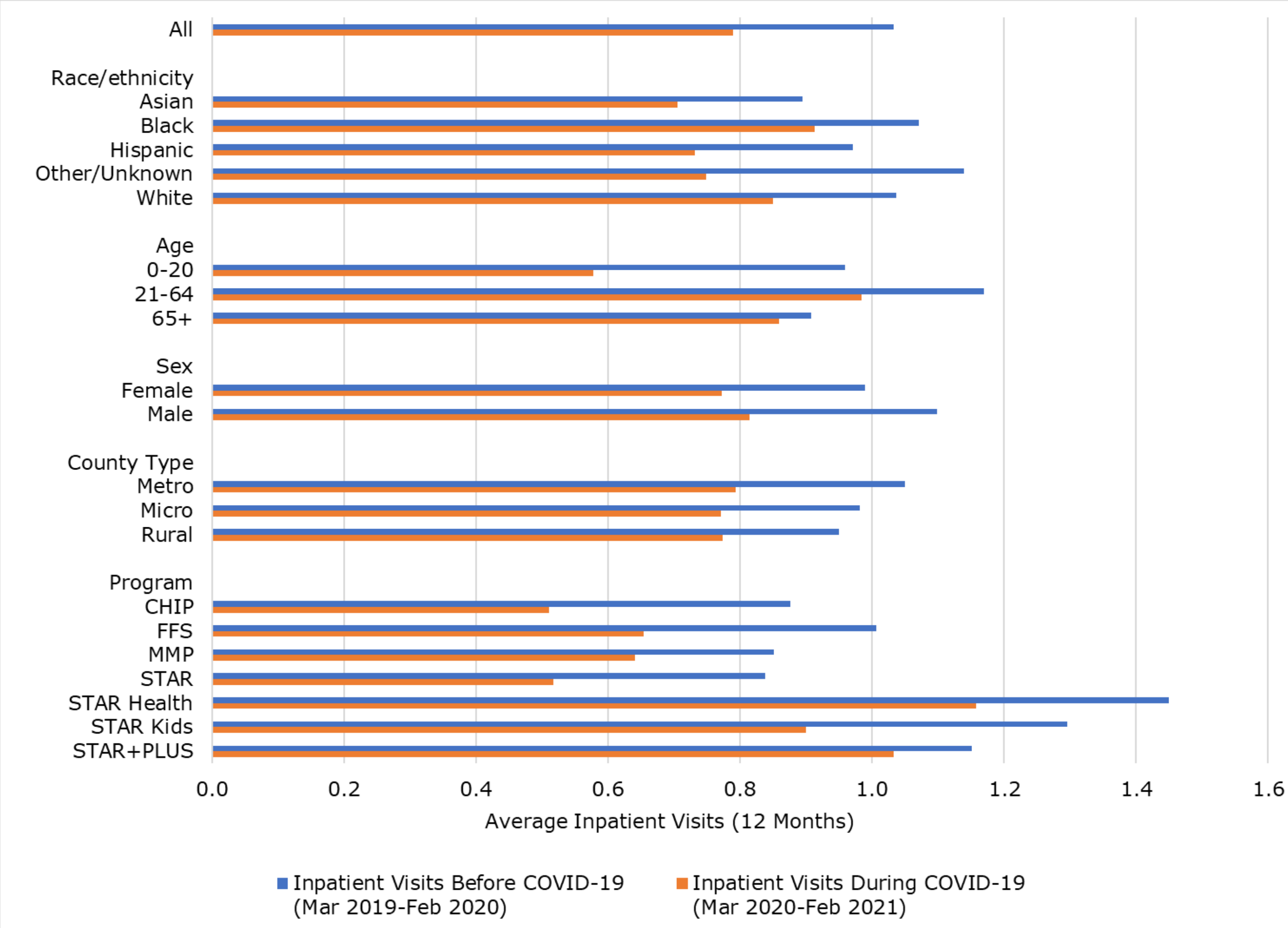
Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28,2021 with at least one ED visit (N=1,248,390). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

Inpatient Hospitalizations

This study examines inpatient hospitalizations for continuously enrolled Texas Medicaid and CHIP clients with at least one inpatient stay (N=234,307) for any reason (including COVID-19) from March 2019 to February 2021. Figure 44 shows the average number of inpatient hospitalizations for each client group one year before and one year after the arrival of COVID-19 in Texas. Overall, inpatient hospitalizations declined after the onset of COVID-19. From the year before the pandemic through the end of its first year, the average number of inpatient stays among clients with an inpatient hospitalization fell from 1.03 to 0.79 (statistically significant; $p<0.001$).

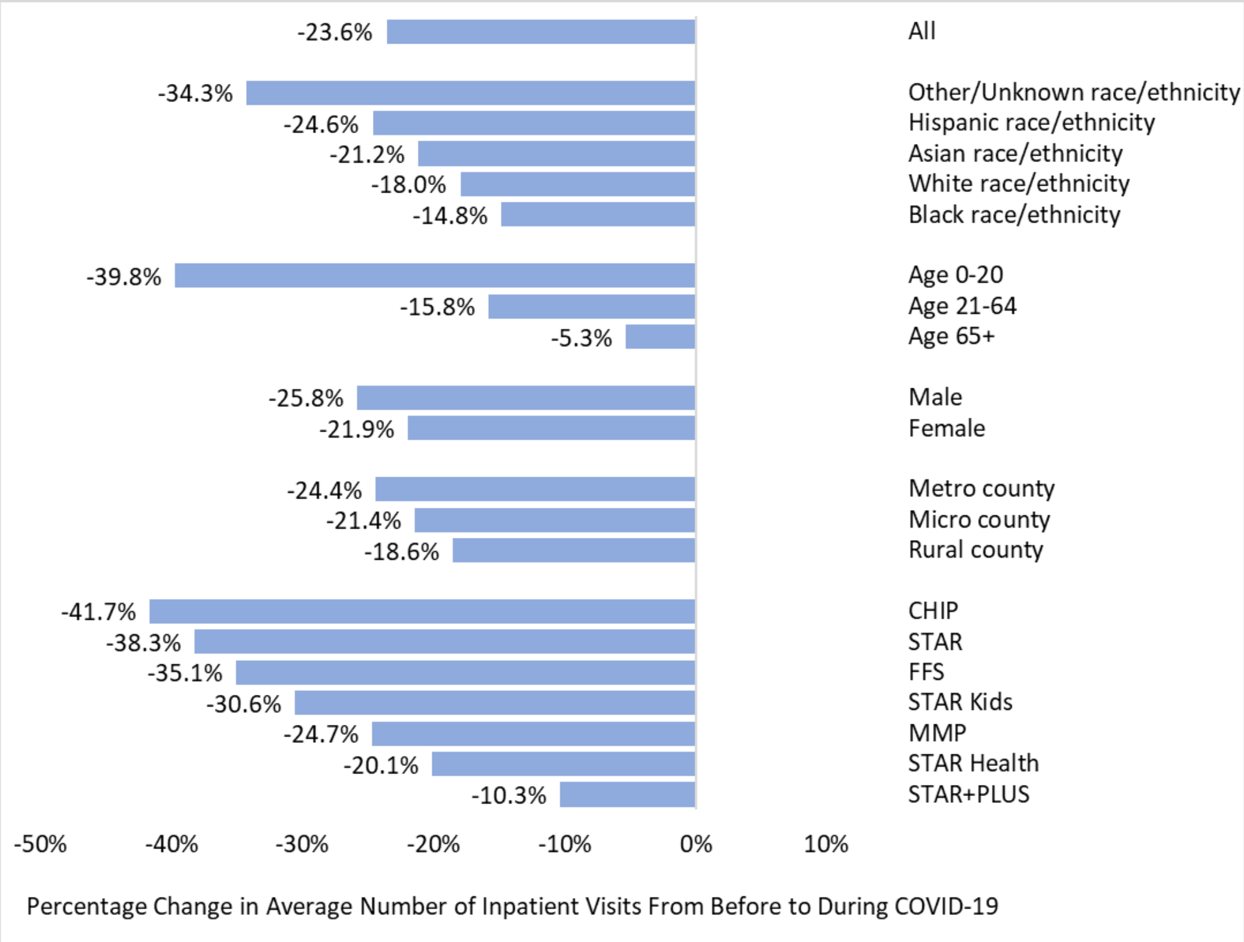
Utilization of inpatient services decreased among all client groups. These changes can be seen in the average number of inpatient hospitalzations per group [Figure 44] as well as in the percentage change in inpatient utilization per group [Figure 45]. Within each domain, the largest percentage decline in average number of inpatient hospitalizations was seen among individuals with Other/Unknown race/ethnicity; individuals under age 21; males; individuals living in metro counties; and individuals enrolled in CHIP and STAR [Figure 45]. In percentage terms, individuals ages 65 and older had the smallest decline in inpatient hospitalizations, reducing their average number of visits by only 5 percent after the onset of COVID-19. See Appendix J for detailed results.

Figure 44. Average number of inpatient hospitalizations before and during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28, 2021 with at least one inpatient hospitalization (N=234,307). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

Figure 45. Percentage change in average number of inpatient hospitalizations from before to during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28,2021 with at least one inpatient hospitalization (N=234,307). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

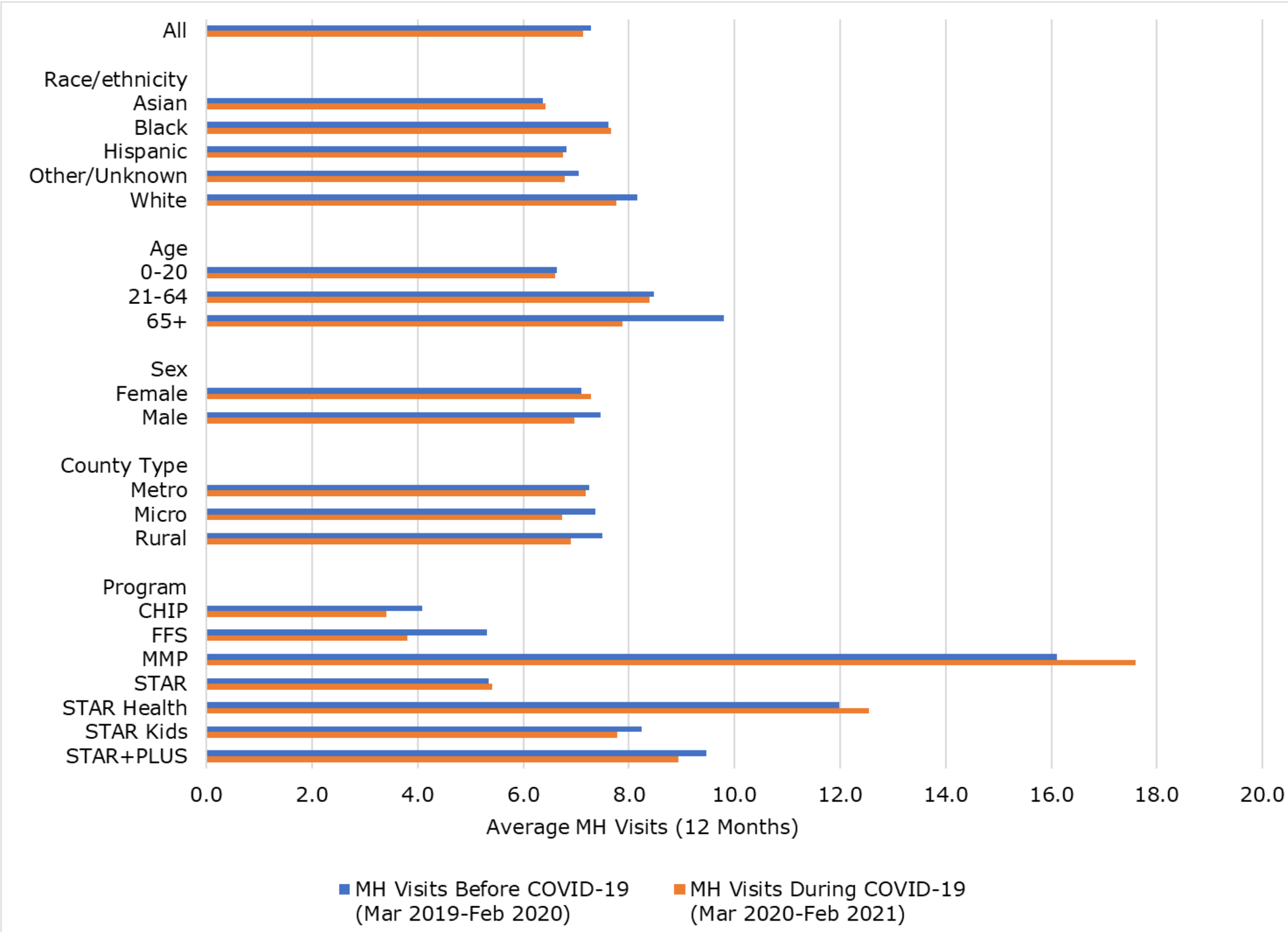
Mental Health Visits

This study examines MH utilization for continuously enrolled Texas Medicaid and CHIP clients with at least one MH visit (N=371,101) for any reason from March 2019 to February 2021. Figure 46 shows the average number of MH visits for each client group one year before and one year after the arrival of COVID-19 in Texas. Overall, MH utilization declined after the onset of COVID-19. From the year before the pandemic through the end of its first year, the average number of MH visits among clients with an MH visit fell from 7.28 to 7.13 (statistically significant; $p<0.001$).

Utilization of MH visits decreased for some client groups and increased for others. These changes can be seen in the average number of MH visits per group [Figure 46] as well as in the percentage change in MH utilization per group [Figure 47]. Within each domain, the largest percentage decline in average number of MH visits was seen among White clients; individuals ages 65 and older; males; clients living in micro counties; and clients enrolled in FFS[23] and CHIP [Figure 47]. Some demographic groups had higher MH utilization during COVID-19, however, including Asian and Black clients; females; and clients enrolled in STAR, STAR Health, and Medicare-Medicaid Plan (MMP). Individuals enrolled in MMP, the program for clients dually eligible for Medicare and Medicaid, had the largest percentage increase in MH utilization during the first year of COVID-19 (9 percent). See Appendix J for detailed results.

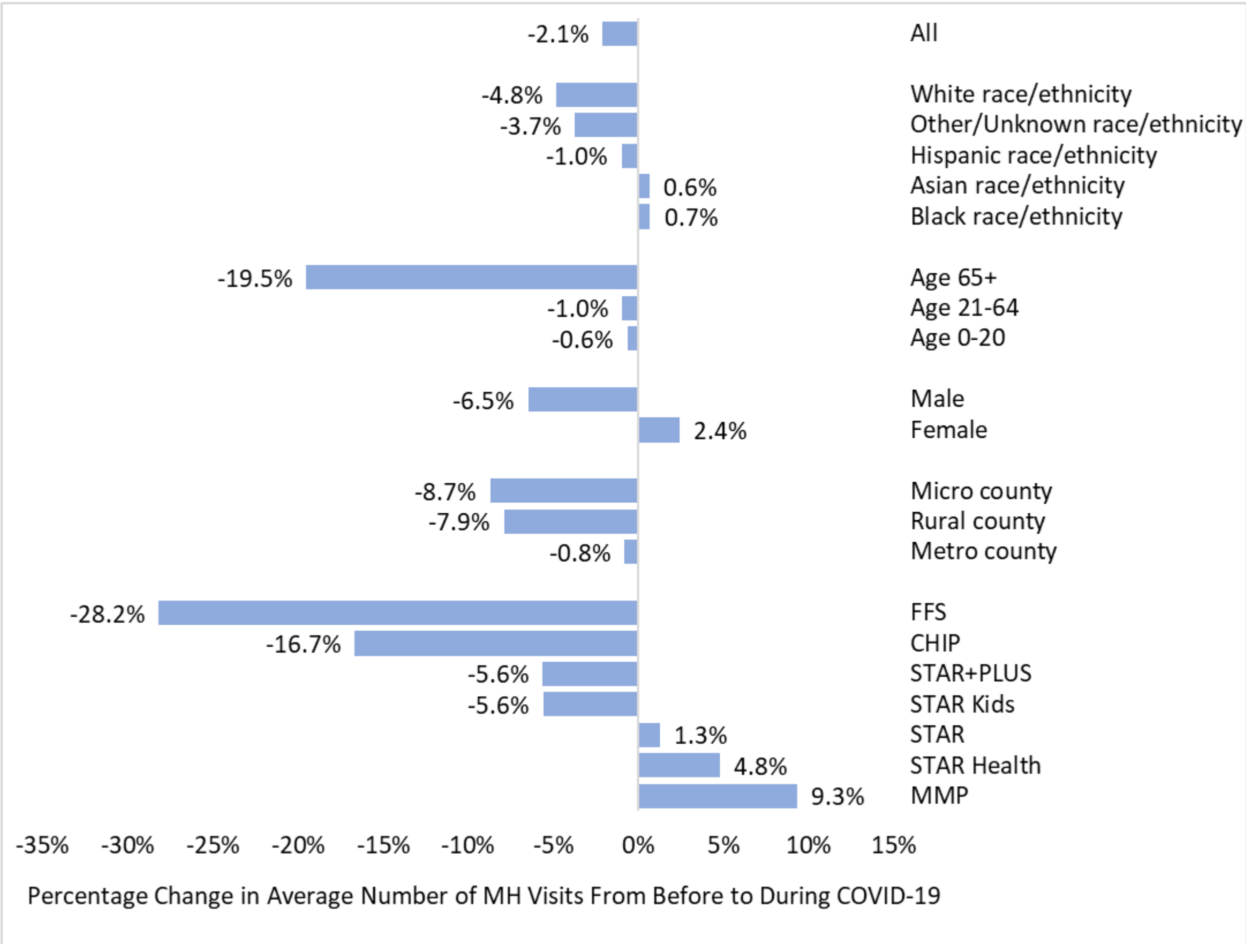
[23] Individuals categorized as FFS Medicaid clients in this study are predominantly enrolled in a Partial Benefits Medicare category or a Medicaid waiver for LTSS, such as CLASS, DBMD, HCS, or TxHmL.

Figure 46. Average number of MH visits before and during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28, 2021 with at least one MH visit (N=371,101). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

Figure 47. Percentage change in average number of MH visits from before to during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28,2021 with at least one MH visit (N=371,101). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

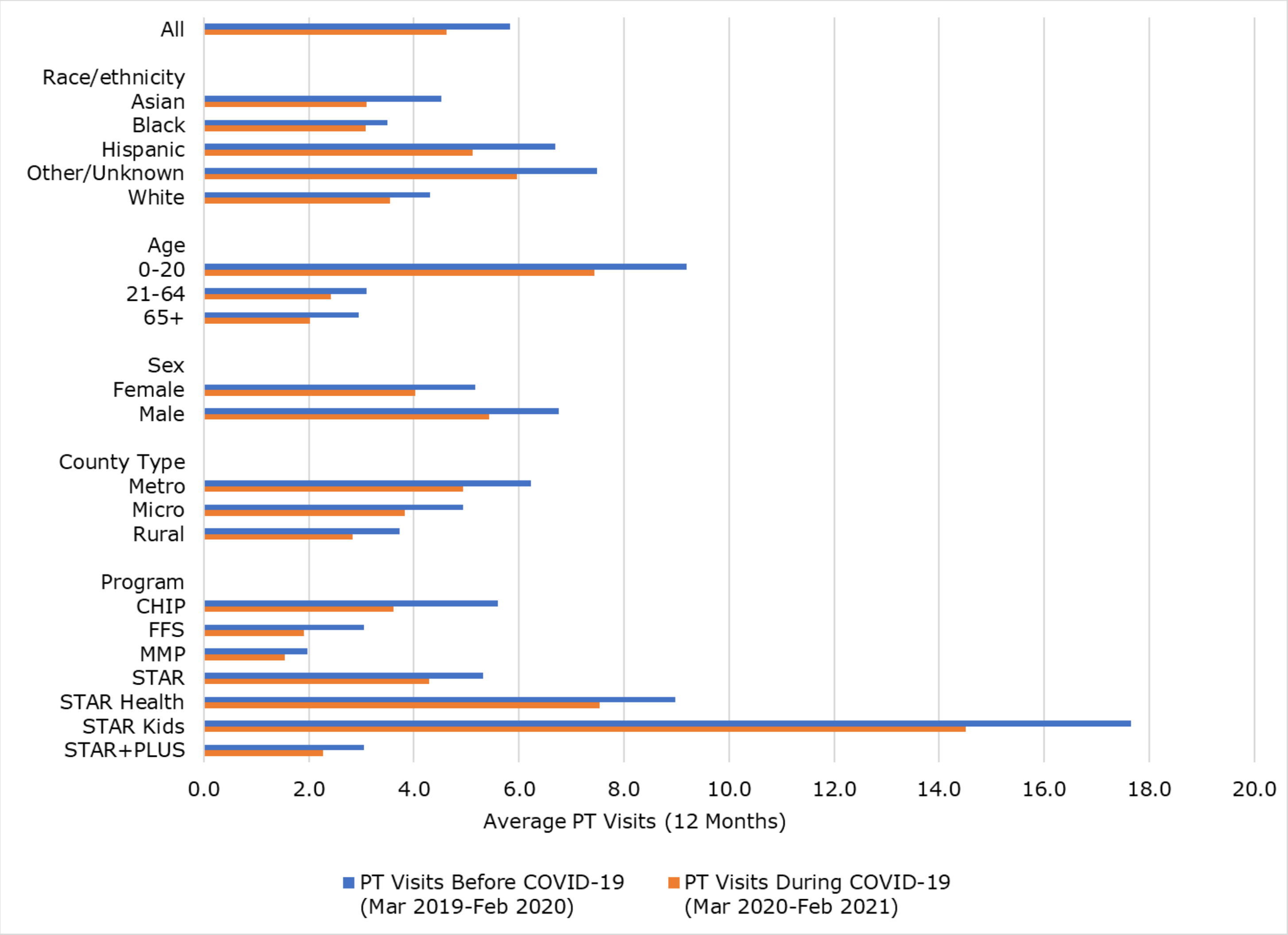
Physical Therapy Visits

This study examines PT utilization for continuously enrolled Texas Medicaid and CHIP clients with at least one PT visit (N=153,985) from March 2019 to February 2021. Figure 48 shows the average number of PT visits for each client group one year before and one year after the arrival of COVID-19 in Texas. Overall, PT utilization declined after the onset of COVID-19. From the year before the pandemic through the end of its first year, the average number of PT visits among clients with a PT visit fell from 5.84 to 4.61 (statistically significant; $p<0.001$).

Utilization of PT services decreased among all client groups. These changes can be seen in the average number of PT visits per group [Figure 48] as well as in the percentage change in PT utilization per group [Figure 49]. Within each domain, the largest percentage decline in average number of PT visits was seen among Asian clients; individuals ages 65 and older; females; individuals living in rural counties; and individuals enrolled in FFS[24] and CHIP [Figure 49]. See Appendix J for detailed results.

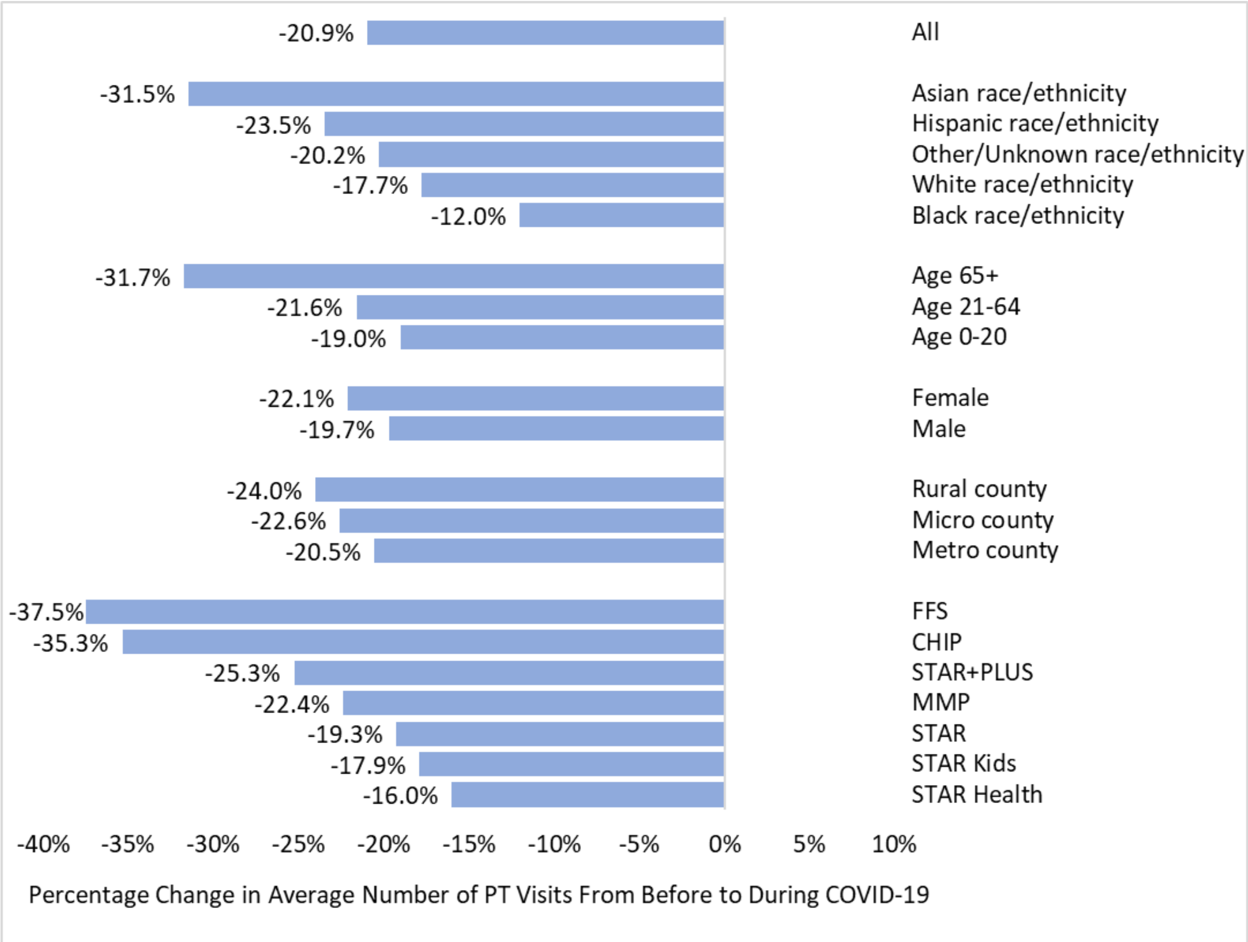
[24] Individuals categorized as FFS Medicaid clients in this study are predominantly enrolled in a Partial Benefits Medicare category or a Medicaid waiver for LTSS, such as CLASS, DBMD, HCS, or TxHmL.

Figure 48. Average number of PT visits before and during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28, 2021 with at least one PT visit (N=153,985). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

Figure 49. Percentage change in average number of PT visits from before to during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28,2021 with at least one PT visit (N=153,985). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

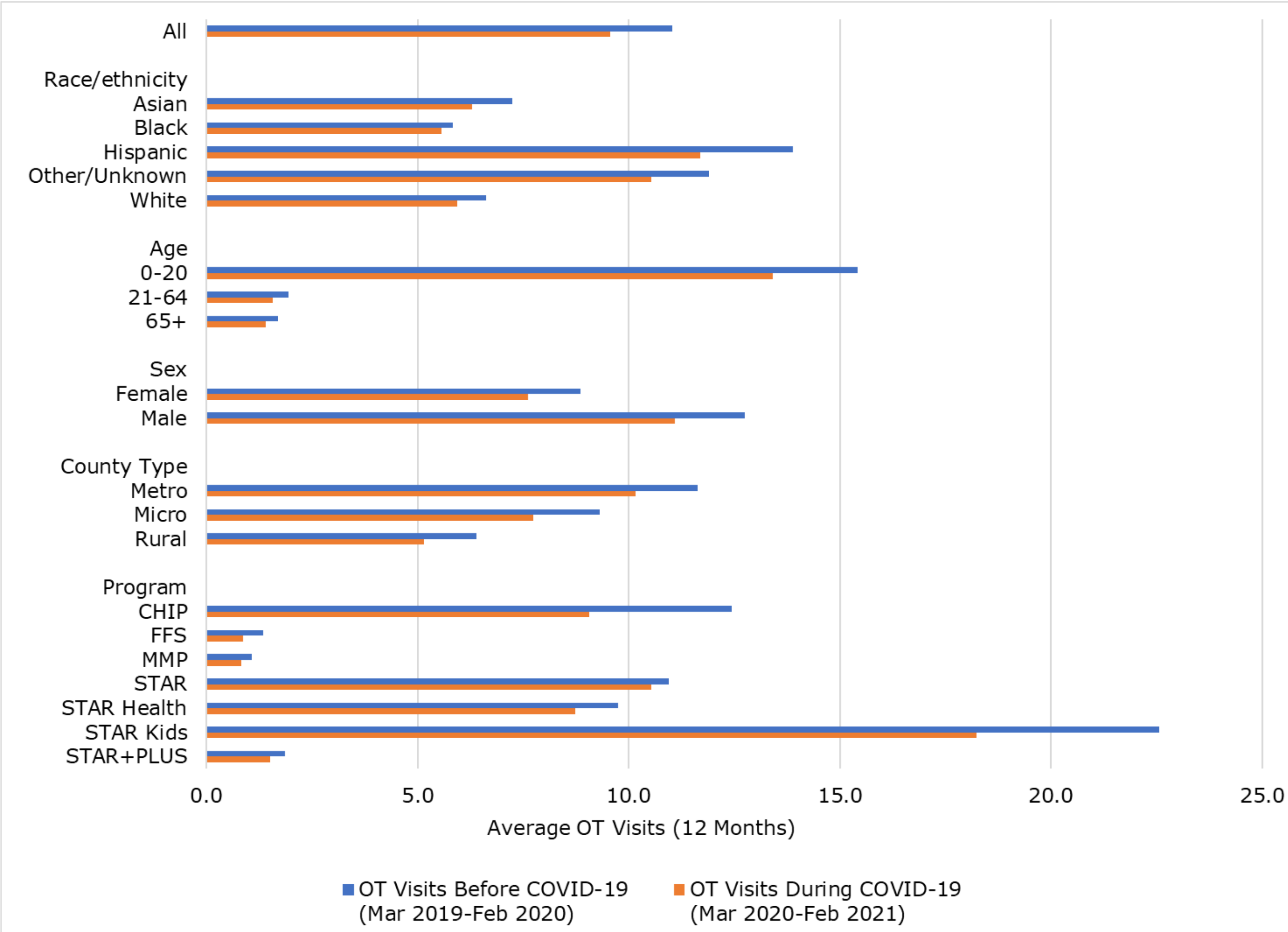
Occupational Therapy Visits

This study examines OT utilization for continuously enrolled Texas Medicaid and CHIP clients with at least one OT visit (N=100,023) from March 2019 to February 2021. Figure 50 shows the average number of OT visits for each client group one year before and one year after the arrival of COVID-19 in Texas. Overall, OT utilization declined after the onset of COVID-19. From the year before the pandemic through the end of its first year, the average number of OT visits among clients with an OT visit fell from 11.03 to 9.56 (statistically significant; $p<0.001$).

Utilization of OT services decreased among all client groups. These changes can be seen in the average number of OT visits per group [Figure 50] as well as in the percentage change in OT utilization per group [Figure 51]. Within each domain, the largest percentage decline in average number of OT visits was seen among Hispanic clients; individuals ages 21-64; females; individuals living in rural counties; and individuals enrolled in FFS[25] and CHIP [Figure 51]. In percentage terms, individuals enrolled in STAR had the smallest decline in OT utilization, reducing their average number of visits by only 4 percent after the onset of COVID-19. See Appendix J for detailed results.

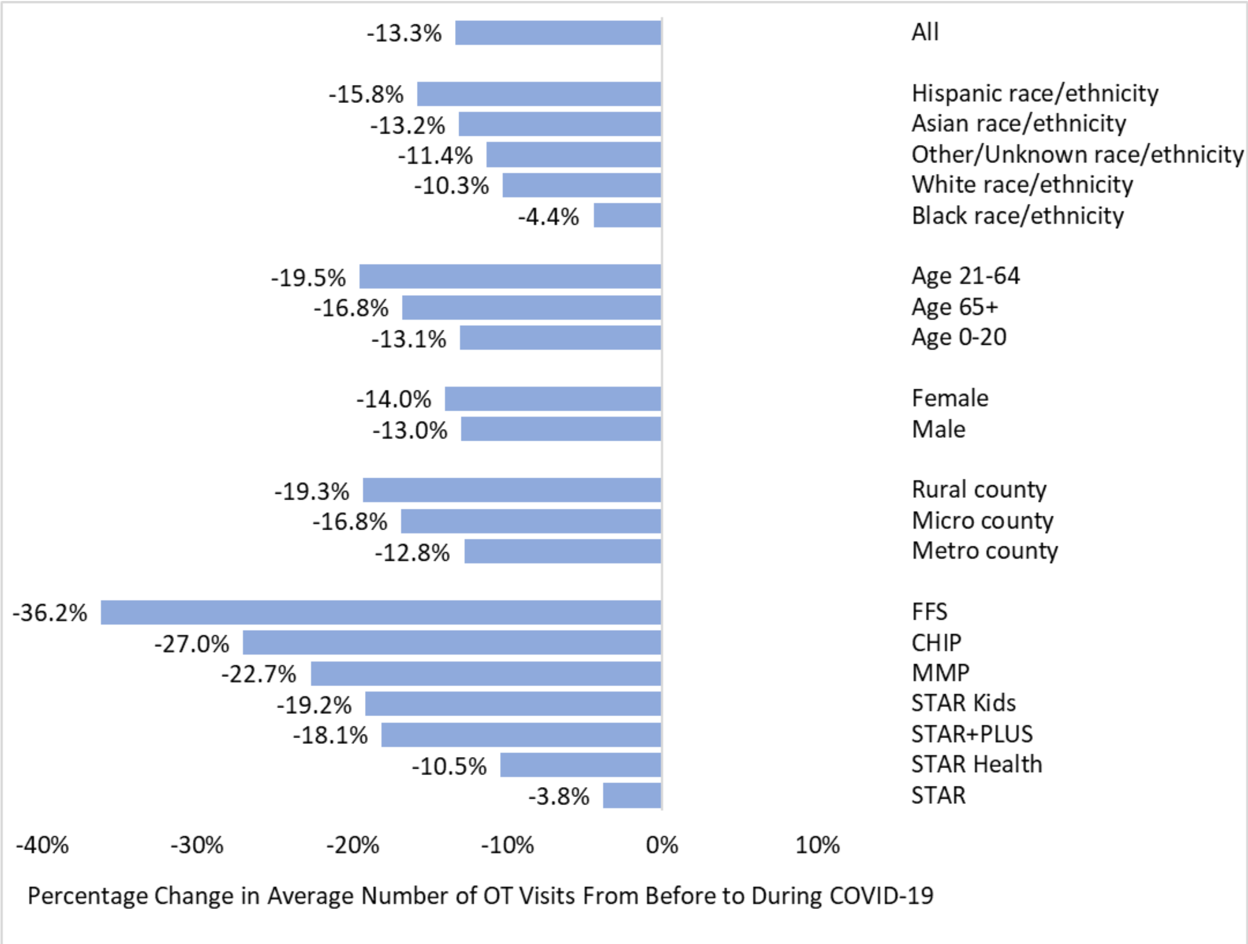
[25] Individuals categorized as FFS Medicaid clients in this study are predominantly enrolled in a Partial Benefits Medicare category or a Medicaid waiver for LTSS, such as CLASS, DBMD, HCS, or TxHmL.

Figure 50. Average number of OT visits before and during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28, 2021 with at least one OT visit (N=100,023). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

Figure 51. Percentage change in average number of OT visits from before to during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28,2021 with at least one OT visit (N=100,023). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

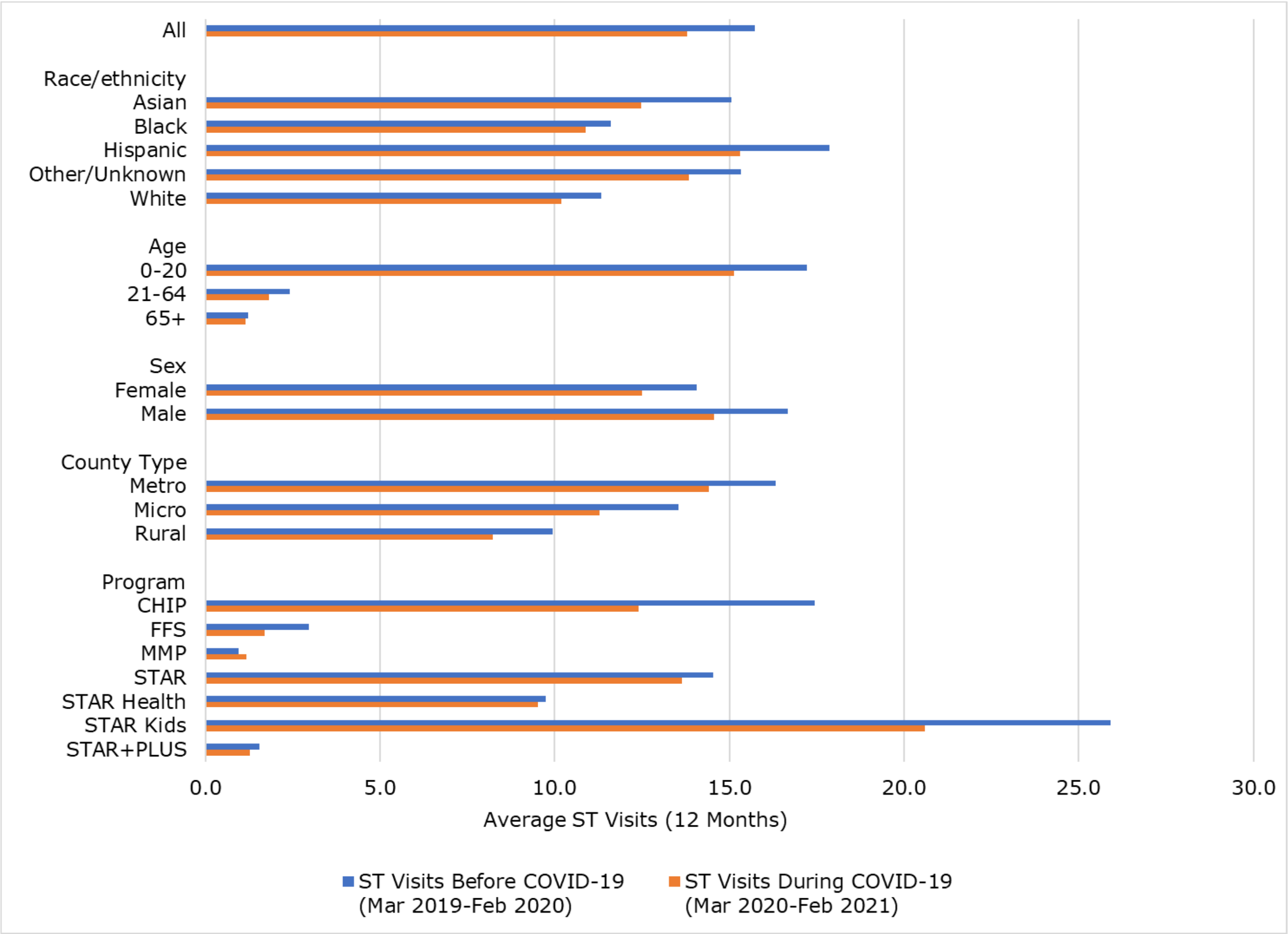
Speech Therapy Visits

This study examines ST utilization for continuously enrolled Texas Medicaid and CHIP clients with at least one ST visit (N=140,981) from March 2019 to February 2021. Figure 52 shows the average number of ST visits for each client group one year before and one year after the arrival of COVID-19 in Texas. Overall, ST utilization declined after COVID-19. From the year before the pandemic through the end of its first year, the average number of ST visits among clients with an ST visit fell from 15.73 to 13.81 (statistically significant; $p<0.001$).

Utilization of ST services decreased among all client groups except those enrolled in MMP. These changes can be seen in the average number of ST visits per group [Figure 52] as well as in the percentage change in ST utilization per group [Figure 53]. Within each domain, the largest percentage decline in average number of ST visits was seen among Asian clients; individuals ages 21 to 64; males; individuals residing in rural counties; and individuals enrolled in FFS[26] and CHIP [Figure 53]. Individuals enrolled in MMP, the program for clients dually eligible for Medicare and Medicaid, was the only group to increase their ST utilization during the first year of COVID-19; clients enrolled in MMP increased their average number of ST visits per year from 0.96 to 1.18, a difference of 23 percent. See Appendix J for detailed results.

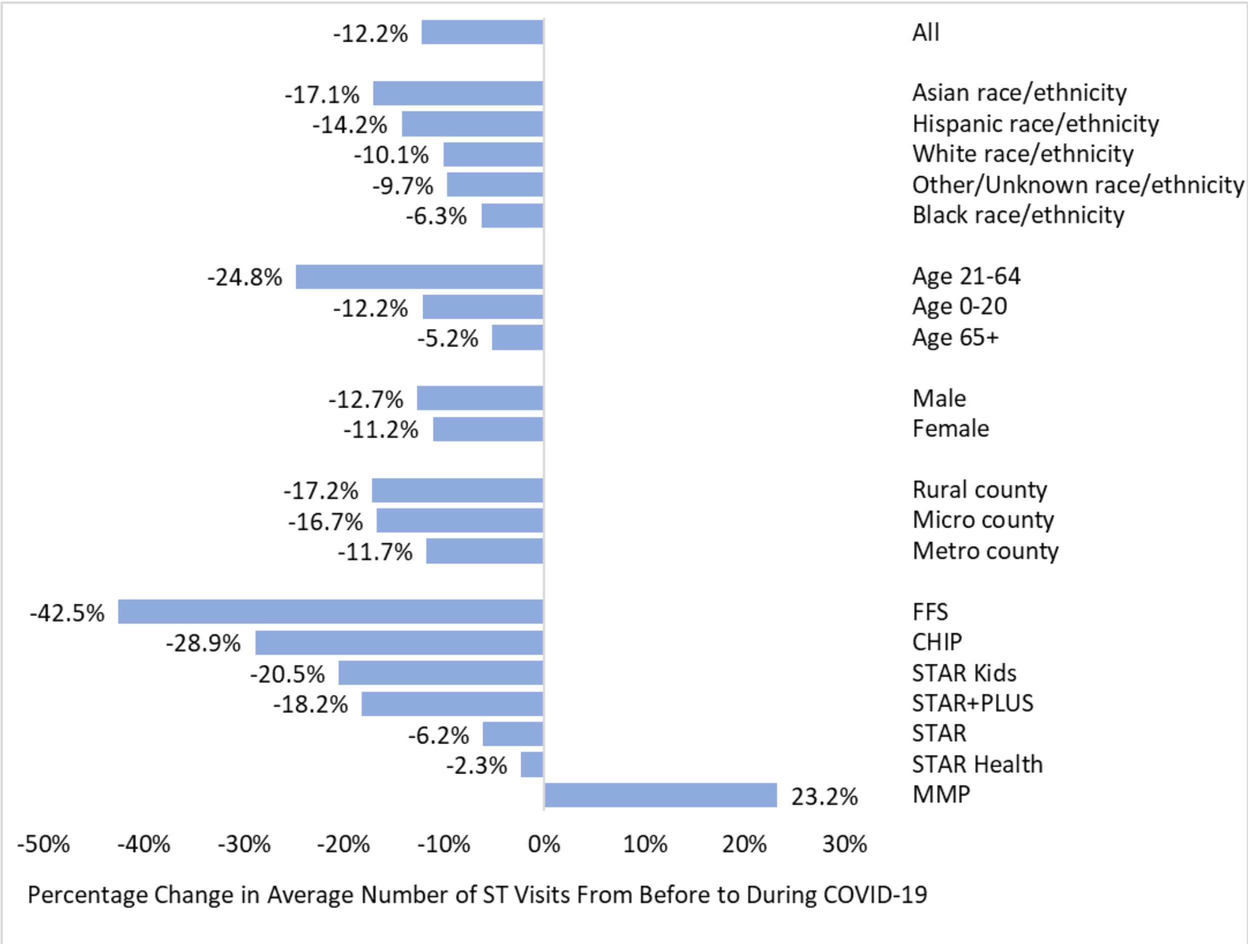
[26] Individuals categorized as FFS Medicaid clients in this study are predominantly enrolled in a Partial Benefits Medicare category or a Medicaid waiver for LTSS, such as CLASS, DBMD, HCS, or TxHmL.

Figure 52. Average number of ST visits before and during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28, 2021 with at least one ST visit (N=140,981). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

Figure 53. Percentage change in average number of ST visits from before to during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28,2021 with at least one ST visit (N=140,981). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes most recent date of service as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

Well-Child Visits

This analysis compares two independent cross-sections of Medicaid/CHIP clients under age 21 to determine whether utilization of well-child visits changed after the onset of COVID-19. This methodology differs from the utilization analyses presented above, which each examine a single group of clients continually enrolled throughout the study period. The reason for this difference in methodology is that the annual number of EPSDT checkups recommended in the Medicaid program for children (referred to as the "periodicity schedule") varies by age group.[27] Because it

[27] This study expands the study population to include CHIP clients using the same methodology and periodicity schedule.

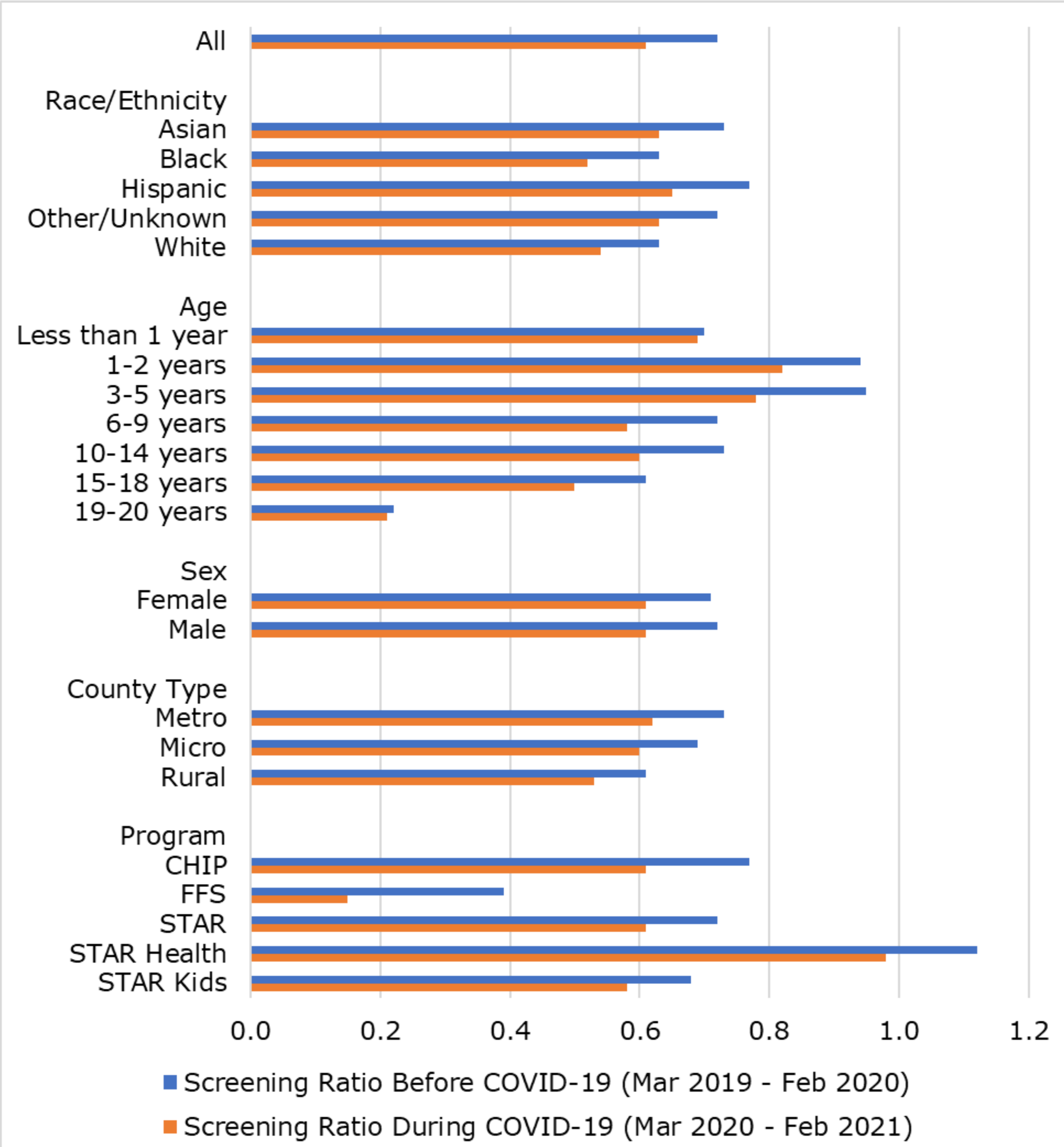
is recommended that newborns and younger children receive checkups more frequently than older children, the analysis could not follow the same individuals over time to determine whether utilization of well-child visits changed. Instead, this analysis identified two separate groups of children enrolled for 90 continuous days on either side of the COVID-19 pandemic and compared their utilization of well-child visits.

Figure 54 shows the ratio of the number of well-child visits completed to the number of well-child visits expected; the ratio is shown for a similar cohort of clients before and during COVID-19. A screening ratio of 1 would indicate a subgroup is receiving all required screenings; screening ratios above 1 signal higher than expected numbers of screenings, while screening ratios below 1 signal lower than expected numbers of screenings. The ratio accounts for differing patterns of enrollment and the requirements for scheduling a checkup, which vary by age of the client.

Overall, screening ratios declined after the onset of COVID-19. The largest decline in screening ratios was observed among Black and Hispanic clients, males, clients living in metro areas, and clients enrolled in CHIP or FFS. Well-child visits for all age groups declined; however, clients under age 1 appear to have been less impacted by the pandemic. Newborns maintained similar screening ratios across the two cohorts. Clients in the oldest age group also recorded minimal declines in screening ratios during the pandemic, however, this group has historically had lower screening ratios than other groups.

For additional detail regarding the methodology and findings related to well-child visits, please see Appendix J.

Figure 54. Well-child screening ratios before and during COVID-19, by client characteristics



Data Source: HHSC, AHQP Claims Universe, Encounters Best Picture Universe, TMHP. Analysis by HHSC-DAP.

Note: Before COVID-19 period is 3/1/19 – 2/29/20. (N=3,874,123); During COVID-19 period is 3/1/20-2/28/21 (N=3,931,195). Screening ratio is the actual number of well-child visits received to the number of visits expected, by age, prorated by the proportion of the year for which clients were enrolled. Inclusion in the before and during COVID-19 periods was determined independently and based on having 90-day continuous enrollment during that period; some clients are included in both periods. Age categories are based on client's age as of February 1 of each period. Method adapted from CMS-416 Reporting instructions. See Appendix D for Medicaid/CHIP program definitions.

Because some of the recommended screenings, such as immunizations and physical exams, require an in-person visit, this study also examined differences in six independently reimbursable screenings: MH screening, tuberculin skin tests, developmental and autism screening, vaccine administration, and oral evaluation and fluoride varnish (OEFV). Results indicate that all six well-child screenings requiring in-person visits declined during the first year of COVID-19; however, the largest drop was observed for tuberculin skin tests, which declined by a total of 36 percent [Appendix J].

Discussion

Nationwide studies have recorded declines in health care utilization among the general population, especially during the first year of the pandemic (Birkmeyer, Barnato, Birkmeyer, Bessler, & Skinner, 2020; Harnett, et al., 2020). In this section, we analyzed service utilization for a continuously enrolled population of Medicaid/CHIP clients before and during the pandemic. The results echo national studies, showing declines in utilization across all service categories during the first year of the pandemic, including ED visits, inpatient visits, MH visits, OT, PT, ST, and well-child visits. Other studies have also shown declines in related ED and inpatient measures among Texas Medicaid recipients in 2020 (Texas Healthcare Learning Collaborative, n.d.).

Though utilization rates declined across all services, some groups experienced larger declines than others depending on the service category. In general, Asian and Hispanic clients tended to experience the largest declines in utilization, except for utilization of MH services, where White clients saw the largest reduction. Black clients, in contrast, usually had the smallest declines in utilization after the onset of COVID-19. Younger groups tended to reduce their number of ED visits and inpatient hospitalizations, while older groups tended to reduce utilization of MH and PT services. Across the state, clients in metro regions saw larger percentage declines in utilization of ED visits and hospitalizations while clients in rural regions tended to reduce their utilization of PT, OT, and ST services. Though utilization changes by Medicaid program varied by service category, clients enrolled in CHIP and FFS[28] had the largest percentage declines across most services.

In most cases, utilization of critical services by populations with complex medical needs remained high, despite declines during the first year of the pandemic (e.g., STAR Kids members continued to utilize PT, OT, and ST services at relatively high

[28] Individuals categorized as FFS Medicaid clients in this study are predominantly enrolled in a Partial Benefits Medicare category or a Medicaid waiver for LTSS, such as CLASS, DBMD, HCS, or TxHmL.

rates). In some cases, clients experienced increased utilization during the pandemic, but only for certain services and certain subgroups. MH services, for example, increased during the first year of pandemic for clients who were Asian, Black, or female; Clients enrolled in MMP, STAR, or STAR Health also had higher utilization of MH services during COVID-19.

Utilization of Teleservices

A critical component to responding to the PHE involved expanding the use of teleservices. Teleservices played a pivotal role in supporting continuity of care during the early phases of the pandemic when social distancing and other preventive measures were central to reducing viral exposure. For the purposes of this study, teleservices are defined as health care services delivered to a patient via telemedicine (physician services) or telehealth (healthcare professional services) by a provider at a different physical location.[29] Importantly, teleservices are characterized as a modality rather than a service; clients may receive different types of services through teleservices.

The federal government implemented temporary measures under the COVID-19 PHE to expedite the adoption and awareness of teleservice utilization. In addition, HHSC expanded coverage of telemedicine, telehealth, and other telecommunications technologies for many Medicaid services during this time. These flexibilities are comprehensive, covering acute care, behavioral health, and LTSS and apply to both managed care organization (MCO) functions (e.g., the use of telecommunications to conduct service coordination) and provider services (i.e., telemedicine and telehealth), so long as they are delivered in accordance with the healthcare provider's licensure. HHSC also implemented new telephonic procedure codes during the PHE.[30] In 2021, the Texas legislature advanced these efforts through the passage of HB 4 (87th Legislature, Regular Session, 2021), which supports a more permanent expansion of teleservices in Medicaid/CHIP.

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[29] Telemedicine medical ("telemedicine") services are defined in Texas statute as healthcare services delivered by a physician or a health professional under physician delegation and supervision to a patient at a different physical location using telecommunications or information technology. Telehealth services are defined in Texas statute as healthcare services delivered by a non-physician health professional to a patient at a different physical location using telecommunications or information technology. Medicare, however, does not differentiate between telemedicine (physician services) and telehealth (healthcare professional services). For the purposes of this report, the term "teleservices" refers to both telemedicine and telehealth services, as well as "audio-only" services using interactive two-way audio communications. Telemonitoring is not included.

[30] For more information, please refer to Medicaid and CHIP Services Information for Providers.

This analysis examines how utilization of teleservices and in-person visits changed during the first year of the pandemic. Drawing on a cohort of 2.78 million Medicaid and CHIP clients with at least one paid claim or encounter, and continuously enrolled from March 1, 2019 to February 28, 2021, the analysis examines the association between changes in teleservice and in-person utilization by client characteristics. Additional information about study methodology is provided in Appendix K.

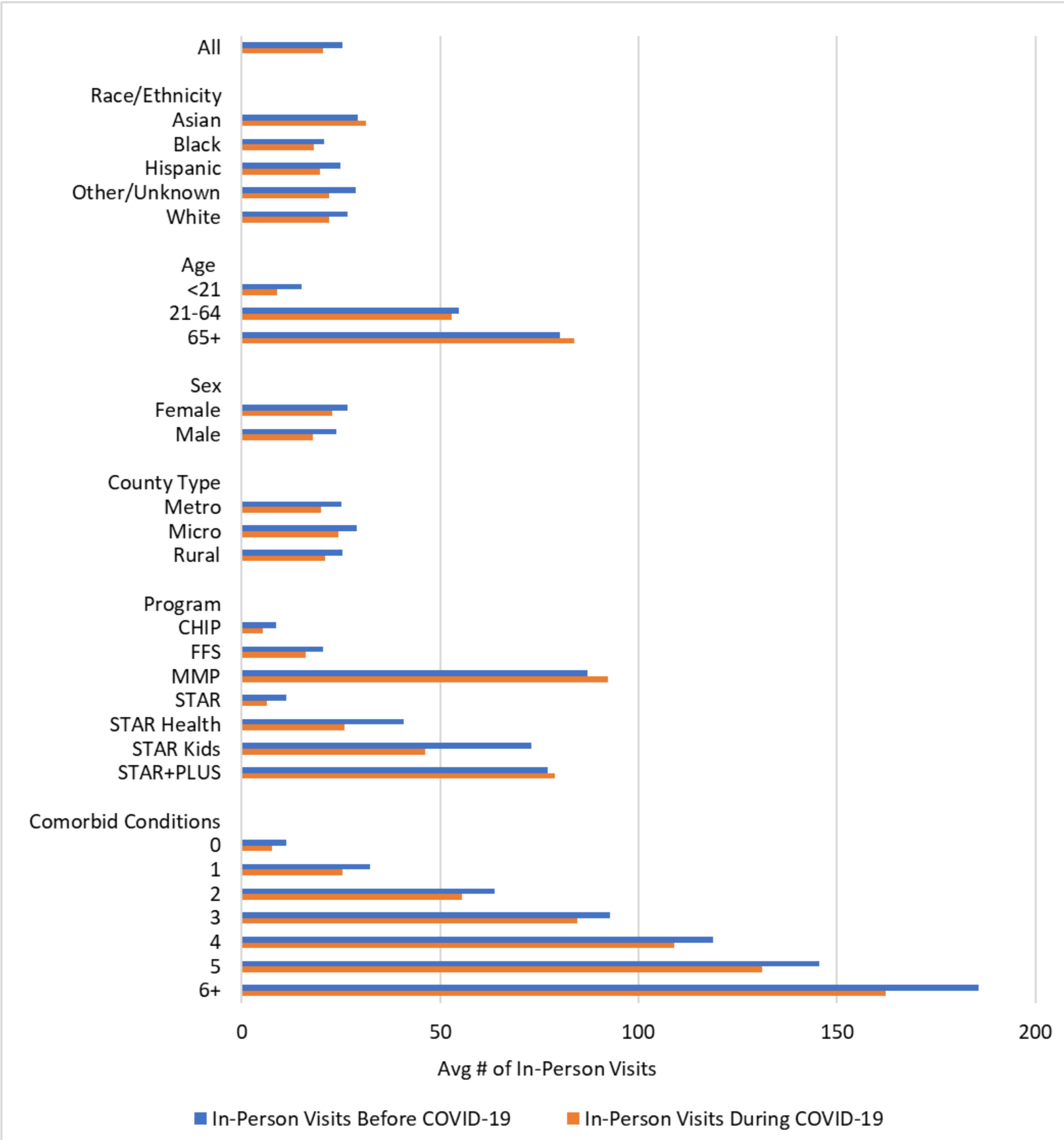
Results

During the first year of the PHE, Medicaid and CHIP clients shifted their utilization away from in-person visits and towards teleservices. From the year before the pandemic through the end of its first year, the average number of in-person visits fell from 25 to 20 (statistically significant; $p<0.001$). During the same time, the average number of teleservice visits increased from zero to two (statistically significant; $p<0.001$).

Figure 55 shows in-person visits declined the most for individuals with Hispanic or Other/Unknown race/ethnicity, children ages 20 and younger; males; individuals living in metro counties; individuals enrolled in STAR, STAR Health, STAR Kids, or CHIP; and individuals with zero comorbidities. In-person visits increased during the first year of the pandemic for Asian clients; individuals over 65; and individuals enrolled in STAR+PLUS and MMP.

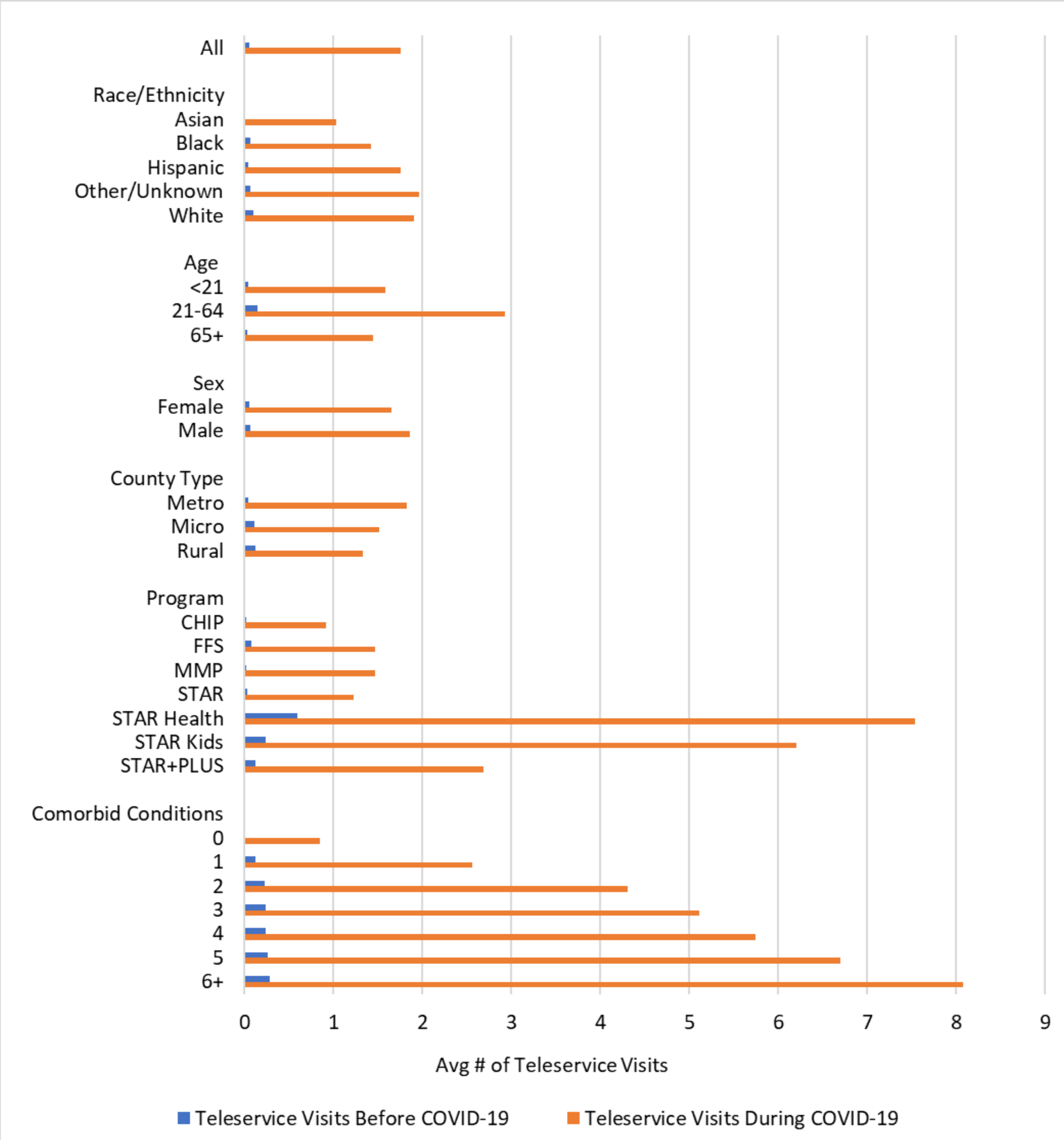
Utilization of teleservices increased among all client groups. Figure 56 shows that in the year before the pandemic, no client group averaged more than one teleservice visit; during the first year of COVID-19, however, all groups averaged more than one teleservice visit except for clients enrolled in CHIP and those with zero comorbidities. The highest teleservice utilization during the first year of COVID-19 was observed among clients enrolled in STAR Health and STAR Kids and individuals with more comorbidities. Much like the number of in-person visits, the average number of teleservice visits increases with the number of comorbidity categories an individual has.

Figure 55. Number of in-person visits before and during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28, 2021 with at least one paid claim or encounter (N=2,780,816). Visits defined as unique combinations of claim numbers, dates of service, and Medicaid IDs. Multiple claims per day per individual were counted as separate visits. Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes February 2020 as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

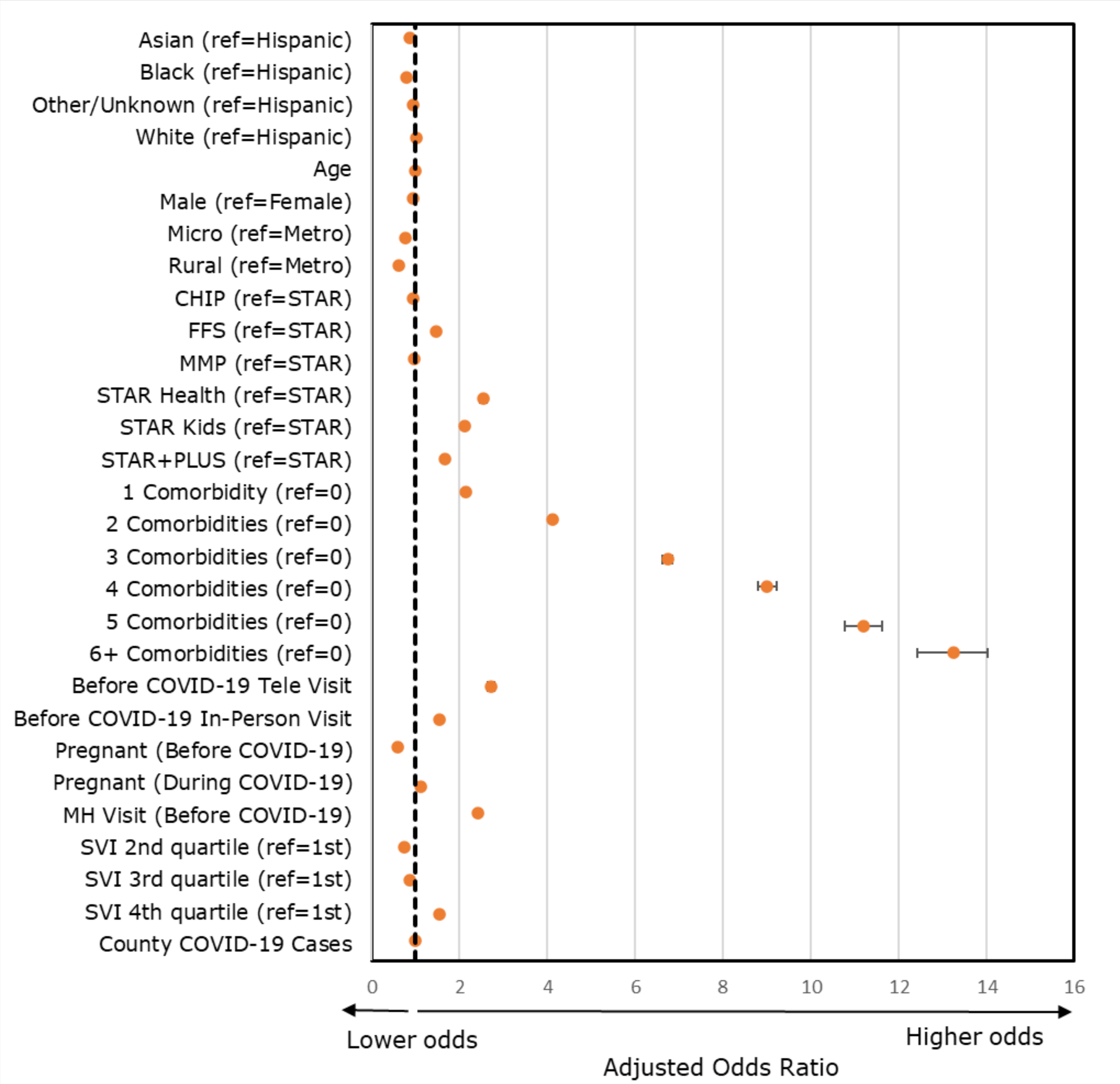
Figure 56. Number of teleservice visits before and during COVID-19, by client characteristics



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28, 2021 with at least one paid claim or encounter (N=2,780,816). Visits defined as unique combinations of claim numbers, dates of service, and Medicaid IDs. Multiple claims per day per individual were counted as separate visits. Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Analysis utilizes February 2020 as the anchor month for client demographic, geographic, and program characteristics. See Appendix D for Medicaid/CHIP program definitions.

Analysts also conducted a multivariate analysis to understand the association between PHE teleservice utilization and client characteristics, while accounting for teleservice and face-to-face utilization before the PHE as well as a range of demographic, geographic, medical, and program characteristics. Figure 57 shows that continuously enrolled Medicaid clients were significantly more likely to have a telehealth visit during the PHE if they had a telehealth or in-person visit in the year before the pandemic, were Hispanic, female, or enrolled in FFS, STAR Health, STAR Kids, or STAR+PLUS (as compared to STAR). They were also more likely to have a telehealth visit during the PHE if they were pregnant or postpartum in that time frame, had a MH visit in the year before COVID-19, had a greater number of comorbidities, lived in a metro county, or lived in a county with a high level of social vulnerability, all else constant. The strongest predictor of PHE teleservice utilization was having a high number of comorbidities; individuals with conditions in six or more comorbidity categories had 13 times higher odds of utilizing teleservices during the first year of the pandemic, all else constant. See Appendix K for detailed results.

Figure 57. Factors predicting teleservices utilization during COVID-19



Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28, 2021 with at least one paid claim or encounter (N=2,780,816). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. Model includes 24,450 pregnant or postpartum clients; not all pregnant or postpartum clients served by HHSC are not included due to continuous enrollment criteria applied in this study.

Note: Logistic Regression Model predicting utilization of any teleservice between 3/1/20 and 2/28/21. Maximum Likelihood Estimation. Odds ratio and confidence intervals shown. Missing or unknown Sex not shown (n=94). Missing or unknown county type (n=239) not included. Model utilizes February 2020 as the anchor month for client demographic, geographic, and program characteristics. Age included as a continuous variable. Pre-COVID-19 teleservice visit and Pre-COVID-19 in-person visit coded as dummy variables. SVI ranking is a percentile rank variable divided into quartiles, with the 1st quartile being the lowest social vulnerability and the 4th quartile being the highest. County COVID-19 cases reflect a cumulative count of confirmed COVID-19 cases by county through March 2021. See Appendix D for Medicaid/CHIP program definitions.

Conclusion

This report provides results from some 30 distinct studies on the impact of COVID-19 on vulnerable populations in Texas. Together, these studies explored how the pandemic affected Texans of different ages, race/ethnicities, and geographies; a number of studies also considered the role of individual sex, pre-existing conditions, Medicaid population group, and community-level social vulnerability. In addition to the direct impacts of the virus, analysts examined the indirect ramifications of COVID-19, including how the pandemic affected program enrollment and health care utilization in HHSC programs.

Who received COVID-19 testing

Over 11 million people were tested for COVID-19 in Texas from March 1, 2020, to March 31, 2021. COVID-19 testing was often highest among 21- to 64-year-olds in the general population, followed by individuals 65 and older. Individuals ages 20 and younger experienced a surge in testing during the fall of 2020, perhaps as a result of returning to school, and sustained higher levels of testing through the remainder of the first year.

Black populations tended to test for COVID-19 at higher rates than other groups, while testing for White populations lagged behind other groups until the fall of 2020.

Who contracted COVID-19

There were more than 2.7 million COVID-19 cases in Texas from March 1, 2020, to March 31, 2021. COVID-19 case rates were highest during the fall and winter of 2020, and generally shifted from east to west Texas over the course of the first year.

Black Texans were most heavily impacted during the early months of the pandemic, but overall, Hispanic and Other race/ethnicities experienced the highest rates of cases during the study period. In the winter of 2020, coinciding with surges in the West Texas and Panhandle regions, middle-aged Hispanic populations suffered some of the highest case rates in the first year, surpassing all race/ethnicities except for Other. In general, people ages 21 to 64 tended to have higher case rates, though Asian individuals under age 21 in rural counties had the highest case rate during the summer of 2020.

Among Medicaid and CHIP clients, White and Black populations 65 and older tended to have higher case rates. During the winter of 2020, White rural clients ages 65 and older experienced the highest case rate in Medicaid during the first year of the pandemic. White Medicaid clients in rural nursing facilities also saw a rise in cases during the winter of 2020.

Who experienced more severe outcomes from COVID-19, such as hospitalization, ICU admission, and death

From March 1, 2020, through March 31, 2021, there were more than 157,000 people hospitalized and 48,000 deaths associated with the COVID-19 pandemic in Texas, making it the third leading cause of death among Texas residents during this time. Consistent with other studies, this report found individuals 65 and older accounted for a disproportionate share of COVID-19 hospitalizations and deaths. High numbers of comorbidities, however, were often the strongest predictor of hospitalizations, ICU admissions, and in-hospital deaths, surpassing other factors like age, sex, race/ethnicity, and geography.

Apart from the early months of the pandemic, the impact of COVID-19 was felt most acutely by Hispanic populations in the state. In the summer of 2020, Hispanics enrolled in Medicaid/CHIP began to register high rates of emergency room visits and hospitalizations due to COVID-19—a trend that would persist into the fall and winter. Multivariate analysis shows that among clients diagnosed with COVID-19 in Medicaid/CHIP, Hispanics were significantly more likely than White clients to have a COVID-19-related hospitalization, ICU admission, or in-hospital death after controlling for age, sex, county type, and comorbid conditions. Among LTSS populations in Medicaid, Hispanic clients also logged disproportionate rates of COVID-19 diagnoses and hospitalizations. These outcomes were echoed in the general population, where Hispanics hospitalized for COVID-19 had significantly higher odds of ICU admission and in-hospital mortality than White individuals, after controlling for controlling for age, sex, comorbid conditions, and community-level social vulnerability. In the winter of 2020, COVID-19-related fatalities peaked, with the highest death rates among older Hispanic populations in rural counties. Age-adjusted death rates were also highest among Hispanics, particularly in micro and rural counties where Hispanic AADRs were more than twice the state rate. When looking at the cause of death on state death certificates, Hispanic ethnicity emerged as the strongest predictor of having a COVID-19-related death after controlling for the influence of age, sex, and community-level social vulnerability. Altogether, Hispanic populations suffered more than 22,000 COVID-19 related fatalities during the first year of the pandemic, accounting for nearly half of the state total.

Asian clients in Medicaid showed elevated risk of hospitalizations, ICU, and in-hospital death across the first year of the pandemic. The odds of hospitalization among Asian clients diagnosed with COVID-19, for example, was twice that of White clients in Medicaid (and higher than any other race/ethnicity) after controlling for age, sex, comorbidities, and county type.

Though Black populations logged the highest rates of hospitalizations and deaths during the early months of the virus, these differences tempered in later months as hospitalizations and deaths climbed among other groups. Within Medicaid, Black clients receiving LTSS were hospitalized at disproportionate rates. Black individuals in the general population, however, tended to have lower risk of ICU admission and in-hospital mortality after entering the hospital. Black patients admitted to the hospital, for example, had 25 percent lower odds of in-hospital mortality than white patients, controlling for age, sex, comorbidities, and community-level social vulnerability. Nevertheless, Black populations suffered higher age-adjusted death rates than all other race/ethnicities except for Hispanics, regardless of county type.

As COVID-19 cases moved through different areas of the state, severe outcomes generally followed. Over the first year of the pandemic, COVID-19 emerged as the leading cause of death in Public Health Regions 1, 10, and 11 (High Plains, Upper Rio Grande, and Lower South Texas, respectively). Counties with a higher-than-expected number of COVID-19 deaths based on their county-specific age distribution included clusters along the Texas-Mexico border, counties across the west, far west, and Panhandle regions of the state, as well as some parts of east and central Texas. These same counties tended to have higher poverty rates, a greater proportion of Hispanics, and higher levels of community-level social vulnerability as defined by the CDC. Indeed, across studies, counties with higher social vulnerability rankings were nearly always associated with higher odds of ICU admission and death. Among Medicaid and CHIP clients, those living in micro and rural counties were hospitalized at significantly higher rates than those in metro counties, after controlling for demographic and medical characteristics. These patterns were echoed among LTSS populations in Medicaid, where micro and rural counties tended to log disproportionate rates of diagnoses and hospitalizations. Rural counties also had the highest age-adjusted death rates among the general population.

In general, males were more heavily impacted than females across COVID-19 outcomes and study populations. Among those hospitalized for COVID-19, for example, males had 46 percent higher odds of in-hospital mortality after controlling for age, race/ethnicity, comorbidities, and community-level social vulnerability.

How COVID-19 impacted HHSC assistance programs

The pandemic also affected state programs due to changes in the labor market, social distancing measures, and shifting health care concerns. New program enrollment increased during the early months of the pandemic as safety net programs like Medicaid, CHIP, SNAP, and TANF absorbed an influx of newly eligible clients. New program enrollment was heavily concentrated among Hispanic and Black children across programs and periods. In March 2020, Congress passed the FFCRA, which included maintenance of eligibility requirements for individuals enrolled in Medicaid in order for states to qualify for enhanced federal matching funds. Designed to prevent coverage losses during the pandemic, the legislation suspended disenrollment from Medicaid during the term of the PHE. In total, the combined Medicaid/CHIP population grew by almost 820,000 clients between March 2020 and March 2021.

How COVID-19 affected health care utilization in Texas Medicaid and CHIP

The pandemic also drove down health care utilization across a range of services in Medicaid and CHIP, though some vulnerable populations continued to seek MH services, ST services, well-child visits, and other necessary services. Utilization of teleservices, however, played a crucial role in mitigating the drop in in-person visits. Teleservices increased for all client groups during the first year of the pandemic—and especially for those with complex medical needs. Notably, individuals with conditions in six or more comorbidity categories had 13 times higher odds of utilizing teleservices than similar individuals without comorbidities, after controlling for a series of demographic and geographic characteristics, as well as prior utilization patterns. Individuals enrolled in STAR Health, the Medicaid program for Texas children in the foster care system, also substantially increased their utilization of teleservices; after controlling for relevant factors, children in STAR Health had 2.5 times higher odds of utilizing teleservices than otherwise similar individuals in STAR, the state’s primary Medicaid program. Increased teleservice utilization among STAR Health clients may have been linked to increased utilization of mental health services; while many client groups sought fewer MH visits during the first year of COVID-19, individuals continuously enrolled in STAR Health from March 2019 to February 2021 increased their MH utilization by 5 percent.

Taken together, results from this report make clear the impacts of COVID-19 were not borne equally by different populations and areas of the state during the first year of the pandemic. Though differences emerged across age, race/ethnicity, and county type, findings in this report also underline the role of comorbid conditions and social vulnerability. While these findings are specific to COVID-19 and may not be generalizable to other emergent pandemics, certain health disparities and social vulnerabilities are likely to persist, suggesting further research by academics and policy experts is needed to better understand the underlying causes and policy implications associated with trends in this report. Texas DSHS continues to monitor COVID-19 trends and provide relevant public health information to the public. HHSC continues to monitor program enrollment, health care utilization, and federal policies related to the PHE declaration.

List of Acronyms

Abbreviation	Definition
AADR	Age-adjusted death rate
AHQP	Ad Hoc Query Platform
ANOVA	Analysis of variance
ATSDR	Agency for Toxic Substances and Disease Registry
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
CDC-NCHS	Center for Disease Control and Prevention, National Center for Health Statistics
CHIP	Children's Health Insurance Program
CI	Confidence interval
CLASS	Community Living Assistance and Support Services
CMS	Centers for Medicare & Medicaid Services
COPD	Chronic Obstructive Pulmonary Disease
COVID-19	Coronavirus disease 2019 caused by the SARS-CoV-2 virus
CPT	Current Procedural Terminology
CY	Calendar year
DBMD	Deaf Blind with Multiple Disabilities
DSHS	Texas Department of State Health Services
DSHS-EAIDU	DSHS Emerging and Acute Infectious Disease Unit
ED	Emergency department
EPSDT	Early Periodic Screening, Diagnostic, and Treatment
FFCRA	Families First Coronavirus Response Act
FFS	Fee-for-Service
HCS	Home and Community-based Services
HFDOS	Header From Date of Service
HHSC	Texas Health and Human Services Commission

Abbreviation	Definition
HHSC-DAP	Texas Health and Human Services Commission, Office of Data, Analytics, and Performance
HTW	Healthy Texas Women
ICD-10-CM	International Classification of Diseases, 10th Revision, Clinical Modification
ICF/IID	Intermediate Care Facility for Individuals with an Intellectual Disability or Related Condition
ICU	Intensive care unit
IDD	Intellectual and developmental disabilities
LTSS	Long-term services and supports
MCO	Managed care organization
MDCP	Medically Dependent Children Program
MDS	Minimum Data Set
MH	Mental health
MMP	Medicare-Medicaid Plan
MOE	Maintenance of eligibility
NEDSS	National Electronic Disease Surveillance System
OEFV	Oral Evaluation and Fluoride Varnish
OR	Odds ratio
OT	Occupational therapy
PHE	Public health emergency
PCR	Polymerase chain reaction
PT	Physical therapy
QMB	Qualified Medicare Beneficiaries
QAI	Quality Assurance and Improvement
SLMB	Specified Low-Income Medicare Benefits
SMR	Standardized Mortality Ratio
SNAP	Supplemental Nutrition Assistance Program
SOI	Spell of illness

Abbreviation	Definition
SSLC	State supported living center
ST	Speech therapy
STAR+PLUS HCBS	STAR+PLUS Home and Community-Based Services
SVI	Social Vulnerability Index
TANF	Temporary Assistance for Needy Families
THCIC	Texas Health Care Information Collection
TIERS	Texas Integrated Eligibility Redesign System
TMHP	Texas Medicaid and Healthcare Partnership
TxHML	Texas Home Living
VSS	Vital Statistics Section
YES	Youth Empowerment Services

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Appendix A. Race/Ethnicity by Data Source

Table 8 presents race/ethnicity definitions by data source.

Table 8. Race/ethnicity by data source

Race / ethnicity	Analytical Data Store[1]	TIERS[1]	QAI[1]	MDS[2]	Death certificates[3]	THCIC[3]	NEDSS[3]
Asian (A)	Asian, non-Hispanic; Pacific Islander	Asian, non-Hispanic	Asian, non-Hispanic	Asian, non-Hispanic	Asian, non-Hispanic	Asian, non-Hispanic	Asian, non-Hispanic
Black (B)	Black, non-Hispanic	Black, non-Hispanic	Black, non-Hispanic	Black, non-Hispanic	Black, non-Hispanic	Black, non-Hispanic	Black, non-Hispanic
Hispanic (H)	Hispanic Ethnicity	Hispanic Ethnicity	Hispanic Ethnicity	Hispanic Ethnicity	Hispanic Ethnicity	Hispanic Ethnicity	Hispanic Ethnicity
White (W)	White, non-Hispanic	White, non-Hispanic	White, non-Hispanic	White, non-Hispanic	White, non-Hispanic	White, non-Hispanic	White, non-Hispanic

Race / ethnicity	Analytical Data Store[1]	TIERS[1]	QAI[1]	MDS[2]	Death certificates[3]	THCIC[3]	NEDSS[3]
Other		American Indian or Alaskan Native; Multiple races (non-Hispanic); Other			Multiple races, non-Hispanic; Pacific Islanders; American Indians/ Alaskan Natives	American Indian/ Eskimo/ Aleut; Asian or Pacific Islander; Other	Native Hawaiian or Other Pacific Islander; Multi-race; American Indian or Alaska Native; Other
Other / Unknown (O/U)	American Indian or Alaskan Native; Unknown / Other; missing		American Indian or Alaskan Native; Multiple races (non-Hispanic); Other; missing	American Indian or Alaskan Native; Multiple races (non-Hispanic); Other; missing			

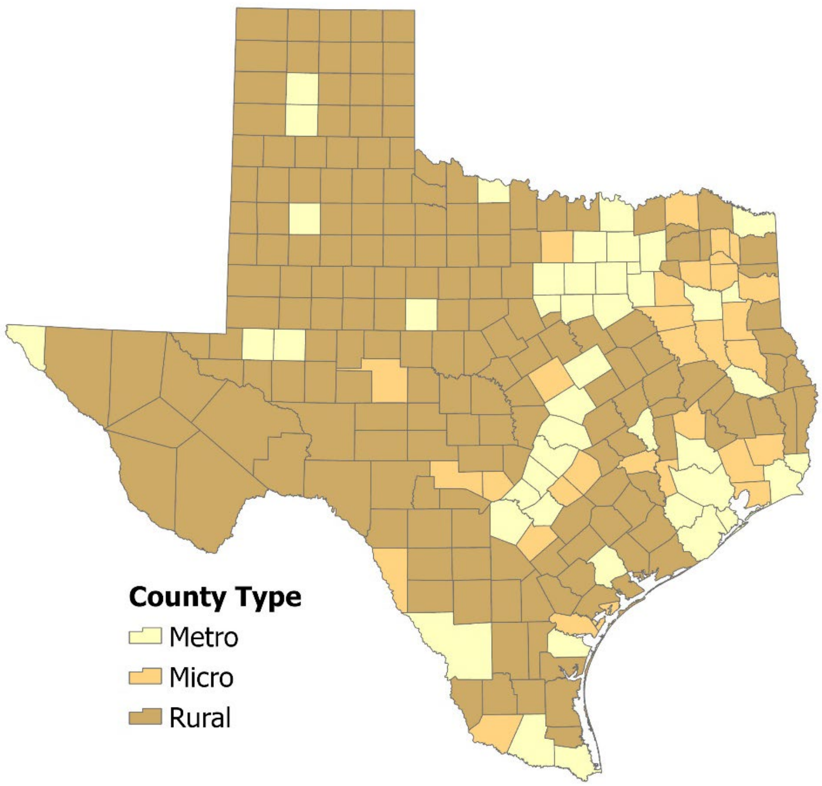
Note: TIERS=Texas Integrated Eligibility Redesign System. QAI=Quality Assurance and Improvement Datamart. CMS= Centers for Medicare and Medicaid Services. MDS=Minimum Data Set. THCIC=Texas Health Care Information Collection. NEDSS=National Electronic Disease Surveillance System.

Note: 1 HHSC-administered data source. 2 CMS-administered data source. 3 DSHS-administered data source.

Note: Race and ethnicity are optional fields on the eligibility application for state benefits. These fields may not be uniformly collected across racial/ethnic groups.

Appendix B. Population and Density Parameters

Figure 58. Texas Medicaid/CHIP managed care network adequacy county types



County Type Definitions

Table 9 lists the population and density parameters applied to determine county type designations. A county must meet both the population and density thresholds for inclusion in a given county type designation. Any of the population density combinations listed for a given county type designation may be met for inclusion within that county type designation. Each year, CMS applies these parameters to the most recently available U.S. Census Bureau population estimates to determine appropriate county type designations.

Table 9. County type definitions

County type	Population	Density
Metro	≥ 1,000,000	≥ 1,000/mi^2
Metro	500,000 – 999,999	≥ 1,500/mi^2
Metro	Any	≥5,000/mi^2
Metro	≥ 1,000,000	10 – 999.9mi^2
Metro	500,000 – 999,999	10 –1,499.9/mi^2
Metro	200,000 – 499,999	10 – 4,999.9/mi^2
Metro	50,000 – 199,999	100 – 4,999.9/mi^2
Metro	10,000 – 49,999	1,000 – 4,999.9/mi^2
Micro	50,000 – 199,999	10 – 99.9/mi^2
Micro	10,000 – 49,999	50 – 999.9/mi^2
Rural	10,000 – 49,999	10 – 49.9/mi^2
Rural	<10,000	10 – 4,999.9/mi^2
Rural	Any	<10mi^2

Source: Medicare Advantage and Section 1876 Cost Plan Network Adequacy Guidance (Last updated: February 20, 2018).

County Names by County Type

Table 10. County names by county type

County type	Counties
Metro	Angelina, Bell, Bexar, Bowie, Brazoria, Brazos, Cameron, Collin, Comal, Dallas, Denton, Ector, El Paso, Ellis, Fort Bend, Galveston, Grayson, Gregg, Guadalupe, Harris, Hays, Hidalgo, Hood, Hunt, Jefferson, Johnson, Kaufman, Lubbock, McLennan, Midland, Montgomery, Nueces, Orange, Parker, Potter, Randall, Rockwall, Smith, Tarrant, Taylor, Travis, Victoria, Webb, Wichita, Williamson
Micro	Anderson, Aransas, Bastrop, Caldwell, Camp, Chambers, Cherokee, Coryell, Hardin, Harrison, Henderson, Kendall, Kerr, Lamar, Liberty, Maverick, Morris, Nacogdoches, Rusk, San Patricio, Starr, Titus, Tom Green, Upshur, Van Zandt, Walker, Waller, Washington, Wilson, Wise, Wood

County type	Counties
Rural	Andrews, Archer, Armstrong, Atascosa, Austin, Bailey, Bandera, Baylor, Bee, Blanco, Borden, Bosque, Brewster, Briscoe, Brooks, Brown, Burleson, Burnet, Calhoun, Callahan, Carson, Cass, Castro, Childress, Clay, Cochran, Coke, Coleman, Collingsworth, Colorado, Comanche, Concho, Cooke, Cottle, Crane, Crockett, Crosby, Culberson, Dallam, Dawson, Deaf Smith, Delta, DeWitt, Dickens, Dimmit, Donley, Duval, Eastland, Edwards, Erath, Falls, Fannin, Fayette, Fisher, Floyd, Foard, Franklin, Freestone, Frio, Gaines, Garza, Gillespie, Glasscock, Goliad, Gonzales, Gray, Grimes, Hale, Hall, Hamilton, Hansford, Hardeman, Hartley, Haskell, Hemphill, Hill, Hockley, Hopkins, Houston, Howard, Hudspeth, Hutchinson, Irion, Jack, Jackson, Jasper, Jeff Davis, Jim Hogg, Jim Wells, Jones, Karnes, Kennedy, Kent, Kimble, King, Kinney, Kleberg, Knox, La Salle, Lamb, Lampasas, Lavaca, Lee, Leon, Limestone, Lipscomb, Live Oak, Llano, Loving, Lynn, Madison, Marion, Martin, Mason, Matagorda, McCulloch, McMullen, Medina, Menard, Milam, Mills, Mitchell, Montague, Moore, Motley, Navarro, Newton, Nolan, Ochiltree, Oldham, Palo Pinto, Panola, Parmer, Pecos, Polk, Presidio, Rains, Reagan, Real, Red River, Reeves, Refugio, Roberts, Robertson, Runnels, Sabine, San Augustine, San Jacinto, San Saba, Schleicher, Scurry, Shackelford, Shelby, Sherman, Somervell, Stephens, Sterling, Stonewall, Sutton, Swisher, Terrell, Terry, Throckmorton, Trinity, Tyler, Upton, Uvalde, Val Verde, Ward, Wharton, Wheeler, Wilbarger, Willacy, Winkler, Yoakum, Young, Zapata, Zavala

Appendix C. Comorbidities and Other Conditions

Table 11. Comorbidities and other conditions

Category	Codes
Cancer	C00-C96: Malignant neoplasms or tumors
Cancer	O9A.1: Malignant neoplasm complicating pregnancy, childbirth and the puerperium
Cancer	Z85: Personal history of malignant neoplasm
Certain types of disabilities	F70-F79: Intellectual development disabilities
Certain types of disabilities	F90: Attention-deficit/hyperactivity disorder
Certain types of disabilities	G71.0: Muscular dystrophy
Certain types of disabilities	G81: Cerebral palsy
Certain types of disabilities	Q90: Down syndrome
Certain types of disabilities	S14: Unspecified injury of cervical spinal cord
Certain types of disabilities	S24: Injury of nerves and spinal cord at thorax level
Certain types of disabilities	S34: Injury of lumbar and sacral spinal cord and nerves at abdomen, lower back and pelvis level
Chronic kidney disease	N18: Chronic kidney disease
Chronic liver disease	B18: Chronic viral hepatitis
Chronic liver disease	E83.0: Wilson's disease
Chronic liver disease	E83.11: Hemochromatosis
Chronic liver disease	K70-K77: Diseases of liver
Chronic lung disease	I26-I28: Pulmonary embolism
Chronic lung disease	J40-J47: Chronic lower respiratory diseases

Category	Codes
Chronic lung disease	J80-J84: Other respiratory diseases principally affecting the interstitium
Chronic lung disease	P27: Chronic respiratory disease originating in the perinatal period
Cystic fibrosis	E84: Cystic fibrosis
Dementia or other neurological conditions	F01-F09: Mental disorders due to known physiological conditions
Dementia or other neurological conditions	G00-G99: Diseases of the nervous system
Diabetes	E08-E13: Diabetes mellitus
Heart conditions	I01: Rheumatic fever with heart involvement
Heart conditions	I05-I09: Chronic rheumatic heart disease
Heart conditions	I10-I16: Hypertensive diseases
Heart conditions	I20-I25: Ischemic heart diseases
Heart conditions	I30-I5A: Other forms of heart disease
Heart conditions	Q20-Q24: Congenital malformations of the heart
HIV	B20: Human immunodeficiency virus [HIV] disease
HIV	Z21: Asymptomatic human immunodeficiency virus [HIV] infection status
Immunocompromised state	D80-D89: Certain disorders involving the immune mechanism
Immunocompromised state	K50: Crohn disease of small intestine
Immunocompromised state	K51: Ulcerative colitis
Immunocompromised state	M08: Juvenile arthritis
Immunocompromised state	M32: Systemic lupus erythematosus
Immunocompromised state	N04: Nephrotic syndrome
Immunocompromised state	Z79.5: Long term (current) use of steroids

Category	Codes
Mental health conditions	F20-F29: Schizophrenia, schizotypal, delusional, and other non-mood psychotic disorders
Mental health conditions	F30-F39: Mood [affective] disorders
Overweight and obesity	E66: Overweight and obesity
Overweight and obesity	Z68.53: Body mass index [BMI] pediatric, 85th percentile to less than 95th percentile for age
Overweight and obesity	Z68.54: Body mass index [BMI] pediatric, greater than or equal to 95th percentile for age
Pregnancy	O00-O9A: Pregnancy, childbirth and the puerperium
Pregnancy	Z33: Pregnant state
Sickle cell disease	D57: Sickle-cell disorders
Smoking, current or former	F17.21: Nicotine dependence, cigarettes
Smoking, current or former	Z72.0: Tobacco use
Solid organ transplant and blood stem cell transplant (including bone marrow transplants)	T86: Complications of transplanted organs and tissue
Solid organ transplant and blood stem cell transplant (including bone marrow transplants)	Z94: Transplanted organ and tissue status
Stroke or cerebrovascular disease	I60-I69: Cerebrovascular diseases
Substance use disorders	F10-F19: Mental and behavioral disorders due to psychoactive substance use
Thalassemia	D56: Thalassemia
Tuberculosis	A15-A19: Tuberculosis

Note: A limited number of diagnosis codes in this table are present under multiple categories; these codes refer to conditions associated with multiple medical categories.

Appendix D. HHSC Program Descriptions

Children's Health Insurance Program (CHIP)

CHIP provides acute care, behavioral health care, dental services and pharmacy services for children in families with too much income to qualify for Medicaid but cannot afford to buy private health insurance. Children covered through CHIP generally receive similar services as children covered through Medicaid.

Community Living Assistance and Support Services (CLASS)

CLASS is a 1915(c) waiver program that provides home and community-based services to people who have a related condition diagnosis qualifying them for placement in an intermediate care facility for individuals with an intellectual disability or related condition (ICF/IID). A related condition is a disability other than an intellectual or developmental disability, which originates before age 22 and which substantially limits life activity.

Deaf Blind with Multiple Disabilities (DBMD)

DBMD provides home and community-based services as an alternative to residing in an intermediate care facility for individuals with an intellectual disability or related condition (ICF/IID) to people of all ages who are deaf, blind or have a condition that will result in deaf-blindness—and who also have an additional disability. The program focuses on increasing opportunities for individuals to communicate and interact with their environment.

Fee-for-Service (FFS)

FFS is a healthcare payment system under which providers receive a payment for each unit of service they provide. Under FFS, clients can go to any Medicaid provider, and the provider will submit claims directly for Medicaid covered services. Currently, only four percent of Medicaid clients in Texas still receive services through FFS. The remaining 96 percent of clients are enrolled into one of the managed care programs.

Healthy Texas Women (HTW)

HTW is a women's health and family planning program for low-income women age 15 through 44. Some women enrolled in HTW transfer into the program after their Medicaid for Pregnant Women coverage expires, which occurs 60 days after delivery. HHSC automatically tests clients whose Medicaid for Pregnant Women coverage is ending for other types of assistance without the requirement for a new application (a process known as "automatic eligibility determination;" women who longer qualify for Medicaid or CHIP programs but meet eligibility requirements for HTW are automatically enrolled, ensuring continuity of postpartum care. In addition, women can apply for HTW like they would for other HHSC programs. HTW was previously a state-administered, state-funded program. Through an 1115 Demonstration Waiver, HTW is now a Medicaid program that receives federal matching funds for services delivered to clients ages 18 to 44. HTW also offers enhanced postpartum services for eligible HTW clients called HTW Plus. HTW Plus services include treatment for mental health conditions, including postpartum depression and substance use disorders, as well as cardiovascular conditions.

Home and Community-based Services (HCS)

HCS provides individualized services to individuals of all ages who qualify for ICF/IID level of care, yet live in their family's home, their own home or other settings in the community.

Medically Dependent Children Program (MDCP)

MDCP provides community-based services to children and youth age 20 and younger as an alternative to residing in a nursing facility.

Medicare-Medicaid Plan (MMP)

MMP is a program for adults who are eligible for both Medicare and Medicaid, known as dual-eligible individuals. MMP is available in six Texas counties and provides the full array of Medicaid and Medicare services, integrating acute care and long-term services and supports for members to better meet their health-care needs.

Supplemental Nutrition Assistance Program (SNAP)

SNAP provides nutrition assistance to needy families so they can purchase healthy food. SNAP provides benefits to eligible low-income individuals and families via an Electronic Benefits Transfer card. This card can be used like a debit card to purchase eligible food in authorized retail food stores.

STAR

STAR is a statewide managed care program primarily for pregnant women and low-income children and their caretakers. Most people in Texas Medicaid get their coverage through STAR.

STAR Health

STAR Health is a statewide managed care program that provides coordinated health services to children and youth in foster care and kinship care. STAR Health benefits include medical, dental and behavioral health services—as well as service coordination and a web-based electronic medical record, known as the Health Passport.

STAR Kids

STAR Kids is a statewide managed care program for children and youth age 20 and younger with disabilities, including children and youth receiving benefits under the MDCP waiver.

STAR+PLUS

STAR+PLUS is a statewide managed care program for adults with disabilities and those age 65 and older.

STAR+PLUS Home and Community-based Services (HCBS) Program

STAR+PLUS HCBS is a waiver program delivered through managed care that provides a cost-effective alternative to living in a nursing facility for individuals who are elderly or have disabilities. STAR+PLUS HCBS is delivered through the Texas 1115 Healthcare Transformation Waiver. Eligibility determinations for STAR+PLUS HCBS are based on medical necessity criteria outlined in the Texas Administrative Code. MCOs provide medical necessity assessments, which are used by HHSC to help determine whether an individual qualifies for STAR+PLUS HCBS. STAR+PLUS HCBS has an interest list.

Temporary Assistance for Needy Families (TANF)

TANF program is a cash assistance program that helps families pay for basic living needs.

Texas Home Living (TxHmL)

TxHmL provides selected services and supports for people with intellectual disabilities who live in their own homes or their family's home.

Youth Empowerment Services (YES)

YES is a home and community-based waiver that allows for more flexibility in the funding of intensive community-based services for children and adolescents with severe emotional disturbances and their families.

Appendix E. Heatmap Technical Specifications

COVID-19 Tests and Cases in the Texas Population

Definitions

COVID-19 test – Laboratory test for COVID-19, including SARS-CoV-2 molecular tests (Nucleic Acid Amplification Tests, such as Reverse Transcription – Polymerase Chain Reaction or PCR) and antigen tests.

Confirmed case - A person who has tested positive through a molecular test that looks for the virus's genetic material. Texas uses the confirmed case definition adopted by the CDC.

Probable case - A person who has either tested positive through an antigen test or has a combination of symptoms and a known exposure to someone with COVID-19 without a more likely diagnosis. Texas uses the probable case definition adopted by the CDC.

Data Processing

SARS-CoV-2 molecular tests (Nucleic Acid Amplification Tests, such as Reverse Transcription – Polymerase Chain Reaction or PCR) and antigen testing data were sourced from the NEDSS. Test results with the same accession number, specimen collection date, test type, and reporting facility were deduplicated. A second round of deduplication also occurred by the local laboratory number. The remaining test results were included if the specimen collection date was between March 2020 and March 2021; was for a Texas resident; had a first name, last name, and date of birth which was appropriate (e.g., "Test" was not an acceptable first or last name and a person could not be 120 years of age); and if the test type was a molecular test or antigen test.

Average monthly testing rates were calculated for each respective period using 2019 population estimates from the Texas Demographic Center. The COVID-19 case data included confirmed and probable cases who had a specimen date from March 2020 through March 2021. Additionally, cases were included if they were

Texas residents, had a known acceptable age, first name, and last name (e.g., "Test" was not an acceptable first name and individuals over 120 years of age were excluded). Cases were also deduplicated by the NEDSS identifier and specimen dates. Cases were not counted again if reinfection criteria were met within the same period. Average monthly case rates were calculated for each respective period using 2019 population estimates from the Texas Demographic Center.

Supplemental Tables

Table 12: Average monthly COVID-19 testing rates per 100,000 individuals, by demographic characteristic and period

Domain	Client characteristic	Period 1 Mar - May 2020	Period 2 Jun - Sep 2020	Period 3 Oct 2020 - Jan 2021	Period 4 Feb - Mar 2021
Race/ethnicity	Asian, non-Hispanic	338.7	1,378.5	4,128.4	3,698.6
Race/ethnicity	Black, non-Hispanic	854.3	2,434.8	4,799.0	4,627.3
Race/ethnicity	Hispanic	426.1	2,125.8	4,504.4	3,625.3
Race/ethnicity	Other, non-Hispanic	1,111.3	4,064.0	19,627.3	14,666.2
Race/ethnicity	White, non-Hispanic	521.1	1,886.4	4,640.6	3,906.1
Age group	Age 0-20	261.7	1,732.4	4,330.8	3,722.5
Age group	Age 21-64	1,108.0	3,919.6	6,968.5	5,264.4
Age group	Age 65+	1,296.7	3,459.2	5,961.2	4,668.7
County type	Metro	867.2	3,213.6	6,178.4	4,820.8
County type	Micro	951.1	2,941.0	4,758.3	3,863.4
County type	Rural	811.8	2,970.7	5,014.1	3,851.8

Data Source: DSHS NEDSS. Analysis by DSHS.

Table 13: Number and percentage of COVID-19 tests, by period

	Period 1 Mar - May 2020	Period 2 Jun - Sep 2020	Period 3 Oct 2020 - Jan 2021	Period 4 Feb - Mar 2021
Number of tests	766,340	3,722,899	7,021,971	2,742,645
Percentage of total tests	5.4	26.1	49.3	19.2

Data Source: DSHS NEDSS. Analysis by DSHS.

Medicaid and CHIP Clients Tested for COVID-19

Definitions

COVID-19 testing includes molecular (procedure codes U0001, U0002, 87635, U0003, U0004, 0223U, 0202U, 0225U, 0226U, 87636, and 87637), antibody (procedure codes 86328, 86769, 86318, 86408, 86409, 0224U, and 86413), and antigen (procedure codes 87426 and 87811) testing. Additional specimen collection codes are included: COVID-19 specific (G2023, G2024, and C9803) and nonCOVID-19 specific (99001, 99211, and S8301). Specimen collection codes are matched to client and date of service to categorize as molecular, antigen, or antibody. If the specimen collection codes cannot be matched to a molecular, antigen or antibody test, they are classified as unknown. COVID-19 specific specimen collection codes count as new COVID-19 tests, while the non-COVID-19 specific specimen collection and personal protective equipment codes are only counted if they match to a COVID-19 client who was tested.

COVID-19 testing data among Medicaid/CHIP clients are based on paid claims and encounters that indicate that a test has been performed. However, the claims do not include the results of the test. Testing and diagnosis information are calculated independently and cannot be directly compared to calculate a COVID-19 positivity rate.

The trendline shown in Figure 9 depicts the daily number of unique clients who received a COVID-19 test. Clients are counted once per day. The rates depicted in the heatmaps in Figure 9 are calculated as the average of monthly utilization per average monthly member enrollment. Clients are counted once per month.

Medicaid and CHIP Clients with COVID-19 Diagnoses

Definitions

COVID-19 diagnosed clients with a service are defined as a primary to 24th diagnosis of U07.1 (2019-nCoV acute respiratory disease). Other possible diagnosis codes are not included in the analysis.

The trendline shown in Figure 10 depicts the daily number of unique clients who received a COVID-19 diagnosis. Clients are counted once per day. The rates depicted in the heatmaps in Figure 10 are calculated as the average of monthly utilization per average monthly member enrollment. Clients are counted once per month.

Medicaid and CHIP COVID-19 Emergency Department Visits

Definitions

COVID-19 ED visits include clients with a primary to 24th diagnosis of U07.1 (2019-nCoV acute respiratory disease). Other possible diagnosis codes are not included in the analysis. ED visits are identified by procedure codes (99281, 99282, 99283, 99284, and 99285), revenue codes (450, 451, 452, 456, 459, and 981) or place of service (23 for professional encounters).

The trendline shown in Figure 11 depicts the daily number of unique clients with an emergency department visit. Clients are counted once per day. The rates depicted in the heatmaps in Figure 11 are calculated as the average of monthly utilization per average monthly member enrollment. Clients are counted once per month.

Medicaid and CHIP COVID-19 Hospitalizations

Definitions

COVID-19 inpatient includes clients with a primary to 24th diagnosis of U07.1 (2019-nCoV acute respiratory disease) on an inpatient hospital claim or encounter. Other possible diagnosis codes and admitting diagnosis codes are not included in the analysis.

COVID-19-related hospital stays spanning multiple days are only counted once. The trendline shown in Figure 12 depicts the daily number of unique clients with a COVID-19-related hospital visit, based on date of admission. Individuals with multiple COVID-19 hospitalizations are counted for each distinct hospital stay. The rates depicted in the heatmaps in Figure 12 are calculated as the average of monthly utilization per average monthly member enrollment. Clients are counted once per month.

Appendix F. COVID-19 Hospitalization Outcomes Technical Specifications

Data Sources

The Texas hospital discharge data is from THCIC. DSHS collects data on health care activity in Texas hospitals. DSHS requires all hospitals except those that are statutorily exempt to submit a standardized administrative claims dataset on inpatient and outpatient discharges to THCIC (Texas Department of State Health Services , 2021). Type of hospitals included in the data are community hospitals, acute care facilities, rehabilitation hospitals, psychiatric hospitals, cancer hospitals, children's or pediatric hospitals, and long term care hospitals. The inpatient dataset includes admission and discharge dates, discharge status, diagnosis and procedure codes, demographics and payer type. The Inpatient Research Data File includes identifiers that enable HHSC to identify and link specific individuals over multiple visits and years. This analysis used the Inpatient Research Data File from March 1, 2020, through March 31, 2021.

Data Processing

Our analyses included records with the following International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) codes in the principal or admitting diagnosis fields, in line with CDC guidance (NCHS, 2022c): in March 2020, any records with B97.29 ("Other coronavirus as the cause of diseases classified elsewhere") or J12.89 ("Other viral pneumonia") that also had a positive molecular test 14 days before or five days after the admit date; from April 2020 through December 2020, any records with U07.1 (“COVID-19”); and from January 2021-March 2021, any records with U07.1 (“COVID-19”) or J12.82 ("Pneumonia due to coronavirus disease 2019”).

We excluded records from the following facilities: standalone psychiatric facilities, standalone rehabilitation facilities, standalone skilled nursing facilities, standalone long-term acute care facilities, standalone other long-term care facilities, standalone psychiatric acute care facilities, and pediatric rehabilitation centers (n=167,383). We then deduplicated our data set by first name, last name, date of birth, and time period and repeated our analyses to examine individuals who were hospitalized for COVID-19, rather than total COVID-19 hospitalizations (n=157,189). Comorbidities were coded using guidance from the CDC.[31] Rates were calculated using 2019 population estimates from the Texas Demographic Center.

Our models included the following predictor variables: a fixed effect for hospital, age (60 years and older versus under 60 years of age), sex (male versus female), race/ethnicity (non-Hispanic White, Black, Asian, Other, and Hispanic), number of comorbidities or certain medical conditions (0, 1, 2, 3, 4, 5, or 6+), and a patient's SVI ranking (a percentile rank variable divided into quartiles, with the 1st quartile being the lowest social vulnerability and the 4th quartile being the highest). We dichotomized age based on previous COVID-19 literature (Di Santo, Franchini, Filiputti, Martone, & Sannino, 2020; Nakanishi, et al., 2021; Suleyman, et al., 2020) and for interpretability purposes. Additionally, we did not include county type (metro, micro, rural) in our models because we included SVI ranking instead (as SVI was coded at the census-tract level rather than county level) (ATSDR, 2022a).

Supplemental Tables

Table 14: Logistic regression results for factors associated with ICU admission and in-hospital mortality among individuals hospitalized for COVID-19, March 1, 2020 - March 31, 2021

Domain	Predictor variable	ICU admission	In-hospital mortality
		OR (95% CI)	OR (95% CI)
Race/ethnicity	Asian non-Hispanic	1.40 (1.27-1.54)***	1.3 (1.13-1.49)***
Race/ethnicity	Black non-Hispanic	0.91 (0.87-0.96)***	0.75 (0.70-0.81)***
Race/ethnicity	Hispanic	1.34 (1.28-1.40)***	1.41 (1.33-1.49)***
Race/ethnicity	Other non-Hispanic	1.23 (1.15-1.32)***	1.25 (1.13-1.37)***
Race/ethnicity	White non-Hispanic (reference)		
Age group	60+ years	1.17 (1.10-1.23)***	2.65 (2.48 - 2.83)***
Age group	<60 years (reference)		
Sex	Male	1.33 (1.30-1.38)***	1.46 (1.40-1.51)***
Sex	Female (reference)		
Comorbidity categories	1	1.48 (1.36-1.61)***	2.59 (2.11-3.17)***
Comorbidity categories	2	1.94 (1.77-2.12)***	4.41 (3.60-5.39)***

[31] Centers for Disease Control and Prevention. People with Certain Medical Conditions. https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html. Updated May 2, 2022. Accessed April 28, 2022.

Domain	Predictor variable	ICU admission	In-hospital mortality
Comorbidity categories	3	2.48 (2.24-2.74)***	7.01 (5.68-8.66)***
Comorbidity categories	4	3.25 (2.91-3.63)***	10.47 (8.33-13.15)***
Comorbidity categories	5	4.06 (3.59-4.59)***	13.62 (10.83-17.11)***
Comorbidity categories	6+	4.27 (3.77-4.83)***	13.12 (10.36-16.63)***
Comorbidity categories	0 (reference)		
Social Vulnerability Index	2nd quartile	1.05 (1.02-1.09)**	1.05 (0.99-1.13)
Social Vulnerability Index	3rd quartile	1.07 (1.03-1.12)**	1.12 (1.05-1.20)**
Social Vulnerability Index	4th quartile	1.10 (1.05-1.15)***	1.20 (1.12-1.28)***
Social Vulnerability Index	1st quartile (reference)		

Data Source: DSHS, THCIC. Analysis by DSHS.

Notes: ***p<0.001, **p<0.01, *p<0.05. OR=Odds ratio, C.I.=Confidence Interval.

Odds Ratios estimated from multivariate logistic regression model, with a hospital fixed effect and robust standard errors clustered on hospital identifier.

Appendix G. Medicaid Severe Outcomes Technical Specifications

This appendix provides technical details for the Medicaid Severe Outcomes study covered in Part 2.

Data Sources

HHSC partners with Texas Medicaid and Healthcare Partnership (TMHP) to maintain claims and encounters data for services provided to Texans participating in the Medicaid or CHIP programs. From these data, HHSC can identify individuals who received services related to COVID-19 testing and treatment and examine the impact of COVID-19 on service utilization within the Medicaid/CHIP population.

- **FFS claims and MCO encounter data:** FFS claims and MCO encounter data have been processed by TMHP since January 1, 2004. TMHP performs internal edits for data quality and completeness. The member-level claims/encounter data contain the Current Procedural Terminology (CPT) codes; the ICD-10-CM codes; place of service codes; and other information necessary to calculate outcome measures. Claims and encounter data are adjudicated on an approximate eight-month time lag. Prior analyses with Texas data showed that, on average, over 96 percent of the claims and encounters are complete by that timeframe.
- **Member-level enrollment files:** The enrollment files contain information about the person's age, sex, race/ethnicity, county, health care service delivery model (i.e., FFS or managed care), MCO enrollment, and length of enrollment. The member-level enrollment files will be used to identify members and member-level subgroups. Member-level enrollment files are subject to an approximate eight-month time lag.

Data Processing

The population consists of Medicaid clients who had a COVID-19 diagnosis between March 2020 and March 2021. Note that COVID-19 diagnosis specifically refers to the presence of a diagnosis code on a paid claim or encounter. The earliest claim record in any health care setting was used to determine the date of the COVID-19 illness began. Demographic categories such as age and county were based on the enrollment record for the month in which the earliest COVID-19 claim occurred.

To ensure that everyone included in the study had an appropriate amount of time to have pre-existing comorbid conditions identified, the study was limited to clients who were continuously enrolled during the pre-COVID-19 year. In some instances, the ability to identify co-existing conditions or special populations differed from other sections, such as the COVID-19 Hospitalization Outcomes among the General Texas Population analysis in Part 2. For example, in this study pregnancy was identified using enrollment data and residents of nursing facilities were identified using MDS data.

Data on race and ethnicity are collected from Medicaid/CHIP clients when they enroll in HHSC programs. Race and ethnicity are optional fields on the eligibility application for state benefits and may not be uniformly collected across racial/ethnic groups. The category "Other/Unknown" indicates that the corresponding demographic fell into a category too small to present on its own or the data element was missing for that client in the enrollment data.

A **COVID-19 diagnosis** refers to the presence of a U07.1, J12.82, or B97.29 diagnosis code on a paid claim or encounter.

Any hospitalization mentioning COVID-19 refers to the presence of a U07.1, J12.82, or B97.29 diagnosis code on a paid claim or encounter.

Hospitalized due to COVID-19 refers to the presence of a U07.1, J12.82, or B97.29 diagnosis code as the admitting or principal diagnosis on a paid claim or encounter.

An **ICU stay** refers to the presence of revenue codes 0200-0209 on a paid inpatient claim or encounter.

In-facility deaths were defined as having a discharge status code of 20, 40, 41, or 42.

Pregnancy was defined as Medicaid for Pregnant Women (TP 40) enrollment or the presence of diagnosis code O00-O9A. Clients identified as pregnant may also be receiving postpartum coverage.

A **nursing facility resident** was defined as any client that received an MDS assessment.

Pre-existing comorbid conditions were conditions defined in Appendix C present on a paid claim or encounter prior to the earliest COVID-19 claim or encounter.

Supplemental Tables

Table 15: Pre-existing comorbidity categories among Medicaid/CHIP clients with a COVID-19 diagnosis, by COVID-19 hospitalization status, March 2020 - March 2021[1]

Comorbidity categories	Total (n=141,914)		Never hospitalized with COVID-19 (n=130,323)		Hospitalized due to COVID-19 (n=11,591)[2]	
	N	%	N	%	N	%
Cancer	6,642	4.7	5,092	3.9	1,550	13.4
Chronic kidney disease	14,287	10.1	9,877	7.6	4,410	38.1
Chronic liver disease	9,639	6.8	7,624	5.9	2,015	17.4
Chronic lung disease	39,564	27.9	33,988	26.1	5,576	48.1
Cystic fibrosis	76	0.1	67	0.1	9	0.1
Diabetes	28,864	20.3	21,749	16.7	7,115	61.4
Immunocompromised state	8,490	6.0	6,647	5.1	1,843	15.9
Certain disabilities	19,935	14.0	18,196	14.0	1,739	15.0
Heart conditions	49,766	35.1	39,737	30.5	10,029	86.5
HIV	694	0.5	569	0.4	125	1.1
MH conditions	39,302	27.7	33,460	25.7	5,842	50.4
Dementia or other neurological conditions	54,748	38.6	45,962	35.3	8,786	75.8
Pregnancy	5,006	3.5	4,890	3.8	116	1.0
Sickle cell disease	395	0.3	323	0.3	72	0.6
Thalassemia	161	0.1	143	0.1	18	0.2
Solid organ transplant and blood stem cell transplant	1,048	0.7	686	0.5	362	3.1
Stroke	13,714	9.7	10,571	8.1	3,143	27.1
Overweight and obesity	41,650	29.3	37,125	28.5	4,525	39.0
Smoking	8,662	6.1	7,239	5.6	1,423	12.3
Substance Use	12,509	8.8	10,528	8.1	1,981	17.1
Tuberculosis	186	0.1	143	0.1	43	0.4

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

1 Study population only includes clients who were continuously enrolled for 12 months prior to study period (March 2019-Feb 2020). Pre-existing condition refers to the presence of the condition prior to the first COVID-related claim or encounter (not necessarily a hospitalization).

2 Hospitalized due to COVID-19 refers to the presence of a U07.1, J12.82, or B97.29 diagnosis code as the admitting or principal diagnosis on a paid inpatient claim or encounter.

Table 16. Logistic regression results for factors associated with hospitalization due to COVID-19, ICU admission, and in-facility deaths

Domain	Predictor Variable	Hospitalized due to COVID-19[1]		Hospitalized due to COVID-19: ICU admission[2]		Hospitalized due to COVID-19: In-facility deaths[3]	
		Model 1[4]	Model 2[5]	Model 1	Model 2	Model 1	Model 2
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Race/ethnicity	Asian	1.57 (1.36-1.80)***	1.95 (1.69-2.25)***	1.1 (0.90-1.33)	1.2 (0.98-1.46)	1.51 (1.20-1.90)***	1.63 (1.29-2.05)***
Race/ethnicity	Black	1.92 (1.8-2.06)***	1.74 (1.63-1.87)***	1.05 (0.96-1.16)	1.03 (0.94-1.13)	0.94 (0.81-1.07)	0.92 (0.8-1.05)
Race/ethnicity	Hispanic	1.46 (1.39-1.54)***	1.59 (1.51-1.68)***	1.16 (1.07-1.25)***	1.19 (1.10-1.28)***	1.63 (1.47-1.80)***	1.67 (1.51-1.84)***
Race/ethnicity	Other/Unknown	1.61 (1.50-1.73)***	1.54 (1.44-1.65)***	1.04 (0.94-1.14)	1.03 (0.93-1.13)	1.23 (1.07-1.40)**	1.23 (1.07-1.41)**
Race/ethnicity	White (reference)						
Age	Age	1.04 (1.04-1.05)***	1.03 (1.03-1.03)***	1.02 (1.02-1.02)***	1.02 (1.01-1.02)***	1.04 (1.03-1.04)***	1.04 (1.03-1.04)***
Sex	Female	Reference	Reference	Reference	Reference	Reference	Reference
Sex	Male	1.36 (1.3-1.41)***	1.33 (1.27-1.39)***	1.30 (1.23-1.38)***	1.29 (1.21-1.37)***	1.44 (1.33-1.56)***	1.44 (1.33-1.55)***
County type	Micro	1.26 (1.17-1.35)***	1.25 (1.17-1.35)***	0.86 (0.78-0.96)**	0.87 (0.78-0.96)**	1.02 (0.89-1.17)	1.02 (0.89-1.17)
County type	Rural	1.13 (1.07-1.2)***	1.16 (1.09-1.23)***	0.72 (0.66-0.78)***	0.72 (0.66-0.79)***	1.02 (0.91-1.14)	1.03 (0.92-1.15)
County type	Metro (reference)						
Comorbidity categories[6]	1		1.37 (1.19-1.57)***		0.64 (0.52-0.78)***		0.73 (0.52-1.04)
Comorbidity categories	2		2.73 (2.41-3.11)***		0.87 (0.72-1.05)		0.84 (0.61-1.14)
Comorbidity categories	3		3.76 (3.32-4.26)***		0.99 (0.83-1.19)		0.99 (0.74-1.32)

Comorbidity categories	4		4.73 (4.17-5.35)***		1.00 (0.84-1.19)		1.15 (0.86-1.52)
Comorbidity categories	5		5.87 (5.18-6.65)***		1.09 (0.92-1.30)		1.15 (0.87-1.52)
Comorbidity categories	6+		8.88 (7.83-9.88)***		1.30 (1.11-1.54)**		1.36 (1.04-1.79)*
Comorbidity categories	0 (reference)						

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

Notes: ***p<0.001, **p<0.01, *p<0.05

Multicollinearity of predictor variables was examined through tolerance statistics (where <0.2). Sex and county type may be collinear when both values are missing; however, missing categories are not reported in the model output.

1 Hospitalized due to COVID-19 refers to the presence of a U07.1, J12.82, or B97.29 diagnosis code as the admitting or principal diagnosis on a paid claim or encounter.

2 ICU admission refers to the presence of revenue codes 0200-0209 on a paid inpatient claim or encounter.

3 In-facility deaths were defined as having a discharge status code of 20, 40, 41 or 42.

4 Model 1 is adjusted for county type, race/ethnicity, age and sex. Age included as a continuous variable.

5 Model 2 is adjusted for county type, race/ethnicity, age, sex and number of pre-existing comorbidity categories. Age included as a continuous variable.

6 Pre-existing comorbid conditions were present on a paid claim or encounter prior to the earliest COVID-19 claim or encounter.

Appendix H. LTSS Technical Specifications

Data Source

This section relies on data from the following sources: 1) Analytical Data Store, TMASP Oracle server, TMHP; 2) HHSC QAI Datamart; and 3) CMS COVID-19 Nursing Home Data.

Data Processing

Individuals were identified as participating in a home and community-based services waiver or an ICF/IID if they had a service authorization for that waiver or ICF/IID during the period of the study. Participants living in SSLCs were identified by the SSLC program. HHSC 8-month eligibility data were used to identify nursing facility residents by category of assistance.

Data from CMS were used to identify trends in COVID-19 cases and deaths in nursing facilities from May 2020 through March 2021. COVID-19 Nursing Home Data as of December 26, 2021, were downloaded from the CMS website. This file contained information about COVID-19 cases and deaths as well as interventions and nursing facility characteristics such as staffing shortages. Information about nursing facility demographics, like age, sex, and racial/ethnic makeup of the residents was obtained from CMS MDS nursing assessments made from March 2020 through March 2021. Other data, including the county-level SVI ranking and county population density, were also included.

Nursing facility data were analyzed at the facility level by period. Post Hoc Bonferroni analyses were used to identify differences in average weekly resident COVID-19 cases and deaths between periods. Then, the effects of race/ethnicity, sex, staffing, SVI ranking, and population density were examined separately for Periods 2, 3, and 4 using one-way analysis of variances (ANOVAs).

Supplemental Tables

Table 17. Demographic characteristics of individuals enrolled in Medicaid waiver programs, by COVID-19 diagnosis

Domain	Characteristic	Number of individuals	Percent (%)	No COVID-19 (%)	COVID-19 diagnosis (%)	P-value
	All	*N=120,250*		*N=110,014*	*N=10,236*	
Race/ethnicity	Asian	3,345	2.8	2.8	2.1	***
Race/ethnicity	Black	19,168	15.9	16.0	14.9	**
Race/ethnicity	Hispanic	40,464	33.6	32.9	41.5	***
Race/ethnicity	Other/Unknown	23,701	19.7	20.0	16.4	***
Race/ethnicity	White	33,572	27.9	28.2	25.1	***
Age group	<21	10,558	8.8	9.2	4.7	***
Age group	21-64	70,789	58.9	58.9	58.1	
Age group	65+	38,903	32.4	31.9	37.1	***
County type	Metro	97,688	81.2	81.4	79.4	***
County type	Micro	9,710	8.1	8.0	8.6	*
County type	Rural	12,782	10.6	10.5	12.0	***
County type	*missing*	70	0.1	0.1	0.0	

Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Note: Proportion (risk) difference test comparing percentage of persons in the COVID-19 diagnosis group with the percentage in the No COVID-19 group: ***p<0.001, **p<0.01, *p<.05

Table 18. Demographic characteristics of individuals enrolled in Medicaid waiver programs diagnosed with COVID-19, by hospitalization status

Domain	Characteristic	COVID-19 diagnosed (N)	Never hospitalized (%)	Hospitalization with COVID-19 diagnosis (%)	Hospitalization for COVID-19 (%)	P-value
	All	*N=10,236*	*N=6,621*	*N=3,615*	*N=2,395*	
Race/ethnicity	Asian	213	1.7	2.8	2.8	**
Race/ethnicity	Black	1,523	13.5	17.4	16.7	***
Race/ethnicity	Hispanic	4,252	40.4	43.5	43.1	*
Race/ethnicity	Other/Unknown	1,681	17.6	14.3	14.0	***
Race/ethnicity	White	2,567	26.8	21.9	23.3	**
Age group	<21	485	5.4	3.5	3.4	***
Age group	21-64	5,952	61.4	52.2	51.3	***
Age group	65+	3,799	33.2	44.3	45.3	***
County type	Metro	8,126	80.3	77.7	75.5	***
County type	Micro	879	8.0	9.6	10.4	**
County type	Rural	1,229	11.7	12.6	14.1	**
County type	*missing*	2	0.0	0.0	0.0	

Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Note: Proportion (risk) difference test comparing percentage of persons hospitalized for COVID-19 to the percentage of persons never hospitalized with or for COVID-19: ***p<0.001, **p<0.01, *p<.05

Table 19. Demographic characteristics of individuals living in private ICFs/IID or group homes, by COVID-19 diagnosis

Domain	Characteristic	Number of individuals	Percent (%)	No COVID-19 (%)	COVID-19 diagnosis (%)	P-value
	All	*N=14,882*		*N=12,978*	*N=1,904*	
Race/ethnicity	Asian	272	1.8	1.8	2.3	
Race/ethnicity	Black	2,308	15.5	15.6	14.8	
Race/ethnicity	Hispanic	2,141	14.4	14.2	15.8	
Race/ethnicity	Other/Unknown	2,718	18.3	18.6	15.8	**
Race/ethnicity	White	7,443	50.0	49.8	51.4	
Age group	<21	746	5.0	5.3	3.2	***
Age group	21-64	12,369	83.1	83.6	79.9	***
Age group	65+	1,767	11.9	11.1	16.9	***
County type	Metro	12,635	84.9	85.2	83.2	*
County type	Micro	1,005	6.8	6.7	6.9	
County type	Rural	1,232	8.3	8.1	9.8	**
County type	*missing*	10	0.1	0.1	0.1	

Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Note: Proportion (risk) difference test comparing percentage of persons in the COVID-19 diagnosis group to the percentage in the No COVID-19 group: ***p<0.001, **p<0.01, *p<.05

Table 20. Demographic characteristics of individuals in private ICFs/IID and group homes diagnosed with COVID-19, by hospitalization status

Domain	Characteristic	COVID-19 diagnosed (N)	Never hospitalized (%)	Any hospitalization with COVID-19 diagnosis (%)	Hospitalization for COVID-19 diagnosis (%)	P-value
	All	*N=1,904*	*N=1397*	*N=507*	*N=330*	
Race/ethnicity	Asian	43	2.0	3.0	3.0	
Race/ethnicity	Black	282	13.4	18.7	17.6	*
Race/ethnicity	Hispanic	300	14.2	19.9	20.0	**
Race/ethnicity	Other/Unknown	300	17.6	10.7	7.9	***
Race/ethnicity	White	979	52.8	47.7	51.5	
Age group	<21	60	3.7	–	1.2	*
Age group	21-64	1,522	83.5	70.0	70.0	***
Age group	65+	322	12.7	28.4	28.8	***
County type	Metro	1,584	82.0	86.4	84.2	
County type	Micro	132	6.9	6.9	7.6	
County type	Rural	187	11.0	6.5	8.2	
County type	*missing*	1	0.1	0	0	

Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Percentages are not reported (—) if the number of individuals in a cell is between 1 and 4.

Note: Proportion (risk) difference test comparing percentage of persons hospitalized for COVID-19 to the percentage of persons never hospitalized with or for COVID-19: ***p<0.001, **p<0.01, *p<.05

Table 21. Demographic characteristics of individuals living in SSLCs, by COVID-19 diagnosis

Domain	Characteristic	Number of individuals	Percent	No COVID-19	COVID-19	P-value
	All	*N=2,839*		*N=2,303*	*N=536*	
Race/ethnicity	Asian	29	1.0	0.9	1.5	
Race/ethnicity	Black	344	12.1	12.8	9.3	*
Race/ethnicity	Hispanic	464	16.3	15.4	20.3	**
Race/ethnicity	Other/Unknown	324	11.4	12.5	6.5	***
Race/ethnicity	White	1,678	59.1	58.4	62.3	
Age group	Age 0-20	139	4.9	5.6	1.7	***
Age group	Age 21-64	2,201	77.5	78.6	72.9	**
Age group	Age 65+	499	17.6	15.8	25.4	***
County type	Metro	2,250	79.3	79.6	77.8	
County type	Micro	348	12.3	11.6	14.9	*
County type	Rural	225	7.9	8.2	6.7	

Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Note: Proportion (risk) difference test comparing percentage of persons in the COVID-19 diagnosis group with the percentage in the No COVID-19 group: ***p<0.001, **p<0.01, *p<.05

Three individuals were missing county type (not shown).

Table 22. Demographic characteristics of individuals in SSLCS diagnosed with COVID-19, by hospitalization status

Domain	Characteristic	COVID-19 diagnosed (N)	Never hospitalized (%)	Hospitalization with COVID-19 diagnosis (%)	Hospitalization for COVID-19 (%)	P-value
	All	*N=536*	*N=343*	*N=193*	*N=129*	
Race/ethnicity	Asian	8	–	–	–	
Race/ethnicity	Black	50	9.6	8.8	9.3	
Race/ethnicity	Hispanic	109	20.4	20.2	20.9	
Race/ethnicity	Other/Unknown	35	7.3	5.2	6.2	
Race/ethnicity	White	334	61.8	63.2	62.0	
Age group	Age 0-20	9	2.6	0.0	0.0	
Age group	Age 21-64	391	76.4	66.8	67.4	*
Age group	Age 65+	136	21.0	33.2	32.6	**
County type	Metro	417	75.5	81.9	82.9	
County type	Micro	80	16.0	13.0	14.0	
County type	Rural	36	7.6	5.2	–	

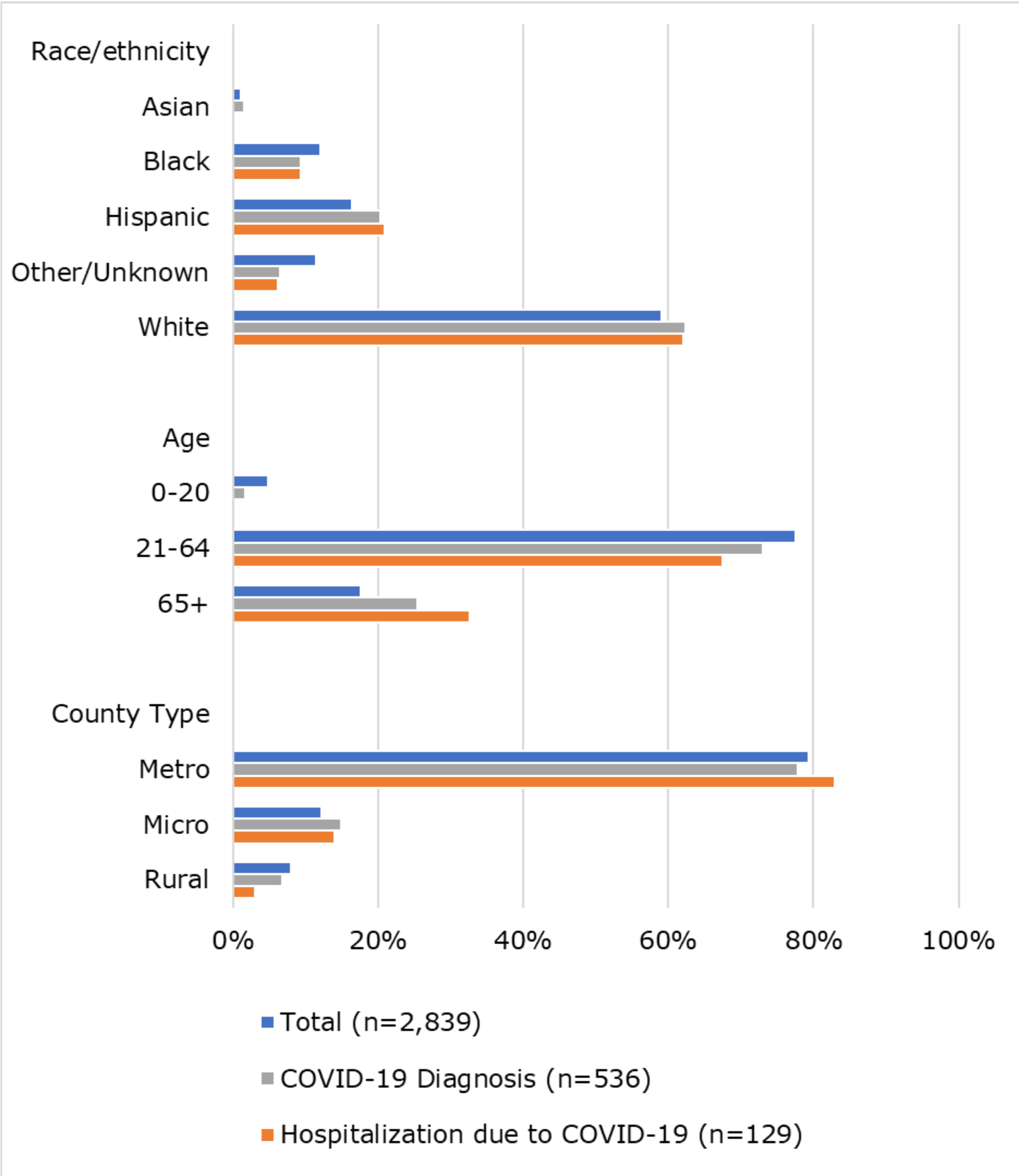
Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Note: Proportion (risk) difference test comparing percent of persons hospitalized for COVID-19 to the percent of persons never hospitalized with or for COVID-19: ***p<0.001, **p<0.01, *p<.05

Percentages are not reported (—) if the number of individuals in a cell is between 1 and 4.

Three individuals were missing county type (not shown).

Figure 59. Demographic characteristics of individuals living in SSLCs, overall and by COVID-19 outcome



Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Table 23. Demographic characteristics of nursing facility residents, by COVID-19 diagnosis

Domain	Characteristic	Number of individuals	Percent (%)	No COVID-19 diagnosis (%)	COVID-19 diagnosis (%)	P-value
	All	*N=92,195*		*N=61,525*	*N=30,670*	
Race/ethnicity	Asian	1,331	1.4	1.4	1.5	
Race/ethnicity	Black	12,941	14.0	13.8	14.6	**
Race/ethnicity	Hispanic	19,420	21.1	20.1	23.0	***
Race/ethnicity	Other/Unknown	12,802	13.9	14.1	13.5	*
Race/ethnicity	White	45,701	49.6	50.6	47.5	***
Age group	<21	75	0.1	0.1	0.0	***
Age group	21-64	18,494	20.1	19.3	21.5	***
Age group	65+	73,625	79.9	80.6	78.4	***
Age group	*missing*	1	0.0	0.0	0.0	
County type	Metro	65,676	71.3	71.2	71.2	
County type	Micro	9,100	9.9	10.0	9.6	*
County type	Rural	17,375	18.9	18.7	19.2	
County type	*missing*	44	0.1	0.1	0.0	**
Eligibility category	Aged	73,450	79.7	80.4	78.2	***
Eligibility category	Disabled	18,745	20.3	19.6	21.8	***

Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Note: Proportion (risk) difference test comparing percent of persons in the COVID-19 diagnosis group with the percent in the No COVID-19 group: ***p<0.001, **p<0.01, *p<.05

Table 24. Demographic characteristics of individuals in nursing facilities diagnosed with COVID-19, by hospitalization status

Domain	Characteristic	COVID-19 diagnosed (N)	Never hospitalized (%)	Any hospitalization with COVID-19 diagnosis (%)	Hospitalization for COVID-19 diagnosis (%)	P-value
	All	*N=30,670*	*N=23,434*	*N=7,236*	*N=4,493*	
Race/ethnicity	Asian	465	1.4	1.8	1.6	
Race/ethnicity	Black	4,467	13.7	17.3	16.6	***
Race/ethnicity	Hispanic	7,039	21.6	27.2	27.4	***
Race/ethnicity	Other/Unknown	4,146	13.7	12.9	12.9	
Race/ethnicity	White	14,553	49.5	40.9	41.5	***
Age group	<21	9	–	–	0.0	
Age group	21-64	6,602	20.7	24.3	23.3	***
Age group	65+	24,059	79.3	75.7	76.7	***
County type	Metro	21,847	71.6	70.0	66.5	***
County type	Micro	2,938	9.3	10.4	11.4	***
County type	Rural	5,880	19.0	19.7	22.1	***
County type	*missing*	5	0.0	0.0	0.0	
Eligibility category	Aged	23,996	79.1	75.5	76.5	**
Eligibility category	Disabled	6,674	20.9	24.5	23.5	**

Data Source: HHSC QAI Data Mart. Analysis by HHSC-DAP.

Percentages are not reported (—) if the number of individuals in a cell is between 1 and 4.

Note: Proportion (risk) difference test comparing percent of persons hospitalized for COVID-19 to the percent of persons never hospitalized with or for COVID-19: ***p<0.001, **p<0.01, *p<.05

Appendix I. COVID-19-Related Deaths

Data Sources

Death certificate information is collected by the DSHS VSS. While its primary purpose is legal and administrative documentation, death certificate data can also be used for public health surveillance. A medical certifier, usually a doctor, determines the cause(s) of death. The data include demographics, information on the primary cause of death, and information on underlying causes of death. While the information is provisional, it is timely, as death certificates must be filed within 10 days. Provisional death data used in this report may not be complete and may be subject to change. Both confirmed and probable cases of COVID-19 may be included. Deaths are reported by decedent's county of residence listed on the death certificate.

The Texas Population Estimates Program at the Texas Demographic Center produces annual estimates of the total populations of counties and places in the state and estimates of county populations by age, sex, and race/ethnicity. For more information, see Texas Population Estimates Program. The latest year for which Texas population estimates are available is CY 2019 and those data were used to calculate the rates published in this report.

Data Processing

The data used in this analysis include all deaths reported to DSHS as of June 2021. COVID-19 deaths were identified by DSHS-EAIDU. Decedents were included if COVID-19 was listed in cause A-D on the death certificate. A medical certifier, usually a doctor, determines the cause(s) of death. Decedents who had COVID-19 but died of an unrelated cause were excluded. Deaths were reported by where the person lived as listed on the death certificate.

ArcGIS StreetMap Premium software was used to geocode the residential addresses of decedents listed on the death certificates. Geocoding is the process of assigning a set of geographic coordinates (latitude, longitude) to an address. The coordinates were geo-spatially joined to their corresponding census tract using boundaries implemented during the 2010 Census and in effect until the year 2020. Ninety-eight percent of the records were successfully geocoded to the census tract level and included in the spatial analysis to examine the impact of societal factors on mortality.

AADRs provide unbiased comparisons that are not influenced by differences in age distribution in subject populations. The standard used is the US 2000 standard population. Population data for Texas are based on the 2019 estimates from the Texas Demographic Center, UT San Antonio. For more information on age adjustment, please see the CHS Vital Statistics Annual Report website.

Projecting the Number of Deaths

Conducting analysis of excess mortality is one of the strategies that can be used to illustrate the degree to which COVID-19 disrupted the statewide mortality trend. This type of analysis is accomplished by comparing the number of deaths that occurred during the year when COVID-19 emerged as a cause of death to a projection of the number of deaths that would have occurred during the same year that is based on some form of extrapolation of pre-COVID-19 mortality patterns and/or trends. Several methods are available for projecting the number of deaths. A straightforward method is an adaptation of the demographic Cohort Component Method commonly used to produce projections of the number of deaths in a population (The Texas Demographic Center). It involves weighing the estimated or projected population for specific demographic cohorts by the baseline (historical) death rates that are associated with them. This produces a projection of the number deaths at the cohort level. The total number of projected deaths in the population as a whole is calculated by adding the projected number of deaths across all the cohorts.

This method was used by HHSC staff to project the total number of deaths during CY 2020. To avoid computing and applying unstable rates, the baseline death rates that were selected represent average annual death rates per 100,000 population for a 3-year period, in this case the 2017-2019 period. This method requires having information about the average number of deaths per year within the baseline period of interest as well as information about the average population size per year during the same period. Baseline death rates were calculated for 40 different demographic cohorts defined according to combinations of age by race/ethnicity. The estimated 2019 population for each of the 40 cohorts was weighted by their corresponding baseline death rate to produce projections of the total number deaths within each cohort. The sum of projected deaths across all the cohorts produced a projection for the total number of deaths. Due to the lack of detailed Census 2020 population counts by age and race/ethnicity, estimates of the 2019 population developed by the Texas Demographic Center were used as proxy for the 2020 population.

Indirect Age Standardization Method

A strategy for assessing differential COVID-19 mortality at the local level involves analysis of differences between the actual versus the expected number of COVID-19 deaths at the county level. In 2020, 102 of Texas' 254 counties reported either zero or one to 20 COVID-19 deaths; 104 reported between 20 and 100; 19 reported 100 to 200; 22 reported 200 to 1,000; and seven reported 1,000 or more COVID-19 deaths.

The task of assessing whether certain counties experienced excess COVID-19 mortality during 2020 can be a challenging one depending on the amount and the quality of the data that are available for conducting the assessment. For example, because COVID-19 was a new cause of death in 2020, it is impossible to rely on analysis of historical data pertaining to that specific cause to determine if, in a historical context, the levels of COVID-19 mortality observed at the county level were either reasonable or excessive. Another consideration is that many counties recorded fewer than 200 COVID-19 deaths during 2020. Under this circumstance, it is difficult to employ a commonly used method such as direct age standardization to produce county-level COVID-19 AADRs that can be used to rank the counties on the basis COVID-19 excess mortality, especially since the method depends on the availability of stable age-specific death rates calculated from a sufficiently large number of events (20 or 25+) across multiple age cohorts (groups).

However, indirect age standardization can be employed as an alternative method for computing AADRs that can be used for assessing excess mortality at the local or county level (Curtin & Klein, 1995; Pennsylvania Department of Health, n.d.). This method applies the age-specific COVID-19 death rates observed in a larger standard population to the age distribution of the study population (the county population in this case) to calculate the number of COVID-19 deaths that would have occurred in the county if the county's population had experienced the age-specific death rates observed in the standard population. The figure that results from applying age-specific standard death rates to the county's population distribution is interpreted as the number of expected deaths. Dividing the actual number of deaths by the number of expected deaths produces the Standardized Mortality Ratio (SMR). An SMR higher than 1 indicates excess mortality, or a case where the number of actual deaths exceeds the number of expected deaths. When the SMR is smaller than 1 the interpretation is the opposite. An SMR of 1 suggests there is no difference between the actual and the expected number of deaths. However, since it is assumed that errors may occur during the collection and recording of mortality data, confidence intervals are calculated to determine whether the SMR is statistically significant. When the value of 1 is contained within the confidence interval, the SMR representing the difference or spread between the actual and the expected number of deaths is not statistically significant.

Statistical significance is based on 95 percent confidence intervals (Curtin & Klein, 1995). A confidence interval is like a margin of error that takes into account the possibility that the rate could be affected by random chance (Texas Health Care Information Collection, 2016).

One disadvantage of the indirect age standardization method is that the age-standardized death rates that result from it cannot be used to make comparisons between the counties, as the AADR for the counties can only be compared to the standard population's death rate. However, the method allows for the identification of counties where the difference between the actual and the expected number of COVID-19 deaths is statistically significant.

To assess excess COVID-19 mortality at the county level, standard COVID-19 age-specific death rates were developed using national (U.S.) mortality statistics for 2020 reported by the CDC as March 16, 2022, as well as national population data for 2019 reported by the U.S. Census Bureau's American Community Survey.

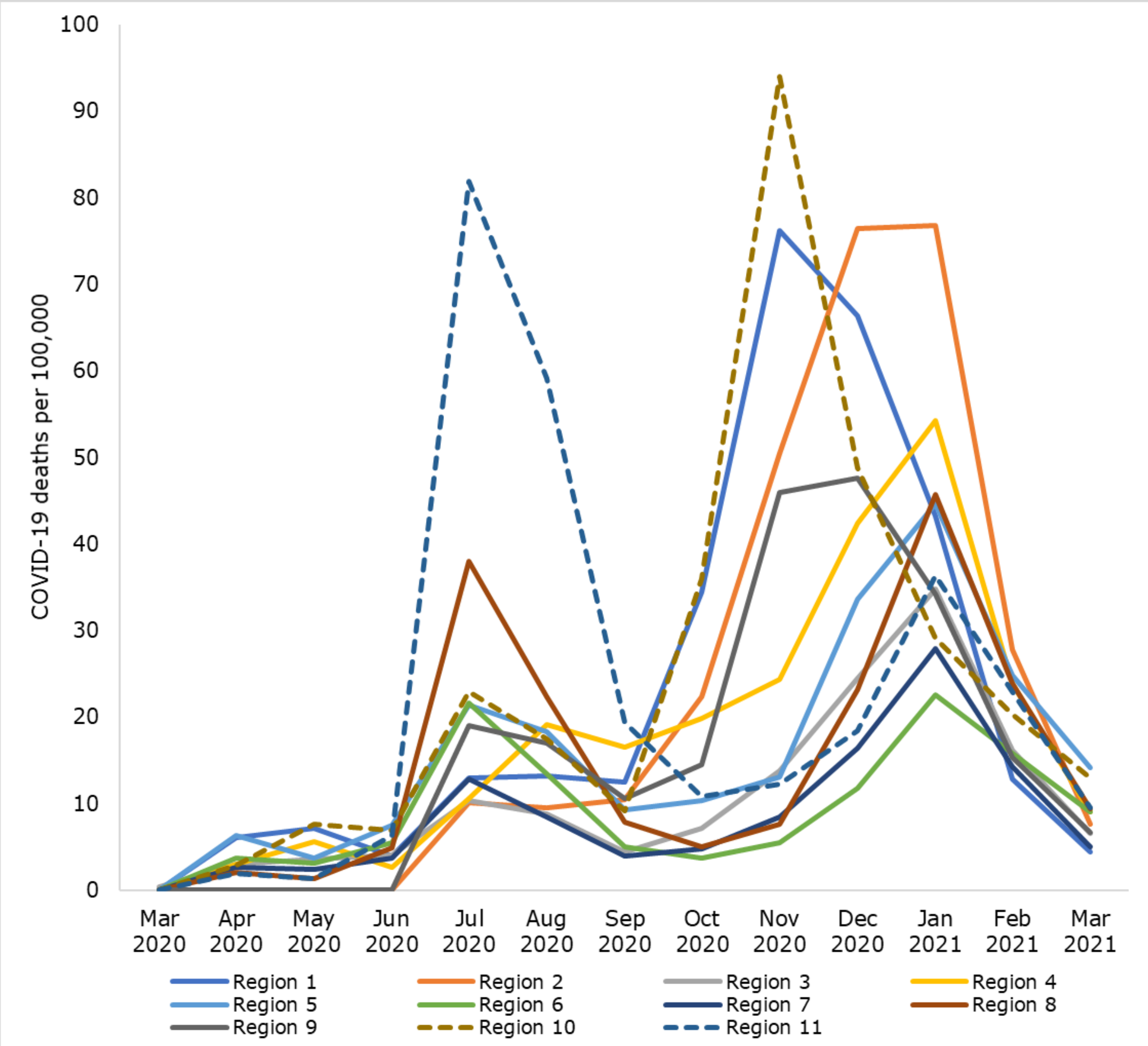
To avoid introducing biases that could result from including Texas' data in the computation of the national standard age-specific death rates, the number of COVID-19 deaths to Texas residents and the Texas population were removed from the calculations of the standard age-specific death rates. Data on the estimated county population distribution were obtained from the Texas Demographic Center. The 2019 population distribution was used as proxy for the 2020 population distribution to remedy an important gap in the availability of more current demographic data: at the present time, the U.S. Census Bureau has not released Census of 2020 population counts for a sufficient number of age cohorts.

Standard death rates associated with nine different age cohorts were calculated and then applied to the county's estimated population distribution to produce county-level estimates of the number of expected COVID-19 deaths in 2020. Ninety-five percent confidence intervals as well as corresponding tests for statistical significance were calculated for all the estimated SMR's representing differences between the actual and the expected number of COVID-19 deaths.

Supplemental Content

COVID-19 Deaths by Public Health Region

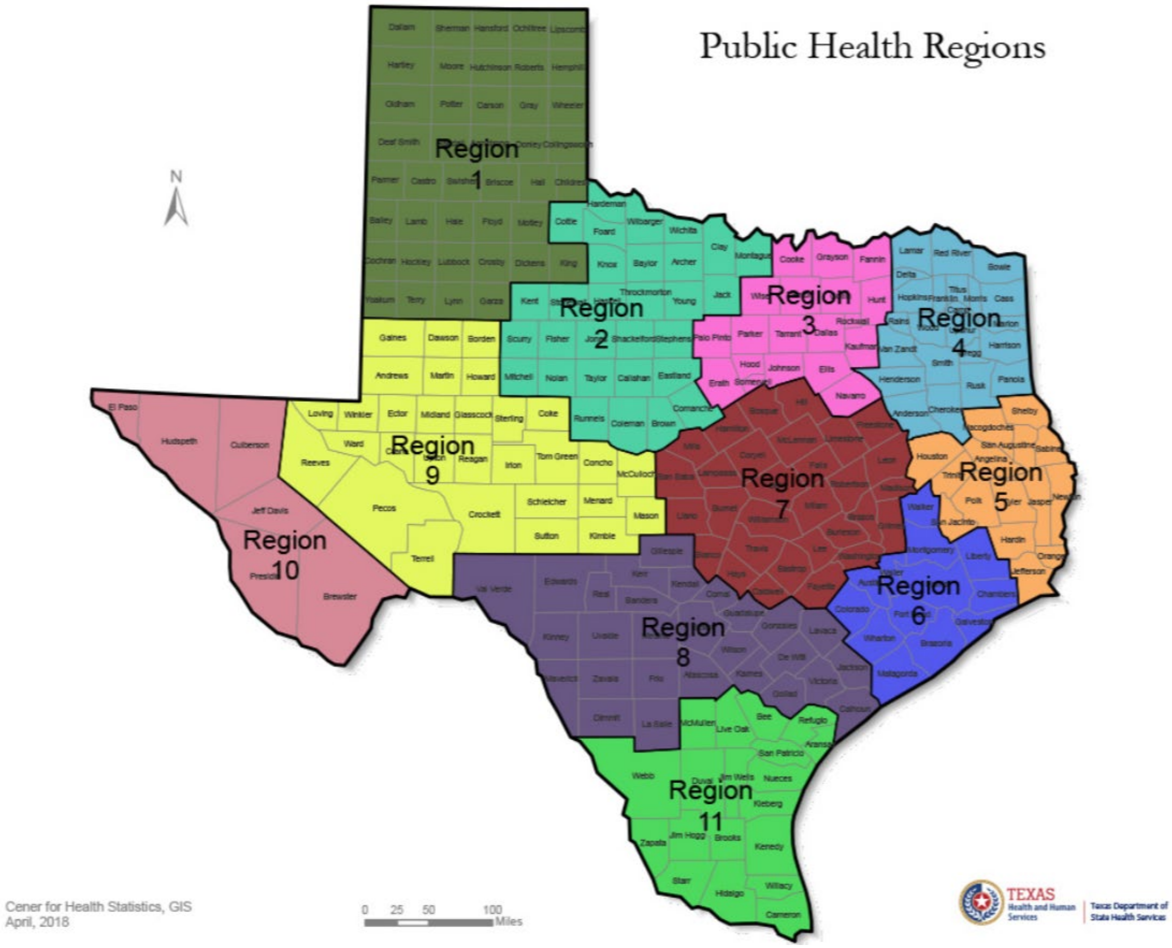
Figure 60. COVID-19 death rates per 100,000 persons, by Public Health Region, March 2020 - March 2021



Data Source: DSHS, Center for Health Statistics. Analysis by HHSC-DAP.

Notes: Includes all COVID-19 deaths reported to DSHS as of June 2021. Death data were considered provisional data as of that date. HHS Region is based on decedent's residence county. Excluded 97 decedents who were missing information on sex, race/ethnicity, residence county, or multiple causes of death (for the March 2020 – March 2021 time period). Data on rates are suppressed if the number of COVID-19 deaths was 25 or less. Population data for Texas are based on the 2019 estimates from the Texas Demographic Center, UT San Antonio

Figure 61. Reference map for Texas Public Health Regions



Source: https://www.dshs.state.tx.us/phr.shtm (accessed on 9/20/2022)

Other Supplemental Tables for COVID-19 Deaths

Table 25: COVID-19 deaths by race/ethnicity, Texas residents, March 2020 – March 2021

Domain	Characteristic	Number of deaths
Race/ethnicity	Asian, non-Hispanic	1,044
Race/ethnicity	Black, non-Hispanic	4,900
Race/ethnicity	Hispanic	22,613
Race/ethnicity	Other	241
Race/ethnicity	Unknown*	23
Race/ethnicity	White, non-Hispanic	19,850
Race/ethnicity	Total	48,671

Data Source: DSHS, Center for Health Statistics. Analysis by HHSC-DAP.

Notes: Includes all COVID-19 deaths reported to DSHS as of June 2021. Death data were considered provisional data as of that date.

*Decedents with unknown race/ethnicity (N=23) have been excluded from all analyses in this report, except for analyses on projected and excess deaths.

Table 26: Contributing causes of death among Texas residents with a COVID-19 death, March 2020 – March 2021

Contributing Cause	ICD-10 code	Deaths
Influenza and pneumonia	J09-J18	26,491
Chronic lower respiratory diseases	J40-J47	3,479
Adult respiratory distress syndrome	J80	4,518
Respiratory failure	J96	18,291
Respiratory arrest	R09.2	540
Other diseases of the respiratory system	J00-J06, J20-J39, J60-J70, J81-J86, J90-J95, J97-J99, U04	2,439
Hypertensive diseases	I10-I15	10,502
Ischemic heart disease	I20-I25	5,016
Cardiac arrest	I46	3,233
Cardiac arrhythmia	I44, I45, I47-I49	3,815
Heart failure	I50	3,373
Cerebrovascular diseases	I60-I69	2,043
Other diseases of the circulatory system	I00-I09, I26-I43, I51, I52, I70-I99	2,869
Sepsis	A40-A41	6,322
Malignant neoplasms	C00-C97	1,655
Diabetes	E10-E14	9,797
Obesity	E65-E68	2,975
Alzheimer's disease	G30	1,406
Vascular and unspecified dementia	F01, F03	3,022
Renal failure	N17-N19	7,119
Intentional and unintentional injury, poisoning, and other adverse events	S00-T98, V01-X59, X60-X84, X85-Y09, Y10-Y36, Y40-Y89, U01-U03	742
All other conditions and causes (residual)	A00-A39, A42-B99, D00-E07, E15-E64, E70-E90, F00, F02, F04-G26, G31-H95, K00-K93, L00-M99, N00-N16, N20-N98, O00-O99, P00-P96, Q00-Q99, R00-R08, R09.0, R09.1, R09.3, R09.8, R10-R99	19,522

Source: DSHS, Center for Health Statistics.

Notes: Includes all COVID-19 deaths reported to DSHS as of June 2021. Death data were considered provisional data as of that date. Excluded 97 decedents who were missing information on sex, race/ethnicity, residence county, or multiple cause of death codes (for the March 2020 – March 2021 time period). Conditions contributing to the death were based on the CDC-NCHS list of contributing causes and identified using the International Classification of Diseases, Tenth Revision (ICD–10). Deaths involving more than one condition (e.g., deaths involving both diabetes and respiratory arrest) were counted in both totals. To avoid counting the same death multiple times, the numbers for different conditions should not be summed. Cause of death fields 1-20 on the Texas death certificate were used in this analysis. Cause of death field 1 was included since 1,190 (or 2.4 percent) of COVID-19 deaths identified by DSHS-EAIDU did not have COVID-19 listed as the primary cause of death.

Table 27: Logistic regression results for factors associated with COVID-19 as the cause of death, March 2020 – December 2020

Domain	Predictor variable	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Race/ethnicity	Asian	1.52 (1.39 – 1.67) ***	1.56 (1.42 – 1.71)***	1.56 (1.42 – 1.71)***
Race/ethnicity	Black	1.24 (1.19 – 1.30)***	1.35 (1.29 – 1.41)***	1.26 (1.20 – 1.32)***
Race/ethnicity	Hispanic	3.32 (3.22 – 3.42)***	3.56 (3.45 – 3.67)***	3.27 (3.16 – 3.38)***
Race/ethnicity	Other	1.45 (1.22 – 1.71)***	1.57 (1.32 – 1.86)***	1.55 (1.31 – 1.85)***
Race/ethnicity	Unknown	1.21 (0.70 – 2.07)	1.23 (0.71 – 2.11)	1.20 (0.70 – 2.05)
Race/ethnicity	White	Reference	Reference	Reference
Age	Continuous		1.01 (1.009 – 1.01)***	1.01 (1.009 – 1.01)***
Sex	Male		1.25 (1.22 – 1.28)***	1.25 (1.22 – 1.28)***
Sex	Female	Reference	Reference	Reference
Social Vulnerability Index	2nd Quartile (Low)			1.19 (1.13 – 1.25)***
Social Vulnerability Index	3rd Quartile (High)			1.32 (1.26 – 1.38)***
Social Vulnerability Index	4th Quartile (Very High)			1.47 (1.40 – 1.55)***
Social Vulnerability Index	1st Quartile (Very Low)	Reference	Reference	Reference

Data Source: DSHS, Center for Health Statistics. Analysis by HHSC-DAP.

Notes: Includes deaths among Texas residents due to all causes that occurred from March 2020 – December 2020 (provisional data). Logistic regression predicting cause of death due to COVID-19 versus cause of death due to other factors.

***p<0.001, **p<0.01, *p<0.05. OR=Odds ratio. CI = Confidence Interval.

Multicollinearity of predictor variables examined through correlation analysis (where p>0.80); no variables in this model were found to be collinear.

Appendix J. Medicaid Utilization Technical Specifications

This appendix provides technical details for the Medicaid/CHIP utilization studies in Part 3.

Data Sources

This analysis includes full benefit Medicaid clients, partial benefit dual eligible clients, and CHIP clients. Both FFS and MCO programs are included. Claims and encounter data are derived from the Analytical Data Store and the composite Medicaid/CHIP eligibility data at TMHP. The data were prepared by the Office of Data, Analytics and Performance at HHSC.

Data Processing

The pre-COVID-19 study period was March 2019 – Feb 2020 and the post-COVID-19 study period was March 2020 – February 2021. Demographic subgroups such as race/ethnicity, age, sex, and residence county were based on the last date of service in each study period. Clients from the Healthy Texas Women's program were excluded from the analysis.

Emergency Department Services

An ED visit is included if the Header From Date of Service (HFDOS) and admission dates occur within the study period, regardless of when the discharge occurred.

ED services are defined as claims that have CPT Codes (Adjudicated or Submitted Procedural Codes): 99281 to 99285, or

Revenue code: 0450, 0451, 0452, 0456, 0459, 0981, 450, 451, 452, 456, 459, or 981, or

Place of Service: 23 (Encounters) regardless of procedure code (FFS Place of Service not limited).

And transaction type: Institutional or Professional

And header and detail status code: P (paid) or E (partially paid)

Inpatient Services

Date of service is defined by the claim or encounter HFDOS.

A hospital stay is included if the HFDOS and admission dates occur within the study period, regardless of when the discharge occurred. A single hospital stay is defined by unique client ID, admission date, and discharge date.

Inpatient services include Medicaid and CHIP paid and partially paid claims and encounters with an institutional category code of "I" (inpatient hospital).

Mental Health Services

MH and Substance Abuse services are defined in the Texas Medicaid Provider Procedures Manual, Volume 2 Behavioral Health and Case Management Services Handbook. https://www.tmhp.com/resources/provider-manuals

MH = Chapter 4 (Outpatient Mental Health Services), Chapter 5 (Mental Health Targeted Case Management & Rehab Services), Chapter 7 (Psychiatric Hospitalization)

Service types are based on procedure codes grouped into similar areas such as: Testing and evaluation ('90791','90792','96101','96116','96118'), psychotherapy ('90837','90834','90832','90833','90836','90838', '90846','90847','90853'), case management ('T1017'), MH Rehab ('H2014','H2017','H2012','G0177'), and other services.

Physical (PT), Occupational (OT), and Speech Therapy (ST) Services

PT services are defined as modifier code 'GP' with procedure codes 97012, 97014, 97016, 97018, 97022, 97024, 97026, 97028, 97032, 97033, 97034, 97035, 97036, 97039, 97110, 97112, 97113, 97116, 97124, 97139, 97140, 97150, 97530, 97535, 97537, 97542, 97750, 97760, 97761, 97762, 97799, S8990 and/or procedure codes 97001, 97002, 97161, 97162, 97163, 97164, G0151 with no modifiers.

OT services are defined as modifier code 'GO' with procedure codes 97012, 97014, 97016, 97018, 97022, 97024, 97026, 97028, 97032, 97033, 97034, 97035, 97036, 97039, 97110, 97112, 97113, 97116, 97124, 97139, 97140, 97150, 97530, 97535, 97537, 97542, 97750, 97760, 97761, 97762, 97799, S8990 and/or procedure codes 97003, 97004, 97165, 97166, 97167, 97168, G0152 with no modifier.

ST services are defined as modifier code 'GN' with procedure code 97535 and/or procedure codes 5456X, 92506, 92507, 92508, 9250X, 92521, 92522, 92523, 92524, 92526, 92610, G0153, S9152 with no modifier codes.

Claims and encounters with Unknown Therapy Type (insufficient modifiers to determine type of therapy or procedure code and modifier combinations do not follow expected patterns) and Multiple Therapy Type (multiple therapy modifiers reported) are excluded from this analysis.

School health and related services data were excluded from this analysis.

Well-Child Visits

A well-child visit is included if the HFDOS and admission dates occur within the study period. Visits are defined as claims which have CPT Codes 99381, 99382, 99383, 99384, 99385, 99391, 99392, 99393, 99394, 99395, and 99211.

Supplemental Tables

Emergency Department Visits

Table 28: Average number of ED visits before and during COVID-19, by client characteristics

Domain	Client characteristics	*N*	ED visits before COVID-19 (Mar 2019-Feb 2020) (Mean)	ED visits during COVID-19 (Mar 2020-Feb 2021) (Mean)	P-value	% Change
All	All	1,248,390	1.69	0.91	***	-46.0%
Race/ethnicity	Asian	14,134	1.36	0.69	***	-49.3%
Race/ethnicity	Black	197,345	1.82	1.07	***	-41.2%
Race/ethnicity	Hispanic	591,176	1.55	0.78	***	-50.0%
Race/ethnicity	Other/Unknown	229,680	1.87	0.95	***	-49.1%
Race/ethnicity	White	216,055	1.79	1.12	***	-37.6%
Age group†	<21	946,805	1.47	0.65	***	-55.7%
Age group†	21-64	224,577	2.67	1.93	***	-27.4%
Age group†	65+	77,008	1.59	1.16	***	-27.2%
Sex	Female	650,862	1.78	1.00	***	-43.9%
Sex	Male	597,461	1.60	0.82	***	-48.7%
Sex	*Unknown*	67	1.36	0.40	***	-
County type	Metro	1,020,734	1.70	0.90	***	-47.2%
County type	Micro	90,124	1.68	1.00	***	-40.7%
County type	Rural	137,408	1.68	1.00	***	-40.6%
County type	*Missing*	124	2.63	1.69	*	-
Program	CHIP	38,392	1.27	0.44	***	-65.3%
Program	FFS	42,161	1.71	1.08	***	-37.0%
Program	MMP	6,106	1.97	1.60	***	-18.7%
Program	STAR	858,204	1.52	0.69	***	-54.8%
Program	STAR Health	16,164	1.70	1.10	***	-35.1%
Program	STAR Kids	71,348	1.74	1.01	***	-42.1%
Program	STAR+PLUS	216,015	2.45	1.81	***	-26.1%

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid clients continuously enrolled March 2019-February 2021 with at least one ED visit (N=1,248,390) for any reason (including COVID-19) were included. Healthy Texas Women and emergency Medicaid excluded. †Age Statistics: Mean = 18.93, Median = 11, Standard deviation = 21.49. Note: Paired t-tests. ***p<0.001, **p<0.01, *p<0.05

Inpatient Hospitalizations

Table 29: Average number of inpatient hospitalizations before and during COVID-19, by client characteristics

Domain	Client characteristics	*N*	Inpatient visits before COVID-19 (Mar 2019-Feb 2020) (Mean)	Inpatient visits during COVID-19 (Mar 2020-Feb 2021) (Mean)	P-value	% Change
All	All	234,307	1.03	0.79	***	-23.6%
Race/ethnicity	Asian	3,761	0.89	0.70	***	-21.2%
Race/ethnicity	Black	37,097	1.07	0.91	***	-14.8%
Race/ethnicity	Hispanic	95,307	0.97	0.73	***	-24.6%
Race/ethnicity	Other/Unknown	46,092	1.14	0.75	***	-34.3%
Race/ethnicity	White	52,050	1.04	0.85	***	-18.0%
Age group†	<21	99,388	0.96	0.58	***	-39.8%
Age group†	21-64	92,965	1.17	0.98	***	-15.8%
Age group†	65+	41,954	0.91	0.86	***	-5.3%
Sex	Female	140,606	0.99	0.77	***	-21.9%
Sex	Male	93,688	1.10	0.81	***	-25.8%
Sex	*Unknown*	13	0.46	0.54		-
County type	Metro	190,012	1.05	0.79	***	-24.4%
County type	Micro	17,714	0.98	0.77	***	-21.4%
County type	Rural	26,539	0.95	0.77	***	-18.6%
County type	*Missing*	42	1.36	0.88		-
Program	CHIP	2,533	0.88	0.51	***	-41.7%
Program	FFS	20,926	1.01	0.65	***	-35.1%
Program	MMP	2,188	0.85	0.64	***	-24.7%
Program	STAR	87,577	0.84	0.52	***	-38.3%
Program	STAR Health	5,148	1.45	1.16	***	-20.1%
Program	STAR Kids	17,811	1.30	0.90	***	-30.6%
Program	STAR+PLUS	98,124	1.15	1.03	***	-10.3%

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid/CHIP clients continuously enrolled March 2019-February 2021 with at least one inpatient visit (N=234,307) for any reason (including COVID-19) were included. Healthy Texas Women and emergency Medicaid excluded. †Age Statistics: Mean = 35.58, Median = 29, Standard deviation = 26.89. Note: Paired t-tests. ***p<0.001, **p<0.01, *p<0.05

Mental Health Visits

Table 30: Average number of MH visits before and during COVID-19, by client characteristics

Domain	Client characteristics	*N*	MH visits before COVID-19 (Mar 2019-Feb 2020) (Mean)	MH visits during COVID-19 (Mar 2020-Feb 2021) (Mean)	P-value	% Change
All	All	371,101	7.28	7.13	***	-2.1%
Race/ethnicity	Asian	2,517	6.38	6.42		0.6%
Race/ethnicity	Black	58,013	7.62	7.67		0.7%
Race/ethnicity	Hispanic	169,059	6.81	6.75	**	-1.0%
Race/ethnicity	Other/Unknown	56,439	7.05	6.79	***	-3.7%
Race/ethnicity	White	85,073	8.15	7.76	***	-4.8%
Age group†	<21	255,748	6.64	6.60		-0.6%
Age group†	21-64	95,696	8.47	8.39		-1.0%
Age group†	65+	19,657	9.79	7.88	***	-19.5%
Sex	Female	187,678	7.11	7.28	***	2.4%
Sex	Male	183,413	7.46	6.97	***	-6.5%
Sex	*Unknown*	10	6.20	4.60		-
County type	Metro	308,777	7.25	7.19	**	-0.8%
County type	Micro	26,185	7.37	6.73	***	-8.7%
County type	Rural	36,132	7.50	6.90	***	-7.9%
County type	*Missing*	7	11.43	1.57		-
Program	CHIP	8,099	4.09	3.41	***	-16.7%
Program	FFS	10,827	5.31	3.81	***	-28.2%
Program	MMP	2,569	16.10	17.60	**	9.3%
Program	STAR	184,890	5.35	5.42	**	1.3%
Program	STAR Health	30,343	11.98	12.55	***	4.8%
Program	STAR Kids	44,277	8.24	7.78	***	-5.6%
Program	STAR+PLUS	90,096	9.46	8.93	***	-5.6%

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid clients continuously enrolled March 2019-February 2021 with at least one MH visit (N=371,101) for any reason were included. Healthy Texas Women and emergency Medicaid excluded. †Age Statistics: Mean = 22.99, Median = 15, Standard deviation = 20.19. Note: Paired t-tests. ***p<0.001, **p<0.01, *p<0.05

Physical Therapy

Table 31: Average number of PT visits before and during COVID-19, by client characteristics

Domain	Client characteristics	*N*	PT visits before COVID-19 (Mar 2019-Feb 2020) (Mean)	PT visits during COVID-19 (Mar 2020-Feb 2021) (Mean)	P-value	% Change
All	All	153,985	5.84	4.61	***	-20.9%
Race/ethnicity	Asian	2,932	4.52	3.10	***	-31.5%
Race/ethnicity	Black	20,336	3.50	3.08	***	-12.0%
Race/ethnicity	Hispanic	66,308	6.68	5.12	***	-23.5%
Race/ethnicity	Other/Unknown	29,450	7.48	5.96	***	-20.2%
Race/ethnicity	White	34,959	4.31	3.55	***	-17.7%
Age group†	<21	70,066	9.19	7.44	***	-19.0%
Age group†	21-64	48,289	3.10	2.43	***	-21.6%
Age group†	65+	35,630	2.95	2.02	***	-31.7%
Sex	Female	89,469	5.17	4.03	***	-22.1%
Sex	Male	64,511	6.76	5.43	***	-19.7%
Sex	*Unknown*	5	12.80	1.00		-
County type	Metro	124,622	6.22	4.94	***	-20.5%
County type	Micro	11,296	4.94	3.83	***	-22.6%
County type	Rural	18,062	3.72	2.83	***	-24.0%
County type	*Missing*	5	1.40	0.20		-
Program	CHIP	3,021	5.59	3.62	***	-35.3%
Program	FFS	10,232	3.05	1.91	***	-37.5%
Program	MMP	1,891	1.98	1.54	***	-22.4%
Program	STAR	49,941	5.31	4.29	***	-19.3%
Program	STAR Health	2,433	8.97	7.53	***	-16.0%
Program	STAR Kids	20,271	17.66	14.50	***	-17.9%
Program	STAR+PLUS	66,196	3.05	2.28	***	-25.3%

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid clients continuously enrolled March 2019-February 2021 with at least one PT visit (N=153,985) for any reason were included. Healthy Texas Women and emergency Medicaid excluded. †Age Statistics: Mean = 37.67, Median = 35, Standard deviation = 29.05. Note: Paired t-tests. ***p<0.001, **p<0.01, *p<0.05

Occupational Therapy

Table 32: Average number of OT visits before and during COVID-19, by client characteristics

Domain	Client characteristics	*N*	OT visits before COVID-19 (Mar 2019-Feb 2020) (Mean)	OT visits during COVID-19 (Mar 2020-Feb 2021) (Mean)	P-value	% Change
All	All	100,023	11.03	9.56	***	-13.3%
Race/ethnicity	Asian	1,361	7.24	6.29	*	-13.2%
Race/ethnicity	Black	11,152	5.83	5.57	*	-4.4%
Race/ethnicity	Hispanic	44,888	13.90	11.70	***	-15.8%
Race/ethnicity	Other/Unknown	23,202	11.89	10.54	***	-11.4%
Race/ethnicity	White	19,420	6.63	5.95	***	-10.3%
Age group†	<21	67,716	15.43	13.41	***	-13.1%
Age group†	21-64	15,040	1.95	1.57	***	-19.5%
Age group†	65+	17,267	1.70	1.42	***	-16.8%
Sex	Female	43,973	8.85	7.61	***	-14.0%
Sex	Male	56,046	12.74	11.09	***	-13.0%
Sex	*Unknown*	4	3.75	0.75		-
County type	Metro	84,777	11.64	10.15	***	-12.8%
County type	Micro	6,462	9.32	7.75	***	-16.8%
County type	Rural	8,783	6.40	5.16	***	-19.3%
County type	*Missing*	1	2.00	0.00		-
Program	CHIP	1,730	12.43	9.07	***	-27.0%
Program	FFS	2,966	1.36	0.86	***	-36.2%
Program	MMP	777	1.08	0.83	**	-22.7%
Program	STAR	37,731	10.94	10.52	***	-3.8%
Program	STAR Health	3,223	9.76	8.74	**	-10.5%
Program	STAR Kids	25,758	22.56	18.23	***	-19.2%
Program	STAR+PLUS	27,838	1.86	1.52	***	-18.1%

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid clients continuously enrolled March 2019-February 2021 with at least one OT visit (N=100,023) for any reason were included. Healthy Texas Women and emergency Medicaid excluded. †Age Statistics: Mean = 25.43, Median = 9, Standard deviation = 29.49. Note: Paired t-tests. ***p<0.001, **p<0.01, *p<0.05

Speech Therapy

Table 33: Average number of ST visits before and during COVID-19, by client characteristics

Domain	Client characteristics	*N*	ST visits before COVID-19 (Mar 2019-Feb 2020) (Mean)	ST visits during COVID-19 (Mar 2020-Feb 2021) (Mean)	P-value	% Change
All	All	140,981	15.73	13.81	***	-12.2%
Race/ethnicity	Asian	1,427	15.06	12.49	***	-17.1%
Race/ethnicity	Black	13,004	11.61	10.88	***	-6.3%
Race/ethnicity	Hispanic	72,086	17.87	15.32	***	-14.2%
Race/ethnicity	Other/Unknown	35,044	15.32	13.84	***	-9.7%
Race/ethnicity	White	19,420	11.33	10.18	***	-10.1%
Age†	<21	127,390	17.23	15.13	***	-12.2%
Age†	21-64	5,127	2.41	1.81	***	-24.8%
Age†	65+	8,464	1.23	1.16	**	-5.2%
Sex	Female	51,148	14.06	12.49	***	-11.2%
Sex	Male	89,832	16.68	14.55	***	-12.7%
Sex	*Unknown*	1	0.00	2.00		-
County type	Metro	122,997	16.34	14.42	***	-11.7%
County type	Micro	8,114	13.55	11.28	***	-16.7%
County type	Rural	9,869	9.94	8.23	***	-17.2%
County type	*Missing*	1	0.00	1.00		-
Program	CHIP	4,107	17.46	12.42	***	-28.9%
Program	FFS	1,345	2.96	1.70	***	-42.5%
Program	MMP	691	0.96	1.18	***	23.2%
Program	STAR	86,139	14.54	13.65	***	-6.2%
Program	STAR Health	5,573	9.75	9.53		-2.3%
Program	STAR Kids	31,491	25.91	20.60	***	-20.5%
Program	STAR+PLUS	11,635	1.56	1.27	***	-18.2%

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid clients continuously enrolled March 2019-February 2021 with at least one ST visit (N=140,981) for any reason were included. Healthy Texas Women and emergency Medicaid excluded. †Age Statistics: Mean = 11.23, Median = 4, Standard deviation = 19.62. Note: Paired t-tests. ***p<0.001, **p<0.01, *p<0.05

Well-Child Visits

Table 34. Medicaid/CHIP clients with at least one well-child visit before and during COVID-19, by client characteristics

Domain	Client characteristic	Number of clients (before COVID-19)	Percent of clients with ≥ 1 checkup (before COVID-19)	Number of clients (during COVID-19)	Percent of clients with ≥ 1 checkup (during COVID-19)
All	**All**	**3,874,123**	**59.7**	**3,931,195**	**53.9**
Race/ethnicity	Asian	66,239	59.6	66,527	54.7
Race/ethnicity	Black	533,822	51.1	539,797	44.8
Race/ethnicity	Hispanic	2,074,636	62.6	2,089,639	56.2
Race/ethnicity	White	554,521	49.2	560,424	44.5
Race/ethnicity	Other/Unknown	644,904	66.6	674,808	62.0
Age group	<1	196,087	86.7	189,196	87.0
Age group	1-2	441,864	83.4	440,179	80.0
Age group	3-5	635,803	67.4	628,083	61.2
Age group	6-9	794,348	56.8	807,294	49.9
Age group	10-14	988,043	57.5	998,637	50.9
Age group	15-18	652,218	46.7	673,880	41.3
Age group	19-20	165,759	13.1	193,926	15.3
Sex	Female	1,931,728	58.8	1,958,391	53.3
Sex	Male	1,942,095	60.6	1,972,493	54.5
Sex	*Unknown*	299	48.8	311	47.9
County type	Metro	3,280,725	61.0	3,321,463	55.0
County type	Micro	242,681	56.0	251,548	52.2
County type	Rural	348,436	50.4	355,738	45.5
County type	*Missing*	2,280	10.9	2,446	13.4
Program	CHIP	462,116	56.9	273,861	49.1
Program	FFS	154,091	26.2	72,953	11.0
Program	STAR	3,051,847	61.9	3,368,669	55.2
Program	STAR Health	33,841	83.2	43,168	77.4
Program	STAR Kids	172,223	53.7	172,540	48.2
Program	STAR+PLUS	4	0.0	4	0.0

Data Source: HHSC, AHQP Claims Universe, Encounters Best Picture Universe, TMHP. Analysis by HHSC-DAP.

Note: Before COVID-19 period is 3/1/19 – 2/29/20. (N=3,874,123); During COVID-19 period is 3/1/20-2/28/21 (N=3,931,195). Inclusion in the before and during COVID-19 periods was determined independently and based on having 90-day continuous enrollment during that period; some clients are included in both periods. Age categories are based on client's age as of February 1 of each period. Method adapted from CMS-416 Reporting instructions.

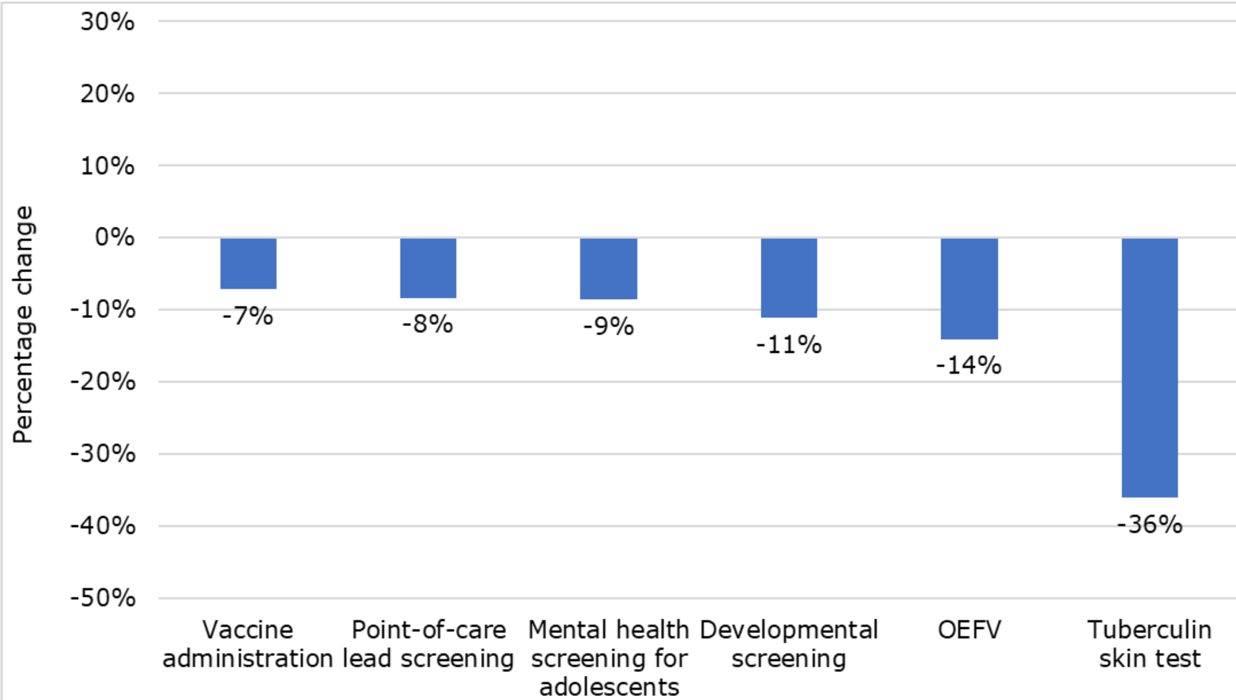
Table 35: Ratio of observed to expected number of well-child visits in Medicaid/CHIP before and during COVID-19, by client characteristics

Domain	Client characteristic	Ratio before COVID-19	Ratio during COVID-19
All	All	0.72	0.61
Race/ethnicity	Asian, Pacific Islander	0.73	0.63
Race/ethnicity	Black, non-Hispanic	0.63	0.52
Race/ethnicity	Hispanic	0.77	0.65
Race/ethnicity	White, non-Hispanic	0.63	0.54
Race/ethnicity	Other/Unknown	0.72	0.63
Age group	<1 year	0.70	0.69
Age group	1-2 years	0.94	0.82
Age group	3-5 years	0.95	0.78
Age group	6-9 years	0.72	0.58
Age group	10-14 years	0.73	0.60
Age group	15-18 years	0.61	0.50
Age group	19-20 years	0.22	0.21
Sex	Female	0.71	0.61
Sex	Male	0.72	0.61
Sex	*missing*	0.57	0.52
County type	Metro	0.73	0.62
County type	Micro	0.69	0.60
County type	Rural	0.61	0.53
County type	*missing*	0.14	0.15
Program	CHIP	0.77	0.61
Program	FFS	0.39	0.15
Program	STAR	0.72	0.61
Program	STAR Health	1.12	0.98
Program	STAR Kids	0.68	0.58

Data Source: HHSC, AHQP Claims Universe, Encounters Best Picture Universe, TMHP. Analysis by HHSC-DAP.

Note: Before COVID-19 period is 3/1/19 – 2/29/20. (N=3,874,123); During COVID-19 period is 3/1/20-2/28/21 (N=3,931,195). Screening ratio is the actual number of well-child visits received to the number of visits expected, by age, prorated by the proportion of the year for which clients were enrolled. Inclusion in the before and during COVID-19 periods was determined independently and based on having 90-day continuous enrollment during that period; some clients are included in both periods. Age categories are based on client's age as of February 1 of each period. Method adapted from CMS-416 Reporting instructions.

Figure 62. Percentage change in the number of clients receiving select well-child services from before to during COVID-19



Data Source: HHSC, AHQP Claims Universe, Encounters Best Picture Universe, TMHP. Analysis by HHSC-DAP.

Notes: Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21.

Services were defined using the following procedure codes: Point-of-care lead screening: 83655; Mental health screening for adolescents: 96160, 96161; Tuberculin skin tests: 86580; Developmental and autism screening: 96110; Vaccination administration: 90460, 90461, 90471, 90472, 90473, 90474; Oral Evaluation and Fluoride Varnish (OEFV): 99429.

Appendix K. Teleservices Technical Specifications

This appendix provides technical details for the teleservices utilization study presented in Part 3.

Data Sources

This analysis includes full benefit Medicaid clients, partial benefit dual eligible clients, and CHIP clients. Both FFS and MCO programs are included. Claims and encounters data are derived from the TMHP Analytical Data Store. Demographic and program information are from HHSC's 8-month eligibility file, 24-month eligibility file, TT FFS file, and CHIP History file.

Data Processing

"Teleservices" includes audio/visual services done by physicians (telemedicine) or non-physicians (telehealth), as well as audio-only done by any licensed provider. Teleservices before 9/1/2019 include procedure codes G0406, G0407, G0408, G0425, G0426, G0427, G0459, or 99457 regardless of modifier or procedure codes 90791, 90792, 90801, 90802, 90804, 90805, 90806, 90807, 90808, 90809, 90832, 90833, 90834, 90836, 90837, 90838, 90862, 90951, 90952, 90954, 90955, 90957, 90958, 90960, 90961, 92507, 92508, 92521, 92522, 92523, 92524, 97150, 97165, 97166, 97167, 97168, 97530, 97802, 97803, 97804, 99201, 99202, 99203, 99204, 99205, 99211, 99212, 99213, 99214, 99215, 99241, 99242, 99243, 99244, 99245, 99251, 99252, 99253, 99254, 99255, 99354, 99355, 99356, 99357, G0406, G0407, G0408, G0425, G0426, G0427, G0459, M0064, S9152, or S9470 with modifier 'GT' or '95'.

Beginning 9/1/2019, teleservices include any procedure codes with modifier GT or 95 or procedure codes G0406, G0407, G0408, G0425, G0426, G0427, G0459, 99457, 99441, 99442, or 99443 regardless of modifier.

Teleservices visits were defined as unique combinations of claim numbers, dates of service, and Medicaid IDs. Multiple claims per day per individual were counted as separate visits.

In-Person Visits are defined as all paid claims and encounters except those with procedure codes and modifiers defined as "Teleservices." In-person visits were defined as unique combinations of claim numbers, dates of service, and Medicaid IDs. Multiple claims per day per individual were counted as separate visits.

Mental Health Visits are defined in the Texas Medicaid Provider Procedures Manual, Volume 2 Behavioral Health and Case Management Services Handbook, Chapter 4 (Outpatient Mental Health Services), Chapter 5 (Mental Health Targeted Case Management & Rehab Services), and Chapter 7 (Psychiatric Hospitalization). Service types are based on procedure codes grouped into similar areas such as: Testing and evaluation ('90791','90792','96101','96116','96118'), psychotherapy ('90837','90834','90832','90833','90836','90838', '90846','90847','90853'), case management ('T1017'), MH Rehab ('H2014','H2017','H2012','G0177'), and other services. Mental health (MH) telehealth, telemedicine, and telephonic services are indicated by MH specific procedure codes along with modifiers 'GT' or '95' submitted on a claim or encounter.

Pregnant is defined by type program 40 (TP 40) in the 8-month eligibility file. Clients identified as pregnant may also be receiving postpartum coverage.

Comorbidities and other conditions are defined in Appendix C.

SVI ranking is a percentile rank variable divided into quartiles, with the 1st quartile being the lowest social vulnerability and the 4th quartile being the highest.

County-level COVID-19 Cases reflect a cumulative count of confirmed COVID-19 cases by county through March 2021. Data derived from DSHS COVID-19 Dashboards.

Supplemental Tables

Table 36: Average number of teleservices and in-person visits before and during COVID-19, by client characteristics

Domain	Client characteristics	*N*	Teleservice visits before COVID-19 (Mean)	Teleservice visits during COVID-19 (Mean)	P-value	In-person visits before COVID-19 (Mean)	In-person visits during COVID-19 (Mean)	P-value
All	All	*2,780,816*	0.06	1.75	***	25.37	20.47	***
Race/ethnicity	Asian	*51,376*	0.01	1.04	***	29.35	31.22	***
Race/ethnicity	Black	*394,196*	0.07	1.42	***	20.87	18.14	***
Race/ethnicity	Hispanic	*1,434,116*	0.04	1.75	***	24.98	19.74	***
Race/ethnicity	Other/Unknown	*460,965*	0.07	1.96	***	28.65	22.04	***
Race/ethnicity	White	*440,163*	0.10	1.90	***	26.79	22.08	***
Age†	<21	*2,198,419*	0.05	1.58	***	15.19	8.94	***
Age†	21-64	*373,483*	0.14	2.93	***	54.68	52.91	***
Age†	65+	*208,914*	0.03	1.44	***	80.20	83.87	***
Sex	Female	*1,435,956*	0.05	1.65	***	26.83	22.83	***
Sex	Male	*1,344,694*	0.07	1.86	***	23.82	17.96	***
Sex	*Unknown*	*166*	*0.02*	*0.70*	***	*13.62*	*9.78*	**
County type	Metro	*2,325,331*	0.05	1.82	***	25.09	20.12	***
County type	Micro	*185,270*	0.12	1.51	***	28.97	24.27	***
County type	Rural	*269,871*	0.13	1.33	***	25.38	20.97	***
County type	*Missing*	*344*	*0.07*	*0.48*	***	*23.28*	*5.75*	***
Program	CHIP	*143,344*	0.02	0.91	***	8.74	5.34	***
Program	FFS	*100,525*	0.07	1.47	***	20.45	16.15	***
Program	MMP	*27,856*	0.01	1.47	***	87.18	92.26	***
Program	STAR	*1,931,613*	0.03	1.23	***	11.31	6.46	***
Program	STAR Health	*26,797*	0.59	7.54	***	40.82	25.82	***
Program	STAR Kids	*141,755*	0.23	6.21	***	72.95	46.29	***
Program	STAR+PLUS	*408,926*	0.12	2.68	***	77.13	78.84	***
Comorbidity categories	0	*1,817,231*	0.01	0.85	***	11.15	7.71	***

Domain	Client characteristics	*N*	Teleservice visits before COVID-19 (Mean)	Teleservice visits during COVID-19 (Mean)	P-value	In-person visits before COVID-19 (Mean)	In-person visits during COVID-19 (Mean)	P-value
Comorbidity categories	1	*591,285*	0.12	2.56	***	32.26	25.47	***
Comorbidity categories	2	*210,054*	0.22	4.31	***	63.74	55.47	***
Comorbidity categories	3	*93,771*	0.24	5.11	***	92.90	84.68	***
Comorbidity categories	4	*43,014*	0.24	5.75	***	118.85	109.01	***
Comorbidity categories	5	*17,609*	0.26	6.70	***	145.64	131.05	***
Comorbidity categories	6+	*7,852*	0.28	8.08	***	185.77	162.21	***

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP. Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28, 2021 with at least one paid claim or encounter (N=2,780,816). Visits defined as unique combinations of claim numbers, dates of service, and Medicaid IDs. Multiple claims per day per individual were counted as separate visits. Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded. †Age Statistics: Mean=18.66, Median=11, Standard Deviation=21.45.

Note: Paired t-tests. ***p<0.001, **p<0.01, *p<0.05. Analysis utilizes February 2020 as the anchor month for client demographic, geographic, and program characteristics.

Table 37. Logistic regression results for factors associated with utilization of teleservices during COVID-19

Domain	Predictor variables	Model 1 OR (95% C.I.)	Model 2 OR (95% C.I.)	Model 3 OR (95% C.I.)	Model 4 OR (95% C.I.)	Model 5 OR (95% C.I.)	Model 6 OR (95% C.I.)
	N	*2,780,816*	*2,780,816*	*2,780,816*	*2,780,816*	*2,780,816*	*2,780,816*
Utilization before COVID-19	Pre-COVID-19 teleservice visit	9.55 (9.34-9.76)***	9.35 (9.15-9.56)***	8.91 (8.72-9.11)***	7.01 (6.86-7.17)***	2.61 (2.55-2.67)***	2.71 (2.65-2.78)***
Utilization during COVID-19	Pre-COVID-19 in-person visit		3.15 (3.09-3.21)***	3.33 (3.27-3.39)***	3.15 (3.09-3.21)***	1.59 (1.56-1.62)***	1.55 (1.52-1.58)***
Age	Age (cont.)			1.01 (1.01-1.01)***	1.00 (1.00-1.00)***	0.99 (0.99-0.99)***	0.99 (0.99-0.99)***
Race/ethnicity	Asian			0.63 (0.62-0.65)***	0.66 (0.65-0.68)***	0.79 (0.77-0.80)***	0.87 (0.85-0.89)***
Race/ethnicity	Black			0.79 (0.79-0.80)***	0.74 (0.74-0.75)***	0.67 (0.67-0.68)***	0.78 (0.78-0.79)***
Race/ethnicity	Other/Unknown			1.03 (1.02-1.03)***	0.85 (0.84-0.85)***	0.85 (0.84-0.85)***	0.95 (0.94-0.96)***
Race/ethnicity	White			1.00 (0.99-1.01)	0.97 (0.96-0.98)***	0.84 (0.83-0.84)***	1.02 (1.01-1.03)***
Race/ethnicity	Hispanic (ref)						
Sex	Male			1.06 (1.06-1.07)***	1.00 (0.99-1.00)	0.94 (0.94-0.95)***	0.94 (0.94-0.95)***
Sex	Female (ref)						
Program	CHIP				0.87 (0.86-0.88)***	0.91 (0.90-0.92)***	0.94 (0.92-0.95)***
Program	FFS				1.91 (1.88-1.94)***	1.39 (1.36-1.41)***	1.48 (1.45-1.50)***
Program	MMP				1.39 (1.35-1.43)***	1.08 (1.05-1.12)***	0.97 (0.94-1.01)
Program	STAR Health				4.44 (4.32-4.55)***	2.33 (2.27-2.40)***	2.54 (2.47-2.61)***
Program	STAR Kids				3.71 (3.67-3.75)***	2.10 (2.07-2.13)***	2.13 (2.10-2.15)***
Program	STAR+PLUS				2.78 (2.75-2.82)***	1.63 (1.61-1.65)***	1.68 (1.65-1.70)***
Program	STAR (ref)						

Domain	Predictor variables	Model 1 OR (95% C.I.)	Model 2 OR (95% C.I.)	Model 3 OR (95% C.I.)	Model 4 OR (95% C.I.)	Model 5 OR (95% C.I.)	Model 6 OR (95% C.I.)
Medical factors	Pregnant (before-COVID-19)[1]					0.59 (0.57-0.62)***	0.60 (0.57-0.62)***
Medical factors	Pregnant (during COVID-19)[2]					1.10 (1.05-1.15)***	1.11 (1.06-1.17)***
Medical factors	MH visit (before-COVID-19)					2.40 (2.38-2.42)***	2.42 (2.40-2.44)***
Medical factors	1 Comorbidity category					2.13 (2.12-2.15)***	2.14 (2.12-2.16)***
Medical factors	2 Comorbidity categories					4.08 (4.03-4.13)***	4.12 (4.07-4.17)***
Medical factors	3 Comorbidity categories					6.59 (6.48-6.70)***	6.74 (6.62-6.85)***
Medical factors	4 Comorbidity categories					8.72 (8.51-8.93)***	9.01 (8.79-9.23)***
Medical factors	5 Comorbidity categories					10.78 (10.38-11.19)***	11.20 (10.78-11.64)***
Medical factors	6+ Comorbidity categories					12.85 (12.10-13.64)***	13.25 (12.47-14.08)***
Medical factors	0 Comorbidity categories (ref)						
Geographic characteristics	Micro						0.76 (0.75-0.77)***
Geographic characteristics	Rural						0.63 (0.62-0.63)***
Geographic characteristics	Metro (ref)						
Geographic characteristics	SVI 2nd quartile						0.74 (0.74-0.75)***
Geographic characteristics	SVI 3rd quartile						0.86 (0.85-0.87)***
Geographic characteristics	SVI 4th quartile						1.54 (1.52-1.55)***

Domain	Predictor variables	Model 1 OR (95% C.I.)	Model 2 OR (95% C.I.)	Model 3 OR (95% C.I.)	Model 4 OR (95% C.I.)	Model 5 OR (95% C.I.)	Model 6 OR (95% C.I.)
Geographic characteristics	SVI 1st quartile (reference)						
Geographic characteristics	County COVID-19 cases						1.00 (1.00-1.00)***

Data Source: Medicaid FFS claims and Managed Care encounters; 8-month eligibility data; ADS. Analysis by HHSC-DAP.

Note: Texas Medicaid and CHIP clients continuously enrolled March 1, 2019-February 28,2021 with at least one paid claim or encounter (N=2,780,816). Before COVID-19 period is 3/1/19 – 2/29/20; During COVID-19 period is 3/1/20-2/28/21. Healthy Texas Women and emergency Medicaid excluded.

Note: Logistic Regression Model predicting utilization of any teleservice between 3/1/20 and 2/28/21. Maximum Likelihood Estimation. M=Model number. OR=Odds ratio, C.I.=Confidence Interval. ***p<0.001, **p<0.01, *p<0.05. Type 3 likelihood ratio statistics were computed for model fit; all M6 parameters significant in chi-square statistics at p<0.0001. Multicollinearity of predictor variables examined through correlation analysis (where p>0.80) and tolerance statistics (where <0.2); no variables in this model were found to be collinear.

Note: Missing or unknown sex not shown (n=94). Missing or unknown county type (n=239) not included. Model utilizes February 2020 as the anchor month for client demographic, geographic, and program characteristics. Age included as a continuous variable. Pre-COVID-19 teleservice visit and Pre-COVID-19 in-person visit coded as dummy variables. SVI ranking is a percentile rank variable divided into quartiles, with the 1st quartile being the lowest social vulnerability and the 4th quartile being the highest. County COVID-19 cases reflect a cumulative count of confirmed COVID-19 cases by county through March 2021.

1 Includes 19,203 pregnant or postpartum clients; of these, 8,808 were also categorized as pregnant or postpartum during the "During COVID-19" period. Not all pregnant or postpartum clients served by HHSC are not included due to continuous enrollment criteria applied in this study.

2 Includes 14,055 pregnant or postpartum clients. 8,808 were also categorized as pregnant or postpartum during the "Before COVID-19" period. Not all pregnant or postpartum clients served by HHSC are not included due to continuous enrollment criteria applied in this study.