The impact of the COVID-19 pandemic on older women in the Women's Health Initiative

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Abstract

Background

The COVID-19 pandemic is a health crisis of which older adults are a high-risk group for severe illness and mortality. The objectives of this paper are to describe the methods and responses to a COVID-19 survey administered by the Women's Health Initiative (WHI) to assess the impact of the pandemic on older women.

Methods

WHI is an ongoing prospective cohort study that recruited 161,808 postmenopausal women from 1993-1998. From June-October 2020, participants in active follow-up were surveyed by mail, phone, or online to assess health and well-being, living situations, lifestyle, health care, and self-reported COVID-19 testing, treatment, and preventive behaviors.

Results

Of 64,061 eligible participants, 49,695 (average age 83.6 years ± 5.6) completed the COVID-19 survey (response rate 77.6%). Many participants reported very good or good well-being (75.6%). Respondents reported being very concerned about the pandemic (51.1%) (more common in urban compared to rural areas), with 6.9% reporting disruptions in living arrangements and 9.7% reporting changes in medication access. Participants (54.4%) reported physical activity levels were much less or somewhat less compared to levels before the pandemic, and this was more pronounced in urban areas vs. rural areas (55.3% vs. 44.4%). Participants engaged in preventive behaviors including wearing a face mask (93.2%). A total of 18.9% reported testing for SARS-CoV-2, among whom 3.5% (n=311) reported testing positive.

Conclusions

In this nationwide survey of older US women, the COVID-19 pandemic was associated with impacts on health and well-being, living situations, lifestyle, health care access, and SARS-CoV-2 testing and preventive behaviors.

Introduction

By February 2022, there have been over 75 million cases of COVID-19 and over 888,000 COVID-19 deaths in the US (1). Risk factors for severe illness from COVID-19 include older age (particularly ages 75 years and older), preexisting conditions (e.g., cancer, heart disease, chronic kidney disease, chronic obstructive pulmonary disease, type 2 diabetes), obesity, and smoking (2-5). While the reasons underlying the increased risk for older age groups are not fully understood, factors including high systolic blood pressure, frailty, obesity, and having multiple long-term conditions (e.g., depression, heart disease) have been shown to explain some of the excess risk in COVID-19 mortality (3, 6).

In addition to COVID-19 morbidity and mortality, the pandemic has been associated with disruptions in everyday life that have important implications for access to health care and medications, mental health, physical activity, and living situations (7-11). Older individuals represent an especially vulnerable population impacted by disruptions due to COVID-19 such as social distancing and stay-at-home orders (8). To date, there has been limited research detailing the personal and economic consequences associated with the pandemic on older individuals in the US. Starting in June 2020, the Women's Health Initiative (WHI), a nationwide prospective cohort of postmenopausal women, sent a survey to participants which included questions regarding their experiences related to the pandemic. The objectives of this paper are to describe the survey methods and to report selected population characteristics and survey responses to describe the direct and indirect effects of the pandemic on the lives of older women, including disruptions in health and well-being, living situations, lifestyle factors, and health care, as well as self-reported COVID-19 testing, diagnoses, treatment, and preventive behaviors.

Methods

Study population

The WHI is a nationwide prospective cohort study funded by the National Heart, Lung, and Blood Institute (NHLBI) that included clinical trials (CTs) and an observational study (OS) from 1993 to 2005 with overall objectives of identifying risk factors for and testing interventions to prevent the major causes of morbidity and mortality in postmenopausal women (12, 13). Between 1993 and 1998, WHI investigators at 40 US clinical centers enrolled 161,808 generally healthy postmenopausal women aged 50 to 79 years (12). At the conclusion of the CTs in 2005, CTs and OS participants were invited to consent for further follow-up in the WHI Extension Studies. Throughout the WHI, these women have provided extensive information including demographics, medical history, diet, medication and supplement use, lifestyle, psychosocial and behavioral measures, selected environmental factors, as well as blood and buffy coat (DNA) samples. At the beginning of the pandemic, 64,061 women remained alive and were in active follow-up. Annual follow-up rates have been very high (>86%) and passive follow-up through linkages to Medicare and the National Death Index (NDI) is conducted annually. The Institutional Review Board at each study site approved the protocols and participants provided written informed consent.

COVID-19 survey

From June to October 2020, active WHI participants were sent a COVID-19 survey, which included questions on the following topics: changes in living arrangements; household composition; residence-based restrictions; Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus exposures, testing, diagnoses, medical care, and preventive behaviors; medications; health conditions; health care access; health and general well-being; pandemic-related concerns; communication with friends and family; lifestyle factors including alcohol consumption, smoking,

and physical activity; and community actions to help during the pandemic (14). The survey was first administered online (using REDCap©) to participants who provided email addresses, and subsequently by mail and phone. In June 2020, the first online survey invitations were sent to participants. Phone-based surveys (for those who are followed by phone) were initiated later in June. From July to August 2020, the paper version was mailed. In September 2020, a re-mail of the paper survey was sent to online and mail non-respondents. Phone follow-up was conducted among non-respondents (with a few exceptions) who were initially contacted by phone and those who had not responded to online and paper re-mailings. Budget limitations precluded phoning all non-respondents to mail and online, so these efforts were directed at underrepresented minorities and those greater than 90 years of age to ensure representation of those important subgroups.

Statistical analysis

Chi-square tests and t-tests for categorical and continuous variables, respectively, were used to compare differences in WHI population characteristics and selected COVID-19 survey responses between survey respondents vs. non-respondents and by rural vs. urban residence, region of residence, and/or time period of survey completion (surveys completed from June to August 2020 were classified as Summer 2020 and surveys completed from September to October 2020 were classified as Fall 2020). All questions included in the COVID-19 survey are available online (14). Questions allowing multiple responses are indicated in the Tables. The current ZIP Code collected in the COVID-19 survey was used to determine rural/urban residence using US Department of Agriculture Rural-Urban Commuting Area (RUCA) codes, which classify all ZIP Codes into one of 10 main categories for metropolitan, micropolitan, small town, and rural commuting areas based on measures of population density, urbanization, and daily commuting (15). There are also 33 subcategories based on secondary commuting flows. Due to the small number of participants in the rural categories, we presented results for urban residence (RUCA codes for metropolitan: 1.0, 1.1,

2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, 9.1, 10.1) and rural residence (RUCA codes for micropolitan: 4.0, 4.2, 5.0, 5.2, 6.0, 6.1; small rural town: 7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.2; isolated small rural town: 10.0, 10.2, 10.3, 10.4, 10.5, 10.6). There were 132 participants for whom RUCA codes were missing because of an invalid ZIP Code (n=129) or the RUCA code was 99 or zero population (n=3). ZIP Codes were also used to determine the US Census region of residence (Northeast, South, Midwest, and West).

In addition, the current ZIP Code was used to map the geographic distribution of participant responses to question 21 of the COVID-19 survey ("In general, how concerned are you about the COVID-19 pandemic?") (14). As multiple participants may have resided in the same ZIP Code, the mode response was determined for each ZIP Code (not at all concerned, somewhat concerned, or very concerned). A total of 241 responses were excluded because the reported ZIP Code was not available in the 2020 US Census Bureau TIGER/Line shapefile boundaries for ZIP Code Tabulation Areas (ZCTAs) (16). All spatial analyses were conducted using ArcGIS 10.7 (Esri, Redlands, CA).

Responses to four questions (27-30) of the COVID-19 survey were used to estimate the perceived stress scale construct, which measures the degree to which situations in one's life are appraised as stressful. This was a four-item version of the 14-item Perceived Stress Scale (PSS) instrument (17), where the score values range from 0 to 16 (a higher score indicates greater perceived stress). In addition to the information collected from the COVID-19 survey, the following variables are presented, which were collected using standardized questionnaires at baseline: age at survey completion (years) (calculated using birthdate), ethnicity (not Hispanic/Latina, Hispanic/Latina, unknown/not reported), race (American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, Black, White, more than one race, unknown/not reported), and education (less than high school, high school diploma or GED, some school after high school, college degree or higher). We also used data from follow-up questionnaires collected prior to the COVID-19 survey to ascertain the following information: body mass index (BMI) (kg/m^2) from most recent data

collection, alcohol consumption from most recent data collection, any cancer except nonmelanoma skin cancer (NMSC), any fracture, autoimmune disease (includes lupus and rheumatoid arthritis), breast cancer, chronic obstructive pulmonary disease (COPD), coronary disease (includes myocardial infarction [MI], revascularization [percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG)], angina, or heart failure), current depression (Burnam score ≥0.06 from most recent data collection) (18), lifetime depression (Burnam score ≥0.06 or antidepressant medication use reported at baseline or at any time during follow-up prior to the COVID-19 survey), MI, osteoarthritis, stroke, treated diabetes, and treated hypertension. Comorbidities were identified based on adjudicated events during follow-up or self-reported disease history (19).

We conducted sensitivity analyses using inverse probability weighting (IPW) to examine the potential impact of selection bias from women who did not respond to the COVID-19 survey. The inverse probability weights were estimated by regressing a binary response variable (responded to survey vs. not) on a set of covariates including demographic characteristics, medical history, and psychosocial variables in a logistic regression model. Statistical tests were conducted in separate logistic regression models in which the response variable was urban vs. rural residence (weighted as described above). All statistical tests were two-sided and *p* < .05 was considered statistically significant. Statistical analyses were conducted using SAS 9.4 (Cary, NC).

Results

Population characteristics

Table 1 shows population characteristics for the participants who completed the COVID-19 survey. Among 64,061 participants who were eligible for contact, a total of 49,695 participants responded to the survey (response rate 77.6%) (**eFigure 1**). The majority of respondents completed the survey by mail (72.6%), followed by online (26.3%) and phone (1.1%). Most surveys were completed in August

2020 (54.1%). Overall, participants were on average 83.6 years old (± 5.6) and had an average BMI of 26.1 kg/m^2 (± 5.2). The majority of participants were non-Hispanic (96.9%, n=48,151) (2.9%, n=1,444 were Hispanic), White (89.9%) (0.2%, n=106 were American Indian/Alaska Native; 2.2%, n=1,087 were Asian; 0.1%, n=35 were Native Hawaiian/Other Pacific Islander; 5.6%, n=2,792 were Black; 1.1%, n=570 were more than one race), and/or had a college degree or higher (49.7%, n=24,513) (1.9%, n=920 had less than a high school education; 13.5%, n=6,680 had a high school diploma or GED; 34.9%, n=17,244 had some school after high school). Women were more likely to have resided in the West region of the US (29.4%), followed by the South (27.0%), Midwest (22.2%), and Northeast (21.3%). Participants residing in rural areas were slightly more likely to be White and/or live in the Midwest and less likely to have a college degree or higher compared to participants residing in urban areas (p < .0001). Participants who did not complete the survey (n=14,665) were slightly older, more likely to be Black, and less likely to have a college degree or higher (p < .0001).

Well-being, living situations, medications, and health care

Many participants reported that their current level of well-being from March to October 2020 during the COVID-19 pandemic was very good (38.7%) or good (36.9%) (**Table 2**). **eTable 1** shows current level of well-being stratified by region of residence and season of survey completion. A relatively lower proportion of participants who responded to the survey in Fall 2020 compared to Summer 2020 reported an excellent, very good, or good current level of well-being (p < .0001). Respondents reported being very concerned about the pandemic (51.1%), which was slightly more common in urban compared to rural areas (51.5% vs. 46.7%) (p < .0001). **Figure 1** shows the geographic distribution of the most frequently reported level of concern by participant ZIP Code, many of which were characterized by responses of somewhat or very concerned. Respondents resided in all 50 states across the US and Washington, D.C. The following were reported by participants as major concerns: the nation and economy more generally (69.5%), risk of family or friends getting infected

(67.3%), risk of themselves getting infected (62.1%), ability to be with family and friends (61.4%), and/or the health and safety of friends and family (58.8%) (**Table 2**). Urban compared to rural residents were slightly more concerned with getting infection (62.4% vs. 58.2%) and getting enough physical activity or exercise (24.0% vs. 14.9%) (*p* < .0001). The average perceived stress scale among participants was 4.8 (± 2.9) (responses used to calculate perceived stress are presented in **eTable 2**).

Approximately 6.9% of women reported a change in living arrangements since March 2020 due to the pandemic, which included having family or friends move in (18.2%) and/or they moved in with other family or friends (13.1%), the latter being more common among rural residents (**Table 2**). Some participants moved into a care facility (8.6%) and/or had a care provider coming to help (7.0%). Respondents in the fall compared to the summer were more likely to have reported moving in with other family or friends, have their care provider now coming to help (particularly in the Northeast and West), and/or moved into a care facility themselves (particularly in the Midwest and South) (*p* < .0001) (**eTable 1**). Living in a private home (where services and/or restrictions were not applicable) was more common among rural compared to urban participants (84.5% vs. 75.8%) (*p* < .0001). For participants who did not live in a private home, 11.4% reported that their place of residence was not allowing visitors and 11.6% reported having food delivered to the home/apartment/room (**eTable 3**). Of the participants who had close family members in assisted living, skilled nursing, or a nursing home (8.9%), around 10.8% reported being able to visit them, with a higher proportion of respondents in the fall having reported being able to visit and the lowest proportions reported in the South (irrespective of time period) (**eTable 1**).

The majority of participants reported taking prescription medications not related to COVID-19 (88.0%) (**eTable 3**). A total of 9.7% of participants reported any change in how they received their medications since March 2020, with difficulties taking medications due to delays in getting prescriptions filled (37.6%). Many participants had health care appointments scheduled from March 2020 up until survey completion (79.4%) that were impacted by the pandemic. Of these women,

nearly half reported appointment conversions to telephone or online, slightly over one-third

reported appointments being rescheduled, and about a quarter reported appointment cancellations

(all of which were more commonly reported among urban compared to rural residents, *p* < .0001).

Although participants were more likely to report no difficulty in receiving routine care since March

2020 (75.5%), 21.9% reported some difficulty.

Pandemic-related preventive behaviors, new actions, and social engagement

The majority of participants took steps since March 2020 to reduce risk of infection, including

wearing a face mask in public (93.2%), washing hands frequently (90.6%), maintaining physical

distance from people outside of their household (89.2%), avoiding shaking hands (80.8%), and/or

staying at home (78.9%) (**Table 2**). Rural participants were less likely to avoid in-person

social/religious activities compared to urban participants (68.1% vs. 74.6%) (*p* < .0001). Participants

responding in the fall compared to the summer were slightly less likely to engage in steps since

March 2020 to reduce risk of infection such as washing hands frequently and/or avoiding shaking

hands (*p* < .0001) (**eTable 1**). Respondents reported taking new actions to help family, friends, or

their community during the pandemic, including contacting friends or family to keep in touch

(71.0%), donating money (30.4%), making masks for others (11.3%), and/or getting food or medicine

for others (10.0%). Over half of participants reported communicating with others outside of their

home every day or several times per week (**Table 2**).

Lifestyle factors: alcohol consumption, smoking, and physical activity

Within the past 3 months of completing the survey, over half of respondents did not consume

alcohol (52.2%), although 13.2% consumed an average of 5-7 drinks per week and 3.4% consumed

an average of more than 7 drinks per week (**Table 3**). Alcohol consumption reported in the COVID-19

survey was lower (47.8%) compared to prior to the pandemic (72.7%) (**eTable 4**), which did not

meaningfully differ by rural vs. urban residence. A small proportion of respondents (1.3%) reported

currently smoking regular or electronic cigarettes during the pandemic.

Participants reported a level of physical activity or exercise that was much less (25.7%),

somewhat less (28.7%), or about the same (37.3%) compared to before the pandemic (**Table 3**). In

the past month of completing the survey, some women (23.2%) reported rarely or never walking

outside of their homes (or equivalent) for at least 5 minutes without stopping, while 18.5% reported

walking seven or more times per week. Participants residing in urban compared to rural areas were

more likely to report much less or somewhat less physical activity or exercise compared to before

the pandemic (55.3% vs. 44.4%) (*p* < .0001).

COVID-19 testing, diagnoses, and treatment

Most participants were never exposed to another person diagnosed or suspected of having a SARS-

CoV-2 infection (96.2%) (**Table 4**). Five percent reported having a family member or close friend die

from COVID-19. A total of 18.9% reported being tested for SARS-CoV-2, most of whom were tested

using nasal swabs (86.6%) and/or were tested once (71.9%). A total of 3.5% of these participants

(n=311) reported a positive test result, 79.6% of which were through nasal swabs. Over 71% of those

who reported testing positive reported ever being hospitalized for COVID-19. Regarding temporal

and regional differences in testing, a higher proportion of respondents in the fall compared to the

summer reported testing for SARS-CoV-2 (*p* < .0001), which was generally consistent across the

Northeast, Midwest, South, and West regions of the US (**eTable 1**).

Other information regarding participant characteristics or collected from the COVID-19

survey, including comorbidities (**eTable 5**), housing, medication, and social impacts (**eTable 6**), and

COVID-19 health care (**eTable 7**), are included as supplemental material. Results were similar when applying IPW to address potential selection bias from non-respondents (data not shown).

Discussion

In this nationwide survey of US older women aged on average 83.6 years, we described survey methods and the experiences of the COVID-19 pandemic using a range of measures regarding health and well-being, living situations, lifestyle factors, and health care. Responses were collected from March to October 2020, which was during the first wave of the pandemic, although the impact of the pandemic (e.g., infection rates, lockdown measures) varied from location to location across the US (20). WHI participants were more likely to report very good or good levels of well-being, but in lower frequency in the fall compared to the summer. Respondents reported being very concerned about the pandemic (more commonly reported among urban residents), with many participating in preventive behaviors including wearing a face mask (which were more commonly practiced in the summer compared to the fall). The most common disruption in living arrangements included having family or friends move in, although a higher proportion of respondents in the fall compared to the summer reported moving into a care facility and/or having their care provider come to help. Many women reported changes in medication and health care access, which included delays in getting prescriptions filled and health care appointment conversions to telephone or online (the latter more commonly reported among urban residents). There were notable changes in lifestyle factors; for example, over half of women reported less physical activity or exercise compared to before the pandemic, which was more commonly reported among women residing in urban areas. A lower proportion of women reported consuming alcohol compared to reports from prior to the COVID-19 pandemic. Although the prevalence of SARS-CoV-2 infection was low in this study population, some observed trends included a higher proportion of respondents reporting having tested for SARS-CoV-

14

2 in the fall compared to the summer. To our knowledge, this survey represents one of the first to describe the impact of the pandemic among a large cohort of US older women.

Overall, WHI participants reported generally high levels of current well-being from March to October 2020 irrespective of geography. These women also experienced low levels of perceived stress, a measure of control and coping (17). Older adults generally have better emotional regulation and positive affective experience compared to younger adults (21). There is also evidence showing that older adults may be less impacted by mental health outcomes compared to younger adults during the pandemic, with lower rates of anxiety disorder, depressive disorder, or trauma- or stress-related disorder, substance abuse, and suicidal ideation among individuals aged 65 years or older (22). Older adults are also more likely to be resilient and have higher levels of wisdom (23-25), which has been associated with adapting to encountered circumstances, accelerating recovery, and mitigating the negative impacts of a crisis (26). Studies conducted in other countries during the pandemic, including Spain and Canada, have shown that older age ≥60 years was associated with lower rates of depression, anxiety, posttraumatic stress disorder, and less reactivity to stressors (27, 28). Social support has also been associated with a protective association with psychological distress and loneliness (26). This is consistent with our finding that a large proportion of WHI participants communicated and engaged with their community, family, and friends during the pandemic, including reports of engaging in new activities such as philanthropy. However, there was a slight decrease in the proportion of women reporting high levels of current well-being in Fall 2020 compared to Summer 2020, potentially due to the long-term effects of social isolation (29). Further, a large proportion of respondents reported being very concerned about the pandemic (especially in urban areas), including concern regarding risk of themselves and/or their family and friends being infected with SARS-CoV-2 (which remained high over time). Further research into the long-term changes in mental health and well-being associated with prolonged disruptions due to the pandemic are warranted.

Testing for SARS-CoV-2 (mostly using nasal swabs) increased over time, although the positivity rate in this study population was low (3.5%). A small proportion of participants reported exposure to another person diagnosed or suspected of having COVID-19. This is consistent with the high rates of participants adopting preventive behaviors to reduce risk of infection, including wearing a face mask, washing their hands, social distancing, and/or staying at home. However, there was a slight decline in the proportion of participants engaging in preventive measures in the fall compared to the summer. Further, in rural areas compared to urban areas, women were less likely to have avoided in-person social/religious activities. Research has shown that rural residents may be less likely to engage in social distancing measures and to wear a face mask during the pandemic (30-32).

Although the majority of participants resided in a private home, there were reported disruptions in living arrangements due to the pandemic, which differed by geography and over time. Rural compared to urban participants, as well as respondents to the survey in the fall compared to the summer, were more likely to report moving in with other family or friends. In the fall compared to summer, women in the Northeast and West were more likely to report having their care provider now coming to help, while women in the Midwest and South were more likely to report having moved into a care facility. Participants also reported lower levels of physical activity compared to before the pandemic, especially among women in urban areas. Although stay-at-home orders and closures of non-essential businesses, such as fitness centers, were implemented to reduce transmission of the virus and the overall burden of the pandemic, this disruption minimized opportunities for physical activity, which may have short- and long-term effects on health among older adults (33, 34). Reported levels of alcohol consumption were also lower compared to prior to the pandemic, which has been observed in research showing that US adults aged 21 years and older who reported decreased alcohol consumption during the pandemic cited reasons related to diminished alcohol availability, less free time, and/or having fewer financial resources (35).

A small proportion of respondents (~10%) reported changes in how they were receiving their prescription drugs since March 2020, while a larger proportion of participants were impacted by disruptions in health care appointments such as rescheduling or cancellations. Many reported conversions to telephone or online appointments, which was more common in urban areas. These results highlight geographic disparities in health care services, where telehealth and other technologies are more commonly provided in urban areas compared to rural areas due to barriers regarding the logistics of implementing telehealth, lack of partners or providers, and limited broadband access (36).

This study has several limitations. The generalizability of the results may be limited as WHI participants are generally healthier and of higher socioeconomic status compared to the general US population and the majority of participants are White and/or non-Hispanic. Further, other considerations potentially impacting generalizability include how 41.4% of participants (67,006/161,808) were deceased when COVID-19 survey administration commenced in June 2020 and how WHI participants who were most severely impacted by COVID-19 illness may have been less likely to be able to complete the COVID-19 survey. Future research should explore pandemic-related disruptions reported in the WHI compared to other populations. However, given the small number of participants who did report a COVID-19 diagnosis, this is unlikely to have significantly impacted our overall results. There are notable strengths, including robust data collection to assess the impact of the COVID-19 pandemic on a large number of measures regarding health and health care, living arrangements, lifestyle, and COVID-19 exposures and treatment. This survey was administered to a large number of older women residing across the US, characterized by a diversity of rural and urban geographic locations.

In conclusion, results from this nationwide survey of older US women in the WHI showed that the COVID-19 pandemic was associated with impacts on health and well-being, living situations, lifestyle, health care access, and SARS-CoV-2 testing and preventive behaviors. Data collected from

this COVID-19 survey can be combined with the extensive database of time-varying WHI information on health, including prior longitudinal questionnaires, linkages with Medicare, the NDI, and the WHI biorepository to enable the investigation of innovative research questions on the short- and long-term health impacts of the pandemic. Further, a re-administration of this COVID-19 survey in late 2021 will provide additional information on the longer term impact of the pandemic and opportunities for future research.

Conflicts of interest

The authors declare no conflicts of interest.

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Table 1. Population characteristics for WHI participants: overall and by rural/urban residence

	Overall (N=49,695)		Rural residence (N=3,923)		Urban residence (N=45,640)			Did not complete survey (N=14,655)		
	N	%	N	%	N	%	*P* value	N	%	*P* value
Age at survey completion (years), mean (SD)	83.6	5.6	83.3	5.5	83.6	5.6	.0009	86.5	6.0	<.0001
70-74	993	2.0	81	2.1	907	2.0	.0611	167	1.1	<.0001
75-79	12324	24.8	1028	26.2	11261	24.7		1955	13.3	
80-84	16083	32.4	1284	32.7	14754	32.3		3518	24.0	
85-89	12160	24.5	937	23.9	11191	24.5		4059	27.7	
90-94	6445	13.0	484	12.3	5949	13.0		3540	24.2	
≥95	1690	3.4	109	2.8	1578	3.5		1416	9.7	
Body mass index at survey completion (kg/m^2), mean (SD)	26.1	5.2	26.5	5.3	26.0	5.2	<.0001	25.9	5.6	.0004
< 25	23154	47.8	1669	43.5	21437	48.2	<.0001	5735	50.1	<.0001
25 - < 30	15708	32.4	1309	34.1	14365	32.3		3495	30.5	
≥30	9564	19.7	859	22.4	8680	19.5		2214	19.3	
Ethnicity							<.0001			<.0001
Not Hispanic/Latina	48151	96.9	3878	98.9	44159	96.8		14030	95.7	

25

	N	%	N	%	N	%	p-value	N	%	p-value
Hispanic/Latina	1444	2.9	41	1.0	1385	3.0		590	4.0	
Unknown/Not reported	100	0.2	4	0.1	96	0.2		35	0.2	
Race							<.0001			<.0001
American Indian/Alaska Native	106	0.2	22	0.6	83	0.2		40	0.3	
Asian	1087	2.2	18	0.5	1068	2.3		309	2.1	
Native Hawaiian/Other Pacific Islander	35	0.1	3	0.1	32	0.1		18	0.1	
Black	2792	5.6	72	1.8	2711	5.9		1538	10.5	
White	44672	89.9	3748	95.5	40814	89.4		12369	84.4	
More than one race	570	1.1	46	1.2	521	1.1		216	1.5	
Unknown/Not reported	433	0.9	14	0.4	411	0.9		165	1.1	
Years of education							<.0001			<.0001
Less than high school	920	1.9	79	2.0	839	1.9		598	4.1	
High school diploma or GED	6680	13.5	678	17.4	5988	13.2		2551	17.5	
Some school after high school	17244	34.9	1530	39.2	15662	34.6		5496	37.7	

College degree or higher	24513	49.7	1615	41.4	22835	50.4		5922	40.7
Month of survey completion[a]							.0142		
June	13043	26.2	939	23.9	12076	26.5			
July	241	0.5	18	0.5	210	0.5			
August	26862	54.1	2207	56.3	24612	53.9			
September	6372	12.8	506	12.9	5830	12.8			
October	3177	6.4	253	6.4	2912	6.4			
Survey mode							.0020		
Online	13072	26.3	940	24.0	12109	26.5			
Paper	36056	72.6	2942	75.0	33047	72.4			
Phone	567	1.1	41	1.0	484	1.1			
Region of residence							<.0001		
Northeast	10570	21.3	412	10.5	10155	22.3			
Midwest	11025	22.2	1580	40.3	9445	20.7			
South	13374	27.0	1051	26.8	12323	27.0			
West	14597	29.4	880	22.4	13717	30.1			

Notes: SD = standard deviation.

[a]Survey completion in July is relatively lower compared to other months because the majority of online surveys were completed in June (initial REDCap invitations were sent June 5, 2020), a small number of phone follow-up results were completed in July (phone follow-up began on June 18, 2020), and due to the duration for mail responses to be sent and returned (paper surveys were mailed from July 13 to August 5, 2020).

Table 2. Impact of the COVID-19 pandemic on well-being, living situations, medications, and health care: overall and by rural/urban residence

	Overall (N=49,695)		Rural residence (N=3,923)		Urban residence (N=45,640)		
	N	%	N	%	N	%	*P* value
Current level of well-being							.6576
Excellent	4915	10.0	390	10.0	4512	10.0	
Very Good	19045	38.7	1543	39.7	17465	38.7	
Good	18151	36.9	1414	36.4	16680	37.0	
Fair	5967	12.1	462	11.9	5485	12.2	
Poor	901	1.8	62	1.6	838	1.9	
Very Poor	171	0.3	16	0.4	155	0.3	
How concerned about the COVID-19 pandemic							<.0001
Not at all concerned	3245	6.8	297	7.8	2937	6.7	
Somewhat concerned	20247	42.2	1726	45.5	18454	41.8	
Very concerned	24533	51.1	1774	46.7	22709	51.5	
Pandemic causing concerns about the following[a]							
Risk of getting COVID-19 infection	30849	62.1	2283	58.2	28476	62.4	<.0001
Risk of family/friends getting COVID-19 infection	33448	67.3	2570	65.5	30806	67.5	.0109
Getting the health care I need	5714	11.5	366	9.3	5339	11.7	<.0001

Getting adequate food	1375	2.8	76	1.9	1294	2.8	.0010
Getting enough exercise/physical activity	11587	23.3	586	14.9	10976	24.0	<.0001
Getting the sleep I need	3813	7.7	224	5.7	3578	7.8	<.0001
Having adequate housing	299	0.6	15	0.4	283	0.6	.0646
Having enough money to cover my needs	2380	4.8	162	4.1	2210	4.8	.0448
My personal safety	8189	16.5	581	14.8	7583	16.6	.0035
Health and safety of my family/friends	29226	58.8	2231	56.9	26933	59.0	.0089
My financial security	3795	7.6	235	6.0	3547	7.8	<.0001
Financial security of my family	5168	10.4	344	8.8	4807	10.5	.0005
Ability to be with family and friends	30533	61.4	2300	58.6	28167	61.7	.0001
Nation and economy more generally	34561	69.5	2723	69.4	31764	69.6	.8083
Perceived stress scale, mean (SD)	4.8	(2.9)	4.6	(2.9)	4.8	(2.9)	.0023
Living arrangement changed since March 2020 due to pandemic[a]	3351	6.9	273	7.1	3067	6.8	.6072
If yes, what changed							
Moved in with other family or friends	356	13.1	45	20.0	310	12.5	.0013
Family or friends moved in	495	18.2	41	18.2	454	18.3	.9881
Household members moved away	148	5.4	11	4.9	137	5.5	.6941

Moved out of shared housing	62	2.3	11	4.9	51	2.1	.0064
Care provider now comes to help	190	7.0	16	7.1	173	7.0	.9316
Care provider no longer comes to help	92	3.4	6	2.7	86	3.5	.5294
Moved into care facility	233	8.6	20	8.9	212	8.5	.8529
Moved out of care facility	61	2.2	8	3.6	53	2.1	.1679
Other changes	1404	51.6	105	46.7	1291	51.9	.1303
Steps taken since March 2020 to reduce risk of infection by COVID-19[a]							
Washing hands frequently	45019	90.6	3564	90.8	41335	90.6	.5625
Trying not to touch face	32157	64.7	2440	62.2	29640	64.9	.0006
Disinfecting surfaces frequently	25227	50.8	1960	50.0	23200	50.8	.2951
Maintaining physical distance from people outside household	44344	89.2	3431	87.5	40809	89.4	.0001
Wearing a face mask in public	46309	93.2	3607	91.9	42599	93.3	.0009
Wearing gloves in public	9517	19.2	555	14.1	8934	19.6	<.0001
Avoiding in-person social/religious activities	36786	74.0	2673	68.1	34032	74.6	<.0001
Avoiding or limiting in-person shopping	34828	70.1	2630	67.0	32122	70.4	<.0001
Avoiding shaking hands	40159	80.8	3072	78.3	36999	81.1	<.0001
Staying home	39210	78.9	3022	77.0	36085	79.1	.0028
New actions taken to help							

family/friends/community during pandemic[a]							
Getting food or medicine for others	4847	10.0	372	9.8	4461	10.0	.6233
Providing childcare	979	2.0	91	2.4	888	2.0	.0962
Donating blood	768	1.6	81	2.1	686	1.5	.0054
Donating money	14679	30.4	1010	26.6	13632	30.7	<.0001
Making masks for others	5455	11.3	542	14.3	4905	11.0	<.0001
Contacting friends/family to keep in touch	34318	71.0	2638	69.4	31603	71.1	.0270
Other actions	1933	4.0	141	3.7	1789	4.0	.3411
No new actions	10258	21.2	834	21.9	9388	21.1	.2344
How often communicate with others outside home							.1133
Every day	22819	47.8	1743	46.3	21030	48.0	
Several times per week	16043	33.6	1326	35.2	14663	33.4	
1-2 times per week	5326	11.2	404	10.7	4906	11.2	
Once per week	1945	4.1	155	4.1	1784	4.1	
Rarely or never	1607	3.4	140	3.7	1462	3.3	

Notes: SD = standard deviation.

[a] The COVID-19 survey allowed participants to mark multiple responses to this question.

Table 3. Lifestyle factors during the COVID-19 pandemic: overall and by rural/urban residence

	Overall (N=49,695)		Rural residence (N=3,923)		Urban residence (N=45,640)		
	N	%	N	%	N	%	*P* value
In past 3 months, average number of alcoholic drinks							<.0001
None	25600	52.2	2168	56.1	23356	51.9	
At most one drink each week	9103	18.6	672	17.4	8413	18.7	
2-4 drinks per week	6142	12.5	446	11.5	5674	12.6	
5-7 drinks per week	6483	13.2	451	11.7	6021	13.4	
More than 7 drinks per week	1674	3.4	127	3.3	1544	3.4	
Currently smoke regular or electronic cigarettes	618	1.3	50	1.3	565	1.3	.8355
Over past month, level of physical activity or exercise compared to average before pandemic							<.0001
Much less	12568	25.7	733	19.0	11809	26.3	
Somewhat less	14051	28.7	976	25.4	13027	29.0	
About the same	18233	37.3	1778	46.2	16413	36.5	
Somewhat more	3226	6.6	281	7.3	2937	6.5	
Much more	852	1.7	80	2.1	768	1.7	
How often walked outside home or equivalent for at least 5 minutes without stopping							.6021

Rarely or never	11290	23.2	888	23.2	10376	23.2
1 time each week	5084	10.4	420	11.0	4649	10.4
2 to 3 times each week	11392	23.4	882	23.0	10471	23.4
4 to 6 times per week	11959	24.5	955	24.9	10978	24.5
7 or more times per week	9038	18.5	683	17.8	8333	18.6

Table 4. COVID-19 exposures, testing, and medical care: overall and by rural/urban residence

	Overall (N=49,695)		Rural residence (N=3,923)		Urban residence (N=45,640)		
	N	%	N	%	N	%	P value
Ever exposed to another person diagnosed or suspected of having COVID-19							.0825
No, not that I know of	47137	96.2	3744	96.9	43265	96.2	
Yes, someone outside of household	1495	3.1	97	2.5	1396	3.1	
Yes, someone living with me	346	0.7	23	0.6	321	0.7	
Family member or close friend died from COVID-19							.0023
No	46524	95.0	3721	96.0	42679	94.9	
Yes	2447	5.0	154	4.0	2287	5.1	
Tested for SARS-CoV-2							.0003
No	39453	80.5	3199	82.5	36149	80.4	
Yes	9241	18.9	646	16.7	8572	19.1	
Unsure	287	0.6	31	0.8	256	0.6	
If tested, test method[a]							.4283
Nasal swab	7714	86.6	547	87.7	7150	86.5	.1658
Throat swab	902	10.1	53	8.5	845	10.2	.5906
Saliva test	281	3.2	22	3.5	259	3.1	.0146
Blood test	1139	12.8	60	9.6	1074	13.0	
If tested, number of times							.0066

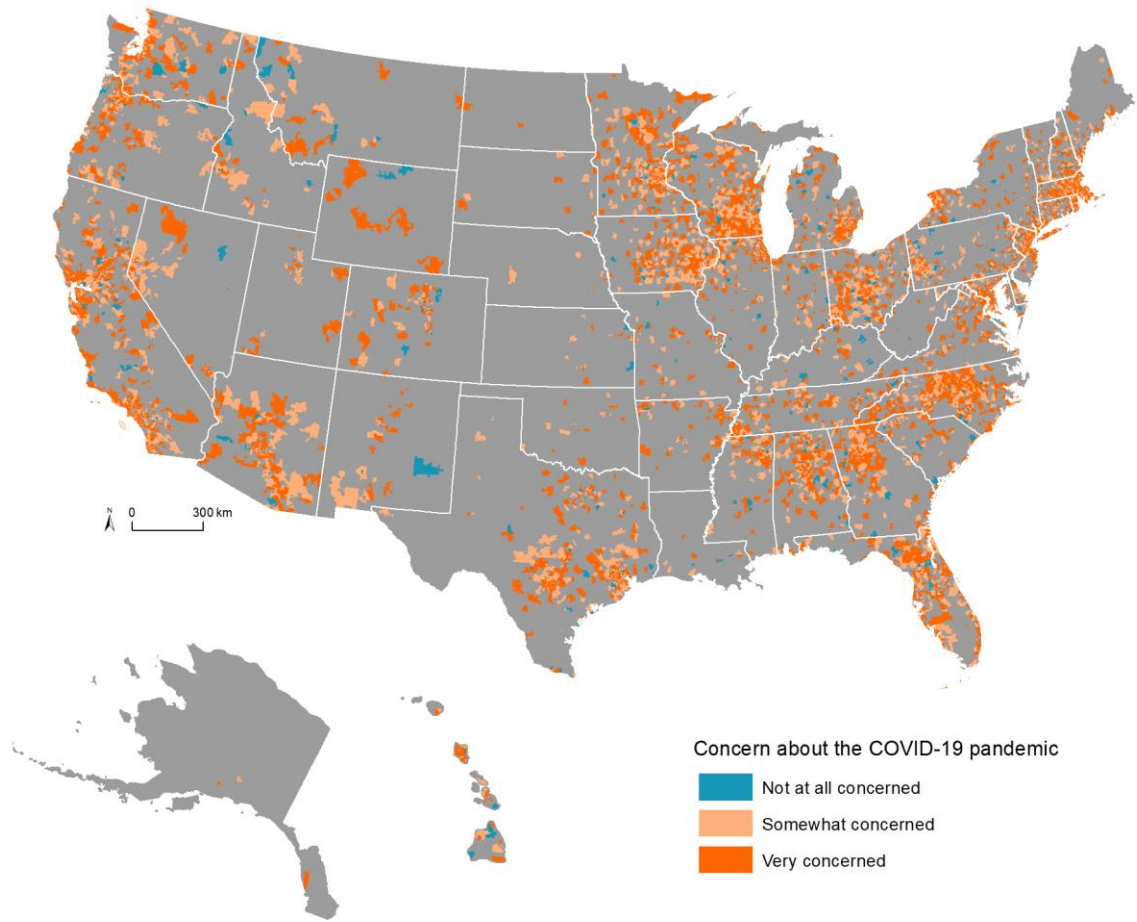|							
1	6480	71.9	486	77.4	5977	71.5	
2	1555	17.3	96	15.3	1454	17.4	
3 or more	872	9.7	40	6.4	831	9.9	
Unsure	104	1.2	6	1.0	98	1.2	
If tested, positive test result							.1279
No	8368	94.0	581	93.3	7766	94.1	
Yes	311	3.5	19	3.0	290	3.5	
Unsure	223	2.5	23	3.7	200	2.4	
If positive result, which test(s) were positive[a]							.8522
Nasal swab	222	79.6	13	81.3	207	79.3	.5070
Saliva test	7	2.5	0	0.0	7	2.7	.0995
Throat swab	22	7.9	3	18.8	19	7.3	.1518
Blood test	57	20.4	1	6.3	55	21.1	
Ever hospitalized for COVID-19							.6938
No	214	71.6	11	64.7	202	72.1	
Yes	81	27.1	6	35.3	75	26.8	
Unsure	4	1.3	0	0.0	3	1.1	

[a] The COVID-19 survey allowed participants to mark multiple responses to this question.

Figure legends

Figure 1. Concern regarding the COVID-19 pandemic among Women's Health Initiative (WHI) participants from March to October 2020. The mode survey response reported by WHI participants residing in each ZIP Code is shown. Geographic areas where participants were not at all concerned are shown in blue. Locations where participants were somewhat or very concerned are shown in orange.

Figure 1

Concern about the COVID-19 pandemic

- Not at all concerned
- Somewhat concerned
- Very concerned