Mental Illness and Its Impact on U.S. Mortality and Longevity

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Mental Illness and Its Impact on U.S. Mortality and Longevity

A look at the impact of the COVID pandemic on mental illness and the impact of mental illness on mortality and longevity in the U.S.

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Executive Summary

In 2019, 20.6% of U.S. adults had a mental illness and 5.2% had a serious mental illness. Mental illness impacts a person's well-being and can impact their physical health. The severity of mental illness can vary, in some cases resulting in little impairment to an individual and in other cases resulting in severe impairment. Measuring the burden of mental illness can be difficult because it requires clear diagnosis and reporting. Multiple surveys are conducted by national agencies in the U.S. to try to assess the prevalence of mental illness. These surveys use questions tailored to assessing the existence of a mental illness in an individual. Individuals may report a condition based on a diagnosis by a professional, or they may answer questions that assess how they are feeling. Because mental illness can impact how a person thinks, feels and acts it can have an impact on all aspects of life, including how a person works, socializes and cares for themselves.

Mental illness and symptoms of mental illness can be exacerbated by external stressors. Risk factors such as poor social supports, financial concerns, loneliness, instability in access to housing or food or a history of mental illness can all increase the likelihood that a stressor will lead to or worsen a mental illness.

The COVID-19 pandemic has had a far-reaching impact on individuals. It has changed the way individuals live, work and play in their communities. By November 2022, as reported by the Centers for Disease Control, more than 1 million individuals in the U.S. had died from the COVID-19 pandemic. Globally, 6.3 million individuals had died from the COVID-19 pandemic and half a billion cases had been reported. In addition to sickness and death, COVID-19 has impacted the global economy and social norms. During the COVID-19 pandemic, numerous external stressors were created or magnified.

U.S. adults reported significant increases in symptoms of anxiety and depression. By late June 2020, the prevalence of symptoms of anxiety disorder or depressive disorders was more than three times the number reported at the end of 2019 (37.8% vs. 11.3%). The prevalence remained elevated reaching its highest point in December 2020 at 42.6%. By May 2022, the prevalence had come down to 30.8% but remained high compared to 2019. The prevalence of anxiety and depression symptoms is inversely related to age in adulthood (i.e., younger ages had higher prevalence than older ages). One possible driver for this relationship is that the pandemic has had a significant impact on employment and a more significant loss of employment was seen for younger ages. However, this inverse relationship existed prior to the pandemic as well, which may indicate other drivers at play. Anxiety and depression symptoms were consistently more prevalent in females than males, which may again be driven by a disproportionate impact of job loss (or deciding to leave the work force to be a caregiver) for females than males. Differences were also seen in anxiety and depression prevalence by race and ethnicity. Based on the Household Pulse Survey, rates of anxiety and depression were lower than the national average for non-Hispanic white, single race and non-Hispanic Asian, single race individuals while other races and ethnicities rates of anxiety and depression fell above the national average.[1] Last, the prevalence of anxiety or depression for adults with a disability (disability

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[1] To monitor recent changes in mental health, the National Center for Health Statistics (NCHS) partnered with the Census Bureau on an experimental data system called the Household Pulse Survey. The terms for race are from the publicly available dataset and may not reflect SOA preferred language.

status is defined as having significant difficulty or being unable to do any of these four domains of functioning: vision, hearing, cognition and mobility) was more than double the prevalence for adults without a disability. This pattern was consistent across the survey period.

In addition to changes in prevalence of anxiety and depression symptoms, changes were also seen in the treatment of mental illness during the pandemic. Individuals receiving therapy or counseling and/or medication to help with emotions, concentration, behavior or mental health increased from 19.2% in December 2019 to 25.2% in December 2020. Rates of therapy and medication generally continued to increase during the pandemic. Prevalence of substance use, suicidal ideation, obsessive compulsive disorder and post-traumatic stress disorder also increased. Amid the increase in prevalence, changes also occurred to the delivery of mental health care. In-person care was limited or modified (to include personal protective equipment and social distancing), and telehealth became a more prominent means of getting treatment. The impact of the change in the delivery of mental health care is not clear but likely had at least some impact on the quality of care, availability of care and overall outcomes from treatment.

Mental illness does not exist in isolation; it can impact physical health. Globally, one study published in 2015 found that 14.3% of deaths can be attributed to mental illness. The impact from mental illness on an individual's mortality can be caused by acute or chronic drivers. Acute drivers include suicide and drug overdose. This paper evaluates how the COVID-19 pandemic impacted mental illness and, in turn, how those changes in mental illness impacted mortality and longevity in the U.S.

Drug overdose deaths rose 30% in 2020 and then an additional 15% in 2021. Suicide deaths decreased slightly in 2020 and again in 2021. Although one might expect to see an increase in suicide deaths given the significant increase in anxiety and depression symptoms, that did not occur. The rationale for the decrease in overall suicide rates is unclear; it may be driven by other factors impacting those most at risk for suicide. For example, overdose deaths could be related to suicide. In addition, the decrease in suicide rates was not consistent across different demographic groups. Suicide rates increased in 2020 for adults younger than 35 and for Black or African Americans. The impact of the pandemic may not have proportionately impacted all groups. Chronic drivers of mortality from mental illness are more difficult to directly measure. Prior research has shown an increase in all-cause mortality for individuals with mental illness. This may be driven by the fact that individuals with mental illness often do not receive preventive services such as immunizations, cancer screenings and tobacco counseling and often receive a lower quality of care for medical conditions. Social isolation is also associated with increased mortality and social isolation increased during the pandemic due to lockdown requirements and quarantining. Initial research has indicated that the risk of mental illness may be higher after contracting COVID-19, and the risk of contracting COVID-19 may be higher for those with mental illness. More research is needed regarding this bidirectional association, especially as more data emerge on the longer-term effect of the COVID-19 disease.

No clear measure is at hand of the impact that mental illness driven by COVID-19 will have on mortality. It is possible either that the collection of data was impacted by the pandemic itself, or that the mental health effect on mortality will be a more long-term effect. As data continue to emerge and researchers continue to study the data, researchers may be able to prove or disprove further hypotheses. Prior research has indicated an increased mortality risk associated with mental illness, and survey data collected during the pandemic show an increase in the prevalence of various mental illnesses and symptoms. In Appendix A and Appendix B of this paper we list multiple resources and data sources that can be used to monitor future trends in mental illness.

Section 1: The Impact of COVID-19 on Mental Illness

In this section, we review trends in the prevalence and treatment of mental illness before and after the start of the pandemic. We discuss the impact of COVID-19 on the delivery of care for mental illness and the potential drivers of the changes in mental illness, as presented in the literature, during the pandemic.

1.1 TRENDS IN MENTAL ILLNESS BEFORE AND AFTER THE PANDEMIC

Mental health impacts how a person thinks, feels and acts. It is important at all stages of life and can change over time. When individuals are faced with challenges that exceed their coping abilities and resources, they may experience poor mental health. Although sometimes used interchangeably, poor mental health and mental illness are not the same. A person could have poor mental health but not be diagnosed with a mental illness, and a person diagnosed with a mental illness could have periods of physical, mental and social well-being. Mental illness can impact physical health, and vice versa, physical illness can impact mental health. This is especially true for chronic physical health problems (Centers for Disease Control 2022).

The COVID-19 pandemic introduced numerous challenges for the U.S. These challenges impacted many facets of daily life including how individuals access health care, access basic needs like food and shelter, how people work, how they provide and receive care for dependents and how they socialize. To understand the prevalence of mental illness in the U.S. before and after the pandemic, we reviewed several published surveys and summarize our findings below.

Based on the National Survey on Drug Use and Health conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA) in 2019, 20.6% of U.S. adults (51.5 million) had a mental illness (of any severity) and 5.2% of U.S. adults (13.1 million) had a serious mental illness. These statistics exclude developmental and substance use disorders. Mental illness can vary in impact, ranging from no impairment to severe impairment. Serious mental illness (SMI) results in serious functional impairment, which substantially interferes with or limits one or more major life activities (NIMH 2022). SMI commonly refers to a diagnosis of psychotic disorders, bipolar disorder and either major depression with psychotic symptoms or treatment-resistant depression. However, SMI can also include anxiety disorders, eating disorders and personality disorders if the degree of functional impairment is severe (Evans et al. 2016). Females had a higher prevalence (24.5% Any Mental Illness, AMI, and 6.5% SMI) of mental illness than males (16.3% AMI and 3.9% SMI). The prevalence of mental illness varied inversely with poverty level as shown in Figure 1. Adults at less than 100% of the poverty level have the highest prevalence (26.7% AMI and 8.0% SMI), and individuals at 200% or more of the poverty level have the lowest prevalence (18.5% AMI and 4.3% SMI).

Figure 1
PERCENTAGE OF ADULTS WITH ANY MENTAL ILLNESS AND SERIOUS MENTAL ILLNESS BY POVERTY LEVEL IN 2019
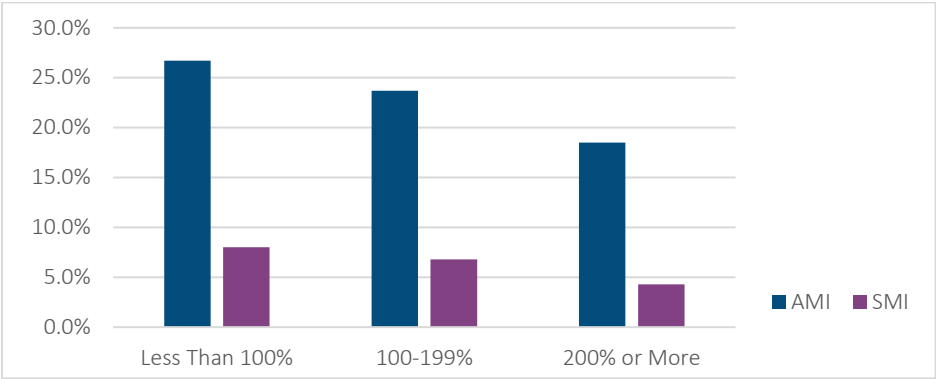
2020 National Survey on Drug Use and Health (NSDUH) conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA), https://www.samhsa.gov/data/report/2020-nsduh-detailed-tables.

The prevalence of mental illness also varied, generally inversely, with age as shown in Figure 2. Adults aged 26–29 had a 30.5% prevalence of AMI and 8.7% prevalence of SMI, whereas adults aged 60–64 had a 13.7% prevalence of AMI and a 3.1% prevalence of SMI.

Figure 2
PERCENTAGE OF ADULTS WITH ANY MENTAL ILLNESS AND SERIOUS MENTAL ILLNESS BY AGE BAND IN 2019
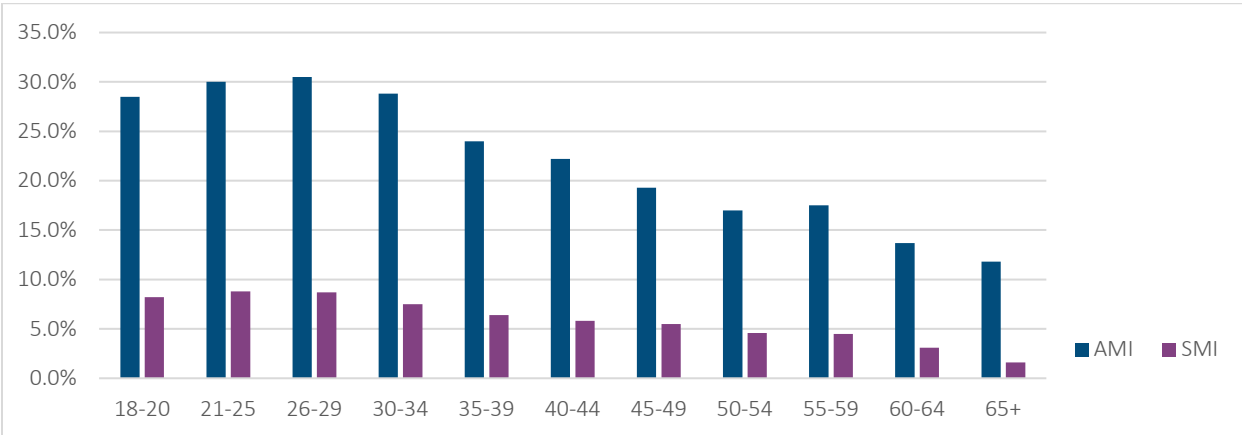
2020 National Survey on Drug Use and Health (NSDUH) conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA), https://www.samhsa.gov/data/report/2020-nsduh-detailed-tables.

The 2019 statistics on the prevalence of mental illness were similar to those of prior years. SAMSHA also conducted the National Survey on Drug Use and Health in 2020. However, they caution readers of the study not to compare the 2020 results to prior years. The pandemic caused changes in the data collection and may have impacted both the true prevalence of a mental health issue and the measurement of the prevalence. Three major factors impacted the 2020 survey: virtually no data were collected from mid-March 2020 through September 2020, the fact that web data collection began in October 2020, and changes in the survey questionnaire beginning in October 2020. SAMSHA further notes that one cannot conclude the data from prior years are not comparable, but the comparability is simply unknown. The changes in the data collection highlight the scope of the pandemic's impact. We reviewed the 2020 survey results and saw similar patterns in the distribution of mental illness by gender, poverty level and age. Figure 3 shows the trend in mental illness and serious mental illness including the 2020 data points from the NSDUH survey, all of which showed a slight increase in 2020.

Figure 3

PERCENTAGE OF ADULTS WITH ANY MENTAL ILLNESS (AMI), MAJOR DEPRESSIVE EPISODE (MDE) OR SERIOUS MENTAL ILLNESS (SMI) BY YEAR FROM 2008 THROUGH 2020
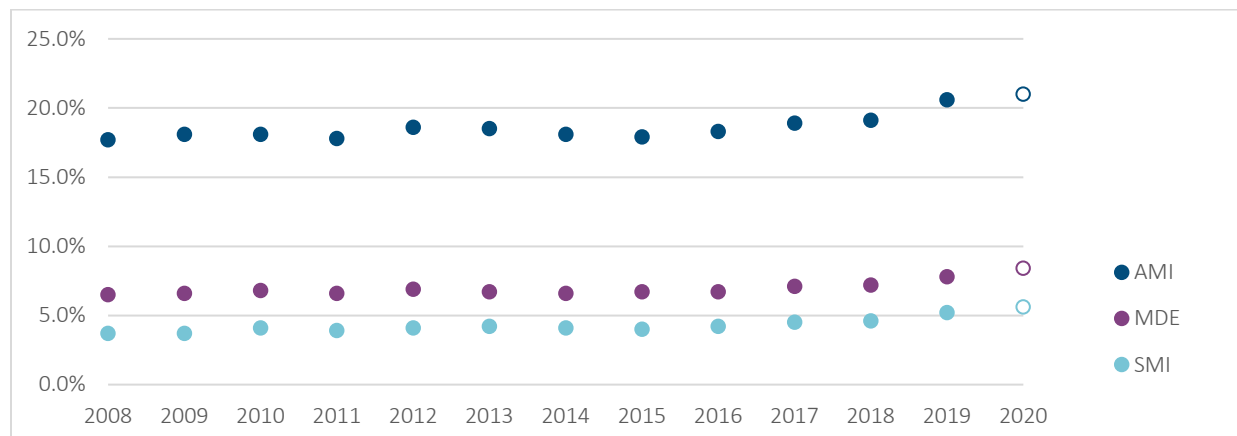
2020 National Survey on Drug Use and Health (NSDUH) conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA), https://www.samhsa.gov/data/report/2020-nsduh-detailed-tables. The 2020 data are displayed differently from prior years in Figure 3 to highlight that the data collection was different in 2020 because of the COVID-19 pandemic.

A pandemic is not just a medical phenomenon. The impacts of a pandemic are far-reaching and can cause disruption, anxiety, stress, stigma and xenophobia (Javed et al. 2020). From prior research on disasters and epidemics, it is known that large numbers of affected people report distress in the wake of a traumatic experience, along with symptoms of mental illness (e.g., anxiety, depression, suicidal ideation or insomnia). More extreme stressors (exposure to the dead or dying) and prolonged disruption increase the likelihood of mental illness. Risk factors such as poor social supports, financial concerns, loneliness, instability in access to housing or food or a history of mental illness can all increase the likelihood that a stressor will lead to a mental illness (Gordon 2021). During the COVID-19 pandemic, a number of these stressors were created and risk factors were exacerbated.

In response to the COVID-19 pandemic in the U.S., the National Center of Health Statistics[2] (NCHS) partnered with the Census Bureau on an experimental data system called the Household Pulse Survey. Data collection for this 20-minute self-reported online survey began April 23, 2020. Appendix A lists the survey questions and further details about the methodology and data collection phases. The figures below show the Household Pulse Survey through Phase 3.4 of the survey. This includes data collected from April 23, 2020, through May 9, 2022 (with periodic breaks in the data collection). Prepandemic levels of anxiety and depression were collected in the NCHS National Health Interview Survey in 2019. We note that the survey questions in 2019 and after July 21, 2021, asked about the prior two weeks, while the survey questions from April 23, 2020, through July 21, 2021, asked about the prior week, which may impact the comparability of the data. The survey looks at several indicators of mental illness including specific symptoms of anxiety and depression, those who received counseling services, those who took prescriptions for mental illness and those who had an unmet need for counseling services. Although we aim to understand both the prevalence and severity of the mental illness burden during the pandemic, the Household Pulse Survey focuses on the prevalence.

TRENDS IN ANXIETY DISORDERS AND DEPRESSIVE DISORDERS

Anxiety disorder and depression are the focus of the Household Pulse Survey. The National Institute of Mental Health (NIMH) describes anxiety disorders as more than just a temporary worry or fear that can interfere with daily

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[2] The National Center for Health Statistics (NCHS) compiles statistical information to guide actions and policies to improve the health of the population and is part of the Centers for Disease Control and Prevention (CDC) in the U.S.

activities such as job performance, school work and relationships. The NIMH describes depression as a common but serious mood disorder. Depression affects how a person feels, thinks and handles daily activities such as sleeping, eating or working. The Centers for Disease Control (CDC) estimate that in 2019, more than 10% of adult Americans displayed the symptoms of either anxiety disorder or depressive disorder (Terlizzi and Schiller 2021). By late June 2020, the prevalence of symptoms of anxiety disorder or depressive disorders was more than three times those reported at the end of 2019 (37.8% vs. 11.3%). The data collected in the survey are self-reported and do not distinguish anxiety disorders from adjustment disorder with anxiety and do not distinguish major depressive disorders from adjustment disorders with depression, which could produce different results. However, the rapid decrease in rates of anxiety and depression from their highest point in December 2020/January 2021 through June 2021 suggests that a significant proportion of these disorders are indeed adjustment disorders because these disorders typically dissipate as the stressor reduces or affected individuals adjust to the new stressor. It is unclear whether individuals are more (or less) likely to disclose mental illness under the revised data collection method, but that is a potential issue with the change in methodology for the data collection.

Figure 4
PERCENTAGE OF ADULTS WITH SYMPTOMS OF ANXIETY OR DEPRESSION FROM 2019 THROUGH FEBRUARY 2022

National Center for Health Statistics, National Health Interview Survey, 2019 and CDC Household Pulse Survey data through Phase 3.4, https://www.cdc.gov/nchs/covid19/pulse/mental-health.htm.
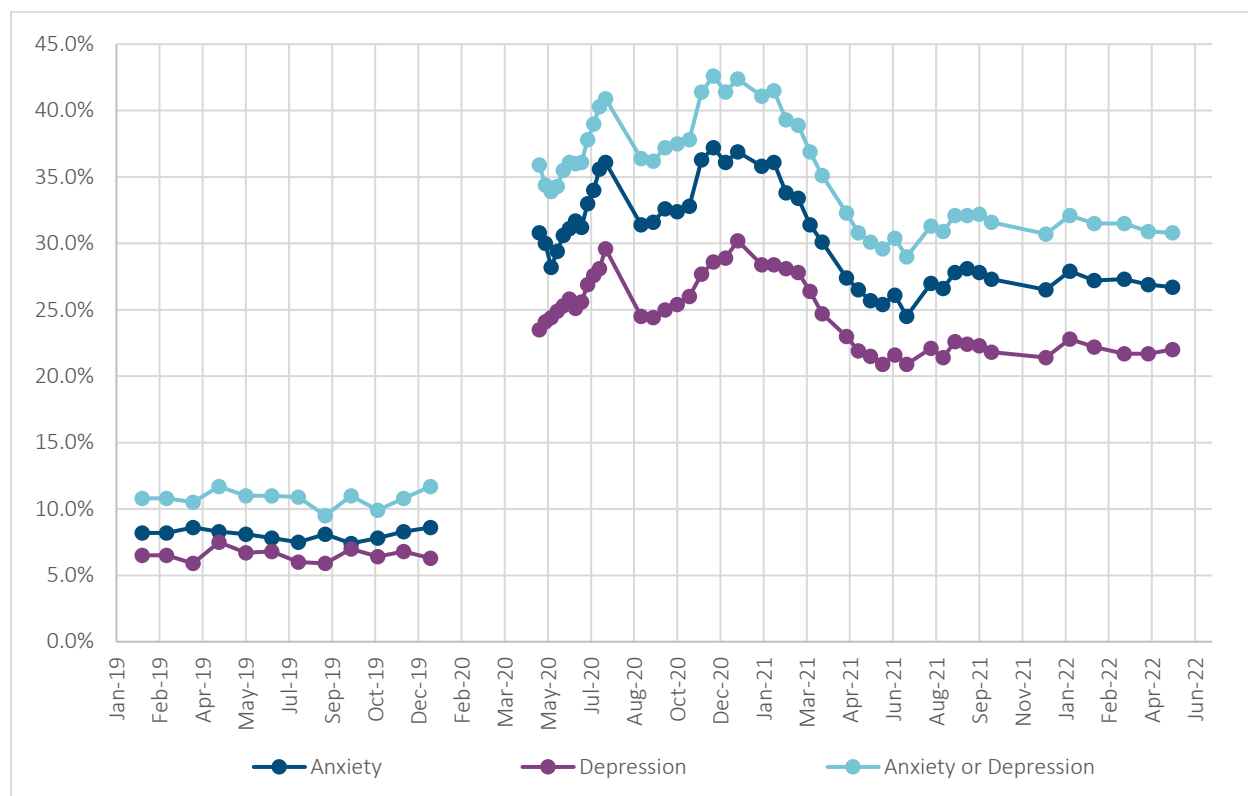
As illustrated in Figure 4, the prevalence of both anxiety and depression increased significantly during the pandemic. The prevalence of anxiety was consistently higher than depression, but both conditions followed the same pattern peaking in December 2020 through January 2021. Rates decreased in June 2021 but continued to be higher than reported rates of anxiety and depression in 2019. As shown in Figure 5, by age, younger ages consistently had higher rates of anxiety and depression under age 70. Based on data reported by the U.S. Census Bureau, COVID-19 had a significant impact on employment. For example, the employment-to-population ratio was 69.5 compared to the expected ratio of 81.1 for ages 25–44 in April 2020. The difference between the actual and expected ratio decreased

with age, and therefore loss of employment may have been a more significant contributor to mental illness for younger adults (Udalova 2021). In addition, this relationship of mental illness to age existed before the pandemic as well, which may indicate other environmental or generational drivers.

Figure 5
PERCENTAGE OF ADULTS WITH SYMPTOMS OF ANXIETY OR DEPRESSION FROM MAY 2020 THROUGH FEBRUARY 2022, BY AGE

National Center for Health Statistics, National Health Interview Survey, 2019 and CDC Household Pulse Survey data through Phase 3.4, https://www.cdc.gov/nchs/covid19/pulse/mental-health.htm.

We examined the survey with other key demographic factors. Rates of anxiety and depression were higher for females than males for all time points in the survey. The average prevalence for women was 39.2% compared to 31.6% for men. The pandemic had a more significant impact on women's employment than men's employment. In a survey conducted by McKinsey & Company, they found that one in four women considered leaving the workforce or downshifting compared to one in five men. This difference was even larger for parents of children under age 10 where 23% of women considered leaving the workforce whereas only 13% of men did (McKinsey & Company 2021). These survey results highlight differences of the impact of the pandemic on women compared to men. By race/ethnicity,[3] as shown in Figure 6, rates of anxiety and depression were higher than the national average for non-Hispanic other races and multiple races, non-Hispanic Black and Hispanic or Latino. Non-Hispanic white and non-Hispanic Asian were below the national average rate.

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[3] The terms for race and ethnicity are from the CDC Household Pulse Survey data, the underlying data source, and may not reflect SOA preferred language.

Figure 6

PERCENTAGE OF ADULTS WITH SYMPTOMS OF ANXIETY OR DEPRESSION FROM 2019 THROUGH FEBRUARY 2022, BY RACE/ETHNICITY
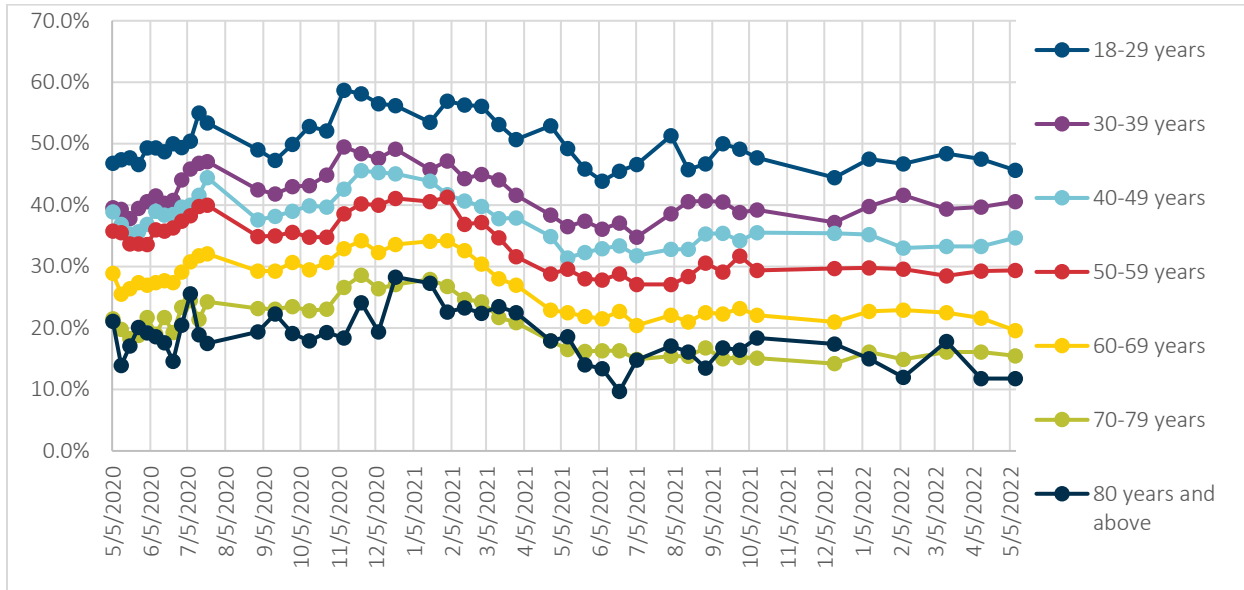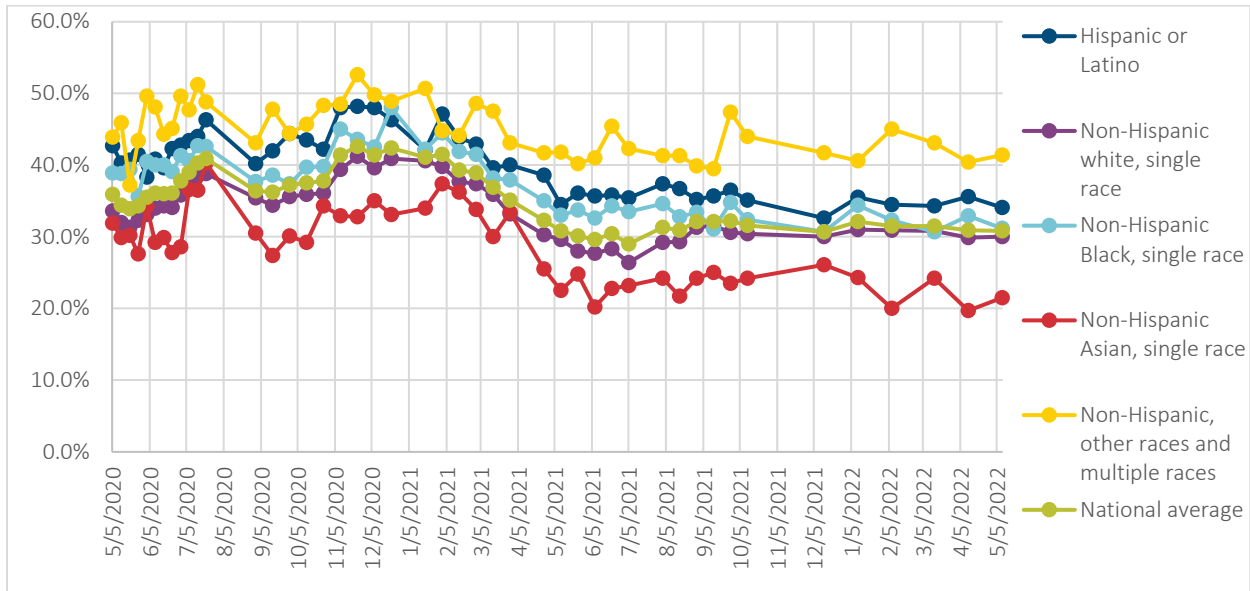

National Center for Health Statistics, National Health Interview Survey, 2019 and CDC Household Pulse Survey data through Phase 3.4, https://www.cdc.gov/nchs/covid19/pulse/mental-health.htm.

Rates of anxiety or depression also varied by education level, with those with less than a high school diploma having the highest rate and those with a bachelor's degree or higher having the lowest rate. Differences were also seen by geography. Louisiana, Oklahoma and New Mexico had the highest rates (45.5%, 44.2% and 42.4%, respectively, in December 2020), whereas South Dakota, Nebraska and North Dakota had the lowest rates (28.3%, 27.9% and 27.4%, respectively, in December 2020). The survey also collected self-reported data regarding functioning and disability. Beginning in Phase 3.1 of the survey, four of six questions from the Washington Group on Disability Statistics Short Set on Functioning were added to the survey. Disability status is defined as having significant difficulty or being unable to do any of these four domains of functioning: vision, hearing, cognition and mobility. The prevalence of anxiety or depression for adults with a disability was more than double the prevalence for adults without a disability. This pattern was consistent across the survey period.

TRENDS IN MENTAL ILLNESS TREATMENT

The Household Pulse Surveys also asked about treatment. These questions were not restricted to anxiety and depression and therefore may provide insight into the overall burden of mental illness and changes during the pandemic. Individuals receiving therapy or counseling (labeled "Therapy" in the graph) and/or medication (to help with any emotions or with concentration, behavior or mental health) in the last four weeks (from the time of the survey) increased from 19.2% in December 2019 to 25.2% in December 2020 as shown in Figure 7. Rates of therapy and medication generally increased during the pandemic. The self-reported unmet need (defined as needing counseling or therapy but not getting it in the last four weeks from the time of the survey) exceeds the rate of those who did receive counseling or therapy. The gap in care was the largest from November 2020 through January 2021. Although no baseline metric is used for the unmet need indicator (i.e., it is not in the 2019 NHIS survey), it appears that a significant unmet need for therapy existed during the pandemic.

Figure 7

PERCENTAGE OF ADULTS WHO RECEIVED THERAPY/COUNSELING OR MEDICATION FOR MENTAL ILLNESS, OR HAD AN UNMET NEED FOR THERAPY 2019 THROUGH FEBRUARY 2022
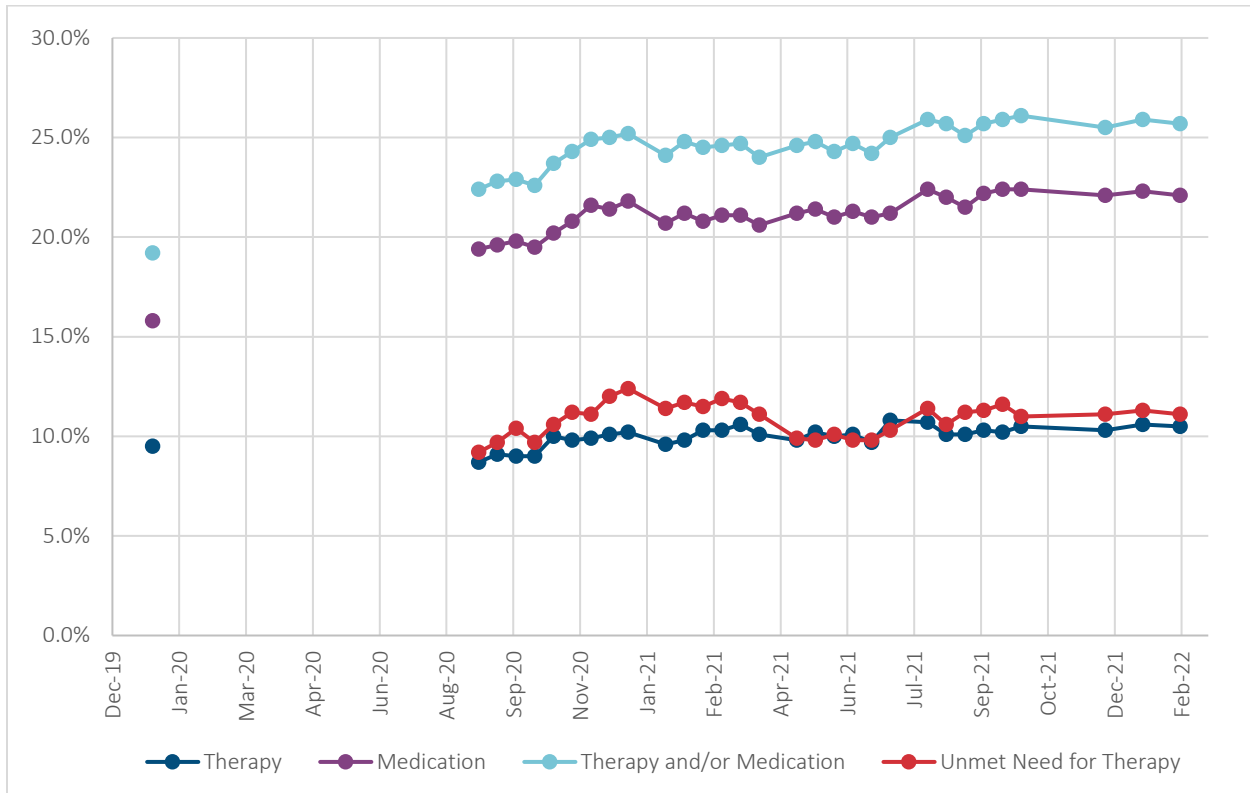
The patterns by demographic factors were fairly consistent with the patterns described above for symptoms of anxiety or depression. One notable difference was by education level. Those with a bachelor's degree or higher had the highest rates of therapy, and those with some college or an associate degree had the highest rates of medication, although these two groups did not have the highest rates of anxiety or depression. This may indicate that treatment was protective against symptoms of anxiety and depression, or other reasons may explain why these groups received more treatment (such as access to providers, telehealth or financial resources). Also, very little variation was seen in use of medication by age, although the rates of therapy showed the same pattern as the symptoms of anxiety and depression (highest at the youngest ages).

TRENDS IN MENTAL ILLNESS (OTHER THAN ANXIETY AND DEPRESSION)

Data from the Household Pulse Surveys provided a rich source of information regarding anxiety, depression and treatment for mental illness at a high level. The data regarding other types of mental illness were not as comprehensive, but the available information did highlight significant changes in mental illness during the pandemic.

For example, the pandemic also had an impact on trauma- or stress-related disorders, substance use and suicidal ideation. In a survey of adult Americans in June 2020, approximately one-quarter reported symptoms of trauma or stress-related disorders due to the pandemic. Ten percent reported that they either started or increased substance use due to the pandemic. Approximately twice as many individuals (10.7%) reported serious consideration of suicide in the previous 30 days in June 2020 compared to survey data collected in 2018 (4.3%), which referred to the previous 12 months (Czeisler et al. 2020).

Individuals with obsessive compulsive disorder (OCD) may be more susceptible to the mental health impact of the pandemic. OCD is a common mental health disorder often associated with marked anxiety. It tends to be long-lasting and causes unreasonable thoughts, fears or worries (obsessions). An individual with OCD tries to manage these obsessions with behaviors or rituals (compulsions). During the pandemic, it might have been more difficult to diagnose OCD given the drastic changes in behavior (frequent hand washing, social distancing, social isolation etc.) related to the prevention of the disease (Jassi et al. 2020). In a systematic review of the impact of COVID-19 on OCD symptoms in young people, five out of six studies found that OCD symptoms were exacerbated during the pandemic (Cunning and Hodes 2021).

Post-traumatic stress disorder (PTSD) may also have been triggered or exacerbated by the pandemic. Tamar Rodney, an assistant professor at the Johns Hopkins School of Nursing who specializes in trauma research, says that the risk for individuals developing PTSD has never been higher. The pandemic has not been a singular event but rather an escalating series of events. PTSD can often be delayed for months or even years after the initial trauma (deNobel 2021). In one review of available studies to date using international data, the researchers found that the moderate to severe PTSD symptoms were reported in 25.8% (ranging from 4.6% to 55.3% for various populations and estimation methods) of the population on average during the pandemic (Husky et al. 2021). The studies were based on self-reported data and may not fully isolate the impact of the pandemic versus other stressors but provide some insight into the potential burden of PTSD in the population. Another meta-analysis that included 13 articles with 1,093 global participants found the prevalence of PTSD for individuals who had a severe COVID-19 infection was 16% (the range of the finding using a 95% confidence interval was 9% to 23%) (Nagarajan et al. 2021). This meta-analysis also shows an increased risk of PTSD due to COVID-19.

1.2 IMPACT OF COVID-19 ON MENTAL HEALTH CARE

The pandemic not only impacted mental health, but it also had a profound impact on the delivery of mental health care. Changes occurred across all settings, including outpatient, emergency room, inpatient, consultation services and the community. Psychiatric physicians were also impacted by the new and constantly evolving protocols related to the pandemic. Relaxed regulatory barriers made it easier and more accessible to provide care remotely via telehealth or remote consultations. In-person care in emergency rooms or inpatient units required personal protective equipment. Inpatient care was faced with unique challenges like determining whether to continue group therapy or allow visitors. Psychiatric staff are not generally trained in infectious disease protocols, and it can be difficult to get psychotic patients to wear masks. These difficulties add to the strain of dealing with COVID-19 (Bojdani et al. 2020).

The use of telehealth increased during the pandemic for outpatient services and mental health and substance use treatment. Prior to the pandemic, telehealth had very minimal utilization. The peak of telehealth utilization occurred between March and August 2020. Outpatient services increased to 11% being conducted via telehealth at the highest point of usage and then dropped down to 5% in March 2021 through August 2021. However, telehealth for mental health increased to 40% at its peak and remained high (36% in March 2020 through August 2021). Telehealth use was not restricted to certain mental health conditions, but rather its use was high across many mental illnesses ranging from 43% usage for trauma-related conditions to 35% for depression and 33% for schizophrenia. Treatment for substance use disorders showed slightly lower utilization of telehealth: 29% for alcohol-related, 29% for opioid-related and 16% for stimulant-related conditions. Telehealth has been a significant factor in delivering care for mental illness during the pandemic, and some state, federal and private insurance regulations were relaxed to increase access to telehealth (Lo et al. 2018).

1.3 DRIVERS OF MENTAL ILLNESS CHANGES DURING THE PANDEMIC

Both the disease itself and the societal response to the disease have contributed to changes in mental illness during the pandemic. Issues such as quarantining, caregiving for those with the illness, social distancing, school and

business closures, changes in the delivery of health care, and other economic changes have impacted many individuals in different ways and for a prolonged period.

Regarding the direct consequences of contracting the disease, one study found that in patients with no previous psychiatric history, a COVID-19 diagnosis was associated with an increased risk of a first mental health diagnosis where it was not associated with an increase in six other health events used as controls (Gordon 2021). Excluding the first 14 days following COVID-19 diagnosis to control for the possibility of misdiagnosis or transient disorders such as delirium, the researchers found that in the 14–90 days following a COVID-19 diagnosis, 18.1% of patients received a psychiatric diagnosis, 5.8% for the first time, which is two to three times the base rate. Other researchers found that 25% of COVID-19 survivors reported having trouble thinking or concentrating (called "brain fog") in the months after contracting the disease, and that 30% developed an anxiety disorder (Groff et al. 2021). Stigmatization of those who contracted COVID-19, health care workers and other front-line workers who are at higher risk of contracting COVID-19 can also have an impact on their mental health (Javed et al. 2020).

In a cohort study, researchers found that a COVID-19 diagnosis resulted in an increased risk of mental illness. They found an increase in a multitude of mental illnesses including anxiety disorders, depressive disorders, use of antidepressants and benzodiazepines, opioid use disorders, other substance use disorders, sleep disorders and neurocognitive decline. The risk was higher for those with COVID-19 than for those admitted to the hospital for seasonal flu. Comparing those with COVID-19 who were admitted to the hospital versus those who were admitted for any other cause, again the risk of developing a mental illness was higher for those with COVID-19 (Xie et al. 2022). This may indicate the impact on mental illness was not solely related to hospitalization but specific to COVID-19.

Although data are limited on the long-term effects of COVID-19 on mental health, one international cross-sectional study of six countries found that individuals with severe acute COVID-19 illness (defined as those with the illness who were bedridden for more than seven days) had higher rates of depression and anxiety than those who did not contract the illness. Although rates of depression and anxiety did mitigate over time, they persisted six to 16 months after diagnosis (Magnúsdóttir et al. 2022). Another study based on data from the U.S. Department of Veterans Affair national health care database found that those who survived COVID-19 had an increased risk of various mental illnesses at one year after diagnosis. The mental illnesses included anxiety, depression, stress and adjustment disorders, opioid and other substance use disorders, cognitive decline and sleep disorders (Xie et al. 2022).

The mental health effects from the pandemic have not been limited to those who contracted or were exposed to the disease. For example, social isolation and loneliness are both linked to worse mental and physical health outcomes, and those sheltering in place were more likely to report a negative mental health effect from COVID-19 than those not sheltering in place (Panchal et al. 2021). Similarly, job loss is associated with increased risk of depression, anxiety and low self-esteem and can lead to both increased substance use and a higher chance of suicide. During the pandemic, households with low incomes or a job loss reported higher rates of mental illness than those with stable jobs (53.4% vs. 31.8%) (Panchal et al. 2021). Discontinuing working because of COVID-19 was also associated with post-traumatic stress symptoms (PTSS), insomnia, perceived stress and adjustment disorder (Rossi et al. 2020). Having to work more during the pandemic was also associated with PTSS, perceived stress and adjustment disorder. These findings adjust for previous psychiatric history and childhood trauma, suggesting an independent effect of pandemic and lockdown. In a study conducted by researchers at the University of Cambridge using state-level U.S. survey data (to study the impact of lockdown, which varied by state), they found a significant negative impact on mental health associated with lockdown orders (mental health was reduced by 0.083 standard deviations of the mean as measured on the standardized World Health Organisation's [WHO] five-item Well-Being Index [WHO-5]). For comparison, bereavement and job loss have been shown to reduce mental health by 0.25 standard deviations of the mean. The negative impact was observed for women and was not explained by an increase in financial worries or care-giving responsibilities, again highlighting the impact of lockdown (Adams-Prassl et al. 2021).

In addition, health care professionals may be more susceptible to developing mental illness because of their role on the front lines of dealing with the pandemic. Their mental health may be impacted by long working hours, unavailability of protective equipment, high patient load, unavailability of effective COVID-19 treatment and death of colleagues and patients in addition to the impact felt by non-health-care professionals (Javed et al. 2020). For example, one meta-analysis of studies examining the mental health of health care workers from early in the pandemic showed that the pooled prevalence of depressive symptoms among front-line health care workers was 24.1%, with the prevalence of moderate to severe depression at 14.6% (Salari et al. 2020). The study showed a 28.6% prevalence of depression and a 25.6% prevalence of PTSS.

A similar meta-analysis from later in 2021 shows an increase in rates of anxiety and depression among front-line health care workers compared to 2020 findings, with pooled prevalence of depression among health care workers at 37%, prevalence of anxiety at 40%, prevalence of distress at 37% and prevalence of PTSD at 49% (Saragih et al. 2021). The dramatic increase from 2020 rates seems to indicate that situation became worse for health care workers as the pandemic continued into its second year. Moreover, the rates for depression and anxiety among health care workers reported in the latter study are 8% and 5% higher than the maximum rates of anxiety and depression reported by the CDC's Household Pulse Survey for the general population. The Household Pulse Survey showed a maximum prevalence of anxiety of just under 32% and a maximum prevalence of depression of 32%. The survey data indicate that health care workers report higher rates of mental illness than the general population during the pandemic.

Section 2: The Effect of Mental Illness on Mortality

As discussed in Section 1, mental illness impacts a significant portion of the U.S. adult population. The degree of mental illness can range from mild to severe, and its prevalence varies based on different demographics and is higher for women than men, younger adults than older adults, and adults with less formal education than those with more formal education. The majority of data related to the prevalence of mental illness are based on survey data. Collection of the survey data was impacted by the pandemic, making it difficult to obtain a clear view of the prevalence of mental illness before and after the pandemic. However, the available data do show a marked increase in the prevalence of anxiety and depression during the pandemic, which has continued through May 2022. In the following section we review how COVID-19 may have impacted mortality through changes in mental illness.

2.1 MAJOR DRIVERS OF MORTALITY

The CDC publishes mortality data collected from their National Vital Statistics System (NVSS) in an online database called WONDER (Wide-Ranging Online Data for Epidemiologic Research). Final data are available from 1999 through 2020. Provisional data are available for 2021 and 2022. Final data are generally available 11 months after the end of the calendar year. We included the provisional 2021 data because the data reflect a complete calendar year. The mortality data are based on information from all death certificates filed in all 50 states and the District of Columbia. Deaths of nonresidents and fetal deaths are excluded. The underlying cause of death is defined by the WHO as "the disease or injury which initiated the chain of events leading directly to death, or the circumstances of the accident of violence which produced the fatal injury" (World Health Organization, 2022). Causes of death are classified in accordance with the International Classification of Disease Tenth Revision (ICD-10). The "leading causes of death" published by the NCHS are used for a consistent grouping and ranking standard. Mental illness is not included in the leading causes of death. Table 1 shows the crude rate of deaths per 100,000 for the 15 leading causes of death in the U.S. in 2020 and 2021 and their historical values from 2016 to 2019. The crude rate per 100,000 is calculated as the absolute number of deaths divided by the population estimate times 100,000 and it is not adjusted for age. The data are based on the primary cause of death recorded on the death certificate (not multiple causes of death).

Table 1
CRUDE DEATH RATE PER 100,000 FOR LEADING CAUSES OF DEATH IN THE U.S. FROM 2011 TO 2021

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021*
Total: All Causes of Death	807.3	810.2	821.5	823.7	844.0	849.3	863.8	867.8	869.7	1,027.0	1,050.5
Heart disease	191.5	191.0	193.3	192.7	197.2	196.6	198.8	200.3	200.8	211.5	210.7
Cancer	185.1	185.6	185.0	185.6	185.4	185.1	183.9	183.2	182.7	182.8	183.6
COVID-19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	106.5	126.2
Unintentional injuries	40.6	40.7	41.3	42.6	45.6	49.9	52.2	51.1	52.7	61.0	56.2
Stroke	41.4	40.9	40.8	41.7	43.7	44.0	44.9	45.2	45.7	48.6	49.4
Chronic lower respiratory diseases	45.9	45.7	47.2	46.1	48.2	47.8	49.2	48.7	47.8	46.3	43.2
Alzheimer's disease	27.3	26.6	26.8	29.3	34.4	35.9	37.3	37.3	37.0	40.7	36.2
Diabetes	23.7	23.6	23.9	24.0	24.7	24.8	25.7	26.0	26.7	31.0	31.3
Influenza and pneumonia	17.3	16.1	18.0	17.3	17.8	15.9	17.1	18.1	15.2	16.3	12.7
Kidney disease	14.6	14.5	14.9	15.1	15.5	15.5	15.5	15.7	15.7	15.9	16.5
Liver disease	10.8	11.1	11.5	12.0	12.5	12.5	12.8	13.1	13.5	15.7	17.1
Suicide	12.7	12.9	13.0	13.4	13.7	13.9	14.5	14.8	14.5	14.0	12.1
Essential hypertension and renal hypertension	8.9	9.3	9.7	9.5	10.0	10.3	10.8	11.0	11.1	12.7	13.0
Parkinson's disease	7.4	7.6	8.0	8.2	8.7	9.2	9.8	10.3	10.8	12.2	11.7
Septicemia	11.5	11.4	12.1	12.2	12.7	12.6	12.6	12.4	11.7	12.2	12.5

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999–2020 on CDC WONDER Online Database, released in 2021. Data are from the Multiple Cause of Death Files, 1999–2020, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. http://wonder.cdc.gov/ucd-icd10.html on Apr 17, 2022. *Provisional data.

The crude rate of death per 100,000 increased by approximately 18.1% in 2020 compared to 2019. COVID-19 was the largest contributor to this increase. Heart disease, unintentional injuries and diabetes were three of the largest other contributors to the increase.

Mental illness is not included among the leading causes of death, and so we looked for other estimates of the impact of mental health on mortality. Globally, one study found that the population attributable risk due to mental illness is estimated to be 14.3%, meaning that 14.3% of deaths worldwide (8 million per year) can be attributed to mental illness. The study was based on a systematic literature review and meta-analysis based on 203 articles that represented 29 countries. Mortality estimates for people with mental illness was compared to those without mental illness to estimate what portion of mortality may be associated with mental illness (Walker 2015). Those with mental illness had higher mortality compared with the general population before, during and after the first peak of COVID-19 deaths, with similar risks across ethnicities. Deaths from all other causes (non-COVID-19) remained elevated for those with mental illness, similar to prepandemic levels across all ethnic groups (Das-Munshi et al. 2021). However, within this, it is helpful to distinguish between acute and chronic causes.

2.2 ACUTE DRIVERS OF MORTALITY FROM MENTAL ILLNESS

Acute drivers of mortality from mental illness include overdose deaths and suicide. However, the CDC classifies overdose deaths as unintentional injuries along with other accidental deaths from falls, motor vehicle traffic accidents, accidental poisoning etc., which are not necessarily associated with mental illness. Rather, we might expect that accidental deaths from road accidents would decrease during COVID lockdowns, as people spent more time indoors, which might cause changes in the unintentional injury category to underestimate the magnitude of a mental health shock to overdose deaths. Nevertheless, according to CDC data (see Table 1), whereas the rate of death from unintentional injury ranged between 49.9 and 52.7 per 100,000 Americans from 2016 to 2019 (a range of just 2.8 per

100,000 over four years), this rate increased to 61.0 in 2020 and 56.2 in 2021 (an 8.7 per 100,000 increase in one year followed by a 4.8 decrease). The largest driver of the increase in unintentional injuries was accidental poisoning and exposure to noxious substances, with a crude death rate of 20.0 per 100,000 in 2019 and 26.5 per 100,000 in 2020, an increase of 32.5% in one year. We explored this trend further by reviewing drug overdose death data.

Figure 8

NUMBER OF DRUG OVERDOSE DEATHS BY MONTH FOR THE 12-MONTH ENDING PERIOD IN THE U.S. FROM 2015 TO 2021
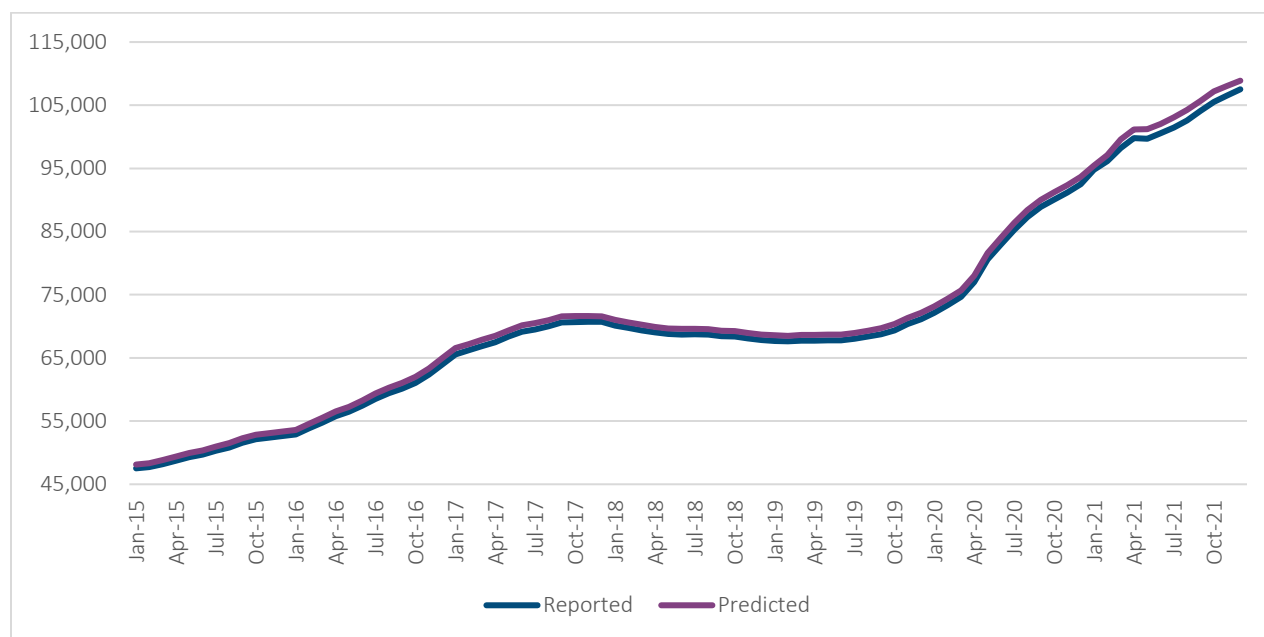
Although deaths from drug overdose rose over 30% from 2019 to 2020, they increased another 15% from 2020 to 2021 (Figure 8). This increase begins between January and April 2020 and follows a two-year period of decreasing drug overdose deaths from October 2017 to October 2019. Moreover, the increase in overdose deaths from 2019 to 2020 is larger than any other year-to-year increase over the past seven years. Although these data on drug overdose deaths do not strictly indicate that the COVID-19 pandemic and lockdowns are responsible for the increase in overdose deaths from 2019 through 2021, they do show an uptick in overdose deaths during the pandemic.

Broken out by drug category, deaths from natural or semisynthetic (prescription) opiates, heroin and methadone have all remained fairly constant from 2015 to 2021, with heroin deaths even decreasing slightly from 2019 to 2021 (Figure 9). Thus, the overall upward trend in overdose deaths from 2019 to 2021 was driven primarily by cocaine, psychostimulants (methamphetamine) and synthetic opiates (fentanyl). Total deaths from cocaine increased by 50.4%, from 16,316 deaths in 2019 to 24,538 in 2021. Similarly, deaths from psychostimulants increased from 16,668 deaths in 2019 to 32,856 in 2021, or about 97.1%. Deaths from synthetic opioids (fentanyl) increased from 37,271 in 2019 to 57,834 in 2020 and 71,238 in 2021, or about 91.1% in two years.

Figure 9
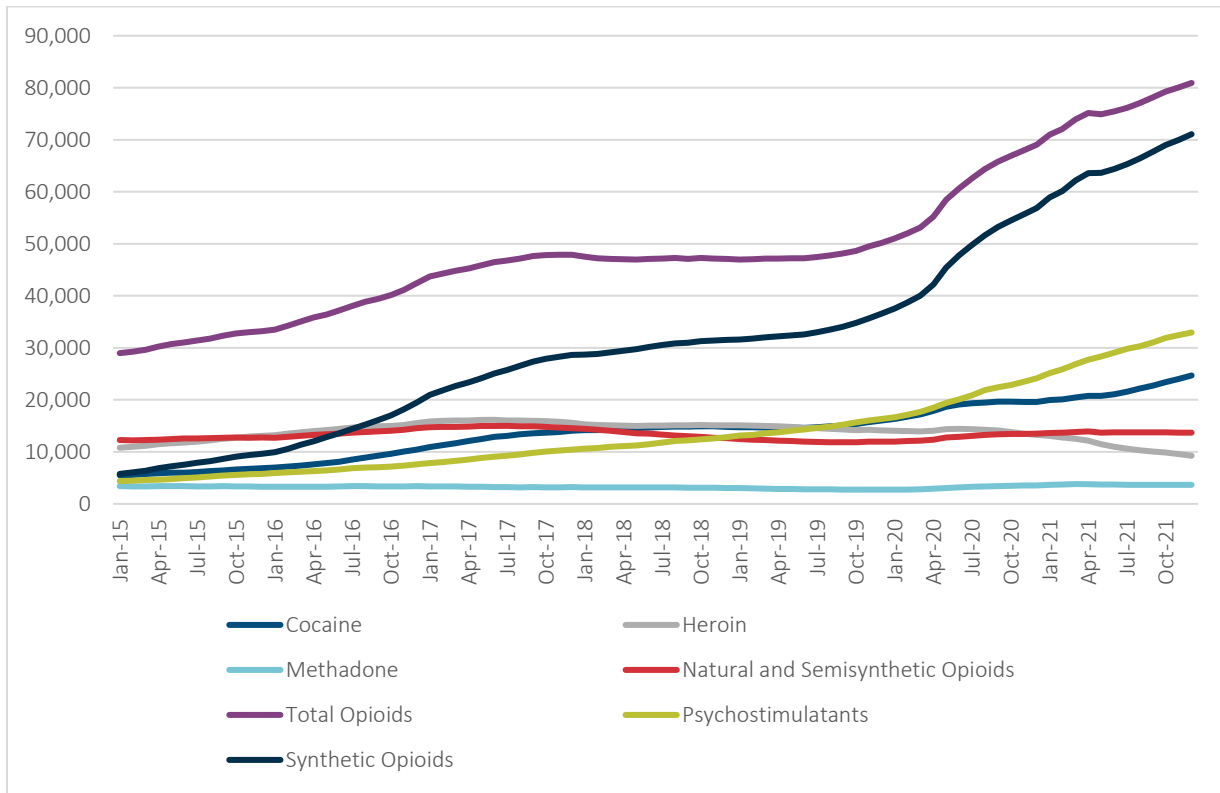NUMBER OF DRUG OVERDOSE DEATHS BY SUBSTANCE IN THE U.S. FROM 2015 TO 2021

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999–2020 on CDC WONDER Online Database, released in 2021. Data are from the Multiple Cause of Death Files, 1999–2020, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm on November 14, 2022.

This means that, in excess of 2019 drug overdose levels, the increase in deaths from cocaine, synthetic opiates and psychostimulants in 2020 and 2021 resulted in the additional deaths of 90,459 Americans in 2020 and 2021 or an average of about 45,230 per year (about 13.7 per 100,000). By comparison, death from the COVID-19 disease itself ranked as the fourth highest crude decrement per 100,000 lives in 2020, with an average of 116.4 lives lost to COVID per 100,000.

Although the crude rate of overdose deaths increased fairly abruptly from 2019 to 2020, the same is not true for the rate of death from suicide. Like rates of overdose, the crude suicide rate per 100,000 increased from 2016 to 2018 and then declined through 2019. However, although the rate of overdose deaths then reversed course from 2019 to 2020, rates of suicide continued to decline. The decrease in crude suicide rate from 14.5 per 100,000 in 2019 to 14.0 per 100,000 2020 was relatively small and fell within the historical range of suicide rates from 2016 to 2019 (13.9–14.8 deaths per 100,000).

Table 2
CRUDE DEATH RATE PER 100,000 FOR SUICIDE IN THE U.S. FROM 2016 TO 2021

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021*
Suicide	12.7	12.9	13	13.4	13.7	13.9	14.5	14.8	14.5	14.0	12.1
By type:											
Suicide by firearm	6.4	6.6	6.7	6.7	6.9	7.1	7.3	7.5	7.3	7.4	6.6
Suicide by other means	6.3	6.4	6.3	6.7	6.9	6.8	7.2	7.3	7.2	6.6	5.5
By sex:											
Female	5.4	5.5	5.7	6	6.2	6.2	6.3	6.4	6.2	5.6	4.8
Male	20.2	20.6	20.6	21.1	21.5	21.8	22.9	23.4	23.0	22.5	19.6
By age:											
5–14 years	0.7	0.8	1	1	1	1.1	1.3	1.5	1.3	1.5	1.2
15–24 years	11.0	11.1	11.1	11.6	12.5	13.2	14.5	14.5	13.9	14.2	12.7
25–34 years	14.6	14.7	14.8	15.1	15.7	16.5	17.5	17.6	17.5	18.4	16.0
35–44 years	16.2	16.7	16.2	16.6	17.1	17.4	17.9	18.2	18.1	17.4	15.5
45–54 years	19.8	20	19.7	20.2	20.3	19.7	20.2	20.0	19.6	18.0	15.0
55–64 years	17.1	18	18.1	18.8	18.9	18.7	19.0	20.2	19.4	16.9	14.1
65–74 years	14.1	14	15	15.6	15.2	15.4	15.6	16.3	15.5	14.5	13.0
75–84 years	16.5	16.8	17.1	17.5	17.9	18.2	18.0	18.7	18.6	18.4	16.1
85+ years	16.9	17.8	18.6	19.3	19.4	19.0	20.1	19.1	20.1	20.9	16.5
By race:											
American Indian or Alaska Native	10.6	11.0	11.7	10.8	12.6	13.6	13.6	14.1	13.8	14.6	14.0
Asian or Pacific Islander	6	6.4	6.0	6.1	6.5	6.8	6.8	7.2	7.4	7	5.9
Black or African American	5.3	5.5	5.4	5.5	5.6	6.1	6.7	7	7.1	7.5	7.1
White	14.5	14.7	14.9	15.5	15.8	15.9	16.5	16.8	16.4	15.7	13.7

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999–2020 on CDC WONDER Online Database, released in 2021. Data are from the Multiple Cause of Death Files, 1999–2020, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. http://wonder.cdc.gov/ucd-icd10.html on Apr 17, 2022 *Provisional data.

Table 2 shows the data for suicide broken out by several key variables, including type of suicide, sex, 10-year age band and race. The data by race is not broken out by ethnicity in Table 2 and individuals who reported multiple races were bridged to a single race category by the CDC. Suicide by firearm was stable (7.3 in 2019 and 7.4 in 2020), whereas suicide by other means decreased (7.2 in 2019 and 6.6 in 2020). Males consistently had a significantly higher rate of suicide than females. From 2011 through 2019 suicide deaths for males were 3.5 to 3.7 times the rate of suicide deaths for females. In 2020 the suicide rate for males was 4.0 times that of females, and in 2021 the corresponding figure was 4.1. This change in the relationship appears to be driven by a decrease in the suicide rate for females without a similar decrease in the suicide rate for males. By race,[4] suicide rates trend upward from 2016 through 2020 for Blacks or African Americans with an increase from 7.1 in 2019 to 7.5 in 2020. For white race, the suicide rate decreased from 16.4 in 2019 to 15.7 in 2020. The majority of suicides were classified as not being drug-induced or alcohol-induced (12.6 of 14.0 in 2020).

Considered by 10-year age band, suicide rates increased for ages 34 and younger and decreased for ages 35 and older from 2019 to 2020. This is consistent with data showing that for those between the ages of 12 and 25, emergency room visits for mental health systems or suspected suicide attempts increased (Yard et al. 2021). These age groups also reported higher levels of anxiety and depression symptoms in response to COVID-19 as discussed in Section 1.

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[4] The terms for race are from the CDC WONDER Online Database, the underlying data source, and may not reflect SOA preferred language.

2.3 CHRONIC DRIVERS OF MORTALITY FROM MENTAL ILLNESS

The impact on mortality associated with mental health does not come primarily from the acute drivers of suicide and overdose or even from the disorder itself. Rather, most people with mental health disorders die of heart disease, other chronic diseases, infections or other causes at increased rates because of their mental illness (Walker 2015). In their meta-analysis, Walker and colleagues showed that 135 of 148 studies dealing with all-cause mortality showed that for those with mental health disorders, all-cause mortality was increased. Pooled relative risk of all-cause mortality among those with mental health disorders was 2.22 times the general population (95% confidence interval between 2.21 and 2.33). For those with depression, the all-cause mortality multiplier was 1.71 and 1.43 for those with an anxiety disorder (Walker 2015). Higher mortality was observed in inpatient versus outpatient populations, suggesting that severity and type of mental disorder is related to mortality risk. Walker and colleagues attribute this differential mortality in people with mental disorders to various causes, including behavioral and lifestyle factors, access to and quality of health care, and social determinants of health, such as poverty and social connectedness. People with mental disorders often do not receive preventive services, such as immunizations, cancer screenings and tobacco counseling, and often receive a lower quality of care for medical conditions.

Social isolation is also associated with increased mortality. One study published in 2018 followed a representative sample of 21,604 participants over a seven-year period in Denmark and found that those with the lowest Social Network Index (SNI) score had mortality 60–70% higher than those with the highest. Researchers measure SNI through questionnaire responses related to a person's interaction with family and friends, participation in religious activities, membership in secular organizations and clubs etc. and compile this into a score of 0 through 4, with 0 indicating a high degree of social isolation and 4 indicating a high degree of social integration (Laugesen et al. 2018).

2.4 IMPACT OF MENTAL ILLNESS ON COVID-SPECIFIC MORTALITY

Although COVID-19 can lead to mental illness, it is also true that patients with mental health disorders were found to be at higher risk of poor COVID-19 outcomes. Patients with mental health disorders can have comorbidities that are risk factors to severe cases of COVID-19: hypertension, chronic obstructive respiratory disease, diabetes or end-stage kidney disease. However, those with mental health disorders were found to be at higher risk of poor COVID-19 outcomes independent of the main clinical risk factors for severe COVID-19 cases (e.g., age, obesity, smoking, kidney disease, cardiovascular disease etc.). The researchers calculated the odds ratio, which measures how strongly an event is associated with an exposure; in this case the event is death from COVID-19, and the exposure is mental illness. They found that the odds of dying from COVID-19 were 1.38 times higher for those with mental illness than those without and 1.67 times higher for those with severe mental illness than those without (Fond et al. 2021). Another systematic review and meta-analysis also found increased mortality risk from COVID-19 for those with mental illness. Their study showed that the risk of death from COVID-19 was doubled for those with mental illness compared to those without. They found a similar association for psychotic disorders (2.05 odds ratio), mood disorders (1.99 odds ratio), substance use disorders (1.76 odd ratio), and intellectual disabilities and developmental disorders (1.73 odds ratio) but not for anxiety disorders (1.07 odds ratio). Except for substance use disorders, these associations remained after being adjusted for demographics and cofounders (Vai et al. 2021). Patients with dementia are precisely twice as likely (adjusted odds ratio 2.00) to contract COVID-19 as those without dementia (Wang et al. 2020). Similarly, for COVID-19 patients who get hospitalized, the presence of dementia predicted a significant increase in mortality over a six-month period compared to those without dementia (25.17% vs. 59.26%).

Preliminary research studying the bidirectional association between COVID-19 and psychiatric disorders (meaning that mental illness is a risk factor for COVID-19 and COVID-19 is a risk factor for mental illness) in the U.S. found an association between COVID-19 and mental illness (although the study results were not adjusted for socioeconomic factors). The researchers used data from electronic health records for 69 million individuals, 62,354 who had been diagnosed with COVID-19, to assess the relationship between COVID-19 and psychiatric illness. In patients with no previous psychiatric history, a diagnosis of COVID-19 was associated with increased incidence of a first psychiatric diagnosis (the incidence was 5.8%) in the following 14 to 90 days compared to six other health events. The other health events were flu, other respiratory tract infections, skin infections, gallstones, kidney stones and fracture of a large bone. The hazard ratios (the ratio of the risk of being first diagnosed with a psychiatric illness for those with

COVID-19 compared to those without) ranged from 1.58 to 2.24. The risk was highest for anxiety disorders, which had a 4.7% probability of being diagnosed 90 days after a COVID-19 diagnosis (hazard ratio of 1.59 to 2.62). The researchers also found an increased risk of insomnia (risk of 1.9% and hazard ratio between 1.85 and 3.29) and dementia among patients older than 65 years old (risk of 1.6% and hazard ratio between 1.89 and 3.18). In addition, a psychiatric diagnosis in the previous year was associated with a higher incidence of COVID-19 diagnosis (independent of known physical risk factors) (Taquet et al. 2020).

2.5 COVID-19 AND COGNITIVE DISORDERS

Many patients who contract the COVID-19 virus experience not only respiratory and psychological symptoms, but also neuropsychological symptoms, including loss of taste or smell, as well as "brain fog," consisting of both cognitive and attention deficits. For some, these symptoms persist long after contracting COVID. For example, one study following patients three to six months after COVID-19 infection found more than half of participants showed statistically significant and persistent problems with forgetfulness, and roughly one in four had problems with language cognition and executive function (de Erausquin et al. 2021). Such neurological symptoms may appear odd because COVID-19 is typically classified as a respiratory infection. However, coronaviruses, especially B-coronaviruses such as SARS-CoV-2, have been shown to invade the central nervous system, and SARS-CoV-2 has been found in the brains of terminal patients post-mortem (Baig and Sanders 2020). Although not conclusive, this indicates a possible mechanism by which COVID-19 might impact neurological symptoms directly.

Researchers measured biological markers in the blood as indicators of brain injury, neuroinflammation and Alzheimer's disease; among these are certain species of amyloid beta (Aβ 40, Aβ42), phosphorylated tau (pTau-181), total tau (t-tau), ubiquitin carboxyl-terminal hydrolase L1 (UCH-L1), neurofilament light (NfL) and glial fibrillary acid protein (GFAP). A comparison of COVID-19 patients with and without corresponding neurological symptoms showed that those with neurological symptoms had a higher proportion of t-tau, NfL, GFAP, pTau-181 and UCH-L1 compared to those who did not have corresponding neurological symptoms (Boutajangout et al. 2021). These findings led researchers to conclude that COVID-19 patients may have an acceleration of Alzheimer's disease and Alzheimer's disease–related dementias.

Conclusion

Survey data indicate that the prevalence of mental illness has increased during the COVID-19 pandemic. The impact has varied across socioeconomic and demographic factors, exacerbating underlying differences in the prevalence and treatment of mental illness in the population. In 2019, 20.6% of U.S. adults had a mental illness, and the subset of those with a serious mental illness was 5.2% of U.S. adults. These figures increased to 21.0% with any mental illness and 5.6% with serious mental illness in 2020. Females had a higher prevalence of both any mental illness and serious mental illness compared to males. Mental illness also varied inversely with poverty level and with age. Older adults reported a lower prevalence of mental illness.

Reported rates of anxiety and depression more than tripled from year end 2019 to late June 2020 and remained elevated until June 2021. Younger adults consistently reported higher levels of anxiety and depression. One contributing factor for younger adults may have been the impact that the COVID-19 pandemic had on employment. Job loss is a considerable stressor that impacted working adults more than those who were not in the workforce. Reported rates of anxiety and depression were also found to be higher in females than males. This difference may have been exacerbated by employment-related stress. One survey found that one in four women thought about leaving the workforce compared to one in five men. This difference was even higher for parents of children under age 10. Reported rates of anxiety and depression also varied by race and ethnicity. Non-Hispanic other races and multiple races had the highest rates of anxiety and depression. Non-Hispanic Black and Hispanic or Latino also had rates of

anxiety and depression higher than the national average.[5] Rates of anxiety and depression were more than doubled for adults with a disability compared to those without a disability, indicating that disability may be a significant contributor to anxiety and depression. The prevalence of anxiety and depression by various groups was similar to the overall patterns observed in mental illness.

The pandemic impacted other types of mental illness such as trauma or stress-related disorders, substance abuse and suicidal ideation. About 25% of adults reported symptoms of trauma or stress-related disorders, 10% reported starting or increasing substance use, and 10% reported serious consideration of suicide (compared to 4.3% in 2018). Individuals with obsessive compulsive disorder also reported elevated symptoms during the pandemic.

In addition to the increase in mental illness, an increase was also seen in the use of treatment (therapy and medication) for mental illness. Although a prepandemic measure is not available for comparison, during the pandemic an approximately 10% reported rate of an unmet need for therapy was found, indicating a shortfall in the availability of care for mental illness.

The impact of the COVID-19 pandemic has been far-reaching, and those on the frontlines, such as health care workers, have reported a substantial increase in the prevalence of mental illness. The delivery of health care was significantly impacted, which led to a variety of stressors for those on the frontlines. In addition, the delivery of mental health treatment was strained by protocols to reduce the spread of COVID-19. Providers had to balance caring for patients with the risk of contracting the virus. Telehealth utilization increased significantly during the pandemic. Although telehealth was used for various services, the most significant increase was seen in mental health treatment. Telehealth treatment for mental illness increased to 40% at its peak and remained high at 36% from March 2020 to August 2021. In addition to the environmental changes caused by the pandemic, contracting the virus itself also impacted mental illness. Those who contracted the virus had an increased risk of a first mental health diagnosis. The effect of COVID-19 on cognitive function is still being studied, but preliminary findings indicate that severe COVID-19 infection may have an impact on cognitive function

Because the pandemic profoundly impacted survey data collection, it makes it difficult to compare different time points. However, the survey data still provide insight into the prevalence of mental illness, as reported by survey respondents at different points in time. In addition, the pandemic led to additional survey data collection regarding mental health. We recommend that these survey data continue to be monitored as the pandemic unfolds and the U.S. adjusts to future conditions (various strains of the COVID-19 virus, changes in testing/treatment/vaccines or COVID-19 becoming endemic).

Although the impact of the COVID-19 pandemic on the prevalence of mental illness can be directly measured through survey data, the impact of the increased mental illness on mortality is more difficult to measure directly and in the short term. Mortality from the COVID-19 virus itself or from acute drivers of mental illness such as suicide and drug overdose can be seen in death record data, but the indirect impact of mental illness on mortality is harder to observe directly and takes time to develop. Past research studies have shown the connection between mental illness and mortality, and we anticipate that more research will become available as the COVID-19 pandemic evolves and long-term data can be collected. Although the connection between mental illness and mortality may be more difficult to observe directly, that does not mean its effect should ignored. Even a seemingly small correlation between mental illness and mortality will be magnified given the magnitude of the increase in the prevalence of mental illness during the pandemic. In addition, research to date indicates a potential bidirectional relationship between the risk of COVID-19 and mental illness. This means that mental illness is a risk factor for COVID-19 and COVID-19 is a risk factor for mental illness, which compounds the issue even further.

We recommend that both the survey data and the mortality data presented in the paper be monitored over time and that additional sources of data be collected to expand on the research regarding COVD-19's impact on mental illness and the impact of mental illness on mortality.

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[5]. The terms for race are from the Household Pulse Survey publicly available dataset and may not reflect SOA preferred language.

Section 3: Acknowledgments

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Appendix A: Definitions and Resources

This appendix provides background information on the definitions and categories of mental illness in the U.S. as well as key federal resources.

DIAGNOSTIC AND STATISTIC MANUAL OF MENTAL DISORDERS, FIFTH EDITION, TEXT REVISION (DSM-5-TR)

The *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition, Text Revision (DSM-5-TR), is the 2022 update to the *Diagnostic and Statistical Manual of Mental Disorders*, the taxonomic and diagnostic tool published by the American Psychiatric Association (APA). In the U.S., the *DSM* serves as the principal authority for psychiatric diagnoses.

NATIONAL INSTITUTE OF MENTAL HEALTH (NIMH)

The National Institute of Mental Health (NIMH) is the lead federal U.S. agency for research on mental illness. The NIMH uses two broad categories to describe mental illness: Any Mental Illness (AMI) and Serious Mental Illness (SMI). This categorization focuses on the severity of the illness. AMI includes all recognized mental illnesses, whereas SMI is a subset of more severe mental illnesses. The NIMH defines AMI as a mental, behavioral or emotional disorder.

SUBSTANCE ABUSE AND MENTAL HEALTH SERVICES ADMINISTRATION (SAMHSA)

The Substance Abuse and Mental Health Services Administration (SAMHSA) is the agency within the U.S. Department of Health and Human Services that leads public health efforts to advance the behavioral health of the nation. SAMHSA's mission is to reduce the impact of substance abuse and mental illness on America's communities.

CENTERS FOR DISEASE CONTROL (CDC)

The CDC is one of the major operating components of the Department of Health and Human Services. The CDC is the leading science-based, data-driven, service organization that protects the public's health in the U.S. To accomplish its mission, the CDC conducts critical science and provides health information that protects the nation against expensive and dangerous health threats and responds when these arise.

Appendix B: Data Sources

CDC HOUSEHOLD PULSE SURVEYS

As reported by the CDC on the following site: https://www.cdc.gov/nchs/covid19/pulse/mental-health.htm.

Adapted PHQ-2 questions:

Over the last 7 days, how often have you been bothered by … having little interest or pleasure in doing things? Would you say not at all, several days, more than half the days, or nearly every day? Select only one answer.

Over the last 7 days, how often have you been bothered by … feeling down, depressed, or hopeless? Would you say not at all, several days, more than half the days, or nearly every day? Select only one answer.

Adapted GAD-2 questions:

Over the last 7 days, how often have you been bothered by the following problems … Feeling nervous, anxious, or on edge? Would you say not at all, several days, more than half the days, or nearly every day? Select only one answer.

Over the last 7 days, how often have you been bothered by the following problems … Not being able to stop or control worrying? Would you say not at all, several days, more than half the days, or nearly every day? Select only one answer.

Beginning in Phase 3.2 (July 21, 2021) of data collection and reporting, the question reference period changed from the "last 7 days" to the "last two weeks."

Scoring and Estimation

For each scale, the answers are assigned a numerical value: not at all = 0, several days = 1, more than half the days = 2 and nearly every day = 3. The two responses for each scale are added together. A sum equal to three or greater on the PHQ-2 has been shown to be associated with diagnoses of major depressive disorder. A sum equal to three or greater on the GAD-2 has been shown to be associated with diagnoses of generalized anxiety disorder. For adults with scores of 3 or greater, further evaluation by a clinician or other health professional is generally recommended.

Estimates on this page are based on these composite scores. Answers to both questions in the scale were required to calculate the scores. Adults with missing responses to one or both questions are not shown separately in the tables and are not included in the calculation of percentages.

Information about individual item responses is available from the Census Bureau website: https://www.census.gov/householdpulsedata.

The survey was designed to meet the goal of accurate and timely weekly estimates. It was conducted by an internet questionnaire, with invitations to participate sent by email and text message. The sample frame is the Census Bureau Master Address File Data. Housing units linked to one or more email addresses or cell phone numbers were randomly selected to participate, and one respondent from each housing unit was selected to respond for him- or herself. Estimates are weighted to adjust for nonresponse and to match Census Bureau estimates of the population by age, sex, race and ethnicity and educational attainment. All estimates shown meet the NCHS Data Presentation Standards for Proportions.

The data collection period for Phase 1 of the Household Pulse Survey occurred between April 23, 2020, and July 21, 2020. Phase 2 data collection occurred between August 19, 2020, and October 26, 2020. Phase 3 data collection occurred between October 28, 2020, and March 29, 2021. Phase 3.1 data collection occurred between April 14,

2021, and July 5, 2021. Phase 3.2 data collection occurred between July 21, 2021, and October 11, 2021. Phase 3.3 data collection occurred between December 1, 2021, and February 7, 2022. Phase 3.4 data collection occurred between March 2, 2022, and May 9, 2022. Phase 3.4 data collection will be continued with a two-weeks-on, two-weeks-off collection and dissemination approach.

NATIONAL HEALTH INTERVIEW SURVEY (NHIS)

The National Health Interview Survey (NHIS) is the principal source of information on the health of the civilian noninstitutionalized population of the United States and is one of the major data collection programs of the National Center for Health Statistics (NCHS), which is part of the Centers for Disease Control and Prevention (CDC). The National Health Survey Act of 1956 provided for a continuing survey and special studies to secure accurate and current statistical information on the amount, distribution and effects of illness and disability in the U.S. and the services rendered for or because of such conditions. The survey referred to in the act, now called the National Health Interview Survey, was initiated in July 1957. Since 1960, the survey has been conducted by the NCHS, which was formed when the National Health Survey and the National Vital Statistics Division were combined.

The main objective of the NHIS is to monitor the health of the U.S. population through the collection and analysis of data on a broad range of health topics. A major strength of this survey lies in the ability to categorize these health characteristics by many demographic and socioeconomic characteristics.

NHIS data are used widely throughout the Department of Health and Human Services (HHS) to monitor trends in illness and disability and to track progress toward achieving national health objectives. The data are also used by the public health research community for epidemiologic and policy analysis of such timely issues as characterizing those with various health problems, determining barriers to accessing and using appropriate health care, and evaluating federal health programs.

Although the NHIS has been conducted continuously since 1957, the content of the survey has been updated about every 15–20 years to incorporate advances in survey methodology and coverage of health topics. In January 2019, NHIS launched a redesigned content and structure that differs from its previous questionnaire design (1997–2018).

NATIONAL VITAL STATISTICS SYSTEM (NVSS)

The National Vital Statistics System is the oldest and most successful example of intergovernmental data sharing in public health, and the shared relationships, standards and procedures form the mechanism by which NCHS collects and disseminates the country's official vital statistics. These data are provided through contracts between NCHS and vital registration systems operated in the various jurisdictions legally responsible for the registration of vital events: births, deaths, marriages, divorces and fetal deaths. Vital statistics data are also available online. In the U.S., legal authority for the registration of these events resides individually with the 50 states, two cities (Washington, DC, and New York City) and five territories (Puerto Rico, the Virgin Islands, Guam, American Samoa and the Commonwealth of the Northern Mariana Islands). These jurisdictions are responsible for maintaining registries of vital events and for issuing copies of birth, marriage, divorce and death certificates.

NATIONAL SURVEY ON DRUG USE AND HEALTH (NSDUH)

NSDUH measures the following:

- Use of illegal drugs, prescription drugs, alcohol and tobacco and misuse of prescription drugs
- Mental disorders, treatment, and co-occurring substance use and mental disorders

The data provide estimates of substance use and mental illness at the national, state and substate region levels. NSDUH data also help to identify the extent of substance use and mental illness among different subgroups, estimate trends over time and determine the need for treatment services.

Professional interviewers conduct the face-to-face surveys, and the data are used to support prevention and treatment programs, monitor substance use trends, estimate the need for treatment and inform public health policy.

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