National Health Statistics Reports

Comparison of Mental Health Estimates by Sociodemographic Characteristics in the Research and Development Survey 3 and the 2019 National Health Interview Survey

By Leanna P. Moron, M.S., Katherine E. Irimata, Ph.D., and Jennifer D. Parker, Ph.D.

Abstract

Objectives—This report compares national and subgroup estimates of any (mild, moderate, or severe) level of major depressive disorder (depression) and generalized anxiety disorder (GAD) symptoms among the U.S. adult population from two data sources, the 2019 National Health Interview Survey (NHIS) and the third round of the Research and Development Survey (RANDS 3).

Methods—Data from the 2019 NHIS ($n = 31,997$) and RANDS 3 ($n = 2,646$) were used. The eight-item Patient Health Questionnaire (PHQ–8), scores ranging from 0 to 24, and the seven-item GAD scale (GAD–7), scores ranging from 0 to 21, were used to measure the severity of depression and GAD symptoms, respectively. Binary indicators of exhibiting symptoms were based on scores of 5 to 24 for depression and 5 to 21 for GAD. The estimates were compared by the following sociodemographic characteristics: age, sex, race and Hispanic origin, education, and region.

Results—Nearly all of the national and subgroup estimates of adults with depression and GAD symptoms were significantly higher based on RANDS 3 compared with the 2019 NHIS. The only exception was the depression symptoms estimate among adults aged 65 and over, where the estimates were comparable across the two data sources. Both data sources found that depression symptoms were associated with sex, age, race and Hispanic origin, and education, and GAD symptoms were associated with age, race and Hispanic origin, and education. However, NHIS identified a few associations that RANDS did not, including associations between depression symptoms and region and GAD symptoms and sex.

Conclusions—Mental health estimates from RANDS, a web-based survey, may be overestimated when compared with a traditional in-person household survey. These results may inform potential strategies to improve the comparability of mental health estimates from RANDS and other surveys like NHIS, such as calibration weights or other model-based methods.

Keywords: generalized anxiety disorder • depression • web survey • face-to-face survey

Introduction

Mental health conditions, including major depressive disorder and generalized anxiety disorder (GAD), are among the most common health conditions in the United States (1). Major depressive disorder (depression) is a mood disorder characterized by feelings of sadness, emptiness, or irritability that may impact an individual's capacity to function. GAD is characterized by excessive worry that is difficult to control accompanied by physical symptoms including restlessness, being easily fatigued, difficulty concentrating, irritability, or sleep disturbance (2). These conditions have been measured and reported through various data sources, including national surveys (3,4).

The National Center for Health Statistics (NCHS) is the nation's principal health statistics agency, monitoring the health of the United States through various surveys and data collection systems such as the National Health Interview Survey (NHIS). NHIS is a nationally representative, cross-sectional population health survey that is primarily conducted through in-person, household interviewing. NHIS is considered a gold-standard survey for measuring

---

health outcomes, including mental health outcomes.

In 2015, NCHS began conducting the Research and Development Survey (RANDS). Unlike NHIS, RANDS is a web-based, commercial panel survey that was designed for methodological research purposes, including the evaluation of estimation approaches to integrate RANDS alongside traditional modes of data collection and the evaluation of measurement error to guide improved questionnaire development. Each round of RANDS is used to address multiple research aims. As a web-based survey, RANDS has more timely and cost-effective data collection compared with in-person household surveys. However, RANDS has experienced lower response rates compared with NHIS (5,6) and may be biased as not all adults in the United States have web access.

An important research aim of the RANDS program is to understand how estimates from commercial panel surveys compare with core NCHS data systems for different health and healthcare outcomes and for population subgroups. These comparisons provide information about the strengths and limitations of web-based survey data and inform analytic decisions for integration and calibration. Prior research comparing estimates of health variables in RANDS and benchmark surveys such as NHIS (7,8) has shown differences between some estimates, including those for chronic conditions, health insurance, and social and behavioral variables. RANDS questionnaires have included various questions on mental health to evaluate different assessment instruments of mental and emotional health. In addition, because some of these mental health assessment questions are included on both RANDS and NHIS, it is possible to evaluate the comparability of mental health estimates for those subsets. To provide a comparison of mental health estimates from RANDS to NHIS, national and subgroup estimates from both data sources were evaluated.

This report compares national and subgroup estimates of any (mild, moderate, or severe) level of depression symptoms as measured by the eight-item Patient Health Questionnaire (PHQ–8), and any level of GAD symptoms as

measured by the seven-item GAD scale (GAD–7), in the third round of RANDS (RANDS 3) that was collected in 2019 with the 2019 NHIS. PHQ–8 and GAD–7 were included in one-half of the RANDS 3 sample as part of a separate question design experiment, as described in Methods. Subgroup estimates were evaluated for five sociodemographic characteristics: sex, age, race and Hispanic origin, education, and region. In addition, this report explores the associations of these sociodemographic characteristics with depression and GAD and evaluates if the associations are comparable between the two surveys.

Methods

Data on U.S. adults aged 18 and over from RANDS 3 ($n = 2,646$) and the 2019 NHIS ($n = 31,997$) were evaluated in this comparison.

Description of RANDS

NCHS established the RANDS program in 2015. RANDS is a primarily web-based series of cross-sectional surveys from probability-sampled commercial survey panels designed for methodological research purposes. The target population of RANDS is the U.S. civilian noninstitutionalized population aged 18 and over.

RANDS 3 ($n = 2,646$) was administered as a web-based survey by NORC at the University of Chicago using the AmeriSpeak panel in the spring of 2019 (9). RANDS 3 was developed for several research purposes, including the evaluation of estimation approaches and measurement error.

The final RANDS 3 sample was weighted to account for the sample design and adjusted to the U.S. population counts to account for differential nonresponse and undercoverage of selected groups in the sample frame. RANDS 3 had a weighted cumulative response rate of 18.1%. All data analyses were based on the public-use RANDS 3 data. Additional details about RANDS data and documentation are available online (5).

Description of NHIS

Since 1957, NHIS has been one of NCHS' major surveys and data collection systems. NHIS is a nationally representative, cross-sectional population health survey. It is administered primarily through in-person, household interviews using computer-assisted personal interviewing. The main objective of 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. The target population of NHIS is the adult U.S. civilian noninstitutionalized population aged 18 and over. The NHIS sample design and questionnaire content change over time. Currently, one sample adult aged 18 or over and one sample child aged 17 or under (if any children live in the household) are randomly selected from each household to participate in the survey.

The 2019 NHIS included 31,997 sample adult respondents. The final response rate for sample adults was 59.1% (6). All data analyses are based on the public-use 2019 NHIS sample adult data file. Additional information about NHIS data and documentation are available online (10).

Measures of depression (PHQ–8) and GAD (GAD–7)

While NHIS collects information on mental health annually, the PHQ–8 and GAD–7 measures for assessing symptoms of depression and GAD are part of the rotating core content and are conducted once every 3 years. Depression symptoms for this study were measured using PHQ–8, a validated diagnostic and severity measure of depression symptoms (11). Table I presents PHQ–8's items and response options. For example, the questionnaire asked respondents how often they have been bothered by having "little interest or pleasure in doing things" or "poor appetite or overeating" in the past 2 weeks. The response options, "not at all," "several days," "more than half the days," and "nearly every day," are each scored from 0 to 3 points, respectively, and then added for a total score. Adults with scores of 0–4 are categorized as having "none or

minimal" depression symptoms, while those with scores of 5–9, 10–14, or 15–24 are categorized as having "mild," "moderate," or "severe" depression symptoms, respectively (11). This report focuses on estimates of mild, moderate, and severe levels of depression symptoms (values 5 to 24).

GAD symptoms were measured using GAD–7, a validated diagnostic and severity measure of GAD symptoms (12). Table II presents GAD–7's items and response options. The measure included questions on how often respondents have been bothered by "feeling nervous, anxious, or on edge" or "not being able to stop or control worrying" over the past 2 weeks. The response options, "not at all," "several days," "more than half the days," and "nearly every day," are each scored from 0 to 3 points, respectively, and then added for a total score. Adults with scores of 0–4 are categorized as having "none or minimal" anxiety symptoms, while those with scores of 5–9, 10–14, or 15–21 are categorized as having "mild," "moderate," or "severe" anxiety symptoms, respectively (12). This report focuses on estimates of mild, moderate, and severe categories of GAD symptoms (values 5 to 21).

RANDS 3 was used to conduct a series of experiments intended to guide questionnaire development (5,9), including using a split sample design for evaluating survey questions. The split sample design was used for two purposes: to compare differences in responses to two versions of a question for several outcomes including self-rated health, pain, and e-cigarette use, and to shorten the length of the survey and reduce survey burden. The PHQ–8 and GAD–7 measures were administered using the split sample to reduce burden on survey respondents, with the PHQ–8 questions included on Form A and the GAD–7 questions included on Form B. The two questionnaire forms (A and B) were randomly assigned, with 1,330 RANDS 3 respondents assigned to Group A and 1,316 respondents assigned to Group B.

Among the RANDS 3 and 2019 NHIS respondents that received the PHQ–8 and GAD–7 components, missing items in the mental health measures were handled in the same manner as described

in the 2019 NHIS survey description documentation (6). For respondents who skipped or refused to answer one question, the average of the remaining response values was calculated and added to the total score. Respondents who skipped or refused to answer two or more questions were categorized as having an unknown severity of symptoms and were coded as missing. Total scores with decimal values (possible with one unknown response) were not rounded up to the next whole integer for determining the severity category.

Selected sociodemographic characteristics

This report considers depression and GAD across five sociodemographic groups: sex, age, race and Hispanic origin, education, and region. Sex was reported as male or female. Age was categorized as 18–44, 45–65, or 65 and over. Race and Hispanic origin were reported as Hispanic, Black non-Hispanic (subsequently, Black), White non-Hispanic (subsequently, White), or other non-Hispanic (subsequently, other; including people of other or multiple races). Adults categorized as Hispanic may be of any race or combination of races. The highest level of educational attainment was categorized as high school diploma or less, some college or associate's degree, or college degree or higher. As described in NHIS' data documentation (10), the states and the District of Columbia are grouped into the four U.S. Census Bureau-defined regions: Northeast, Midwest, South, and West. The Northeast region includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The Midwest region includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. The South region includes Alabama, Arkansas, Delaware, the District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. The West region includes Alaska, Arizona,

California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Statistical analysis

All data analyses were conducted using the statistical software SAS version 9.4 (13) and accounted for the complex survey design features of RANDS 3 and the 2019 NHIS such that results are representative of the adult U.S. civilian noninstitutionalized population. For both data sources, national estimates of the selected sociodemographic characteristics were reported, as well as national and subgroup estimates of any level of depression symptoms or GAD symptoms by the selected sociodemographic characteristics (sex, age, race and Hispanic origin, education, and region). All estimates were evaluated using the NCHS data presentation standards of reliability (14).

RANDS 3 did not include missing values for any of the selected sociodemographic characteristics. The 2019 NHIS included 3 unknown cases for sex, 81 unknown cases for age, and 179 unknown cases for education. All data analyses were based on complete cases as the percentage of missing depression and GAD symptom indicators, overall and by subgroup, were fairly low in both sources. For depression, the frequency of unknown values ranged from 0.0% to 0.6% in RANDS 3 and from 0.2% to 2.3% in the 2019 NHIS. For GAD, the frequency of unknown values ranged from 0.1% to 1.0% in RANDS 3 and from 0.2% to 2.4% in the 2019 NHIS.

The Rao–Scott chi-squared tests (15,16) were performed at the 0.05 significance level to identify statistically significant differences between the distributions of the sociodemographic characteristics and estimates of depression or GAD symptoms across data sources. In addition, the Rao–Scott chi-squared tests were used to evaluate statistically significant associations between depression or GAD symptoms and the sociodemographic characteristics within each data source, and similar associations between RANDS 3 and the 2019 NHIS were identified. Adjustments for multiple comparisons are not reported.

Results

Table A displays the weighted percentages of the selected sociodemographic characteristics of the adult U.S. civilian noninstitutionalized population in 2019 based on the 2019 NHIS and RANDS 3. The distributions of sex, age, race and Hispanic origin, and region were similar across both data sources. However, the estimates were significantly different between the data sources for education.

Comparison of depression estimates and association findings

Table B and Figure 1 show the national and subgroup estimates of U.S. adults experiencing mild, moderate, or severe levels of depressive symptoms. According to NHIS data, 18.5% of U.S. adults experienced any level of depression symptoms in 2019. However, the national estimate of any level of depression symptoms was significantly higher in RANDS 3 data (39.6%). In addition, nearly all of the subgroup estimates of depression were significantly higher in RANDS 3 data compared with 2019 NHIS data. However, depression subgroup estimates for adults aged 65 and over were comparable across the two data sources.

In both data sources, any level of depressive symptoms was found to be associated with sex, age, race and Hispanic origin, and education. For instance, both data sources found depressive symptoms to be more common among women compared with men. However, in contrast to RANDS 3 data, NHIS data also identified an association between region and depression.

Comparison of GAD estimates and association findings

Table C and Figure 2 show the national and subgroup estimates of U.S. adults experiencing mild, moderate, or severe levels of GAD symptoms in RANDS 3 and the 2019 NHIS. In the 2019 NHIS, 15.6% of U.S. adults experienced any level of GAD symptoms.

Table A. Unweighted sample sizes and weighted percent distributions of selected sociodemographic characteristics among adults aged 18 and over, by data source: United States, 2019

Characteristic	2019 NHIS[1] (n = 31,997)		RANDS 3[2] (n = 2,646)	
	Sample size	Percent (weighted)	Sample size	Percent (weighted)
Sex				
Female	17,261	51.7	1,328	51.7
Male	14,733	48.3	1,318	48.3
Age (years)				
18–44	12,024	46.0	1,166	46.0
45–64	10,597	33.0	894	33.1
65 and over.	9,295	21.1	586	20.9
Race and Hispanic origin				
Black, non-Hispanic	3,483	11.8	273	11.9
White, non-Hispanic	21,915	63.2	1,729	63.1
Other, non-Hispanic[3]	2,447	8.5	227	8.5
Hispanic[4]	4,152	16.5	417	16.5
Education[5]				
High school diploma or less	11,155	39.9	577	38.8
Some college	9,386	31.1	1,222	27.7
College degree or higher	11,277	29.0	847	33.5
Region[6]				
Northeast	5,410	17.8	396	17.6
Midwest	7,104	21.0	699	20.8
South	11,676	37.7	893	37.9
West	7,807	23.5	658	23.7

[1]NHIS is National Health Interview Survey.
[2]RANDS is Research and Development Survey.
[3]Non-Hispanic adults of races other than White or Black, and those of multiple races.
[4]People of Hispanic origin may be of any race.
[5]Statistically significant difference between RANDS 3 and 2019 NHIS estimates based on Rao–Scott chi-squared test of association ($p < 0.05$).
[6]In the geographic classification of the U.S. population, states are grouped into four regions used by the U.S. Census Bureau. Northeast includes: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest includes: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South includes: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West includes: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

SOURCES: National Center for Health Statistics, Research and Development Survey 3, 2019, and National Health Interview Survey, 2019.

However, the national estimate of U.S. adults that experienced any level of GAD symptoms was significantly higher in RANDS (39.5%).

In addition to the national estimate, all GAD subgroup estimates were significantly higher in RANDS 3 compared with the NHIS. For instance, the GAD subgroup estimates for all four race and Hispanic-origin groups (Hispanic, Black, White, and other), were significantly higher in RANDS 3 compared with the NHIS. Similarly, the GAD subgroup estimates by all four regions (Northeast, Midwest, South, and West) were significantly higher in RANDS 3 compared with the 2019 NHIS.

For association findings, both data sources found that any level of GAD symptoms differed by age, race

and Hispanic origin, and education. In addition, both RANDS and NHIS found that the prevalence of GAD symptoms did not differ by region. However, NHIS results suggest that in addition to age, race and Hispanic origin, and education, estimates of GAD symptoms also differ by sex, while RANDS did not identify differences in GAD symptom prevalence by sex.

Discussion

This report examined estimates of any level of depression symptoms and GAD symptoms based on the 2019 NHIS and RANDS 3 data. The mental health estimates were evaluated at the national level and by five sociodemographic characteristics: sex, age, race and Hispanic origin, education, and region. In

Figure 1. Percentage of adults aged 18 and over with any level of depressive symptoms, by sociodemographic characteristics and data source: United States, 2019
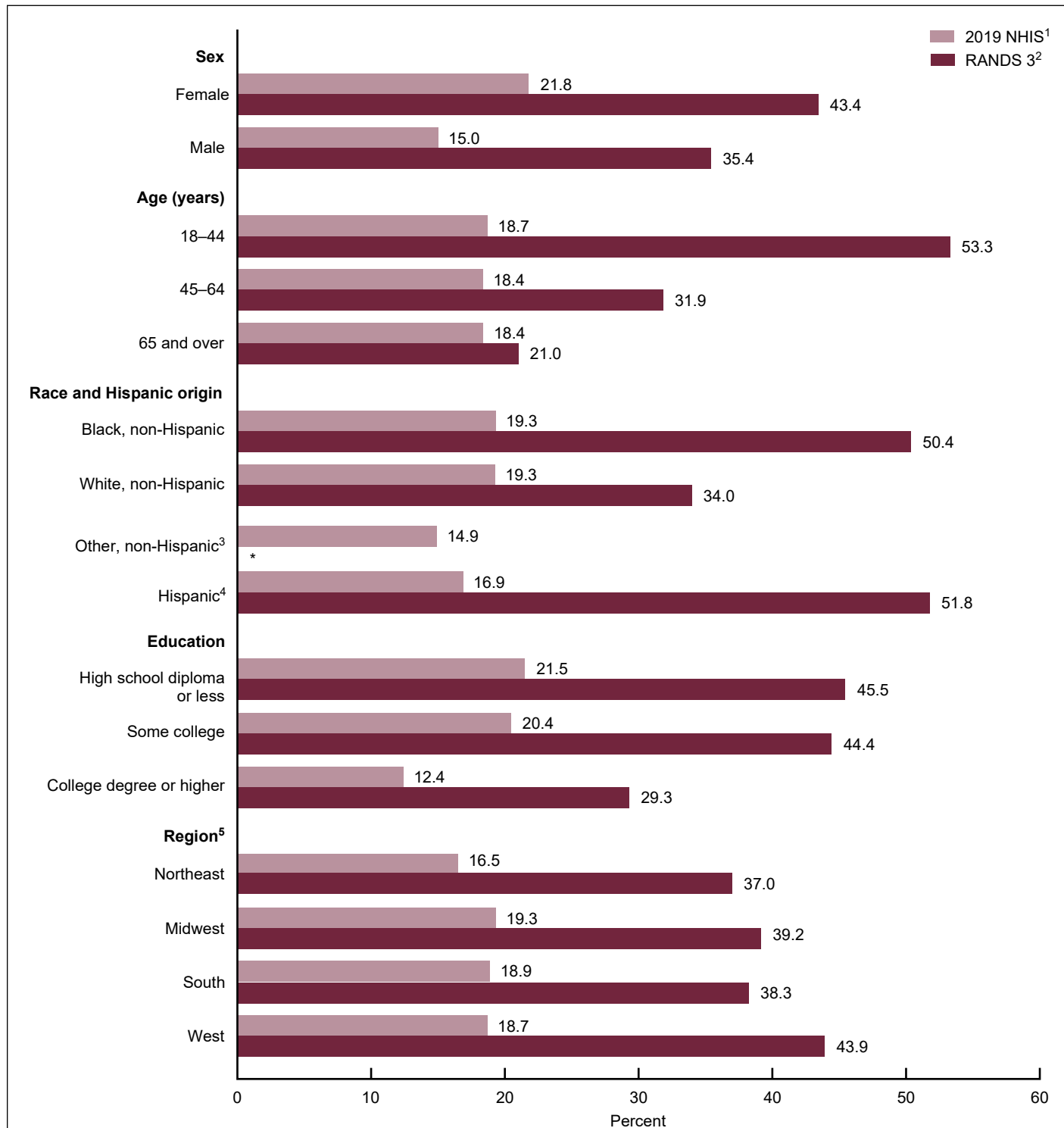
* The RANDS subgroup estimate for other races was not reported because it does not meet National Center for Health Statistics standards of reliability.
[1]NHIS is National Health Interview Survey.
[2]RANDS is Research and Development Survey.
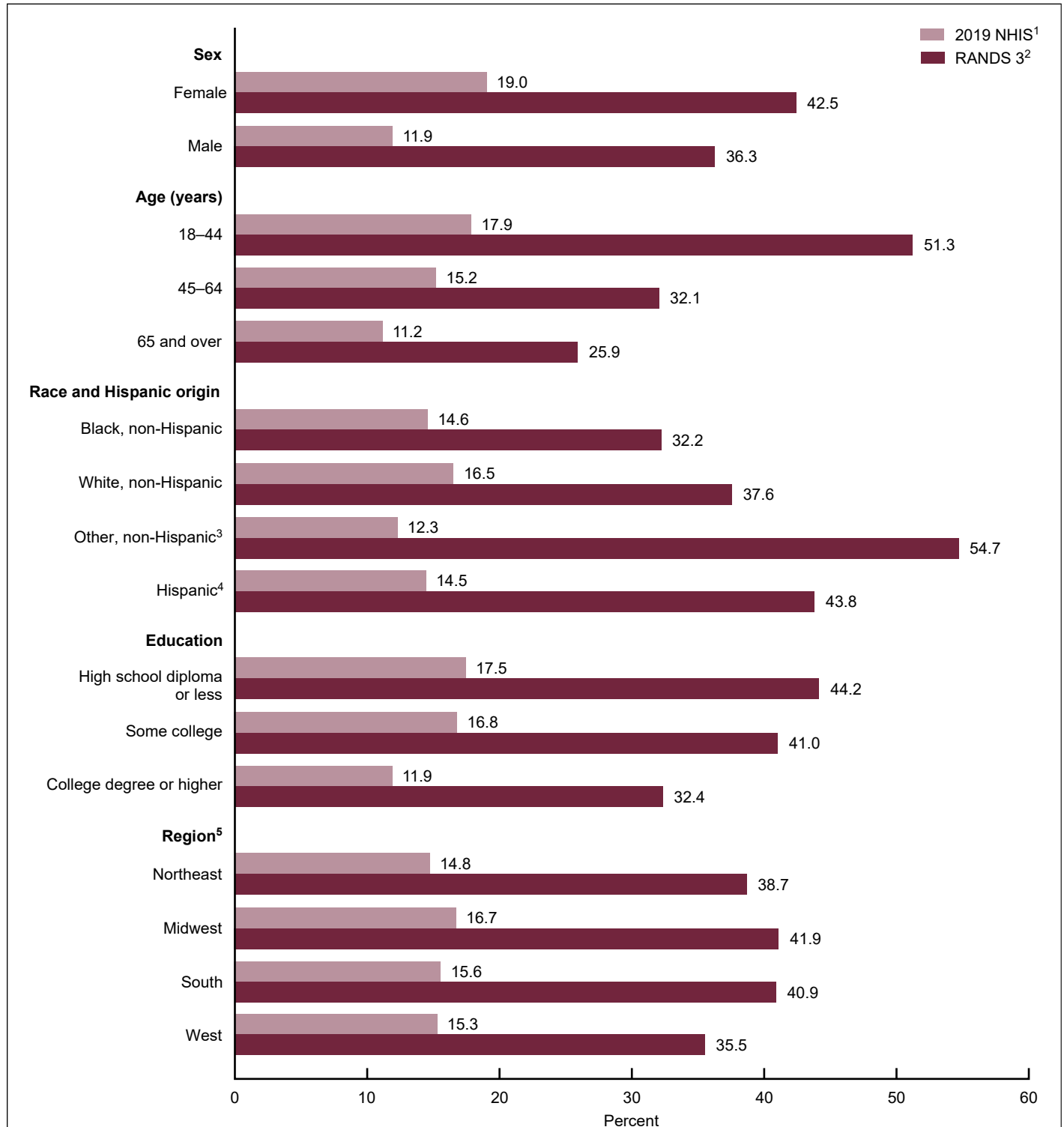[3]Non-Hispanic adults of races other than White or Black, and those of multiple races.
[4]People of Hispanic origin may be of any race.
[5]In the geographic classification of the U.S. population, states are grouped into four regions used by the U.S. Census Bureau. Northeast includes: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest includes: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South includes: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West includes: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.
NOTES: Depression was measured using the eight-item Patient Health Questionnaire (PHQ–8), with summed scores ranging from values of 0 to 24. The measure was summarized into the following categories: none to minimal (values 0–4), mild (values 5–9), moderate (values 10–14), or severe (values 15–24) levels of depressive symptoms. Estimates of any level of depressive symptoms (values 5–24), which includes the mild, moderate, and severe categories, are reported.
SOURCES: National Center for Health Statistics, Research and Development Survey 3, 2019, and National Health Interview Survey, 2019.

Figure 2. Percentage of adults aged 18 and over with any level of generalized anxiety disorder symptoms, by sociodemographic characteristics and data source: United States, 2019

Legend: 2019 NHIS[1], RANDS 3[2]

Sex
- Female: 19.0 (NHIS), 42.5 (RANDS 3)
- Male: 11.9 (NHIS), 36.3 (RANDS 3)

Age (years)
- 18–44: 17.9 (NHIS), 51.3 (RANDS 3)
- 45–64: 15.2 (NHIS), 32.1 (RANDS 3)
- 65 and over: 11.2 (NHIS), 25.9 (RANDS 3)

Race and Hispanic origin
- Black, non-Hispanic: 14.6 (NHIS), 32.2 (RANDS 3)
- White, non-Hispanic: 16.5 (NHIS), 37.6 (RANDS 3)
- Other, non-Hispanic[3]: 12.3 (NHIS), 54.7 (RANDS 3)
- Hispanic[4]: 14.5 (NHIS), 43.8 (RANDS 3)

Education
- High school diploma or less: 17.5 (NHIS), 44.2 (RANDS 3)
- Some college: 16.8 (NHIS), 41.0 (RANDS 3)
- College degree or higher: 11.9 (NHIS), 32.4 (RANDS 3)

Region[5]
- Northeast: 14.8 (NHIS), 38.7 (RANDS 3)
- Midwest: 16.7 (NHIS), 41.9 (RANDS 3)
- South: 15.6 (NHIS), 40.9 (RANDS 3)
- West: 15.3 (NHIS), 35.5 (RANDS 3)

Percent (x-axis: 0 to 60)

[1]NHIS is National Health Interview Survey.
[2]RANDS is Research and Development Survey.
[3]Non-Hispanic adults of races other than White or Black, and those of multiple races.
[4]People of Hispanic origin may be of any race.
[5]In the geographic classification of the U.S. population, states are grouped into four regions used by the U.S. Census Bureau. Northeast includes: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest includes: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South includes: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West includes: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.
NOTES: Generalized anxiety disorder was measured using the seven-item Generalized Anxiety Disorder scale (GAD–7), with summed scores ranging from values of 0 to 24. The measure was summarized into four categories: none to minimal (values 0–4), mild (values 5–9), moderate (values 10–14), or severe (values 15–21) levels of GAD symptoms. Estimates of any level of GAD symptoms (values 5–21), which includes the mild, moderate, and severe categories, are reported.
SOURCES: National Center for Health Statistics, Research and Development Survey 3, 2019, and National Health Interview Survey, 2019.

Table B. Unweighted sample sizes and weighted percentages of adults aged 18 and over with any level of depressive symptoms, by data source and selected sociodemographic characteristics: United States, 2019

Characteristic	2019 NHIS[1] (n = 31,997)			RANDS 3[2] (n = 1,330)		
	Sample size	Percent (weighted)	Standard error	Sample size	Percent (weighted)	Standard error
Overall[3].	5,898	18.5	0.3	499	39.6	1.8
Sex[3–5]						
Female	3,649	21.8	0.5	276	43.4	2.6
Male	2,247	15.0	0.4	223	35.4	2.5
Age[4,5] (years)						
18–44[3]	2,245	18.7	0.5	308	53.3	2.8
45–64[3]	1,980	18.4	0.5	137	31.9	3.1
65 and over.	1,666	18.4	0.6	54	21.0	3.3
Race and Hispanic origin[4,5]						
Black, non-Hispanic[3]	662	19.3	0.9	60	50.4	5.1
White, non-Hispanic[3]	4,153	19.3	0.4	291	34.0	2.1
Other, non-Hispanic[6]	370	14.9	0.9	*	*	*
Hispanic[3,7]	713	16.9	0.7	104	51.8	5.0
Education[3–5]						
High school diploma or less	2,407	21.5	0.6	126	45.5	3.7
Some college	1,981	20.4	0.6	248	44.4	2.3
College degree or higher	1,479	12.4	0.4	125	29.3	2.4
Region[3,4,8]						
Northeast	901	16.5	0.7	74	37.0	4.8
Midwest	1,374	19.3	0.8	118	39.2	3.6
South	2,167	18.9	0.5	168	38.3	2.8
West	1,456	18.7	0.7	139	43.9	3.5

* Estimate was not reported because it does not meet National Center for Health Statistics standards of reliability.
[1]NHIS is National Health Interview Survey.
[2]RANDS is Research and Development Survey.
[3]Statistically significant difference between RANDS 3 and 2019 NHIS estimates based on Rao–Scott chi-squared test of association ($p < 0.05$).
[4]Statistically significant difference between subgroup estimates of any level of depressive symptoms within the 2019 NHIS ($p < 0.05$).
[5]Statistically significant difference between subgroup estimates of any level of depressive symptoms within RANDS 3 ($p < 0.05$).
[6]Non-Hispanic adults of races other than White or Black, and those of multiple races.
[7]People of Hispanic origin may be of any race.
[8]In the geographic classification of the U.S. population, states are grouped into four regions used by the U.S. Census Bureau. Northeast includes: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest includes: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South includes: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West includes: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

NOTES: Depression was measured using the eight-item Patient Health Questionnaire (PHQ–8), with summed scores ranging from values of 0 to 24. The measure was summarized into the following categories: none to minimal (values 0–4), mild (values 5–9), moderate (values 10–14), or severe (values 15–24) levels of depressive symptoms. Estimates of any level of depressive symptoms (values 5–24), which includes the mild, moderate, and severe categories, are reported.

SOURCES: National Center for Health Statistics, Research and Development Survey 3, 2019, and National Health Interview Survey, 2019.

addition, sociodemographic associations were identified and compared across the two data sources.

For any level of depression symptoms, the national estimate was significantly higher in RANDS 3 compared with NHIS. Nearly all of the subgroup estimates of depression were significantly higher in RANDS 3 compared with NHIS, except for adults aged 65 and over, where estimates were not significantly different across the two data sources. Both RANDS 3 and NHIS identified statistically significant associations between depression and

sex, age, race and Hispanic origin, and education. In contrast to RANDS, NHIS also identified an association between region and depression.

For any level of GAD symptoms, the RANDS national estimate was significantly higher compared with the NHIS estimate. All sociodemographic subgroup estimates of GAD symptoms were significantly higher in RANDS compared with NHIS. Both data sources demonstrated statistically significant associations between GAD symptoms and age, race and Hispanic origin, and education, as well as no association

with region. NHIS also identified an association between sex and GAD, while RANDS did not.

These results indicate that the alignment of depression and GAD estimates from NHIS and RANDS differed significantly for both national and subgroup estimates. In this study, the RANDS 3 estimates were significantly higher compared with the 2019 NHIS estimates for most instances. Potential reasons for the observed differences may be due in part to the differences in the response rate, sample size, and survey mode between the two data sources. The 2019 NHIS had a higher response rate (59.1%) compared with RANDS 3 (18.1%). The RANDS 3 sample size (n = 2,646) was much smaller than that of the 2019 NHIS (n = 31,997), which resulted in relatively larger standard errors compared with the 2019 NHIS. In addition, the PHQ–8 and GAD–7 question series were only administered to one-half of RANDS respondents. For survey mode, the 2019 NHIS was conducted primarily through in-person, household interviews, while RANDS 3 was administered as a web-based survey.

Although RANDS is probability sampled and the weights are adjusted to align with population characteristics before estimation, the differences identified between the mental health estimates in RANDS and NHIS could be due in part to differences in the way individuals respond using different administration methods. Alternative sources of bias, such as selection bias, could also be a factor in the differing results as individuals without web access are excluded from web panels. Finally, although both surveys are weighted to produce nationally representative estimates, analytic weighting and nonresponse approaches differ between RANDS and NHIS, including differences in methods, variable coding (such as age groups or race and ethnicity categories), and additional factors.

For example, while both the 2019 NHIS and RANDS 3 weights are adjusted to marginal population totals for education using raking, NHIS is adjusted to the American Community Survey and RANDS is adjusted to the Current Population Survey. Both the American Community Survey and

Table C. Unweighted sample sizes and weighted percentages of adults aged 18 and over with any level of generalized anxiety disorder symptoms, by data source and selected sociodemographic characteristics: United States, 2019

Characteristic	2019 NHIS[1] (n = 31,997)			RANDS 3[2] (n = 1,316)		
	Sample size	Percent (weighted)	Standard error	Sample size	Percent (weighted)	Standard error
Overall[3]	4,815	15.6	0.3	505	39.5	1.8
Sex[3,4]						
Female	3,098	19.0	0.4	268	42.5	2.6
Male	1,715	11.9	0.3	237	36.3	2.6
Age[3–5] (years)						
18–44	2,190	17.9	0.5	295	51.3	3.0
45–64	1,641	15.2	0.5	137	32.1	2.8
65 and over	979	11.2	0.4	73	25.9	3.2
Race and Hispanic origin[3–5]						
Black, non-Hispanic	493	14.6	0.8	47	32.2	5.3
White, non-Hispanic	3,411	16.5	0.4	303	37.6	2.3
Other, non-Hispanic[6]	310	12.3	0.8	63	54.7	5.3
Hispanic[7]	601	14.5	0.7	92	43.8	5.2
Education[3–5]						
High school diploma or less	1,916	17.5	0.5	119	44.2	3.8
Some college	1,557	16.8	0.5	250	41.0	2.2
College degree or higher	1,324	11.9	0.4	136	32.4	2.7
Region[3,8]						
Northeast	779	14.8	0.6	72	38.7	5.0
Midwest	1,149	16.7	0.7	134	41.9	3.8
South	1,746	15.6	0.5	188	40.9	2.9
West	1,141	15.3	0.6	111	35.5	3.3

[1]NHIS is National Health Interview Survey.
[2]RANDS is Research and Development Survey.
[3]Statistically significant difference between RANDS 3 and 2019 NHIS estimates based on Rao–Scott chi-squared test of association ($p < 0.05$).
[4]Statistically significant difference between subgroup estimates of any level of generalized anxiety disorder symptoms within the 2019 NHIS ($p < 0.05$).
[5]Statistically significant difference between subgroup estimates of any level of generalized anxiety disorder symptoms within RANDS 3 ($p < 0.05$).
[6]Non-Hispanic adults of races other than White or Black, and those of multiple races.
[7]People of Hispanic origin may be of any race.
[8]In the geographic classification of the U.S. population, states are grouped into four regions used by the U.S. Census Bureau. Northeast includes: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest includes: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South includes: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West includes: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

NOTES: Generalized anxiety disorder was measured using the seven-item Generalized Anxiety Disorder scale (GAD–7), with summed scores ranging from values of 0 to 24. The measure was summarized into four categories: none to minimal (values 0–4), mild (values 5–9), moderate (values 10–14), or severe (values 15–21) levels of GAD symptoms. Estimates of any level of GAD symptoms (values 5–21), which includes the mild, moderate, and severe categories, are reported.

SOURCES: National Center for Health Statistics, Research and Development Survey 3, 2019, and National Health Interview Survey, 2019.

the Current Population Survey are conducted by the U.S. Census Bureau, although the American Community Survey includes both institutionalized and noninstitutionalized group quarters. Group quarters are not included in the Current Population Survey, which covers the U.S. civilian noninstitutionalized population, which may result in the differences seen in the distribution of education estimates between RANDS 3 and the 2019 NHIS.

A potential strategy to improve the comparability of mental health estimates between RANDS and NHIS is through the implementation of calibration weights or other model-based methods. The use of calibration weights is a statistical approach aimed at improving the quality of survey estimates by adjusting the weights to a benchmark survey on the specified reference variables. Calibration weighting using raking has been implemented in later rounds of RANDS, including the three rounds of RANDS that took place during the COVID-19 pandemic (17). While this study focused on differences between mental health estimates in RANDS and NHIS before calibration weighting adjustments, such approaches could be specifically designed for depression and GAD outcomes by

including variables related to mental health that account for differences between the sources (18,19) to align the surveys' estimates more closely.

The findings presented in this report are subject to several limitations. These results are based on comparisons using the RANDS 3 and 2019 NHIS sample adult data files, and the differences identified may not be consistent in other years of RANDS and NHIS. The mental health measures used in this report were PHQ–8 and GAD–7, and results may not be generalizable to other mental health measures or instruments. Alternate mental health measures include the two-item versions of the Patient Health Questionnaire (PHQ–2) and GAD scale (GAD–2), as reported on the U.S. Census Bureau's Household Pulse Survey (20), as well as depression and GAD indicators developed by the Washington Group on Disability Statistics (21). In addition, these mental health measures are based on self-reported responses and do not necessarily represent clinical diagnoses of depression or GAD.

References

1. About mental health. Centers for Disease Control and Prevention. 2023. Available from: https://www.cdc.gov/mentalhealth/learn/index.htm.

2. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. 2013.

3. Villarroel MA, Terlizzi EP. Symptoms of depression among adults: United States, 2019. NCHS Data Brief, no 379. Hyattsville, MD: National Center for Health Statistics. 2020. Available from: https://www.cdc.gov/nchs/products/databriefs/db379.htm.

4. Terlizzi EP, Villarroel MA. Symptoms of generalized anxiety disorder among adults: United States, 2019. NCHS Data Brief, no 378. Hyattsville, MD: National Center for Health Statistics. 2020. Available from: https://www.cdc.gov/nchs/products/databriefs/db378.htm.

5. National Center for Health Statistics. RANDS 3 data and documentation. 2020. Available from: https://www.cdc.gov/nchs/rands/rands3.htm.

6. National Center for Health Statistics. Survey description, National Health Interview Survey, 2019. 2020.

7. He Y, Cai B, Shin H-C, Beresovsky V, Parsons V, Irimata K, et al. The National Center for Health Statistics' 2015 and 2016 Research and Development Surveys. National Center for Health Statistics. Vital Health Stat 1(64). 2020. Available from: https://www.cdc.gov/nchs/data/series/sr_01/sr01-64-508.pdf.

8. Parker J, Miller K, He Y, Scanlon P, Cai B, Shin H-C, et al. Overview and initial results of the National Center for Health Statistics' Research and Development Survey. Stat J IAOS 36(4):1199–211. 2020.

9. National Center for Health Statistics. RANDS 3 technical documentation. 2020. Available from: https://www.cdc.gov/nchs/rands/files/RANDS3_technical_documentation.pdf.

10. National Center for Health Statistics. National Health Interview Survey, 2019. Public-use data file and documentation. 2020. Available from: https://www.cdc.gov/nchs/nhis/2019nhis.htm.

11. Kroenke K, Strine TW, Spitzer RL, Williams JBW, Berry JT, Mokdad AH. The PHQ–8 as a measure of current depression in the general population. J Affect Disord 114(1–3):163–73. 2009.

12. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: The GAD–7. Arch Intern Med 166(10):1092–7. 2006.

13. SAS Institute, Inc. SAS (Version 9.4) [computer software]. 2013.

14. Parker JD, Talih M, Malec DJ, Beresovsky V, Carroll M, Gonzalez JF Jr, et al. National Center for Health Statistics data presentation standards for proportions. National Center for Health Statistics. Vital Health Stat 2(175). 2017.

15. Scott AJ, Rao JNK. IV: Superpopulation models. Chi-squared tests for contingency tables with proportions estimated from survey data. In: Krewski D, Platek R, Rao JNK, editors. Current topics in survey sampling. New York, NY: Academic Press, Inc., 247–65. 1981.

16. Scott A. Rao-Scott corrections and their impact. In: Proceedings of the Survey Research Methods Section, American Statistical Association. 2007.

17. Irimata KE, Scanlon PJ. The Research and Development Survey (RANDS) during COVID-19. Stat J IAOS 38(1):13–21. 2022.

18. Irimata KE, He Y, Cai B, Shin H-C, Parsons VL, Parker JD. Comparison of quarterly and yearly calibration data for propensity score adjusted web survey estimates. Surv Methods Insights Field. 2020. Available from: https://surveyinsights.org/?p=13426.

19. Li Y, Irimata K, He Y, Parker J. Variable inclusion strategies through directed acyclic graphs to adjust health surveys subject to selection bias for producing national estimates. J Off Stat 38(3):875–900. 2022.

20. U.S. Census Bureau. Measuring household experiences during the coronavirus pandemic: What is the Household Pulse Survey? 2023. Available from: https://www.census.gov/data/experimental-data-products/household-pulse-survey.html.

21. Washington Group on Disability Statistics. Analytic guidelines: Creating disability identifiers using the Washington Group Short Set on Functioning–Enhanced (WG-SS Enhanced) SPSS Syntax. 2021. Available from: https://www.washingtongroup-disability.com/fileadmin/uploads/wg/WG_Document__7A_-_Analytic_Guidelines_for_the_WG-SS_Enhanced__SPSS_.pdf.

Technical Notes

Table I. Patient Health Questionnaire–8: Items and response option values

Over the past 2 weeks, how often have you been bothered by the following symptoms?	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself, or that you are a failure, or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite, being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3

NOTES: Patient Health Questionnaire–8 total scores range from values of 0 to 24. Scores are categorized as none to minimal (values 0–4), mild (values 5–9), moderate (values 10–14), and severe (values 15–24) levels of depressive symptoms.

SOURCES: National Center for Health Statistics, Research and Development Survey 3, 2019, and National Health Interview Survey, 2019.

Table II. Generalized Anxiety Disorder Scale–7: Items and response option values

Over the past 2 weeks, how often have you been bothered by the following symptoms?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it's hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

NOTES: Generalized Anxiety Disorder Scale–7 total scores range from values of 0 to 21. Scores are categorized as none to minimal (values 0–4), mild (values 5–9), moderate (values 10–14), and severe (values 15–21) levels of generalized anxiety disorder symptoms.

SOURCES: National Center for Health Statistics, Research and Development Survey 3, 2019, and National Health Interview Survey, 2019.

For more NCHS NHSRs, visit:
https://www.cdc.gov/nchs/products/nhsr.htm.

National Health Statistics Reports ■ Number 188 ■ July 10, 2023