Trends in Mental Health Symptoms, Service Use, and Unmet Need for Services among US Adults through the First Nine Months of the COVID-19 Pandemic

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Abstract

The COVID-19 pandemic has led to rising morbidity, mortality, and social and economic disruption, stressors which have impaired mental health.¹ Evidence emerged of substantial increases in anxiety and depression in spring and summer, 2020.²⁻⁷ To understand the effects of the pandemic and inform public health initiatives, it is essential to track trends in mental health disorders, as well as use of and need for mental health services, and to identify demographic groups at highest risk. Analyzing cross-sectional samples of 1,483,378 US adults, we show that reports of anxiety and depression rose significantly from April to November, 2020 to rates six-times higher than early 2019 US norms. Use of prescription medication, counseling services, and unmet need for mental health services also rose significantly. Prevalence rates of mental health disorders were highest among young, less educated, single, female, Black, Hispanic, and other race/ethnicity adults, with age and education disparities growing over time. Hispanics, Blacks, other race/ethnicities, and less educated respondents also were significantly less likely to be receiving medication or counseling and reported higher unmet needs for services. Together, disparities in estimates of mental health disorders and mental health treatment indicate a striking disequilibrium between the potential need for and the use of mental health services during the COVID-19 pandemic. Rising mental health challenges are being born largely by young, less advantaged people of color and women, with the potential for expanded interruptions to optimal functioning and repercussions for social and economic recovery from COVID-19.

Introduction

Along with rising morbidity, mortality, and social and economic disruption, the COVID-19 pandemic also has brought a surge of mental health challenges. Stressors ranging from fear of illness, job and income loss, and social and educational disruptions have lead to rising stress and social isolation.¹ Numerous single- or duo-wave surveys in spring and summer 2020 found increased levels of anxiety and depression in the US and other countries.²⁻⁷ One survey of US adults, for example, found rates of serious psychological distress of 14.2% in April and 13.0% in July, 2020,⁴ while a June, 2020 survey found prevalence rates of 24.3% for anxiety and 24.3% for depressive disorder, severely elevated compared to prior national norms.²

Due to demographic disparities in the physical, economic, and social impacts of COVID-19, it is likely that mental health disparities may emerge as well. Indeed, recent work found mental health challenges were heightened among younger adults, parents, Hispanic adults, and those of lower socioeconomic status early in the pandemic.^{1,2-3,7-8} Evidence to date has focused primarily on point-in-time or short-term shifts in mental health, presenting data from spring and summer 2020. It is essential to consider whether early increases in mental health symptomatology have remained stable, have grown, or have declined through the ongoing pandemic. Identifying the demographic groups at highest risk for increased mental health symptomatology is also critical.

In addition to tracking levels of psychological distress, to inform public health initiatives and direct scarce resources, we also consider changes in the use of and unmet need for mental health services. The COVID-19 pandemic led to guidelines to postpone non-essential medical services and screenings.⁹ Research is beginning to assess the growing gaps in mental health treatment in the US and internationally.¹⁰ An April,

2020 survey of 880 US behavioral health organizations, for example, found that 93% had reduced services in response to COVID-19.¹¹ An assessment of US electronic health records found mental and behavioral health visits declined in March, 2020, but dropped less than other types of medical visits, and rebounded more quickly to near pre-pandemic levels by April, 2020.¹² It is essential to consider how changes in mental health care have evolved, and to evaluate the prevalence of unmet need for mental health services.

In the current research, we assess repeated cross-sectional surveys of nationally-representative samples of US residents from the US 2020 Household Pulse Survey conducted from April through November, 2020 to track trends in mental health disorder symptoms, mental health care, and unmet need for care across the entirety of the pandemic to date. These data provide a far more expansive view of changing mental health needs in the US population than prior short-term studies. The large and diverse sample also allows consideration of how trends vary across demographic strata.

Results

eTable 1 presents weighted sample descriptives. Table 2 shows odds ratios (OR), 95% confidence intervals (CI), and predicted prevalence rates (adjusted for cohort, state, and demographic characteristics) for anxiety and depression, with Figure 1 presenting prevalence rates across the sample cohorts. Table 3 and Figure 1 show these results for the prescription, counseling, and unmet need for counseling outcomes. Results for interaction models are presented in eTables 4-8. In describing the results in text, we focus on adjusted prevalence rates for ease of interpretability and practical significance.

Anxiety

Over the entire weighted sample, 44% of respondents met the criteria for anxiety disorder. Results from logistic regressions indicate significant growth in anxiety from early April through November (Table 2 and Figure 1), with prevalence rising from 38% for the first cohort (April 23-May 12, 2020) to 50% in the final cohort (November 11-23, 2020). Prevalence varied significantly by race/ethnicity, with anxiety higher among people identifying as other racial/ethnic groups (51%), Hispanic (50%), and Black (47%) compared to Whites (41%), who were higher than Asians (39%). Interactions between race/ethnicity and wave were significant as a group (eTable 4), with gaps between Hispanics and Whites narrowing, and gaps between Asians and Whites growing across some cohorts.

Rates of anxiety were significantly higher among younger adults, with the prevalence among those age 18-29 (57%) nearly double that of those aged 70 and above (30%). Significant interaction results (eTable 5) found that age disparities grew over the cohorts, with anxiety prevalence rising most quickly for young adults. Females had significantly higher prevalence of anxiety than males (47% vs 40%), and single adults with child(ren) (51%) had higher prevalence than those in adult only households (42%). Nonsignificant interactions showed stable sex and household structure differences over cohorts (eTables 6, 7). Anxiety prevalence declined significantly with greater education, ranging from 47% for those with a high school degree or less to 35% for respondents with a graduate degree. Significant interactions found that educational disparities grew in May and then stabilized (eTable 8).

Depression

Over the entire analytic sample, 38% of respondents met the criteria for depressive disorder. Prevalence of depression grew significantly over the cohorts (Table 2 and Figure 1) from 32% in late April/early May to 44% in mid November. Respondents identifying as other racial/ethnic backgrounds (45%), Hispanics (44%), and Blacks (43%) reported higher prevalence of depression than Whites (35%), with some narrowing of gaps between Hispanics and Whites across cohorts. Depression declined notably with age, with prevalence for 18-29 year olds (52%) nearly twice as high as those for 70+ (27%). Age disparities grew significantly over time: a 20 point gap in the first cohort (42% vs 22% for 18-29 vs 70+) rose to a nearly 30 point gap by the final cohort (61% to 32%). Females reported higher prevalence of depression than males (39% vs 37%), with nonsignificant shifts over cohorts. Prevalence of depression differed across all household structures, with respondents living with other adults reporting the lowest prevalence of depression, and single adults with child(ren) the highest prevalence at 45%, differences which remained stable over cohorts. Depression declined with greater education, with prevalence dropping from 43% for those with a high school degree or less to 25% for respondents with a graduate degree. Education disparities grew over time, with the greatest growth in depression over cohorts among the least educated.

Use of Prescription Medication

Across the entire sample, 21% of respondents reported using prescription medication for emotional, behavioral, or mental health disorders in the prior month. Logistic regression models found that prevalence of medication use grew over time, particularly in late October and through November, ranging from 19% among the first cohort who reported on medication use in late August to 22% in mid November (Table 3 and Figure 1). Medication use varied by race/ethnicity, with prevalence among Whites (23%) significantly higher than Hispanic (16%), Black (15%), and Asian (8%) respondents. Prevalence of medication use varied significantly by age, ranging from a low of 17% among respondents aged 70 and above to a high of 22% among those in their 50s. Females reported significantly higher medication use than males (25% versus 15%). Adults living alone reported higher medication use (23%) than those in multiple adult households (20%), who in turn were higher than those in households with adults and child(ren) (19%). In relation to education, respondents with some college reported significantly higher prevalence of medication use (22%) than those with a high school degree or less (19%). Sets of interactions were all nonsignificant, showing stable demographic differences across cohorts.

Mental Health Counseling

Over the whole sample, 9% of respondents reported accessing mental health counseling in the prior month. Logistic regression results (Table 3, Figure 1) found that prevalence increased over the cohorts, rising to 10% in mid October and November. Prevalence rates of mental health counseling were lower among Asian (6%), Black (9%), and Hispanic (9%) respondents than their White (10%) counterparts. Prevalence varied significantly by age as well, with 13% of 18-29 year olds reporting counseling, more than three times higher than among respondents age 70 and above (4%). Females were more likely than males to receive counseling (11% versus 7%), as were those in single adult (11%) or single adult with child(ren) (13%) households compared to those living with other adults (9%). Prevalence of mental health counseling was

significantly lower among those with a high school degree or less (7%) than among their peers with some college (10%) or a bachelors or graduate degree (both 12%). Nonsignificant interactions indicated stable demographic differences across cohorts.

Unmet Need for Mental Health Counseling

Overall, 10% of the sample reported needing but not receiving mental health counseling services in the prior month. Logistic regression results (Table 3 and Figure 1) found increasing prevalence over cohorts, rising from 9% in late August to 11% starting in late October. Prevalence of unmet need for counseling were highest among those identifying as other race/ethnicity (16%) and lowest among Asians (6%), both significantly different than Whites (10%). Unmet needs decreased significantly with age, with prevalence among young adults aged 18-29 (18%) over five times higher than among the oldest respondents age 70 and above (3%). Females were more likely than males to report unmet need for mental health counseling (13% versus 8%). Significant but practically small differences emerged across household structure, while differences across educational strata were larger, with all respondents with higher education reporting greater prevalence of unmet need for mental health services than their peers with a high school degree or less (8%), with the highest predicted rate (13%) among those with some college. Like other measures of mental health services, nonsignificant interactions indicated stable demographic differences across cohorts.

Intersections between Mental Health Disorders and Services

A final set of descriptive analyses assessed intersections between mental health disorders and use of mental health services, using weighted chi square analyses. Of respondents meeting criteria for anxiety disorder, 35% reported use of prescription medication, 17% received counseling, and 24% reported unmet need for counseling versus 13%, 5%, and 3% among those not meeting criteria (all $p < .001$). Of respondents meeting criteria for depressive disorder, 36% reported using medication, 17% received counseling, and 27% reported unmet need for counseling versus 14%, 6%, and 4% among those not meeting criteria (all $p < .001$).

Discussion

The COVID-19 pandemic has disrupted nearly all aspects of life, leading to rising mortality rates, increasing economic inequities, and gross disturbances in people's daily lives and social interactions. Perhaps not surprisingly, these myriad stressors have led to rising rates of mental health disorder symptoms, a trend which was already apparent by April, 2020.^{2,7} Tracking trends in mental health disorder symptoms as well as use of mental health services over the course of the pandemic is essential to inform public health initiatives and identify subgroups of greatest concern.

Using nationally representative US Household Pulse survey data from nearly 1.5 million US residents between April and November, 2020, this study provides essential new insights into these questions. Results found significant increases in clinically-significant levels of anxiety through the first 9 months of the pandemic, with adjusted prevalence rising from 38% to 50% between April and November, 2020. By November, the prevalence of anxiety was over 6 times higher than national prevalence rates from January-June, 2019 (8%) as reported in the NHIS survey.¹⁷ Rates of depression, which rose from 32% to 44% between

April and November, 2020, similarly were more than 6 times higher than national norms (7%) from early 2019.¹⁷ As such, these estimates present glaring evidence of growing mental health conditions and likely need for mental health services among US residents.

Use of mental health services, including prescription medication and counseling services, also showed growth (albeit at a less rapid rate) between April and November, 2020. Nationally, 22% of US residents had taken medication and 10% had received counseling for mental health conditions in the prior month by November, 2020. In contrast to mental health disorders, these rates were less elevated in comparison to prior national norms (although different reporting periods prohibit exact comparisons). The 2019 NHIS surveys, for example, found 16% of adults had used prescription medication and 10% had received counseling for a mental health disorder in the *prior year*.¹⁸ Together, disparities in the estimates of mental health disorder and mental health treatment in 2020 indicate a striking disequilibrium between the potential need for and the use of mental health services. Indeed, by November, 2020, 11% of respondents reported needing but not receiving mental health services in the prior month, with prevalence of 24% and 27% for those meeting criteria for anxiety and depressive disorders, respectively, providing direct evidence of this disequilibrium.

Results from this study also extend evidence on notable disparities in mental health disorders and services across key demographic strata. Most notably, Hispanics, Blacks, and those identifying as other race/ethnicity, and those with a high school degree or less reported elevated prevalence of anxiety and depression in comparison to their White and more educated peers, but were significantly less likely to be receiving medication or counseling and reported higher unmet needs for mental health counseling. Females and single parents also reported heightened prevalence of anxiety and depression, as well as heightened prevalence of service receipt, although these groups still reported higher prevalence of unmet need for mental health counseling as well. Finally, young adults, those aged 18-29, reported rates of anxiety and depression at nearly twice the prevalence of older adults, and although the former were more likely to be receiving counseling, they also reported unmet need for such services at 6 times the prevalence of older adults. These patterns extend prior evidence of such disparities,^{1,2-3,7-8} highlighting growth in age and educational disparities in mental health symptoms as the pandemic progressed.

Together, results provide the latest national evidence of striking increases in mental health challenges in the face of the COVID-19 pandemic, challenges born largely by young, less advantaged people of color and women. Disparities between prevalence rates of mental health disorders and receipt of services suggest that a substantial portion of US residents experiencing mental health symptoms are not receiving necessary services, with the potential for expanded interruptions to optimal functioning and related repercussions for social and economic recovery from the COVID-19 pandemic.

In interpreting these results, it is essential to acknowledge limitations, including cross-sectional data, brief (albeit validated) mental health screeners which do not specify clinical diagnoses, and online surveys which may miss key populations and lead to under-reporting of mental health symptoms.¹³ Beyond these key limitations, results suggest a growing mental health crisis driven by the COVID-19 pandemic. Assessing specific drivers of these increased mental health challenges derived from illness, financial, and social

stressors will help to elucidate the potential for larger scale policy interventions, while evaluation of new modes of treatment, such as teletherapy, will help to direct future clinical service responses.

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Tables

Table 2. Weighted logistic regression models predicting anxiety and depression.

	Anxiety		Depression	
	OR (95% CI)	Pred. Rate	OR (95% CI)	Pred. Rate
Race/Ethnicity				
White, non Hispanic	Ref	0.414	Ref	0.349
Black, non Hispanic	<i>1.093 (1.061-1.126)</i>	0.470	<i>1.229 (1.192-1.267)</i>	0.430
Asian, non Hispanic	<i>0.835 (0.799-0.872)</i>	0.388	1.020 (0.975-1.067)	0.354
Other, non Hispanic	<i>1.308 (1.252-1.367)</i>	0.512	<i>1.344 (1.285-1.406)</i>	0.446
Hispanic	<i>1.103 (1.070-1.137)</i>	0.496	<i>1.155 (1.120-1.191)</i>	0.442
Age				
18-29	Ref	0.565	Ref	0.520
30-39	<i>0.738 (0.716-0.761)</i>	0.480	<i>0.656 (0.636-0.677)</i>	0.399
40-49	<i>0.626 (0.607-0.646)</i>	0.444	<i>0.556 (0.539-0.574)</i>	0.367
50-59	<i>0.542 (0.526-0.559)</i>	0.415	<i>0.503 (0.488-0.520)</i>	0.353
60-69	<i>0.412 (0.399-0.426)</i>	0.355	<i>0.398 (0.385-0.411)</i>	0.306
70+	<i>0.316 (0.304-0.328)</i>	0.296	<i>0.339 (0.325-0.352)</i>	0.271
Sex				
Male	Ref	0.402	Ref	0.365
Female	<i>1.384 (1.360-1.408)</i>	0.471	<i>1.177 (1.156-1.199)</i>	0.393
Household structure				
Adults only	Ref	0.419	Ref	0.365
Single adult	1.026 (1.002-1.051)	0.407	<i>1.126 (1.098-1.155)</i>	0.374
Single w/ child(ren)	<i>1.101 (1.059-1.145)</i>	0.506	<i>1.107 (1.064-1.152)</i>	0.447
Adults w/ child(ren)	0.978 (0.956-0.999)	0.465	<i>0.940 (0.919-0.962)</i>	0.395
Education				
HS or below	Ref	0.467	Ref	0.43
Some college	<i>0.898 (0.879-0.918)</i>	0.460	<i>0.832 (0.814-0.850)</i>	0.403
Bachelors	<i>0.690 (0.675-0.706)</i>	0.394	<i>0.558 (0.545-0.571)</i>	0.309
Grad degree	<i>0.631 (0.616-0.646)</i>	0.347	<i>0.470 (0.458-0.482)</i>	0.252
Cohort				
23 Apr-12 May	Ref	0.377	Ref	0.318
14-26 May	<i>1.075 (1.023-1.129)</i>	0.403	<i>1.157 (1.098-1.218)</i>	0.36
28 May-9 Jun	<i>1.139 (1.088-1.193)</i>	0.417	<i>1.187 (1.131-1.245)</i>	0.366
11-23 Jun	<i>1.091 (1.039-1.146)</i>	0.406	<i>1.076 (1.022-1.133)</i>	0.343
25 Jun-7 Jul	<i>1.137 (1.086-1.190)</i>	0.414	<i>1.142 (1.088-1.199)</i>	0.355
9-21 Jul	<i>1.267 (1.211-1.326)</i>	0.441	<i>1.236 (1.178-1.297)</i>	0.373
19-31 Aug	<i>1.394 (1.335-1.455)</i>	0.452	<i>1.452 (1.387-1.520)</i>	0.397
2-14 Sep	<i>1.375 (1.316-1.436)</i>	0.449	<i>1.417 (1.353-1.484)</i>	0.392
16-28 Sep	<i>1.413 (1.351-1.478)</i>	0.455	<i>1.437 (1.370-1.506)</i>	0.395
30 Sep-12 Oct	<i>1.419 (1.356-1.485)</i>	0.456	<i>1.476 (1.407-1.548)</i>	0.401
14-26 Oct	<i>1.471 (1.404-1.541)</i>	0.464	<i>1.541 (1.468-1.618)</i>	0.410
28 Oct-9 Nov	<i>1.733 (1.645-1.826)</i>	0.502	<i>1.731 (1.639-1.827)</i>	0.435
11-23 Nov	<i>1.739 (1.657-1.825)</i>	0.503	<i>1.728 (1.643-1.817)</i>	0.436
Constant	0.944 (0.879-1.013)		0.943 (0.876-1.014)	
Observations	1,483,378		1,483,378	

Note. OR Odds Ratio. CI Confidence Intervals. Models also adjust for state of residence. ORs and CIs in italics significant at $p < .01$.

Table 3. Weighted logistic regression models predicting mental health services.

	Prescription Medication		Mental Health Counseling		Unmet Need for Counseling	
	OR (95% CI)	Pred. Rate	OR (95% CI)	Pred. Rate	OR (95% CI)	Pred. Rate
Race/Ethnicity						
White, non Hispanic	Ref	0.228	Ref	0.097	Ref	0.099
Black, non Hispanic	<i>0.531 (0.500-0.565)</i>	0.145	<i>0.832 (0.773-0.896)</i>	0.088	0.998 (0.927-1.075)	0.110
Asian, non Hispanic	<i>0.332 (0.303-0.363)</i>	0.084	<i>0.427 (0.383-0.477)</i>	0.059	<i>0.467 (0.419-0.519)</i>	0.061
Other, non Hispanic	0.959 (0.888-1.035)	0.225	1.081 (0.977-1.196)	0.117	<i>1.388 (1.275-1.511)</i>	0.156
Hispanic	<i>0.695 (0.658-0.735)</i>	0.162	<i>0.818 (0.761-0.880)</i>	0.089	0.942 (0.878-1.011)	0.114
Age						
18-29	Ref	0.191	Ref	0.134	Ref	0.178
30-39	<i>1.127 (1.065-1.193)</i>	0.203	0.950 (0.892-1.013)	0.131	<i>0.829 (0.780-0.882)</i>	0.146
40-49	<i>1.167 (1.104-1.233)</i>	0.208	<i>0.774 (0.726-0.826)</i>	0.106	<i>0.607 (0.569-0.647)</i>	0.110
50-59	<i>1.174 (1.111-1.239)</i>	0.219	<i>0.584 (0.546-0.625)</i>	0.086	<i>0.441 (0.412-0.472)</i>	0.088
60-69	1.003 (0.949-1.060)	0.207	<i>0.366 (0.340-0.394)</i>	0.059	<i>0.253 (0.236-0.273)</i>	0.055
70+	<i>0.755 (0.708-0.805)</i>	0.170	<i>0.221 (0.199-0.244)</i>	0.038	<i>0.140 (0.126-0.156)</i>	0.032
Sex						
Male	Ref	0.149	Ref	0.074	Ref	0.077
Female	<i>1.931 (1.873-1.991)</i>	0.250	<i>1.573 (1.510-1.640)</i>	0.112	<i>1.788 (1.712-1.868)</i>	0.126
Household structure						
Adults only	Ref	0.201	Ref	0.087	Ref	0.097
Single adult	<i>1.214 (1.170-1.260)</i>	0.232	<i>1.424 (1.356-1.495)</i>	0.110	<i>1.245 (1.182-1.311)</i>	0.104
Single w/ child(ren)	1.065 (1.003-1.132)	0.223	<i>1.279 (1.188-1.377)</i>	0.126	1.010 (0.932-1.094)	0.129
Adults w/ child(ren)	<i>0.907 (0.874-0.941)</i>	0.192	<i>0.884 (0.841-0.928)</i>	0.097	<i>0.830 (0.790-0.873)</i>	0.109
Education						
HS or below	Ref	0.186	Ref	0.066	Ref	0.083
Some college	<i>1.201 (1.155-1.248)</i>	0.223	<i>1.416 (1.332-1.505)</i>	0.101	<i>1.375 (1.298-1.456)</i>	0.126
Bachelors	1.029 (0.990-1.071)	0.199	<i>1.579 (1.486-1.678)</i>	0.116	<i>1.160 (1.094-1.229)</i>	0.110
Grad degree	1.049 (1.008-1.092)	0.198	<i>1.849 (1.740-1.965)</i>	0.120	<i>1.177 (1.108-1.249)</i>	0.095
Cohort						
19-31 Aug	Ref	0.194	Ref	0.087	Ref	0.092
2-14 Sep	1.018 (0.973-1.066)	0.196	1.042 (0.978-1.110)	0.091	1.062 (0.997-1.132)	0.097
16-28 Sep	1.032 (0.986-1.081)	0.198	1.039 (0.975-1.107)	0.090	<i>1.160 (1.085-1.240)</i>	0.104

30 Sep-12 Oct	1.008 (0.962-1.057)	0.195	1.038 (0.975-1.106)	0.090	1.071 (1.004-1.141)	0.097
14-26 Oct	1.057 (1.006-1.111)	0.202	<i>1.162 (1.083-1.246)</i>	0.100	<i>1.176 (1.095-1.263)</i>	0.106
28 Oct-9 Nov	<i>1.089 (1.029-1.152)</i>	0.208	<i>1.138 (1.057-1.226)</i>	0.098	<i>1.275 (1.182-1.376)</i>	0.112
11-23 Nov	<i>1.147 (1.089-1.209)</i>	0.216	<i>1.152 (1.072-1.236)</i>	0.099	<i>1.259 (1.173-1.351)</i>	0.111
Constant	0.219 (0.196-0.244)		0.073 (0.062-0.088)		0.124 (0.107-0.143)	0.092
Observations	528,615		528,586		528,925	

Note. OR Odds Ratio. CI Confidence Intervals. Models also adjust for state of residence. ORs and CIs in italics significant at $p < .01$.

Methods

Survey Data

We drew data from all available cohorts of the 2020 Household Pulse Survey, conducted by the U.S. Census Bureau and other government agencies to track effects of COVID-19 on US residents.¹³ These data are publicly available through the US Census bureau [<https://www.census.gov/programs-surveys/household-pulse-survey/datasets.html>]. Pulse conducted on-line surveys with cross-sections of adults in American households across all 50 states and Washington, DC in weekly or biweekly samples drawn from April 23 through July 21 (Phase 1), August 19 through October 26 (Phase 2), and October 28 through December 21, 2020 (Phase 3; data through November 23 were available for analysis). A small proportion of respondents repeated surveys for one or two additional weeks; we included each respondent's first survey data only. Data were clustered into approximately 2-week cohorts, with a total sample of 1,483,378 unique respondents. Sample weights adjust for nonresponse and sampling stratification to produce estimates representative of the US adult population.¹³ Our university Institutional Review Board reviewed this study and considered it exempt.

Mental Health Reports

Respondents completed the widely-used and validated Patient Health Questionnaire for Depression and Anxiety,¹⁴ encompassing the 2-item Generalized Anxiety Disorder Screener (GAD-2)¹⁵ to report symptoms of anxiety ("feeling nervous, anxious, or on edge"; "not being able to stop or control worrying", summed) and the 2-item Patient Health Questionnaire (PHQ-2)¹⁶ to report symptoms of depression ("feeling down, depressed, or hopeless"; "having little interest or pleasure in doing things", summed) in the past week (0 "not at all" to 3 "nearly every day"). Based on validation studies,¹⁴⁻¹⁶ responses ≥ 3 were delineated as clinically significant indicators of likely anxiety disorder and depressive disorder, respectively. Starting in Phase 2, respondents also reported whether (yes/no) in the past 4 weeks they took prescription medication for mental health needs; received counseling or therapy from a mental health professional; and needed but did not receive counseling or therapy from a mental health professional, questions drawn from the National Health Interview Survey (NHIS).

Demographics

Respondents reported on their birth year (coded into age cohorts of 18-29; 30-39; 40-49; 50-59; 60-69; 70+), sex (male, female), race and ethnicity (coded non-Hispanic White; non-Hispanic Black; non-Hispanic Asian; non-Hispanic other; or Hispanic of any race), family structure (coded single adult; multiple adults; single adult with child(ren); multiple adults with child(ren)), and educational attainment (coded high school degree or less; some college; bachelors degree; graduate degree). Missing demographic data were imputed using hot deck imputation by the U.S. Census Bureau.¹³ State of residence was also recorded.

Statistical analyses

To assess trends over time in mental health symptoms and treatment, we conducted logistic regression models on each of the five mental health measures, using Stata version 16.1. All models included age, sex, race/ethnicity, family structure, and education; cohort indicators to assess shifts over time; state indicators to adjust for geographic differences; and clustered standard errors to properly estimate variances. We then interacted each set of demographic variables with the cohort indicators to assess whether time trends varied across subgroups of the US population, assessing the omnibus significance of each set of interactions using Wald tests. Two-tailed significance tests were employed, adjusted for multiple comparisons with Bonferroni corrections (thus considering $p < .01$ as statistically significant). All analyses incorporated population weights to make the samples nationally representative.¹³

Declarations

Acknowledgements

Author Contributions:

Coley: concept and design; interpretation of data; drafting of manuscript; revision and approval of manuscript

Baum: concept and design; acquisition and analysis of data; interpretation of data; revision and approval of manuscript.

Conflict of Interest Disclosures: Coley and Baum have no conflicts to disclose.

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Disclaimer: The findings and conclusions in this study are those of the authors and do not necessarily represent the official position of the US Census Bureau or other federal agencies.

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Etables

eTable 1. Weighted sample descriptives from the US Household Pulse Survey, N=1,483,378.^a

	Weighted %		Weighted %
Mental Health Outcomes		State	
Anxiety	43.8%	Alabama	1.5%
Depression	37.9%	Alaska	0.2%
Prescription medication	20.1%	Arizona	2.2%
Counseling services	9.4%	Arkansas	0.9%
Unmet need for services	10.3%	California	12.2%
Race/Ethnicity		Colorado	1.8%
White, non Hispanic	61.2%	Connecticut	1.1%
Black, non Hispanic	12.1%	Delaware	0.3%
Asian, non Hispanic	5.2%	District of Columbia	0.2%
Other, non Hispanic	3.8%	Florida	6.9%
Hispanic	17.7%	Georgia	3.2%
Age		Hawaii	0.4%
18-29	19.4%	Idaho	0.5%
30-39	19.1%	Illinois	3.8%
40-49	16.6%	Indiana	2.0%
50-59	16.7%	Iowa	0.9%
60-69	16.6%	Kansas	0.8%
70+	11.6%	Kentucky	1.3%
Sex		Louisiana	1.4%
Male	48.5%	Maine	0.4%
Female	51.5%	Maryland	1.8%
Household structure		Massachusetts	2.1%
Adults only	51.9%	Michigan	3.0%
Single adult	7.8%	Minnesota	1.7%
Single w/ child(ren)	2.9%	Mississippi	0.9%
Adults w/ child(ren)	37.4%	Missouri	1.8%
Education		Montana	0.3%
HS or below	40.4%	Nebraska	0.6%
Some college	30.5%	Nevada	1.0%
Bachelors	16.5%	New Hampshire	0.4%
Graduate degree	12.6%	New Jersey	2.7%
Cohort		New Mexico	0.6%
23 Apr-12 May	9.7%	New York	5.9%
14-26 May	8.0%	North Carolina	3.2%
28 May-9 Jun	8.5%	North Dakota	0.2%
11-23 Jun	8.7%	Ohio	3.5%
25 Jun-7 Jul	8.6%	Oklahoma	1.2%
9-21 Jul	8.8%	Oregon	1.3%
19-31 Aug	6.8%	Pennsylvania	3.9%
2-14 Sep	6.8%	Rhode Island	0.3%
16-28 Sep	6.8%	South Carolina	1.6%
30 Sep-12 Oct	6.8%	South Dakota	0.3%
14-26 Oct	6.8%	Tennessee	2.1%
28 Oct-9 Nov	6.8%	Texas	8.6%
11-23 Nov	6.8%	Utah	0.9%
		Vermont	0.2%

Virginia	2.6%
Washington	2.3%
West Virginia	0.6%
Wisconsin	1.8%
Wyoming	0.2%

^a Except reports of prescription medication (N=528,615), counseling (N=528,586), and unmet need for counseling(N=528,925).

Table e4. Logistic regression models with interactions between race/ethnicity and cohort predicting mental health outcomes.

	Anxiety	Depression	Prescription Medication	Mental health Counseling	Unmet Need for Counseling
23 Apr-12 MayXWhite	Ref	Ref			
23 Apr-12 MayXBlack	Ref	Ref			
23 Apr-12 MayXAsian	Ref	Ref			
23 Apr-12 MayXOther	Ref	Ref			
23 Apr-12 MayXHispanic	Ref	Ref			
14-26 MayXWhite	Ref	Ref			
14-26 MayXBlack	0.954 (0.825- 1.105)	0.956 (0.825- 1.108)			
14-26 MayXAsian	0.897 (0.722- 1.115)	0.929 (0.742- 1.163)			
14-26 MayXOther	0.929 (0.745- 1.159)	1.037 (0.821- 1.309)			
14-26 MayXHispanic	0.932 (0.785- 1.108)	0.942 (0.788- 1.126)			
28 May-9 JunXWhite	Ref	Ref			
28 May-9 JunXBlack	0.988 (0.855- 1.141)	1.055 (0.910- 1.223)			
28 May-9 JunXAsian	0.913 (0.736- 1.132)	0.861 (0.690- 1.074)			
28 May-9 JunXOther	0.975 (0.779- 1.220)	1.009 (0.792- 1.286)			
28 May-9 JunXHispanic	<i>0.779 (0.667- 0.910)</i>	<i>0.797 (0.678- 0.936)</i>			
11-23 JunXWhite	Ref	Ref			
11-23 JunXBlack	0.922 (0.794- 1.071)	0.936 (0.803- 1.091)			
11-23 JunXAsian	0.770 (0.607- 0.978)	0.810 (0.631- 1.040)			
11-23 JunXOther	0.894 (0.701- 1.140)	1.045 (0.808- 1.350)			
11-23 JunXHispanic	<i>0.808 (0.687- 0.950)</i>	0.806 (0.680- 0.955)			
25 Jun-7 JulXWhite	Ref	Ref			
25 Jun-7 JulXBlack	0.899 (0.778- 1.039)	0.995 (0.856- 1.156)			
25 Jun-7 JulXAsian	<i>0.741 (0.594- 0.923)</i>	0.833 (0.655- 1.060)			
25 Jun-7 JulXOther	0.937 (0.746- 1.178)	1.006 (0.786- 1.288)			
25 Jun-7 JulXHispanic	<i>0.768 (0.659- 0.895)</i>	0.811 (0.690- 0.953)			
9-21 JulXWhite	Ref	Ref			
9-21 JulXBlack	0.859 (0.744- 0.992)	0.940 (0.810- 1.090)			
9-21 JulXAsian	0.932 (0.753- 1.155)	0.937 (0.749- 1.173)			
9-21 JulXOther	0.907 (0.731-	0.983 (0.783-			

	1.125)	1.234)			
9-21 JulXHispanic	0.865 (0.740-1.011)	0.863 (0.733-1.015)			
19-31 AugXWhite	Ref	Ref	Ref	Ref	Ref
19-31 AugXBlack	0.947 (0.825-1.086)	1.041 (0.905-1.197)	Ref	Ref	Ref
19-31 AugXAsian	0.851 (0.695-1.043)	0.901 (0.731-1.111)	Ref	Ref	Ref
19-31 AugXOther	0.791 (0.636-0.984)	0.906 (0.719-1.141)	Ref	Ref	Ref
19-31 AugXHispanic	0.839 (0.720-0.978)	0.949 (0.810-1.114)	Ref	Ref	Ref
2-14 SepXWhite	Ref	Ref	Ref	Ref	Ref
2-14 SepXBlack	1.015 (0.881-1.169)	1.111 (0.962-1.283)	1.234 (1.019-1.493)	1.237 (0.970-1.577)	1.181 (0.944-1.478)
2-14 SepXAsian	0.748 (0.614-0.912)	0.848 (0.691-1.041)	1.038 (0.788-1.368)	0.823 (0.584-1.158)	0.887 (0.636-1.236)
2-14 SepXOther	0.959 (0.774-1.189)	0.955 (0.760-1.200)	1.003 (0.771-1.304)	1.126 (0.784-1.616)	1.136 (0.856-1.507)
2-14 SepXHispanic	0.911 (0.783-1.062)	0.950 (0.811-1.112)	1.205 (1.019-1.425)	1.079 (0.866-1.344)	0.999 (0.814-1.226)
16-28 SepXWhite	Ref	Ref	Ref	Ref	Ref
16-28 SepXBlack	0.940 (0.814-1.086)	0.993 (0.858-1.150)	1.062 (0.879-1.283)	1.056 (0.827-1.347)	0.969 (0.775-1.212)
16-28 SepXAsian	0.803 (0.650-0.991)	0.847 (0.681-1.053)	1.060 (0.784-1.435)	0.834 (0.598-1.163)	1.175 (0.846-1.632)
16-28 SepXOther	0.784 (0.633-0.971)	0.847 (0.675-1.063)	0.891 (0.704-1.127)	0.981 (0.719-1.340)	1.002 (0.759-1.322)
16-28 SepXHispanic	0.908 (0.774-1.066)	0.945 (0.801-1.115)	1.276 (1.072-1.519)	1.218 (0.974-1.524)	1.213 (0.965-1.524)
30 Sep-12 OctXWhite	Ref	Ref	Ref	Ref	Ref
30 Sep-12 OctXBlack	0.962 (0.830-1.114)	1.136 (0.979-1.317)	1.154 (0.961-1.385)	0.978 (0.783-1.223)	1.139 (0.919-1.412)
30 Sep-12 OctXAsian	0.869 (0.706-1.070)	0.882 (0.712-1.093)	0.978 (0.736-1.298)	0.771 (0.553-1.074)	1.060 (0.757-1.485)
30 Sep-12 OctXOther	0.838 (0.670-1.048)	0.977 (0.772-1.237)	1.165 (0.916-1.482)	1.006 (0.743-1.362)	0.915 (0.696-1.203)
30 Sep-12 OctXHispanic	0.895 (0.761-1.053)	1.018 (0.863-1.202)	1.193 (0.995-1.431)	1.010 (0.808-1.262)	0.929 (0.752-1.148)
14-26 OctXWhite	Ref	Ref	Ref	Ref	Ref
14-26 OctXBlack	1.032 (0.887-1.201)	1.152 (0.987-1.344)	1.173 (0.972-1.414)	1.200 (0.950-1.516)	1.109 (0.842-1.462)
14-26 OctXAsian	0.981 (0.791-1.217)	0.981 (0.785-1.227)	1.078 (0.796-1.460)	1.029 (0.717-1.476)	1.300 (0.908-1.862)
14-26 OctXOther	0.912 (0.720-1.154)	1.009 (0.790-1.290)	1.001 (0.742-1.352)	1.179 (0.779-1.785)	1.069 (0.776-1.473)
14-26 OctXHispanic	0.901 (0.764-1.061)	1.008 (0.851-1.193)	1.320 (1.081-1.611)	1.601 (1.239-2.067)	1.006 (0.801-1.263)
28 Oct-9 NovXWhite	Ref	Ref	Ref	Ref	Ref
28 Oct-9 NovXBlack	0.971 (0.813-1.159)	1.145 (0.957-1.368)	1.076 (0.861-1.344)	1.184 (0.906-1.548)	1.192 (0.912-1.558)

28 Oct-9 NovXAsian	0.951 (0.725-1.247)	1.019 (0.774-1.341)	1.160 (0.827-1.628)	0.868 (0.596-1.263)	<i>1.917 (1.321-2.781)</i>
28 Oct-9 NovXOther	0.827 (0.643-1.064)	0.916 (0.706-1.188)	1.091 (0.829-1.437)	1.211 (0.855-1.716)	0.995 (0.736-1.345)
28 Oct-9 NovXHispanic	1.006 (0.837-1.210)	1.087 (0.901-1.311)	1.205 (0.953-1.523)	1.234 (0.959-1.588)	<i>1.421 (1.108-1.824)</i>
11-23 NovXWhite	Ref	Ref	Ref	Ref	Ref
11-23 NovXBlack	0.981 (0.833-1.155)	1.098 (0.933-1.291)	<i>1.393 (1.109-1.751)</i>	1.183 (0.901-1.553)	1.222 (0.964-1.549)
11-23 NovXAsian	0.797 (0.631-1.007)	0.885 (0.698-1.122)	0.939 (0.657-1.341)	0.984 (0.614-1.577)	1.139 (0.782-1.660)
11-23 NovXOther	0.910 (0.714-1.160)	1.010 (0.784-1.300)	0.966 (0.744-1.255)	1.116 (0.816-1.527)	1.107 (0.810-1.511)
11-23 NovXHispanic	0.913 (0.770-1.081)	0.911 (0.766-1.083)	1.176 (0.970-1.426)	1.247 (0.976-1.592)	1.193 (0.941-1.512)
Wald p-value	0.005	0.004	0.216	0.176	0.012
Observations	1,483,378	1,483,378	528,615	528,586	528,925

Note. OR Odds Ratio. CI Confidence Intervals. Models also adjust for race/ethnicity, age, sex, household structure, education, cohort, and state of residence.

ORs and CIs in italics significant at $p < .01$.

Table e5. Logistic regression models with interactions between age and cohort predicting mental health outcomes.

	Anxiety	Depression	Prescription Medication	Mental health Counseling	Unmet Need for Counseling
23 Apr-12 MayX18-29	Ref	Ref			
23 Apr-12 MayX30-39	Ref	Ref			
23 Apr-12 MayX40-49	Ref	Ref			
23 Apr-12 MayX50-59	Ref	Ref			
23 Apr-12 MayX60-69	Ref	Ref			
23 Apr-12 MayX70+	Ref	Ref			
14-26 MayX18-29	Ref	Ref			
14-26 MayX30-39	0.854 (0.726-1.004)	0.714 (0.604-0.843)			
14-26 MayX40-49	0.795 (0.673-0.940)	0.689 (0.579-0.819)			
14-26 MayX50-59	0.816 (0.684-0.974)	0.767 (0.638-0.923)			
14-26 MayX60-69	0.902 (0.755-1.076)	0.853 (0.711-1.022)			
14-26 MayX70+	0.925 (0.749-1.142)	0.923 (0.742-1.148)			
28 May-9 JunX18-29	Ref	Ref			
28 May-9 JunX30-39	0.853 (0.734-0.992)	0.786 (0.673-0.919)			
28 May-9 JunX40-49	0.783 (0.669-0.917)	0.792 (0.673-0.932)			
28 May-9 JunX50-59	0.771 (0.654-0.910)	0.781 (0.657-0.927)			
28 May-9 JunX60-69	0.794 (0.671-0.940)	0.795 (0.669-0.945)			
28 May-9 JunX70+	0.923 (0.765-1.113)	0.906 (0.744-1.103)			
11-23 JunX18-29	Ref	Ref			
11-23 JunX30-39	0.864 (0.735-1.015)	0.753 (0.638-0.890)			
11-23 JunX40-49	0.881 (0.747-1.038)	0.841 (0.709-0.997)			
11-23 JunX50-59	0.842 (0.709-1.000)	0.813 (0.679-0.974)			
11-23 JunX60-69	0.841 (0.705-1.004)	0.871 (0.724-1.047)			
11-23 JunX70+	0.918 (0.746-1.129)	0.949 (0.764-1.179)			
25 Jun-7 JulX18-29	Ref	Ref			
25 Jun-7 JulX30-39	0.965 (0.829-1.124)	0.917 (0.784-1.074)			

25 Jun-7 JulX40-49	0.877 (0.749-1.027)	0.884 (0.751-1.041)			
25 Jun-7 JulX50-59	0.855 (0.726-1.007)	0.898 (0.756-1.067)			
25 Jun-7 JulX60-69	0.927 (0.784-1.096)	1.024 (0.860-1.220)			
25 Jun-7 JulX70+	0.841 (0.696-1.016)	0.966 (0.790-1.182)			
9-21 JulX18-29	Ref	Ref			
9-21 JulX30-39	0.933 (0.800-1.089)	0.873 (0.744-1.024)			
9-21 JulX40-49	0.834 (0.713-0.976)	0.890 (0.758-1.046)			
9-21 JulX50-59	0.787 (0.669-0.927)	0.828 (0.699-0.982)			
9-21 JulX60-69	0.833 (0.706-0.983)	0.940 (0.791-1.116)			
9-21 JulX70+	0.847 (0.706-1.017)	0.910 (0.751-1.103)			
19-31 AugX18-29	Ref	Ref	Ref	Ref	Ref
19-31 AugX30-39	0.881 (0.758-1.023)	0.805 (0.691-0.939)	Ref	Ref	Ref
19-31 AugX40-49	0.796 (0.682-0.929)	0.780 (0.666-0.914)	Ref	Ref	Ref
19-31 AugX50-59	0.778 (0.664-0.912)	0.765 (0.648-0.903)	Ref	Ref	Ref
19-31 AugX60-69	0.837 (0.713-0.983)	0.846 (0.716-0.998)	Ref	Ref	Ref
19-31 AugX70+	0.840 (0.702-1.006)	0.824 (0.682-0.995)	Ref	Ref	Ref
2-14 SepX18-29	Ref	Ref	Ref	Ref	Ref
2-14 SepX30-39	0.919 (0.789-1.070)	0.814 (0.697-0.952)	1.119 (0.940-1.332)	1.003 (0.818-1.230)	1.072 (0.886-1.298)
2-14 SepX40-49	0.806 (0.689-0.942)	0.819 (0.698-0.961)	1.011 (0.851-1.201)	1.008 (0.814-1.248)	1.128 (0.926-1.374)
2-14 SepX50-59	0.777 (0.662-0.913)	0.744 (0.630-0.880)	1.017 (0.856-1.210)	0.896 (0.715-1.123)	0.974 (0.790-1.201)
2-14 SepX60-69	0.830 (0.705-0.977)	0.838 (0.708-0.991)	1.122 (0.943-1.336)	1.026 (0.813-1.296)	0.983 (0.776-1.244)
2-14 SepX70+	0.883 (0.736-1.058)	0.824 (0.682-0.996)	0.989 (0.810-1.209)	0.882 (0.662-1.174)	1.283 (0.933-1.763)
16-28 SepX18-29	Ref	Ref	Ref	Ref	Ref
16-28 SepX30-39	0.941 (0.804-1.102)	0.859 (0.731-1.009)	1.110 (0.930-1.324)	1.129 (0.921-1.386)	0.946 (0.773-1.158)
16-28 SepX40-49	0.820 (0.697-0.964)	0.808 (0.684-0.954)	0.991 (0.833-1.180)	1.071 (0.866-1.325)	0.898 (0.724-1.113)
16-28 SepX50-59	0.756 (0.641-0.893)	0.745 (0.627-0.884)	0.994 (0.834-1.183)	0.958 (0.769-1.195)	0.913 (0.730-1.142)
16-28 SepX60-69	0.853 (0.721-1.010)	0.884 (0.743-1.052)	1.058 (0.885-1.266)	1.159 (0.906-1.483)	0.875 (0.686-1.115)
16-28 SepX70+	0.802 (0.666-	0.780 (0.643-	0.877 (0.719-	0.965 (0.722-	1.064 (0.758-1.494)

	0.965)	0.946)	1.070)	1.291)	
30 Sep-12 OctX18-29	Ref	Ref	Ref	Ref	Ref
30 Sep-12 OctX30-39	0.864 (0.735-1.016)	0.791 (0.671-0.931)	1.149 (0.962-1.372)	1.014 (0.826-1.244)	1.013 (0.833-1.233)
30 Sep-12 OctX40-49	0.795 (0.673-0.939)	0.789 (0.667-0.934)	1.136 (0.951-1.356)	1.067 (0.859-1.325)	0.998 (0.821-1.214)
30 Sep-12 OctX50-59	0.730 (0.616-0.865)	0.683 (0.574-0.813)	1.088 (0.908-1.304)	0.950 (0.756-1.192)	1.009 (0.814-1.249)
30 Sep-12 OctX60-69	0.746 (0.628-0.885)	0.757 (0.635-0.902)	1.109 (0.926-1.327)	0.988 (0.783-1.249)	0.897 (0.707-1.139)
30 Sep-12 OctX70+	0.757 (0.627-0.914)	0.719 (0.591-0.874)	1.075 (0.874-1.324)	0.988 (0.727-1.341)	0.908 (0.656-1.259)
14-26 OctX18-29	Ref	Ref	Ref	Ref	Ref
14-26 OctX30-39	0.957 (0.813-1.127)	0.854 (0.724-1.008)	1.155 (0.948-1.408)	1.056 (0.842-1.324)	1.004 (0.812-1.242)
14-26 OctX40-49	0.838 (0.708-0.993)	0.819 (0.690-0.972)	1.039 (0.856-1.261)	0.914 (0.727-1.150)	0.910 (0.732-1.131)
14-26 OctX50-59	0.722 (0.606-0.859)	0.707 (0.591-0.846)	1.090 (0.893-1.330)	0.959 (0.747-1.230)	0.957 (0.738-1.241)
14-26 OctX60-69	0.825 (0.694-0.981)	0.804 (0.673-0.959)	0.958 (0.790-1.162)	0.901 (0.704-1.154)	0.835 (0.651-1.071)
14-26 OctX70+	0.790 (0.650-0.961)	0.745 (0.609-0.913)	0.914 (0.726-1.151)	0.824 (0.532-1.276)	1.151 (0.785-1.688)
28 Oct-9 NovX18-29	Ref	Ref	Ref	Ref	Ref
28 Oct-9 NovX30-39	0.809 (0.667-0.982)	0.825 (0.681-1.000)	1.121 (0.890-1.412)	1.013 (0.793-1.293)	0.879 (0.694-1.112)
28 Oct-9 NovX40-49	0.713 (0.588-0.865)	0.722 (0.595-0.876)	0.883 (0.709-1.099)	0.822 (0.640-1.056)	0.760 (0.602-0.960)
28 Oct-9 NovX50-59	0.620 (0.509-0.756)	0.642 (0.526-0.784)	0.903 (0.724-1.127)	0.897 (0.681-1.181)	0.883 (0.681-1.144)
28 Oct-9 NovX60-69	0.634 (0.520-0.774)	0.636 (0.520-0.778)	0.989 (0.790-1.236)	0.928 (0.699-1.230)	0.706 (0.533-0.934)
28 Oct-9 NovX70+	0.664 (0.533-0.826)	0.663 (0.530-0.831)	0.886 (0.690-1.138)	0.643 (0.466-0.887)	0.986 (0.656-1.480)
11-23 NovX18-29	Ref	Ref	Ref	Ref	Ref
11-23 NovX30-39	0.879 (0.737-1.047)	0.769 (0.645-0.918)	1.178 (0.965-1.439)	0.937 (0.741-1.184)	1.006 (0.814-1.243)
11-23 NovX40-49	0.833 (0.696-0.996)	0.766 (0.639-0.918)	1.024 (0.843-1.244)	0.948 (0.750-1.200)	0.985 (0.788-1.230)
11-23 NovX50-59	0.738 (0.614-0.887)	0.700 (0.580-0.845)	1.146 (0.943-1.394)	0.833 (0.651-1.066)	1.175 (0.923-1.495)
11-23 NovX60-69	0.756 (0.630-0.909)	0.675 (0.560-0.814)	1.093 (0.899-1.329)	0.886 (0.677-1.160)	0.964 (0.745-1.248)
11-23 NovX70+	0.833 (0.680-1.020)	0.750 (0.609-0.923)	0.984 (0.783-1.238)	0.827 (0.597-1.146)	1.070 (0.734-1.562)
Wald p-value	0.002	0.000	0.194	0.415	0.421
Observations	1,483,378	1,483,378	528,615	528,586	528,925

Note. OR Odds Ratio. CI Confidence Intervals. Models also adjust for race/ethnicity, age, sex, household structure, education, cohort, and state of residence.

ORs and CIs in italics significant at $p<.01$.

Table e6. Logistic regression models with interactions between sex and cohort predicting mental health outcomes.

	Anxiety	Depression	Prescription Medication	Mental health Counseling	Unmet Need for Counseling
23 Apr-12 MayXMale	Ref	Ref			
23 Apr-12 MayXFemale	Ref	Ref			
14-26 MayXMale	Ref	Ref			
14-26 MayXFemale	0.912 (0.826- 1.008)	0.919 (0.827- 1.020)			
28 May-9 JunXMale	Ref	Ref			
28 May-9 JunXFemale	0.983 (0.896- 1.078)	0.928 (0.842- 1.023)			
11-23 JunXMale	Ref	Ref			
11-23 JunXFemale	0.900 (0.816- 0.993)	0.901 (0.811- 1.000)			
25 Jun-7 JulXMale	Ref	Ref			
25 Jun-7 JulXFemale	0.961 (0.876- 1.054)	0.907 (0.821- 1.001)			
9-21 JulXMale	Ref	Ref			
9-21 JulXFemale	0.938 (0.856- 1.029)	0.914 (0.829- 1.008)			
19-31 AugXMale	Ref	Ref	Ref	Ref	Ref
19-31 AugXFemale	0.957 (0.877- 1.046)	0.894 (0.814- 0.981)	Ref	Ref	Ref
2-14 SepXMale	Ref	Ref	Ref	Ref	Ref
2-14 SepXFemale	0.902 (0.825- 0.985)	<i>0.857 (0.780- 0.941)</i>	0.882 (0.799- 0.972)	0.998 (0.872- 1.142)	1.080 (0.940-1.241)
16-28 SepXMale	Ref	Ref	Ref	Ref	Ref
16-28 SepXFemale	0.948 (0.866- 1.039)	0.916 (0.832- 1.008)	0.949 (0.861- 1.047)	1.005 (0.877- 1.151)	1.014 (0.875-1.176)
30 Sep-12 OctXMale	Ref	Ref	Ref	Ref	Ref
30 Sep-12 OctXFemale	0.916 (0.835- 1.004)	0.895 (0.812- 0.986)	0.885 (0.801- 0.977)	0.899 (0.786- 1.028)	1.040 (0.903-1.197)
14-26 OctXMale	Ref	Ref	Ref	Ref	Ref
14-26 OctXFemale	0.948 (0.863- 1.042)	0.892 (0.808- 0.984)	0.888 (0.797- 0.989)	0.887 (0.762- 1.032)	0.906 (0.774-1.060)
28 Oct-9 NovXMale	Ref	Ref	Ref	Ref	Ref
28 Oct-9 NovXFemale	0.942 (0.847- 1.046)	<i>0.837 (0.750- 0.935)</i>	0.944 (0.835- 1.066)	0.968 (0.827- 1.134)	0.833 (0.707-0.980)
11-23 NovXMale	Ref	Ref	Ref	Ref	Ref
11-23 NovXFemale	1.004 (0.910- 1.108)	0.928 (0.837- 1.028)	0.925 (0.826- 1.035)	0.863 (0.740- 1.007)	1.015 (0.868-1.187)
Wald p-value	0.252	0.181	0.132	0.207	0.049
Observations	1,483,378	1,483,378	528,615	528,586	528,925

Note. OR Odds Ratio. CI Confidence Intervals. Models also adjust for race/ethnicity, age, sex, household structure, education, cohort, and state of residence. ORs and CIs in italics significant at $p<.01$.

Table e7. Logistic regression models with interactions between household structure and cohort predicting mental health outcomes.

	Anxiety	Depression	Prescription Medication	Mental health Counseling	Unmet Need for Counseling
23 Apr-12 MayXSingle adult	Ref	Ref			
23 Apr-12 MayXAdults only	Ref	Ref			
23 Apr-12 MayXSingle w/ child(ren)	Ref	Ref			
23 Apr-12 MayXAdults w/child(ren)	Ref	Ref			
14-26 MayXSingle adult	1.076 (0.942- 1.230)	1.095 (0.953- 1.258)			
14-26 MayXAdults only	Ref	Ref			
14-26 MayXSingle w/ child(ren)	1.169 (0.953- 1.433)	1.089 (0.888- 1.337)			
14-26 MayXAdults w/child(ren)	1.029 (0.923- 1.148)	1.046 (0.932- 1.174)			
28 May-9 JunXSingle adult	1.080 (0.944- 1.236)	1.067 (0.928- 1.227)			
28 May-9 JunXAdults only	Ref	Ref			
28 May-9 JunXSingle w/ child(ren)	1.201 (0.998- 1.445)	1.152 (0.953- 1.391)			
28 May-9 JunXAdults w/child(ren)	0.997 (0.901- 1.103)	1.005 (0.902- 1.119)			
11-23 JunXSingle adult	0.964 (0.841- 1.105)	0.967 (0.840- 1.114)			
11-23 JunXAdults only	Ref	Ref			
11-23 JunXSingle w/ child(ren)	0.970 (0.800- 1.176)	0.965 (0.787- 1.185)			
11-23 JunXAdults w/child(ren)	0.969 (0.871- 1.079)	0.919 (0.819- 1.031)			
25 Jun-7 JulXSingle adult	1.003 (0.880- 1.144)	1.055 (0.920- 1.211)			
25 Jun-7 JulXAdults only	Ref	Ref			
25 Jun-7 JulXSingle w/ child(ren)	1.092 (0.920- 1.295)	1.045 (0.876- 1.246)			
25 Jun-7 JulXAdults w/child(ren)	1.057 (0.955- 1.169)	1.030 (0.924- 1.149)			
9-21 JulXSingle adult	0.968 (0.855- 1.097)	1.011 (0.887- 1.153)			
9-21 JulXAdults only	Ref	Ref			
9-21 JulXSingle w/ child(ren)	0.872 (0.720- 1.056)	0.971 (0.796- 1.184)			
9-21 JulXAdults w/child(ren)	1.013 (0.917- 1.120)	1.033 (0.928- 1.150)			
19-31 AugXSingle adult	1.008 (0.899- 1.130)	0.995 (0.883- 1.121)	Ref	Ref	Ref
19-31 AugXAdults only	Ref	Ref	Ref	Ref	Ref
19-31 AugXSingle w/ child(ren)	1.218 (1.025- 1.447)	1.219 (1.022- 1.454)	Ref	Ref	Ref
19-31 AugXAdults w/child(ren)	1.019 (0.925- 1.124)	1.047 (0.944- 1.162)	Ref	Ref	Ref

2-14 SepXSingle adult	0.997 (0.888-1.118)	0.976 (0.866-1.101)	0.887 (0.791-0.994)	0.889 (0.762-1.036)	0.924 (0.785-1.087)
2-14 SepXAdults only	Ref	Ref	Ref	Ref	Ref
2-14 SepXSingle w/ child(ren)	<i>1.261 (1.066-1.492)</i>	1.088 (0.916-1.293)	0.894 (0.743-1.074)	0.835 (0.662-1.052)	0.946 (0.732-1.221)
2-14 SepXAdults w/child(ren)	1.000 (0.906-1.104)	0.987 (0.889-1.096)	0.961 (0.864-1.068)	0.890 (0.769-1.030)	0.971 (0.842-1.120)
16-28 SepXSingle adult	1.026 (0.911-1.156)	1.006 (0.888-1.139)	1.041 (0.925-1.171)	1.074 (0.916-1.260)	0.900 (0.751-1.079)
16-28 SepXAdults only	Ref	Ref	Ref	Ref	Ref
16-28 SepXSingle w/ child(ren)	<i>1.300 (1.084-1.561)</i>	1.161 (0.964-1.399)	0.944 (0.770-1.156)	0.944 (0.729-1.221)	0.825 (0.633-1.076)
16-28 SepXAdults w/child(ren)	1.049 (0.949-1.160)	1.065 (0.957-1.185)	1.054 (0.948-1.171)	0.975 (0.843-1.127)	0.992 (0.856-1.150)
30 Sep-12 OctXSingle adult	1.098 (0.974-1.239)	1.046 (0.922-1.186)	1.033 (0.917-1.164)	1.054 (0.886-1.253)	0.972 (0.824-1.147)
30 Sep-12 OctXAdults only	Ref	Ref	Ref	Ref	Ref
30 Sep-12 OctXSingle w/ child(ren)	1.205 (1.013-1.434)	1.108 (0.929-1.321)	0.991 (0.816-1.203)	0.809 (0.639-1.023)	1.029 (0.782-1.356)
30 Sep-12 OctXAdults w/child(ren)	1.067 (0.963-1.182)	1.104 (0.992-1.230)	0.947 (0.850-1.055)	0.893 (0.773-1.031)	0.935 (0.811-1.077)
14-26 OctXSingle adult	1.012 (0.895-1.143)	0.936 (0.824-1.063)	0.977 (0.862-1.108)	0.962 (0.809-1.144)	0.906 (0.753-1.088)
14-26 OctXAdults only	Ref	Ref	Ref	Ref	Ref
14-26 OctXSingle w/ child(ren)	<i>1.276 (1.067-1.526)</i>	1.186 (0.989-1.423)	1.016 (0.834-1.236)	0.859 (0.675-1.093)	1.097 (0.824-1.460)
14-26 OctXAdults w/child(ren)	1.032 (0.930-1.146)	1.056 (0.946-1.179)	1.011 (0.901-1.134)	1.011 (0.861-1.187)	0.906 (0.774-1.062)
28 Oct-9 NovXSingle adult	1.100 (0.964-1.254)	1.076 (0.938-1.234)	0.994 (0.863-1.144)	1.046 (0.865-1.264)	1.026 (0.837-1.256)
28 Oct-9 NovXAdults only	Ref	Ref	Ref	Ref	Ref
28 Oct-9 NovXSingle w/ child(ren)	1.195 (0.975-1.465)	1.117 (0.908-1.374)	0.786 (0.642-0.962)	0.959 (0.745-1.234)	0.981 (0.740-1.302)
28 Oct-9 NovXAdults w/child(ren)	1.078 (0.958-1.213)	<i>1.183 (1.046-1.338)</i>	0.989 (0.869-1.127)	0.929 (0.785-1.099)	0.957 (0.808-1.135)
11-23 NovXSingle adult	0.994 (0.873-1.132)	0.965 (0.843-1.104)	0.920 (0.798-1.061)	0.905 (0.758-1.081)	0.916 (0.762-1.102)
11-23 NovXAdults only	Ref	Ref	Ref	Ref	Ref
11-23 NovXSingle w/ child(ren)	1.251 (1.041-1.504)	1.242 (1.029-1.498)	0.848 (0.680-1.059)	0.790 (0.603-1.035)	1.072 (0.788-1.459)
11-23 NovXAdults w/child(ren)	1.033 (0.927-1.152)	1.095 (0.977-1.226)	0.966 (0.858-1.086)	1.015 (0.864-1.192)	0.897 (0.767-1.050)
Wald p-value	0.025	0.017	0.172	0.228	0.708
Observations	1,483,378	1,483,378	528,615	528,615	528,615

Note. OR Odds Ratio. CI Confidence Intervals. Models also adjust for race/ethnicity, age, sex, household structure, education, cohort, and state of residence. ORs and CIs in italics significant at $p<.01$.

Table e8. Logistic regression models with interactions between education and cohort predicting mental health outcomes.

	Anxiety	Depression	Prescription medication	Mental health services	Unmet need for services
23 Apr-12 MayXHs or below	Ref	Ref			
23 Apr-12 MayXSome college	Ref	Ref			
23 Apr-12 MayXBachelors	Ref	Ref			
23 Apr-12 MayXGrad degree	Ref	Ref			
14-26 MayXHs or below	Ref	Ref			
14-26 MayXSome college	0.909 (0.805-1.025)	0.926 (0.818-1.048)			
14-26 MayXBachelors	0.829 (0.733-0.939)	0.797 (0.701-0.906)			
14-26 MayXGrad degree	0.806 (0.707-0.919)	0.808 (0.702-0.930)			
28 May-9 JunXHs or below	Ref	Ref			
28 May-9 JunXSome college	1.000 (0.895-1.119)	0.987 (0.880-1.107)			
28 May-9 JunXBachelors	0.976 (0.870-1.095)	0.908 (0.805-1.024)			
28 May-9 JunXGrad degree	0.907 (0.807-1.020)	0.879 (0.776-0.995)			
11-23 JunXHs or below	Ref	Ref			
11-23 JunXSome college	0.987 (0.876-1.112)	0.971 (0.858-1.098)			
11-23 JunXBachelors	0.959 (0.850-1.083)	0.864 (0.759-0.982)			
11-23 JunXGrad degree	0.925 (0.814-1.052)	0.885 (0.771-1.015)			
25 Jun-7 JulXHs or below	Ref	Ref			
25 Jun-7 JulXSome college	1.017 (0.909-1.137)	0.978 (0.870-1.098)			
25 Jun-7 JulXBachelors	0.923 (0.824-1.034)	0.856 (0.759-0.965)			
25 Jun-7 JulXGrad degree	0.889 (0.788-1.003)	0.875 (0.768-0.996)			
9-21 JulXHs or below	Ref	Ref			
9-21 JulXSome college	1.019 (0.911-1.141)	1.014 (0.904-1.139)			
9-21 JulXBachelors	1.031 (0.920-1.156)	0.962 (0.853-1.084)			
9-21 JulXGrad degree	0.975 (0.867-1.097)	0.932 (0.822-1.056)			
19-31 AugXHs or below	Ref	Ref	Ref	Ref	Ref
19-31 AugXSome college	0.993 (0.891-1.106)	0.947 (0.847-1.058)	Ref	Ref	Ref
19-31 AugXBachelors	1.009 (0.905-1.125)	0.932 (0.832-1.045)	Ref	Ref	Ref
19-31 AugXGrad degree	1.042 (0.931-	0.949 (0.842-	Ref	Ref	Ref

	1.166)	1.068)			
2-14 SepXHHS or below	Ref	Ref	Ref	Ref	Ref
2-14 SepXSome college	0.945 (0.847-1.055)	0.966 (0.864-1.081)	1.008 (0.890-1.142)	1.084 (0.892-1.318)	0.898 (0.747-1.079)
2-14 SepXBachelors	0.943 (0.845-1.053)	0.915 (0.815-1.026)	0.949 (0.836-1.078)	0.983 (0.811-1.192)	0.817 (0.678-0.983)
2-14 SepXGrad degree	0.948 (0.846-1.061)	0.920 (0.817-1.036)	0.939 (0.827-1.066)	1.057 (0.874-1.278)	0.840 (0.696-1.013)
16-28 SepXHHS or below	Ref	Ref	Ref	Ref	Ref
16-28 SepXSome college	0.974 (0.871-1.090)	0.968 (0.863-1.085)	1.095 (0.966-1.241)	1.225 (1.007-1.492)	0.967 (0.796-1.176)
16-28 SepXBachelors	1.028 (0.918-1.151)	1.008 (0.896-1.135)	1.015 (0.893-1.153)	1.047 (0.861-1.273)	0.941 (0.772-1.146)
16-28 SepXGrad degree	1.031 (0.917-1.158)	0.968 (0.856-1.095)	0.994 (0.874-1.131)	1.127 (0.928-1.370)	0.876 (0.717-1.071)
30 Sep-12 OctXHHS or below	Ref	Ref	Ref	Ref	Ref
30 Sep-12 OctXSome college	1.005 (0.897-1.126)	1.005 (0.895-1.129)	1.053 (0.926-1.197)	<i>1.358 (1.111-1.658)</i>	1.071 (0.886-1.294)
30 Sep-12 OctXBachelors	0.993 (0.885-1.113)	0.923 (0.820-1.039)	1.007 (0.885-1.145)	1.191 (0.980-1.449)	1.081 (0.893-1.307)
30 Sep-12 OctXGrad degree	1.023 (0.909-1.150)	0.918 (0.811-1.038)	1.033 (0.907-1.176)	1.292 (1.063-1.570)	0.955 (0.787-1.160)
14-26 OctXHHS or below	Ref	Ref	Ref	Ref	Ref
14-26 OctXSome college	0.979 (0.872-1.100)	0.936 (0.832-1.054)	1.128 (0.982-1.294)	1.225 (0.980-1.531)	0.927 (0.751-1.143)
14-26 OctXBachelors	0.991 (0.882-1.114)	0.907 (0.804-1.024)	1.073 (0.934-1.232)	1.021 (0.820-1.272)	0.882 (0.714-1.090)
14-26 OctXGrad degree	0.949 (0.842-1.070)	0.866 (0.764-0.982)	1.036 (0.900-1.192)	1.119 (0.898-1.394)	0.852 (0.687-1.057)
28 Oct-9 NovXHHS or below	Ref	Ref	Ref	Ref	Ref
28 Oct-9 NovXSome college	0.977 (0.857-1.115)	0.910 (0.796-1.039)	1.055 (0.904-1.232)	1.298 (1.027-1.641)	0.848 (0.684-1.052)
28 Oct-9 NovXBachelors	0.959 (0.841-1.095)	<i>0.785 (0.685-0.899)</i>	0.986 (0.843-1.153)	1.113 (0.886-1.398)	0.770 (0.620-0.956)
28 Oct-9 NovXGrad degree	1.051 (0.917-1.205)	0.841 (0.729-0.971)	1.010 (0.862-1.184)	1.098 (0.873-1.381)	0.806 (0.644-1.010)
11-23 NovXHHS or below	Ref	Ref	Ref	Ref	Ref
11-23 NovXSome college	0.979 (0.866-1.105)	0.976 (0.863-1.104)	0.954 (0.828-1.098)	1.255 (0.998-1.577)	0.953 (0.777-1.170)
11-23 NovXBachelors	0.942 (0.833-1.066)	0.912 (0.804-1.035)	0.948 (0.821-1.094)	1.149 (0.916-1.442)	0.896 (0.730-1.101)
11-23 NovXGrad degree	0.924 (0.814-1.048)	0.870 (0.763-0.992)	0.931 (0.804-1.077)	1.217 (0.969-1.529)	0.841 (0.679-1.042)
Wald p-value	0.000	0.002	0.794	0.288	0.361
Observations	1,483,378	1,483,378	528,615	528,586	528,925

Note. OR Odds Ratio. CI Confidence Intervals. Models also adjust for race/ethnicity, age, sex, household structure, education, cohort, and state of residence. ORs and CIs in italics significant at $p < .01$

Figures

Figure 1

Adjusted prevalence of anxiety, depression, prescription use, mental health counseling, and unmet need for counseling, April-November, 2020.