





The first year of the COVID-19 pandemic and health among cancer survivors in the United States

Xuesong Han, PhD ¹; Sylvia Kewei Shi, MPH¹; Jingxuan Zhao, MPH¹; Leticia M. Nogueira, PhD ¹; Priti Bandi, PhD¹; Stacey A. Fedewa, PhD ^{1,2}; Ahmedin Jemal, DVM, PhD ¹; and K. Robin Yabroff, PhD¹

BACKGROUND: Cancer survivors represent a population with high health care needs. If and how cancer survivors were affected by the first year of the coronavirus disease 2019 (COVID-19) pandemic are largely unknown. **METHODS:** Using data from the nationwide, population-based Behavioral Risk Factor Surveillance System (2017–2020), the authors investigated changes in health-related measures during the COVID-19 pandemic among cancer survivors and compared them with changes among adults without a cancer history in the United States. Sociodemographic and health-related measures such as insurance coverage, employment status, health behaviors, and health status were self-reported. Adjusted prevalence ratios of health-related measures in 2020 versus 2017–2019 were calculated with multivariable logistic regressions and stratified by age group (18–64 vs. ≥65 years). **RESULTS:** Among adults aged 18–64 years, the uninsured rate did not change significantly in 2020 despite increases in unemployment. The prevalence of unhealthy behaviors, such as insufficient sleep and smoking, decreased in 2020, and self-rated health improved, regardless of cancer history. Notably, declines in smoking were larger among cancer survivors than nonelderly adults without a cancer history. Few changes were observed for adults aged ≥65 years. **CONCLUSIONS:** Further research is needed to confirm the observed positive health behavior and health changes and to investigate the role of potential mechanisms, such as the national and regional policy responses to the pandemic regarding insurance coverage, unemployment benefits, and financial assistance. As policies related to the public health emergency expire, ongoing monitoring of longer term effects of the pandemic on cancer survivorship is warranted. *Cancer* 2022;128:3727–3733. © 2022 American Cancer Society.

KEYWORDS: cancer survivorship, coronavirus disease 2019 (COVID-19) pandemic, employment, health behaviors, insurance coverage, self-reported health.

INTRODUCTION

The economic and health care disruptions caused by the coronavirus disease 2019 (COVID-19) pandemic have been widespread in the United States. Cancer survivors, a population with high health care needs, are among the most vulnerable.^{1,2} If and how cancer survivors were affected by the pandemic are largely unknown. Using data from the nationwide, population-based Behavioral Risk Factor Surveillance System (BRFSS), we examined changes in multiple health-related measures in 2020, the year when the COVID-19 pandemic was declared, among cancer survivors and compared them with adults without a cancer history.

MATERIALS AND METHODS

BRFSS is an annual household telephone survey that collects data about noninstitutionalized adults' health behaviors, chronic health conditions, and health care access.³ We used 2017–2020 BRFSS data from all 50 states and the District of Columbia. The response rates ranged from 45.9% to 49.9% in 2017–2020.³ Cancer history was based on the self-reported diagnosis of cancer other than skin cancer. Changes in demographic characteristics and the following self-reported health-related measures before (2017–2019) and during (2020) the COVID-19 pandemic were compared between cancer survivors and adults without a cancer history (see Table S1 for details of the measures): access to care (including noninsurance and no usual source of care), unemployment, health behaviors (including insufficient sleep, obesity, physical inactivity, current cigarette smoking, binge drinking, and heavy drinking),⁴ and unfavorable health status (including other than “excellent” self-rated health⁵ and frequent mental distress⁶). The timeframe for all measures referred to either the current situation or the past 30 days. Adjusted prevalence ratios (PRs) and 95% confidence intervals (CIs) for health-related measures in 2020 versus 2017–2019 were calculated with multivariable logistic regressions controlling for sociodemographic

Corresponding Author: Xuesong Han, Surveillance and Health Equity Science, American Cancer Society, 3380 Chastain Meadows Pkwy NW, Ste 200, Kennesaw, GA 30144, USA (xuesong.han@cancer.org).

¹Surveillance and Health Equity Science, American Cancer Society, Atlanta, Georgia, USA; ²Department of Hematology and Medical Oncology, Emory University, Atlanta, Georgia, USA

Additional supporting information may be found in the online version of this article.

DOI: 10.1002/cncr.34386, **Received:** March 21, 2022; **Revised:** May 24, 2022; **Accepted:** June 8, 2022, **Published online** August 22, 2022 in Wiley Online Library (wileyonlinelibrary.com)

factors and the state COVID-19 mortality rate in 2020. State unemployment benefit generosity⁷ and state-level per capita gross domestic product in 2019⁸ were added to multivariable models for unemployment outcomes. Analyses were stratified by age group (18–64 vs. ≥ 65 years) because of differences in health insurance coverage and employment distribution. Because Medicare provides nearly universal insurance coverage for persons aged ≥ 65 years after retirement in the United States, only health behaviors and health status were examined among individuals aged ≥ 65 years. A sensitivity analysis was conducted by further inclusion of the BRFSS interview month in the models. All analyses used sample weights to account for the complex survey design and nonresponses, and they were conducted with SAS9.4 and SAS-callable SUDAAN (SAS Institute, Inc, Cary, North Carolina). All tests were two-sided with a significance level of .05. The analysis of de-identified, publicly available data do not constitute human subjects research thus IRB review was not required.

RESULTS

A total of 57,132 adult cancer survivors and 1,044,585 adults without a cancer history were included. Regardless of cancer history, participants in 2020 reported slightly higher household incomes and were less likely to report disabilities in comparison with participants in 2017–2019 (Table 1). For individuals aged 18–64 years (Table 2), the percentage unemployed increased by 43% (95% CI for PR, 1.22–2.68) among cancer survivors and by 57% (95% CI for PR, 1.51–1.62) among adults without a cancer history in 2020 versus 2017–2019. Further analysis by unemployment duration showed that the increase in unemployment was driven by short-term unemployment for <1 year. The percentage uninsured and the percentage without a usual source of care did not show significant changes in 2020.

For individuals aged 18–64 years (Table 2), in terms of health behaviors, the prevalence of insufficient sleep and smoking decreased in 2020 in adults with and without a cancer history. Moreover, smoking prevalence decreased to a larger extent among cancer survivors (PR, 0.88 vs. 0.93; *p* for interaction = .049). The prevalence of physical inactivity and binge drinking also decreased among adults without a cancer history. Following the recent trend (Fig. 1), the prevalence of obesity continued to increase, regardless of cancer history. Self-rated health improved among both cancer survivors and adults without a cancer history. More adults without a cancer history reported frequent mental distress in 2020 than 2017–2019. Among participants aged ≥ 65 years, few changes in health-related measures were observed.

Results from the sensitivity analysis further including the interview month in the multivariable models are shown in Table S2. The findings were virtually the same as those from the main analysis.

DISCUSSION

To the best of our knowledge, our study provides the first nationally representative estimation of the effects of the first year of the COVID-19 pandemic on cancer survivors in the United States. In agreement with previous studies conducted in the general population, we found that the uninsured rate did not change significantly among working-age cancer survivors in 2020 despite increased unemployment amidst the COVID-19 pandemic. This trend is potentially explained in part by increased enrollment in the Affordable Care Act Marketplace, especially in states that relaxed enrollment criteria in 2020,⁹ and by the Families First Coronavirus Response Act, which increased the federal government's share of Medicaid costs, prohibited states from implementing new Medicaid eligibility restrictions, and prevented states from terminating Medicaid coverage during the public health emergency.¹⁰ These provisions likely compensated for the loss in employer-sponsored insurance.¹¹ The Families First Coronavirus Response Act is expected to expire in 2022; ongoing monitoring of health insurance coverage and access to care will be important, especially as new COVID-19 variants emerge.

Among adults aged 18–64 years, decreased unhealthy behaviors such as insufficient sleep and smoking were observed, regardless of cancer history, and decreased physical inactivity and binge drinking were observed for individuals without a cancer history; this suggests that the pandemic may have motivated people to adopt certain healthier lifestyles. Decreased commute times¹² and converting to active transportation¹³ might also provide some workers opportunities to increase physical activity during the pandemic. An exception is that obesity rates increased in adults with and without a cancer history, which may reflect a continuation of the prepandemic obesity epidemic trend and difficulty in changing one's weight status over a short time.¹⁴ Self-rated health improved in 2020 overall, and this potentially reflects decreases in unhealthy behaviors and positive health effects from national policy responses to the pandemic, including financial assistance.¹⁵ Adults without a cancer history were more likely to report ≥ 2 weeks of mental distress during the past month in 2020, and this confirms the increased mental health problems reported in studies using smaller convenience samples.^{16,17}

TABLE 1. Sample characteristics by cancer history, Behavioral Risk Factor Surveillance System, 2017–2020

| Characteristic | Cancer survivors | | | Individuals without a cancer history | | | p |
|---------------------------------------|-----------------------|-----------------------------------|------------------------------|--------------------------------------|------------------------------------|----------------------------------|-------|
| | Total (N = 57,132) | 2017–2019 (N = 45,025 [53.0%]) | 2020 (N = 12,107 [47.0%]) | Total (N = 1,044,585) | 2017–2019 (N = 794,565 [49.7%]) | 2020 (N = 250,020 [50.3%]) | |
| 18–64 years | | | | | | | |
| Sex | | | | | | | |
| Male | 17,640 (33.1) | 13,800 (32.7) | 3840 (33.5) | 503,517 (50.5) | 382,166 (50.6) | 121,351 (50.5) | .68 |
| Female | 39,492 (66.9) | 31,225 (67.3) | 8267 (66.5) | 541,068 (49.5) | 412,399 (49.4) | 128,669 (49.5) | |
| Age, years | | | | | | | .29 |
| 18–44 | 9905 (24.4) | 7797 (25.2) | 2108 (23.5) | 481,467 (59.8) | 361,570 (59.6) | 119,897 (59.9) | |
| 45–54 | 14,452 (26.5) | 11,306 (27.4) | 3146 (25.4) | 246,502 (20.3) | 187,615 (20.4) | 58,887 (20.1) | |
| 55–64 | 32,775 (49.1) | 25,922 (47.4) | 6853 (51.1) | 316,616 (19.9) | 245,380 (19.9) | 71,236 (19.9) | |
| Race/ethnicity | | | | | | | <.001 |
| Non-Hispanic White | 44,562 (69.6) | 35,129 (69.5) | 9433 (69.7) | 719,431 (56.1) | 549,188 (56.8) | 170,243 (55.3) | |
| Non-Hispanic Black | 4080 (10.1) | 3265 (10.5) | 815 (9.7) | 91,413 (12.4) | 70,709 (12.4) | 20,704 (12.3) | |
| Hispanic | 3369 (12.3) | 2645 (12.2) | 724 (12.4) | 121,258 (19.9) | 91,100 (19.5) | 30,158 (20.3) | |
| Other and unknown | 5121 (8.1) | 3986 (7.9) | 1135 (8.3) | 112,483 (11.6) | 83,568 (11.2) | 28,915 (12.0) | |
| Household income | | | | | | | <.001 |
| <\$25,000 | 14,842 (25.1) | 12,051 (26.7) | 2791 (23.2) | 205,533 (20.1) | 161,054 (21.3) | 44,479 (18.9) | |
| \$25,000–\$74,999 | 16,978 (28.3) | 13,402 (28.2) | 3576 (28.5) | 325,513 (29.5) | 250,910 (30.2) | 74,603 (28.8) | |
| ≥\$75,000 | 16,774 (30.7) | 13,007 (30.0) | 3767 (31.4) | 348,605 (32.4) | 261,675 (31.7) | 86,930 (33.1) | |
| Unknown | 8538 (15.9) | 6565 (15.1) | 1973 (16.9) | 164,934 (18.0) | 120,926 (16.8) | 44,008 (19.2) | |
| Educational attainment ^a | | | | | | | <.001 |
| ≤High school graduate | 18,923 (39.6) | 15,119 (39.9) | 3804 (39.3) | 348,258 (39.9) | 266,465 (40.4) | 81,793 (39.4) | |
| Some college | 17,109 (32.3) | 13,492 (32.9) | 3617 (31.6) | 290,882 (30.7) | 221,956 (30.9) | 68,926 (30.4) | |
| ≥College graduate | 20,904 (27.6) | 16,268 (26.8) | 4636 (28.5) | 401,001 (29.0) | 302,949 (28.3) | 98,052 (29.7) | |
| Marital status | | | | | | | .030 |
| Married | 30,779 (55.3) | 24,174 (55.4) | 6605 (55.3) | 542,993 (48.3) | 413,951 (48.6) | 129,042 (48.0) | |
| Unmarried ^b | 26,363 (44.7) | 20,851 (44.6) | 5502 (44.7) | 501,592 (51.7) | 380,614 (51.5) | 120,978 (52.0) | |
| No. of health conditions ^c | | | | | | | <.001 |
| 0 | 16,743 (30.5) | 13,006 (29.5) | 3737 (31.7) | 549,254 (57.0) | 414,142 (56.5) | 135,112 (57.5) | |
| 1 | 15,760 (28.4) | 12,443 (28.5) | 3317 (28.2) | 285,508 (26.5) | 217,712 (26.5) | 67,796 (26.4) | |
| 2+ | 24,629 (41.1) | 19,576 (42.0) | 5053 (40.1) | 209,823 (16.6) | 162,711 (17.0) | 47,112 (16.1) | |
| With disabilities ^d | | | | | | | <.001 |
| No | 33,975 (59.6) | 26,370 (58.1) | 7605 (61.2) | 814,449 (79.4) | 615,336 (78.8) | 199,113 (80.1) | |
| Yes | 23,157 (40.4) | 18,655 (41.9) | 4502 (38.8) | 230,136 (20.6) | 179,229 (21.2) | 50,907 (19.9) | |
| 65+ years | | | | | | | .62 |
| Sex | | | | | | | |
| Male | 45,491 (46.0) | 34,970 (45.2) | 10,521 (46.8) | 204,961 (44.2) | 156,731 (44.3) | 48,230 (44.1) | |
| Female | 62,424 (54.0) | 48,629 (54.9) | 13,795 (53.2) | 293,711 (55.8) | 226,426 (55.7) | 67,285 (55.9) | |
| Age, years | | | | | | | .32 |
| 65–74 | 54,284 (51.6) | 42,057 (51.6) | 12,227 (51.6) | 299,924 (60.8) | 230,399 (61.0) | 69,525 (60.7) | |
| 75–79 | 23,603 (22.0) | 18,302 (22.3) | 5301 (21.7) | 90,797 (18.6) | 69,478 (18.3) | 21,319 (18.8) | |
| 80+ | 30,028 (26.4) | 23,240 (26.1) | 6788 (26.7) | 107,951 (20.6) | 83,280 (20.7) | 24,671 (20.5) | |
| Race/ethnicity | | | | | | | .008 |
| Non-Hispanic White | 93,719 (81.3) | 72,593 (81.1) | 21,126 (81.5) | 411,081 (73.7) | 315,983 (74.1) | 95,098 (73.2) | |
| Non-Hispanic Black | 5965 (8.3) | 4654 (7.8) | 1311 (8.8) | 32,142 (9.3) | 24,842 (9.0) | 7300 (9.7) | |
| Hispanic | 2055 (4.4) | 1586 (5.1) | 469 (3.8) | 21,105 (9.7) | 16,134 (9.4) | 4971 (10.1) | |
| Other and unknown | 6176 (6.0) | 4766 (6.1) | 1410 (5.8) | 34,344 (7.3) | 26,198 (7.5) | 8146 (7.1) | |

(Continued)

TABLE 1. Continued

| Characteristic | Cancer survivors | | | Individuals without a cancer history | | | p |
|---------------------------------------|-----------------------|-----------------------------------|------------------------------|--------------------------------------|------------------------------------|----------------------------------|-------|
| | Total (N = 57,132) | 2017–2019 (N = 45,025 [53.0%]) | 2020 (N = 12,107 [47.0%]) | Total (N = 1,044,585) | 2017–2019 (N = 794,565 [49.7%]) | 2020 (N = 250,020 [50.3%]) | |
| Annual household income | | | | | | | <.001 |
| <\$25,000 | 22,571 (20.1) | 17,966 (21.2) | 4605 (19.0) | 110,448 (23.0) | 86,948 (24.0) | 23,500 (22.0) | <.001 |
| \$25,000–\$74,999 | 40,108 (35.2) | 31,232 (36.2) | 8876 (34.3) | 178,647 (33.2) | 137,955 (33.8) | 40,692 (32.6) | <.001 |
| ≥\$75,000 | 21,524 (21.0) | 16,500 (20.1) | 5024 (21.8) | 95,632 (19.1) | 72,574 (18.9) | 23,058 (19.4) | <.001 |
| Unknown | 23,712 (23.7) | 17,901 (22.5) | 5811 (25.0) | 113,945 (24.7) | 85,680 (23.3) | 28,265 (26.0) | <.001 |
| Educational attainment ^a | | | | | | | .37 |
| ≤High school graduate | 36,355 (39.6) | 28,487 (40.8) | 7868 (38.4) | 178,806 (43.6) | 138,927 (43.9) | 39,879 (43.3) | .37 |
| Some college | 29,630 (31.7) | 22,814 (31.2) | 6816 (32.2) | 135,120 (29.8) | 103,092 (29.8) | 32,028 (29.8) | .13 |
| ≥College graduate | 41,630 (28.3) | 32,078 (27.7) | 9552 (29.0) | 182,633 (26.1) | 139,533 (25.8) | 43,100 (26.4) | .13 |
| Marital status | | | | | | | .48 |
| Married | 53,494 (55.3) | 41,087 (54.8) | 12,407 (55.8) | 249,908 (54.7) | 190,660 (54.4) | 59,248 (55.1) | .48 |
| Unmarried ^b | 54,421 (44.7) | 42,512 (45.2) | 11,909 (44.2) | 248,764 (45.3) | 192,497 (45.6) | 56,267 (45.0) | .48 |
| No. of health conditions ^c | | | | | | | <.001 |
| 0 | 23,649 (21.2) | 18,302 (21.4) | 5347 (21.1) | 139,217 (27.7) | 106,000 (27.5) | 33,217 (27.9) | <.001 |
| 1 | 34,603 (31.8) | 26,839 (31.7) | 7764 (31.8) | 165,585 (32.8) | 127,243 (32.8) | 38,342 (32.8) | <.001 |
| 2+ | 49,663 (47.0) | 38,458 (46.9) | 11,205 (47.1) | 193,870 (39.5) | 149,914 (39.7) | 43,956 (39.3) | <.001 |
| With disabilities ^d | | | | | | | <.001 |
| No | 58,438 (54.1) | 45,038 (53.7) | 13,400 (54.6) | 303,418 (60.7) | 231,510 (59.6) | 71,908 (61.8) | <.001 |
| Yes | 49,477 (45.9) | 38,561 (46.3) | 10,916 (45.4) | 195,254 (39.3) | 151,647 (40.4) | 43,607 (38.2) | <.001 |

Note: The data are presented as sample N (weighted %).

^aThe education categories do not add up to 100% because of a small number of missing values (<1%).

^bUnmarried includes divorced, widowed, separated, never married, a member of an unmarried couple, refused, and missing.

^cHealth conditions include a history of heart attack (also known as myocardial infarction), angina (also known as coronary heart disease), stroke, asthma, chronic obstructive pulmonary disease (emphysema or chronic bronchitis), arthritis, depression disorder, kidney disease, and diabetes.

^dDisabilities include six questions on whether the participant is deaf or has serious difficulty with hearing; is blind or has serious difficulty with seeing even when wearing glasses; has serious difficulty with concentrating, remembering, or making decisions; has serious difficulty with walking or climbing stairs; has difficulty with dressing or bathing; and has difficulty with doing errands such as visiting a doctor's office or shopping alone.

TABLE 2. Association of the COVID-19 pandemic with health-related measures by cancer history, Behavioral Risk Factor Surveillance System, 2017–2020

| | Cancer survivors | | | Individuals without a cancer history | | | <i>p</i> for interaction ^a in adjusted model |
|---------------------------------------|---------------------|------|------------------------------------|--------------------------------------|------|------------------------------------|---|
| | Crude prevalence, % | | Adjusted prevalence ratio (95% CI) | Crude prevalence, % | | Adjusted prevalence ratio (95% CI) | |
| | 2017–2019 | 2020 | | 2017–2019 | 2020 | | |
| 18–64 years | | | | | | | |
| Access to care | | | | | | | |
| Uninsured | 8.8 | 8.0 | 0.92 (0.79–1.06) | 15.2 | 15.6 | 1.02 (0.998–1.05) | .14 |
| No usual source of care | 11.8 | 11.5 | 0.98 (0.86–1.10) | 27.8 | 28.2 | 1.01 (0.997–1.03) | .54 |
| Unemployment | | | | | | | |
| Unemployed | 6.5 | 9.3 | 1.43 (1.22–1.68) | 6.0 | 9.3 | 1.57 (1.51–1.62) | .49 |
| Unemployed for ≥1 year | 3.8 | 3.4 | 0.89 (0.71–1.12) | 2.7 | 2.7 | 0.99 (0.93–1.05) | .45 |
| Unemployed for <1 year | 2.7 | 5.9 | 2.18 (1.75–2.72) | 3.3 | 6.7 | 2.04 (1.96–2.13) | .51 |
| Health behaviors | | | | | | | |
| Insufficient sleep ^b | 43.1 | 39.2 | 0.91 (0.86–0.97) | 37.1 | 34.3 | 0.92 (0.91–0.94) | .39 |
| Obesity ^c | 36.5 | 40.2 | 1.10 (1.04–1.17) | 30.8 | 32.7 | 1.06 (1.04–1.07) | .12 |
| Physical inactivity ^d | 29.2 | 30.5 | 1.04 (0.97–1.12) | 22.0 | 21.3 | 0.97 (0.95–0.99) | .08 |
| Currently smoking ^e | 21.9 | 19.2 | 0.88 (0.82–0.94) | 16.0 | 14.9 | 0.93 (0.91–0.95) | .049 |
| Binge drinking ^f | 12.4 | 11.2 | 0.90 (0.81–1.01) | 18.4 | 17.0 | 0.93 (0.91–0.95) | .73 |
| Heavy drinking ^g | 7.3 | 6.9 | 0.95 (0.83–1.10) | 7.4 | 7.6 | 1.02 (0.99–1.06) | .45 |
| Health outcomes | | | | | | | |
| Self-rated health: not excellent | 91.7 | 88.4 | 0.96 (0.95–0.98) | 80.0 | 74.8 | 0.94 (0.93–0.94) | .32 |
| Frequent mental distress ^h | 22.0 | 22.3 | 1.01 (0.94–1.10) | 13.3 | 14.7 | 1.10 (1.08–1.13) | .09 |
| 65+ years | | | | | | | |
| Health behaviors | | | | | | | |
| Insufficient sleep ^b | 27.3 | 26.0 | 0.96 (0.89–1.02) | 26.5 | 25.6 | 0.96 (0.93–0.999) | .82 |
| Obesity ^c | 29.2 | 29.1 | 1.00 (0.95–1.05) | 28.8 | 29.4 | 1.02 (0.99–1.05) | .35 |
| Physical inactivity ^d | 32.1 | 32.2 | 1.00 (0.96–1.05) | 29.4 | 30.5 | 1.04 (1.01–1.06) | .22 |
| Currently smoking ^e | 7.5 | 8.0 | 1.06 (0.95–1.18) | 8.6 | 8.5 | 0.99 (0.95–1.04) | .31 |
| Binge drinking ^f | 4.3 | 4.4 | 1.02 (0.88–1.19) | 4.9 | 4.7 | 0.97 (0.9–1.04) | .51 |
| Heavy drinking ^g | 4.7 | 4.9 | 1.05 (0.92–1.21) | 4.7 | 4.7 | 0.99 (0.92–1.06) | .37 |
| Health outcomes | | | | | | | |
| Self-rated health: not excellent | 92.1 | 91.5 | 0.99 (0.98–1.003) | 86.5 | 85.9 | 0.99 (0.99–0.999) | .58 |
| Frequent mental distress ^h | 8.9 | 9.4 | 1.06 (0.96–1.17) | 7.3 | 7.7 | 1.06 (0.99–1.12) | .89 |

Abbreviations: CI, confidence interval; COVID-19, coronavirus disease 2019.

Note: Models have been adjusted for the following: sex, age group, race/ethnicity, marital status, annual household income, number of comorbidities (for cancer survivors) or number of chronic conditions (for individuals without a cancer history), disability status, and state COVID-19 mortality rate in 2020. For unemployment outcomes, state unemployment benefit generosity and state-level per capita gross domestic product in 2019 have been further adjusted.

^a*p* for interaction is the *p* value for the interaction term of period (2020 vs. 2017–2019) by cancer history in the model.

^bInsufficient sleep is defined as less than 7 hours per night on average. Data are available only for 2018 and 2020.

^cObesity is defined as a body mass index ≥30 kg/m².

^dPhysical inactivity is defined as no participation in any physical activities or exercise during the past month.

^eCurrently smoking is defined as smoking cigarettes every day or some days.

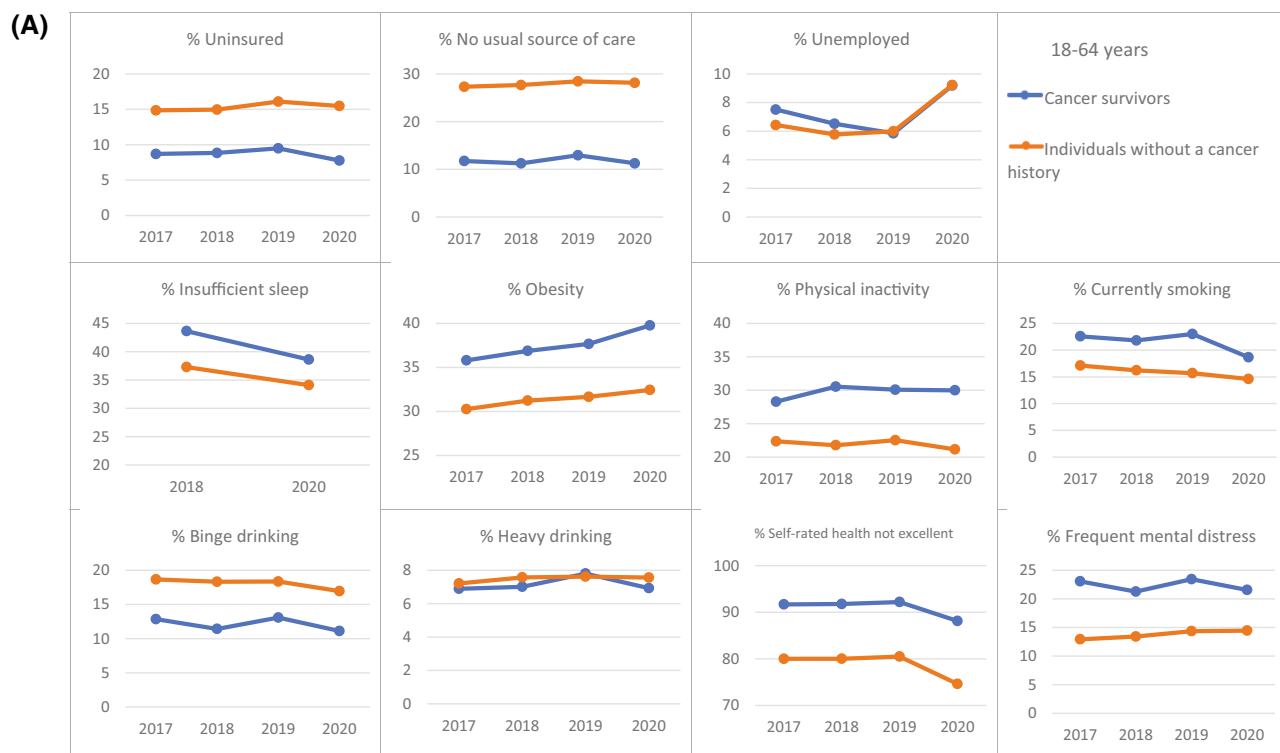
^fBinge drinking is defined as having ≥5 drinks for males or having ≥4 drinks for females on ≥1 occasion in the past month.

^gHeavy drinking is defined as having >14 drinks per week for males or having >7 drinks per week for females.

^hFrequent mental distress is defined as ≥14 self-reported mentally unhealthy days in the past 30 days.

There are several limitations to the study. First, the survey provides population-based weights for annual estimation; thus, we were not able to examine the changes by month, although further controlling for the interview month in the models did not change the estimates (Table S2). The World Health Organization declared COVID-19 a pandemic in March 2020; therefore, our results may underestimate the effects of the pandemic. Second, although the response rates were similar across the 4 years of study, some states paused interviews during shutdowns, and income was slightly higher for 2020 participants than those in earlier years. Other surveys, including the census, have

noted this pattern as well.¹⁸ Although BRFSS weights account for nonresponse bias, residual bias may be present. Third, although we selected a wide range of health-related measures, we were unable to examine some important outcomes because they were not assessed in BRFSS nationwide (e.g., insurance type), were not assessed in 2020 (e.g., vegetable and fruit intake), or were not assessed within the current or near-current timeframe (e.g., care affordability assessed for the past 12 months, which could include months in 2019); these merit further investigation. For example, with the sharp decline in employment, many working-age adults changed their employment-sponsored



insurance to public insurance or self-purchased private insurance from the Marketplace during the pandemic,¹⁹ with variations in cost-sharing and provider networks. The

effects of these changes in coverage type on out-of-pocket costs, access to care, and care utilization across the cancer continuum are important areas for future evaluation

Figure 1. Trends of health-related measures among cancer survivors and individuals without a cancer history (Behavioral Risk Factor Surveillance System, 2017–2020): (A) individuals aged 18–64 years and (B) individuals aged ≥ 65 years. *Insufficient sleep* is defined as less than 7 hours per night on average (data are available only for 2018 and 2020). *Obesity* is defined as a body mass index ≥ 30 kg/m². *Physical inactivity* is defined as no participation in any physical activities or exercise during the past month. *Currently smoking* is defined as smoking cigarettes every day or some days. *Binge drinking* is defined as having ≥ 5 drinks for males or having ≥ 4 drinks for females on ≥ 1 occasion in the past month. *Heavy drinking* is defined as having >14 drinks per week for males or having >7 drinks per week for females. *Frequent mental distress* is defined as ≥ 14 self-reported mentally unhealthy days in the past 30 days.

as data become available. Lastly, the COVID-19 status of individuals is not available in BRFSS 2020, and neither is the essential worker status.

In conclusion, using a nationwide, population-based survey dataset, we found that the uninsured rate did not change significantly in 2020 among working-age individuals in the United States despite increases in unemployment. Moreover, the prevalence of some unhealthy behaviors, such as insufficient sleep and smoking, decreased in 2020, and self-rated health improved, regardless of cancer history, among individuals aged 18–64 years. Future research is needed to confirm the observed positive health behavior and health changes and to investigate the role of potential mechanisms, such as the national and regional policy responses to the pandemic regarding insurance coverage, unemployment benefits, and financial assistance. As policies related to the public health emergency expire, ongoing monitoring of longer term effects of the pandemic on cancer survivorship is warranted. Future studies are also needed to evaluate the impact of health policies, including Medicaid expansion and other provisions of the Affordable Care Act, on health equity as the nation transitions into a COVID-19 endemic.

AUTHOR CONTRIBUTIONS

Xuesong Han: Conceptualization, formal analysis, data curation, investigation, methodology, project administration, supervision, writing—original draft, and writing—review and editing. **Sylvia Kewei Shi:** Conceptualization, formal analysis, data curation, investigation, methodology, and writing—review and editing. **Jingxuan Zhao:** Conceptualization, data curation, investigation, methodology, and writing—review and editing. **Leticia M. Nogueira:** Conceptualization, data curation, investigation, methodology, and writing—review and editing. **Priti Bandi:** Conceptualization, data curation, investigation, methodology, and writing—review and editing. **Stacey A. Fedewa:** Conceptualization, data curation, investigation, methodology, and writing—review and editing. **Ahmedin Jemal:** Conceptualization, data curation, investigation, methodology, supervision, and writing—review and editing. **K. Robin Yabroff:** Conceptualization, data curation, investigation, methodology, supervision, and writing—review and editing.

CONFLICTS OF INTEREST

Xuesong Han and Jingxuan Zhao have received a grant from AstraZeneca for research outside the current study. K. Robin Yabroff serves on the Flatiron Health Equity Advisory Board. All authors are employed by the American Cancer Society, Inc, a not-for-profit public health organization that receives support from the public through fundraising and direct contributions. The society also receives a small portion of its support from corporations and industry to support its mission programs and services.

REFERENCES

1. Kutikov A, Weinberg DS, Edelman MJ, Horwitz EM, Uzzo RG, Fisher RI. A war on two fronts: cancer care in the time of COVID-19. *Ann Intern Med.* 2020;172:756-758.
2. Leach CR, Kirkland EG, Masters M, et al. Cancer survivor worries about treatment disruption and detrimental health outcomes due to the COVID-19 pandemic. *J Psychosoc Oncol.* 2021;39:347-365.
3. Behavioral Risk Factor Surveillance System. Centers for Disease Control and Prevention. Accessed January 18, 2022. <https://www.cdc.gov/brfss/>
4. Secinti E, Wu W, Kent EE, Demark-Wahnefried W, Lewson AB, Mosher CE. Examining health behaviors of chronic disease caregivers in the U.S. *Am J Prev Med.* 2022;62(3):e145-e158.
5. Salomon JA, Nordhagen S, Oza S, Murray CJ. Are Americans feeling less healthy? The puzzle of trends in self-rated health. *Am J Epidemiol.* 2009;170:343-351.
6. Moriarty DG, Zack MM, Kobau R. The Centers for Disease Control and Prevention's Healthy Days Measures—population tracking of perceived physical and mental health over time. *Health Qual Life Outcomes.* 2003;1:37.
7. Unemployment benefits comparison by state. [FileUnemployment.org](https://fileunemployment.org/unemployment-benefits-comparison-by-state). Accessed October 6, 2021. <https://fileunemployment.org/unemployment-benefits-comparison-by-state>
8. GDP by state. Bureau of Economic Analysis. Accessed October 6, 2021. <https://www.bea.gov/data/gdp/gdp-state>
9. Hsu J, Chin CY, Weiss M, et al. Growth in ACA-compliant marketplace enrollment and spending risk changes during the COVID-19 pandemic. *Health Aff (Millwood).* 2021;40:1722-1730.
10. Brooks T, Schneider A. The Families First Coronavirus Response Act: Medicaid and CHIP Provisions Explained. Georgetown University Health Policy Institute; 2020.
11. Bundorf MK, Gupta S, Kim C. Trends in US health insurance coverage during the COVID-19 pandemic. *JAMA Health Forum.* 2021;2:e212487.
12. Kun AL, Sadun R, Shaer O, Teodorovitz T. Where did the commute time go? Harvard Business Review. Published December 10, 2020. Accessed May 12, 2022. <https://hbr.org/2020/12/where-did-the-commute-time-go>
13. Cusack M. Individual, social, and environmental factors associated with active transportation commuting during the COVID-19 pandemic. *J Transp Health.* 2021;22:101089.
14. Hales CM, Carroll MD, Fryar CD, Ogden CL. Prevalence of obesity and severe obesity among adults: United States, 2017–2018. *NCHS Data Brief.* 2020;360:1-8.
15. Sun S, Huang J, Hudson DL, Sherraden M. Cash transfers and health. *Annu Rev Public Health.* 2021;42:363-380.
16. Marroquin B, Vine V, Morgan R. Mental health during the COVID-19 pandemic: effects of stay-at-home policies, social distancing behavior, and social resources. *Psychiatry Res.* 2020;293:113419.
17. Wang X, Hegde S, Son C, Keller B, Smith A, Sasangohar F. Investigating mental health of US college students during the COVID-19 pandemic: cross-sectional survey study. *J Med Internet Res.* 2020;22:e22817.
18. Rothbaum J, Eggleston J, Bee A, Klee M, Mendez-Smith B. An overview of addressing nonresponse bias in the American Community Survey during the COVID-19 pandemic using administrative data. US Census Bureau Published November 30, 2021. Accessed May 24, 2022. <https://www.census.gov/newsroom/blogs/random-samplings/2021/11/nonresponse-acs-covid-administrative-data.html>
19. McDermott D, Cox C, Rudowitz R, Garfield R. How has the pandemic affected health coverage in the U.S.? KFF. Published December 9, 2020. Accessed May 12, 2022. <https://www.kff.org/policy-watch/how-has-the-pandemic-affected-health-coverage-in-the-u-s/>