Continuity of care among postmenopausal women with cardiometabolic diseases in the United States early during the COVID-19 pandemic: Findings from the Women's Health Initiative

Eugenia Wong, MHS[1], Nora Franceschini, MD, MPH[1], Lesley F. Tinker, PhD, RD[2], Sherrie Wise Thomas, DrPH, MPH, MCHES[3], JoAnn E. Manson, MD, DrPH[4], Nazmus Saquib, PhD, MBBS, MPH[5], Simin Liu, MD, ScD[6], Mara Vitolins, DrPH, MPH, RDN[7], Charles P. Mouton, MD, MS[8], Mary Pettinger, MS[2], Chris Gillette, PhD[7,9]

[1]Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC
[2]Division of Public Health Sciences, Fred Hutchinson Cancer Research Center, Seattle, WA
[3]Wake Forest School of Medicine, Clinical and Translational Science Institute, Winston-Salem, NC
[4]Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA
[5]College of Medicine, Sulaiman AlRajhi University, Saudi Arabia
[6]Department of Epidemiology, School of Public Health, Brown University, Providence, RI
[7]Department of Epidemiology and Prevention, Division of Public Health Sciences, Wake Forest School of Medicine, Winston-Salem, NC
[8]Department of Family Medicine, University of Texas Medical Branch, Galveston, TX
[9]Department of Physician Assistant Studies, Wake Forest School of Medicine, Winston-Salem, NC

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Corresponding Author:

Eugenia Wong, MHS

eugeniasw@unc.edu

University of North Carolina at Chapel Hill | Gillings School of Global Public Health

123 W. Franklin Street | Suite 4240-A

Chapel Hill, North Carolina, 27516

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Abstract

Background:

In response to the COVID-19 pandemic, public health measures, including stay-at-home orders, were widely instituted in the United States (US) by March 2020. However, few studies have evaluated the impact of these measures on continuity of care among older adults living with chronic diseases.

Methods:

Beginning in June 2020, participants of the national Women's Health Initiative (WHI) (N=64,061) were surveyed on the impact of the pandemic on various aspects of their health and well-being since March 2020, including access to care appointments, medications, and caregivers. Responses received by November 2020 (response rate=77.6%) were tabulated and stratified by prevalent chronic diseases, including hypertension, type 2 diabetes, and cardiovascular disease (CVD).

Results:

Among 49,695 respondents (mean age=83.6 years), 70.2% had a history of hypertension, 21.8% had diabetes, and 18.9% had CVD. Half of respondents reported being very concerned about the pandemic and 24.5% decided against seeking medical care to avoid COVID-19 exposure. A quarter reported difficulties with getting routine care and 45.5% had in-person appointments converted to telemedicine formats; many reported cancelled (27.8%) or rescheduled (37.7%) appointments. Among those taking prescribed medication (88.0%), 9.7% reported changing their method of obtaining medications. Those living with and without chronic diseases generally reported similar changes in care and medication access.

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Conclusions:

Early in the pandemic, many older women avoided medical care or adapted to new ways of receiving care and medications. Therefore, optimizing alternative services, like telemedicine, should be prioritized to ensure that older women continue to receive quality care during public health emergencies.

Keywords:

Continuity of care, Health services, Chronic disease, COVID-19, Women's health

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Background:

As the coronavirus disease-19 (COVID-19) pandemic began to unfold, the majority of states in the U.S. had issued stay-at-home orders and declared States of Emergency by March 2020.[1] Although these measures were instituted to mitigate the spread of COVID-19, early evidence suggested they resulted in adverse, unintended consequences for individuals requiring care for non-COVID-related medical conditions.[2-4] In the setting of acute care, hospitals saw abrupt declines in emergency department visits, even for potentially fatal conditions such as myocardial infarction and stroke.[4-7] Furthermore, the prioritization of COVID-19 had many hospitals postpone or cancel in-person appointments for non-emergent conditions,[8] with some facilities converting entire wards to care for suspected COVID-positive patients,[9,10] leading to a large increase in telehealth utilization and a backlog of millions of elective procedures across the country.[11-15]

The changes resulting from the COVID-19 pandemic may have had a negative impact on continuity of care among those living with chronic diseases, especially those in underserved and vulnerable populations. The World Health Organization (WHO) defines continuity of care as reflecting "the extent to which a series of discrete health care events is experienced by people as coherent and interconnected over time and consistent with their health needs and preferences".[16] Elements of care continuity that could be affected by pandemic restrictions include access to health care, access to medications, and changes in living arrangements (and caregivers), among others. Maintaining continuity of care has been shown to be associated with improved patient outcomes and medication adherence, and reduced acute healthcare utilization and costs, whereas delaying or forgoing care may result in worsened morbidity, impacting quality of life and mortality.[17-23]

During the pandemic, individuals with chronic conditions likely had reduced access to health care services.[2] Recent estimates from the Centers for Disease Control and Prevention (CDC) found that 41% of adults in the US delayed or cancelled medical care due to COVID-19, including 12% who avoided urgent or emergency care.[2] More recently, a Robert Wood Johnson Foundation survey of 4,003 adults (ages 18 to 64) found that nearly one-third of respondents reported that their health condition(s) worsened because of delaying or forgoing care.[24]

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COVID-19 restrictions also likely impacted many older adults by affecting their access to medications. National surveys estimate that 89% of adults over the age of 65 currently take at least one prescription medication and the most commonly reported medications are those prescribed to manage chronic conditions: lipid-lowering agents, antidiabetic agents, and antihypertensives.[25] During the pandemic, there have been reports of pharmacy closures due to staffing shortages or COVID-19 exposure, increased demands for certain medications that could result in drug shortages, stockpiling of medications by patients, and inappropriate hoarding of medications by providers.[26,27] Stay-at-home orders, physical distancing mandates, and resultant changes in living arrangements may also have made it difficult for older adults to receive care from home health staff or informal caregivers who promote medication adherence and disease monitoring. More than 22% of adults describe being an informal caregiver to a friend or family member, and caregiving duties commonly involve medication management.[28]

Although previous works have assessed the impact of the ongoing pandemic on emergency department utilization and hospitalizations,[5-7,29] relatively little is known about how individuals with chronic conditions have been affected. While several studies have attempted to assess the impact of COVID-era restrictions on continuity of care, most have focused on singular elements care (e.g. telehealth usage) and relied on cross-sectional surveys administered to small samples.[2,30-32] Understanding the association of pandemic restrictions with different facets of medical care is important for both preventing severe COVID-19 infection and promoting continuity of care among older adults. Furthermore, the frequency of disruptions in care and potential differences by demographic characteristics, have not been well-studied in a diverse sample of older adults. Therefore, the objective of this study is to provide an overview of how COVID-19 restrictions may have disrupted access to medical care, medications, and caregiving in a diverse cohort of older women with hypertension, type 2 diabetes, and cardiovascular disease (CVD).

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Methods:

Study Population

Since the study's inception in 1993, the characteristics of the WHI study population have been described in previous works.[33-35] Briefly, the WHI recruited 161,808 postmenopausal women of diverse racial, ethnic, and socioeconomic backgrounds from 40 clinical centers across the U.S. Participants were recruited to be part of either one, two, or three clinical trials (n=68,132) or an observational study (n=93,676).[36] Informed consent was obtained for all participants and the institutional review boards of each study center approved the WHI protocol. After the conclusion of the WHI clinical trials in 2005, participants were invited to continue participating in a series of extension studies (Extension 2005-2010, n=115,407; Extension 2010-2020, n=93,567) during which they were contacted annually to provide updates on their health.

Beginning in 2010, adjudication of CVD outcomes was reduced to a subset of extension study participants, the Medical Records Cohort (MRC, n=22,316). The MRC is comprised of all former hormone trial participants, and all non-Hispanic Black/African American and Hispanic/Latina participants regardless of their previous study enrollment. In the MRC, participants' annually self-reported cardiovascular outcomes are further confirmed through review of their medical records by trained study adjudicators.[37,38] All other remaining participants were part of the Self-Report Cohort (SRC, n=71,251), in which active annual outcome data collection is limited to self-report, except for cancer outcomes. We used data from both the SRC and MRC in our main analysis.

In previous studies that compared self-reported versus adjudicated outcomes in WHI, it was found that adjudication confirmed 50-70% of self-reported cardiovascular diagnoses. Often, adjudication resulted in a different, but related, diagnosis.[38,39] To investigate potential differences between the MRC versus the combined SRC and MRC population, we performed a sensitivity analysis limiting to respondents from the MRC, only considering women who had adjudicated cardiovascular outcomes as having CVD. Additional sensitivity analyses were performed to examine

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potential differences based on geographic region (Western, Midwest, Northeast, South) and age (<85 years vs ≥85 years).

Baseline demographic characteristics were collected at study baseline. Current body mass index (BMI) was estimated using historic, measured height, which was collected during the main WHI studies among all participants, and self-reported weight, which was collected throughout the WHI Extension studies. On average, self-reported weight was collected 1.9 years prior to participants' COVID-19 survey. Data on physical functioning and activities of daily living (ADL) were collected within 2 years of COVID-19 survey completion. Self-reported physical functioning was evaluated using the Medical Outcomes Study Scale (Rand SF-36 questionnaire),[40] with scores ranging between 0-100 and low physical functioning defined by a score below 70. Participants also self-reported whether they needed help with ADLs, such as feeding and dressing oneself.

At WHI study baseline, the age range of participants was 50-79 years of age; currently, participants are 69-101 years of age, with 18% being over the age of 90.[33,39] As of February 2020, 74% of actively enrolled WHI participants have developed at least one morbidity, such as hypertension, diabetes, or CVD (excluding fatal MI).[39] Additional details on the design and methodological features of WHI have been published.[33-35]

WHI COVID-19 Survey

The inclusion criterion of this analysis was response to the WHI COVID-19 Survey, a questionnaire that was administered to all active WHI participants between June-August 2020 (n=64,061). The final analytic cohort of this study consisted of 49,695 women (MRC, n=10,700; SRC, n=38,995) who responded to the survey by November 1, 2020 (response rate=77.6%). The WHI COVID-19 Survey queried participants on various experiences relating to the COVID-19 pandemic. It included questions on participants' current zip code; living arrangements; COVID-19 exposures, testing, and treatment; COVID-19-related concerns, including concern for basic needs (food, housing, financial resources); general health and well-being; social support and isolation; and recent changes to

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healthcare utilization, including access to health care appointments, medications, and caregivers. The reported zip code was used to determine each participant's geographic region and residence type (urban vs rural) at the time of survey completion. The WHI COVID-19 Survey is publicly available (Version 1, https://www.whi.org/doc/WHI-COVID-19-Survey.pdf).

Access to Health Care Appointments, Medications, and Caregivers

Through the WHI COVID-19 Survey, participants provided a categorical response as to whether they had any of the following since March 2020: scheduled health care appointments (yes/no/unsure), rescheduled or cancelled appointments, in-person appointments converted to telehealth formats, decided not to go to a doctor/hospital to avoid potential COVID-19 exposure (yes/no), or faced challenges in receiving routine medical care (none/some/much/unable or difficult). Items concerning medication management were also measured categorically. Participants self-reported information regarding their current prescription medication use for conditions unrelated to COVID-19 (yes/no). Further, they reported on their current methods of obtaining medication, whether this was through their local pharmacy, a delivery service, another person, the facility in which they lived, or another method. Respondents were also asked to describe any new barriers to taking their medication, including delays in having prescriptions filled, delaying or not taking medication, no longer having someone to assist with medication management, difficulties with paying for medication, or other problems. Respondents provided dichotomous (yes/no) responses to describe whether they had experienced changes in their living arrangements, including changes in their caregiving relationships.

Hypertension, Diabetes, and Cardiovascular Disease

Data collected during WHI follow-up, between study baseline and each participant's date of WHI COVID-19 Survey completion, was used to categorize women as having existing hypertension,

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type 2 diabetes, or CVD. A participant was considered hypertensive at survey completion, if she self-reported having a doctor or other healthcare provider had prescribed pills for high blood pressure or hypertension previously during follow-up. A participant was considered to have diabetes if she self-reported having a doctor or health care provider prescribe insulin, pills/medication other than insulin, or diet and/or physical activity to treat diabetes during follow-up. As both MRC and SRC participants were included in this analysis, a participant was considered to have existing CVD, if she had self-reported a hospitalization or outpatient diagnosis during follow-up involving clinical myocardial infarction, coronary artery bypass graft/percutaneous carotid intervention (CABG/PCI), carotid artery disease (CAD), heart failure, stroke, peripheral vascular disease (PVD), deep vein thrombosis (DVT), or pulmonary embolism (PE). Due to the chronic nature of hypertension, diabetes, and CVD, if participants self-reported any of these conditions during follow-up, they were considered to have these conditions when they completed the WHI COVID-19 Survey.

Statistical Approach

We tabulated descriptive statistics (frequencies and percentages) of participant responses to the WHI COVID-19 Survey, with a focus on questions relating to health care appointments, medication management, and living arrangements. Percentages were calculated after excluding for missing values, since not all respondents (n=49,695) provided responses for every survey question. In some cases, questions allowed participants to select more than one response. Results were stratified by outcome groups, among participants who had hypertension, diabetes, or CVD. These groups were not mutually exclusive; a participant was included in more than one outcome group if she had more than one chronic condition. Overall frequencies, inclusive of responses from participants without hypertension, diabetes, or CVD, were also calculated.

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Results:

Population Characteristics

Among 49,695 survey respondents, most self-reported as non-Hispanic White at study baseline (88.2%) followed by non-Hispanic Black/African American (5.8%), Hispanic/Latina (2.4%), Asian/Pacific Islander (2.3%), and Native American/Native Alaskan (0.3%) **(Table 1**). Half of participants had a college degree or higher level of education, while 13.5% had a high school diploma or GED. Baseline income was evenly distributed among respondents, with 28.8% of participants reporting an annual household income of greater than $75,000 and 25.7% reporting an annual household income of less than $35,000. Non-respondents were more likely to be non-Hispanic Black/African American, have less than a college degree, and be slightly older than survey respondents.[41]

At the time of survey completion, the mean age of participants was 83.6 years (standard deviation [SD] 5.6) with many being over the age of 85 (40.8%). Nearly half of participants had a BMI of less than 25 while 19.7% had a BMI indicative of obesity. A large proportion of respondents were living in urban areas (92.1% versus 7.9% rural) but were spread across all geographic regions throughout the US. Based on outcomes data collected during WHI follow-up, 70.2% respondents had hypertension, 21.8% respondents had diabetes, and 18.9% respondents had CVD. The most common cardiovascular conditions among survey respondents were CABG/PCI, stroke, and clinical MI. In comparison, non-respondents tended to have a higher prevalence of hypertension (70.2%), diabetes (25.9%), and CVD (27.8%). Half of respondents expressed that they were very concerned about the COVID-19 pandemic, 42.2% were somewhat concerned, and 6.8% were not at all concerned.

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Access to Health Care Appointments

Overall, 79.4% of respondents reported having health care appointments scheduled since March 2020, with a considerable proportion reporting that their appointments were cancelled (27.8%) or rescheduled (37.7%) (**Table 2**). In comparison to the overall sample, participants with

hypertension, diabetes, and CVD reported similar numbers of cancellations and rescheduled appointments. Among all respondents, 45.4% reported that their appointment was converted to a phone call or online/video visit, but conversion to telehealth appointments was reported slightly more frequently among those with hypertension (47.1%), diabetes (49.8%) and CVD (51.0%).

A quarter of all respondents reported that they had decided not to go to the doctor or hospital to avoid potential COVID-19 exposure (23.1%). This result was consistent across outcome groups, including those with hypertension (24.2%), diabetes (25.5%), and cardiovascular disease (24.8%). Overall, 24.5% of respondents reported at least some difficulty with getting routine medical care and no differences were observed across those with hypertension, diabetes, or CVD.

Reports of appointment cancellation and rescheduling were comparable across specific CVD conditions. (**Supplementary Table 1**). Participants with stroke were the least likely to report having an appointment converted to a telehealth format (48.0%) while those with PVD were the most likely to do so (54.3%). Among those with CVD, respondents with PVD, DVT, and PE were the most likely to report having at least some difficulties with getting routine medical care.

Access to Medications

Overall, 88.0% of respondents reported taking a prescription medication, these percentages were between 91.5% and 92.7% for those with hypertension, diabetes, or CVD (**Table 3**). While 21,332 (84.0%) of participants with hypertension (n=25,404) reported taking an antihypertensive, 4,312 (54.0%) of participants who previously reported being treated for diabetes with medications, diet, or exercise (n=7,983) reported taking an antidiabetic agent in this survey. Half of respondents reported obtaining prescription medications by picking them up at a local pharmacy, but participants with CVD were less likely to do so (42.6%). Those with CVD were more likely to report having another person picking up their medication or living in a facility that provided medications. Overall, 9.7% reported that their method of obtaining prescription medications had changed since March 2020. Regarding difficulties with taking medication, 4.0% of respondents reported experiencing delays in

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having medications filled and 1.6% reported challenges with paying for medication; those with hypertension, diabetes, and CVD were equally likely to report these difficulties.

Changes in Living Arrangements

Since March 2020, most respondents (93.1%) reported that they had experienced no changes in their living arrangements (**Table 4**). Among those reporting changes, the most common changes reported included having family members or friends move in (1.0%), moving to live with family members or friends (0.7%), moving into a care facility (0.5%), and gaining a new care provider (0.4%). Very few participants (0.2%) reported having lost a care provider/companion that usually came to help them. Results among those with morbidities were generally similar to those in the overall study sample.

Sensitivity Analysis: Restriction to MRC Participants

When this analysis was limited to respondents who were part of the MRC, 10,700 individuals were included. The average age of respondents in this group was similar to the combined MRC and SRC population (mean=83.4, SD 5.6 years), but by design, was more diverse (**Supplementary Table 2**). The respondents consisted of 60% non-Hispanic Whites, 26.7% non-Hispanic Black/African Americans, 10.9% Hispanic/Latinas, 1.2% Asian/Pacific Islanders, and 0.3% Native Americans/Native Alaskans. Participants in the MRC were less educated and had lower incomes than the combined MRC and SRC population. Also, chronic conditions were more common among MRC participants. Based on data collected during WHI follow-up, 76.0% had hypertension, 27.5% had diabetes, and 19.1% had CVD.

In this subgroup, changes to health care access and medication management were comparable to those reported in the larger SRC and MRC cohort (**Supplementary Tables 3 & 4**). A lesser proportion of MRC respondents reported avoiding health care appointments for fear of COVID-19

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exposure (23.1%). In comparison to the overall cohort, fewer MRC participants reported currently taking prescription medications (86.2%) and changes in their methods of obtaining medications since March 2020 (9.1%). However, MRC participants experienced delays in filling medication (4.5%) and difficulties with paying for medication (2.3%) more frequently. Regarding changes in living arrangements in the MRC, results were similar to those of the combined SRC and MRC sample (**Supplementary Table 5**).

Sensitivity Analysis: Geographic Region

Most baseline characteristics did not differ by geographic region, although greater proportions of participants from the Midwest (92.8%) and Northeast (93.5%) were non-Hispanic White in comparison to those living in the West (85.0%) and South (83.6%) (**Supplementary Table 6**). With regard to changes in health care appointments, fewer participants from in the Midwest reported avoiding medical care to prevent COVID-19 exposure (19.9%), but participants across all four regions reported similar levels of difficulty with getting routine care (**Supplementary Table 7**). Some variability in methods of obtaining medication was observed across regions. For example, participants in the West more frequently reported having medications delivered (46.4%) whereas most participants in other regions picked up their medications from a local pharmacy. However, changes in access in medication and living arrangements did not appear to differ by geographic region (**Supplementary Tables 8 and 9**).

Sensitivity Analysis: Age

When stratified by age (<85 years vs ≥85 years), women over the age of 85 more frequently reported having an income below $35,000 (34.5% vs 19.6%) (**Supplementary Table 10**). The proportion of women with low physical function was nearly double among older versus younger participants (64.0% vs 35.3%). Similarly, older women more frequently reported needing help with activities of daily living. Changes in access to health care appointments did not differ by age category

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(**Supplementary Table 11**). Although women over 85 were more likely to report living in a facility that provided their medications and having their medications picked up by another person, no apparent differences were observed regarding changes in medication access or living arrangements (**Supplementary Tables 12 and 13**).

Discussion

In a survey of nearly 50,000 older, postmenopausal women from across the US, half of respondents expressed high levels of concern about the COVID-19 pandemic. This may have affected their willingness to seek medical care; although most had health care appointments scheduled, nearly a quarter reported deciding against going to the doctor/hospital to avoid COVID-19 exposure. Among those that sought medical services, many reported difficulties with getting routine care. With regard to medications, the vast majority of women were taking a prescription medication when surveyed. While some women reported having to change how they obtained their medications since March 2020, few encountered insurmountable barriers to medication use. We found no evidence of a differential impact of the pandemic on care continuity according to age range or geographic region. In general, we did not find that those with hypertension, diabetes, and CVD reported increased levels of disruption of care continuity in comparison to the overall study sample.

Previously, in a survey of 4,975 American adults, Czeisler et al. reported that 35.8% of all female participants reported avoiding routine medical care due to COVID-related concerns,[2] a greater proportion than what was found in our study. This discrepancy could be due to differing age distributions, as the average age of participants when they completed the WHI COVID-19 Survey was over 80 years old, and it was found by Czeisler et al. that older adults (≥65 years) were less likely to report avoidance of medical care than younger adults (25-44 years). Czeisler et al. also reported that individuals with underlying conditions (obesity, diabetes, high blood pressure, CVD, cancer) reported similar levels of care avoidance (33.0-37.7%) when compared to the overall sample.[2] We also found differences among those with hypertension, diabetes, or CVD to be minimal.

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Nearly half of participants reported that they had a health care appointment that was converted to a phone or video call. This finding aligns with other reports of widespread increases in telehealth usage in the US because of COVID-19 restrictions.[14,15,30,42,43] This is worth noting, considering that the effectiveness of telehealth services can vary depending on the patient population, outcome of interest, integration of relevant technologies, and whether telehealth is being used to supplement in-person interactions versus being used as the main medium for medical care.[44-47]

Most participants were taking a prescription medication and 9.7% reported that their methods for obtaining medication had changed since March 2020. Furthermore, delays in filling medications and difficulties with paying for medication were some of the most commonly encountered challenges of medication management. Prior research found that soon after the US declared COVID-19 a public health emergency, Americans filled more prescriptions during March 2020 than at any other time prior.[48] However, as the pandemic progressed, there were steep declines in prescriptions being filled and third-party payers relaxing rules that would have previously resulted in refills not being allowed.[48] Future research should examine whether rules instituted by third-parties improved medication continuity among older patients, especially since even minor deviations from prescribed drug treatments can result in poor treatment outcomes and adverse effects.[49,50]

This study had numerous strengths. Firstly, its results are based on survey responses from a large sample of older women recruited from across the U.S., allowing for a better understanding of how continuity of care among older women, specifically, has been affected by the pandemic. Second, the survey was developed for the specific aim of understanding the impact of the COVID-19 pandemic in the well-characterized WHI cohort. This cohort includes participants with extant and comprehensive assessments of demographic, clinical, and biochemical variables, enabling us to draw stronger inferences about the outcome groups that have been most affected by pandemic restrictions. Nevertheless, several limitations need to be considered. Limits to the length and scope of the survey meant that not all topics could be explored with depth. Also, it is possible that based on retrospective WHI data, some participants were misclassified as having hypertension, diabetes, or CVD at the time of survey completion. Non-respondents were more likely to have these conditions than respondents;

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therefore, our results could be biased if our study sample did not capture participants with the highest burden of disease and greatest need for continuity of care. Previous works have shown that WHI participants and trial participants in general are more likely to be non-Hispanic White, and tend to have higher income and education levels.[51,52] Given the likely impact that social determinants of health had on continuity of care during the pandemic, our findings may not be generalizable to certain vulnerable and underserved populations. Lastly, the design of the WHI COVID-19 Survey and descriptive nature of this analysis limits our ability to demonstrate causality between pandemic restrictions and the individual-level outcomes described here.

Conclusion

The results of this large survey of postmenopausal women suggests that since March 2020, many older women may have avoided medical care due to COVID-related concerns. Those who continued to seek medical services often experienced difficulties with getting routine care and had to adapt to different ways of engaging in health care appointments and obtaining prescription medications. However, disruptions in care continuity were largely comparable among those living with and without chronic diseases. The consequences of these changes remain unclear, and future work should evaluate whether they have had a detrimental impact on disease management in the long term. As the COVID-19 pandemic continues to evolve, a sustained focus should be placed on optimizing alternative services, like telemedicine, to ensure that older women continue to receive high quality care during public health emergencies.

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Conflict of Interest

The authors have no conflicts of interest to declare.

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Author contributions

The study questions and design were developed by Wong, Franceschini, Gillette, Tinker, and Wise Thomas. Data acquisition and analysis were performed by Pettinger and Wong. Initial manuscript preparation was conducted by Wong and Gillette. All listed authors contributed to data interpretation and critical revisions of this work. All listed authors provided final approval of this version for publication.

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Tables

Table 1. Baseline demographics and characteristics of 49,695 Women's Health Initiative (WHI) COVID-19 survey respondents*

Characteristic	Total (n=49,695)	Hypertension (n=34,884)	Diabetes (n=10,823)	CVD (n=9,401)
Age at survey completion Mean (SD)	83.6 (5.6)	84.0 (5.6)	83.6 (5.6)	85.4 (5.6)
< 85	29,400 (59.2)	19549 (56.0)	6450 (59.6)	4354 (46.3)
≥ 85	20,295 (40.8)	15335 (44.0)	4373 (40.4)	5047 (53.7)
Race/Ethnicity				
Non-Hispanic White	43,807 (88.2)	30195 (86.6)	8893 (82.2)	8512 (90.5)
Non-Hispanic Black/African American	2,860 (5.8)	2511 (7.2)	1049 (9.7)	487 (5.2)
Hispanic/Latina	1171 (2.4)	845 (2.4)	366 (3.4)	164 (1.7)
Native American/Native Alaskan	160 (0.3)	120 (0.3)	54 (0.5)	33 (0.4)
Asian/Pacific Islander	1144 (2.3)	818 (2.3)	306 (2.8)	109 (1.2)
Unknown	553 (1.1)	395 (1.1)	155 (1.4)	96 (1.0)
Education at baseline				
Less than high school	920 (1.9)	748 (2.2)	268 (2.5)	222 (2.4)
High school diploma or GED	6680 (13.5)	5088 (14.7)	1565 (14.6)	1539 (16.5)
Some school after high	17244 (34.9)	12703 (36.7)	3998 (37.2)	3546 (38.0)

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school				
College degree or higher	24513 (49.7)	16096 (46.5)	4919 (45.8)	4026 (43.1)
Missing	338	249	73	68
Annual Household Income at baseline				
< $35,000	12148 (25.7)	9207 (27.7)	3134 (30.3)	2864 (32.1)
$35,000 - $49,999	9905 (20.9)	7118 (21.4)	2179 (21.1)	2023 (22.7)
$50,000 - $74,999	11664 (24.6)	8110 (24.4)	2427 (23.4)	2032 (22.8)
≥ $75,000	13613 (28.8)	8790 (26.5)	2611 (25.2)	1997 (22.4)
Missing	2365	1659	472	485
Body Mass Index at survey completion (kg/m^2) Mean (SD)	26.1 (5.2)	26.7 (5.4)	27.8 (5.8)	26.8 (5.7)
< 25	23154 (47.8)	14399 (42.4)	3666 (35.0)	3899 (42.8)
25 - < 30	15708 (32.4)	11602 (34.2)	3572 (34.1)	3039 (33.3)
≥30	9564 (19.7)	7943 (23.4)	3232 (30.9)	2180 (23.9)
Missing	1269	940	353	283
Residence at survey completion				
Urban	45640 (92.1)	32045 (92.1)	9869 (91.4)	8558 (91.3)
Rural	3923 (7.9)	2745 (7.9)	924 (8.6)	812 (8.7)
Missing	132	94	30	31
Geographic region at survey completion				
Western	14597 (29.4)	10067 (28.9)	3139 (29.1)	2532 (27.0)

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Midwest	11025 (22.2)	7720 (22.2)	2336 (21.6)	2284 (24.4)
Northeast	10570 (21.3)	7486 (21.5)	2156 (20.0)	2106 (22.5)
South	13374 (27.0)	9518 (27.4)	3162 (29.3)	2449 (26.1)
Low (<70) physical functioning at survey completion	19156 (46.4)	15058 (52.7)	4968 (57.1)	5021 (67.5)
Missing	8382	6294	2129	1959
Any help needed with activities of daily living at survey completion	2944 (6.4)	2331 (7.2)	905 (9.1)	1105 (13.0)
Missing	3428	2557	898	869
Medical Outcomes as of survey completion				
CVD Adjudicated or self-report				
Clinical MI	2095 (4.2)	1827 (5.2)	651 (6.0)	2095 (22.3)
CABG/PCI	3253 (6.5)	2847 (8.2)	1087 (10.0)	3253 (34.6)
Carotid artery disease	613 (1.2)	555 (1.6)	205 (1.9)	613 (6.5)
Heart failure (UNC)	1727 (3.5)	1512 (4.3)	560 (5.2)	1727 (18.4)
Stroke	2469 (5.0)	2085 (6.0)	711 (6.6)	2469 (26.3)
Peripheral vascular disease (PVD)	494 (1.0)	419 (1.2)	167 (1.5)	494 (5.3)
Deep vein thrombosis (DVT)	1606 (3.2)	1213 (3.5)	445 (4.1)	1606 (17.1)
Pulmonary embolism (PE)	1178 (2.4)	911 (2.6)	306 (2.8)	1178 (12.5)

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Total CVD†	9401 (18.9)	7824 (22.4)	2697 (24.9)	9401 (100.0)
Self-reported				
Hypertension	34884 (70.2)	34,884 (100.0)	8848 (81.8)	7824 (83.2)
Type 2 diabetes	10823 (21.8)	8848 (25.4)	10823 (100.0)	2697 (28.7)
No morbidities (CVD, hypertension, or diabetes)	11551 (23.2)			
Concern about the COVID-19 pandemic at survey completion				
Not at all concerned	3245 (6.8)	2225 (6.6)	741 (7.1)	653 (7.2)
Somewhat concerned	20247 (42.2)	14240 (42.3)	4363 (42.0)	3885 (43.1)
Very concerned	24533 (51.1)	17194 (51.1)	5283 (50.9)	4469 (49.6)
Missing	1670	1225	436	394

*Frequencies and column percentages are shown, unless specifically labelled as a mean and standard deviation. Percentages calculated based on the number of respondents to each question, after excluding for missingness.
†Cardiovascular disease outcomes were not mutually exclusive: 11,714 outcomes occurred among 9,401 participants.
Abbreviations: cardiovascular disease (CVD); general educational development (GED); coronary artery bypass graft or percutaneous coronary intervention (CABG/PCI); myocardial infarction (MI); standard deviation (SD).

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Table 2. Access to health care appointments according to cardiometabolic diseases, among 49,695 WHI COVID-19 survey respondents*

	Overall (n=49,695)	Hypertension (n=34,884)	Diabetes (n=10,823)	CVD (n=9,401)
	N (%)	N (%)	N (%)	N (%)
Health care appointments scheduled March 2020 until survey completion (yes)†	37683 (79.4)	26959 (81.0)	8479 (82.6)	7421 (83.7)
If yes, appointment was cancelled	10132 (27.8)	7267 (27.9)	2306 (28.3)	2022 (28.3)
If yes, appointment was rescheduled	13735 (37.7)	9779 (37.5)	2983 (36.6)	2652 (37.1)
If yes, converted to phone call or online/video visit	16543 (45.4)	12256 (47.1)	4061 (49.8)	3647 (51.0)
Decided not to go to doctor or hospital to avoid COVID-19 exposure (yes)	11723 (24.5)	8304 (24.7)	2619 (25.2)	2291 (25.4)
Difficulty getting routine care				
None	36377 (75.5)	25352 (74.9)	7694 (73.6)	6649 (73.3)
Some	10549 (21.9)	7550 (22.3)	2441 (23.4)	2123 (23,4)
Much	771 (1.6)	566 (1.7)	208 (2.0)	193 (2.1)
Unable or very difficult	496 (1.0)	367 (1.1)	110 (1.1)	104 (1.1)
Missing	1502	1049	370	332

*Frequencies and column percentages are shown. Percentages calculated based on the number of respondents to each question, after excluding for missingness.

†Participants could select more than one response; responses from a single participant could be presented in more than one row.

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Table 3. Access to medications according to cardiometabolic diseases, among 49,695 WHI COVID-19 survey respondents*

	Overall (n=49,695)	Hypertension (n=34,884)	Diabetes (n=10,823)	CVD (n=9,401)
Currently taking prescription medications (yes) †	41543 (88.0)	30621 (92.7)	9349 (91.5)	8138 (92.0)
Hypertension (yes)	22416 (69.1)	21332 (84.0)	5484 (68.7)	4835 (76.2)
Diabetes (yes)	4498 (13.9)	3945 (15.5)	4312 (54.0)	1212 (19.1)
Method of obtaining prescription medications				
At a local pharmacy where I pick up	19090 (50.0)	13561 (48.4)	4072 (48.2)	3121 (42.6)
Delivered	13550 (35.5)	10218 (36.4)	3044 (36.0)	2686 (36.7)
Another person I know picks up my medications	3159 (8.3)	2490 (8.9)	763 (9.0)	911 (12.4)
I live in a facility that provides my medications	1051 (2.8)	825 (2.9)	291 (3.4)	383 (5.2)
Other	1328 (3.5)	941 (3.4)	275 (3.3)	225 (3.1)
Missing	11517	6849	2378	2075
Method of obtaining prescription medications has changed since March 2020 (yes)	3981 (9.7)	2973 (9.9)	917 (10.0)	820 (10.3)

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Experiencing difficulties taking medication(s), if currently taking†				
Delays in medications being filled or refilled	1653 (4.0)	1320 (4.3)	484 (5.2)	400 (4.9)
Delaying or not taking medication	273 (0.7)	217 (0.7)	95 (1.0)	70 (0.9)
No longer having someone help me take my medications	240 (0.6)	201 (0.7)	64 (0.7)	68 (0.8)
Paying for medications	646 (1.6)	537 (1.8)	235 (2.5)	187 (2.3)
Other	1614 (3.9)	1217 (4.0)	438 (4.7)	339 (4.2)

*Frequencies and column percentages are shown. Percentages calculated based on the number of respondents to each question, after excluding for missingness.

†Participants could select more than one response; responses from a single participant could be presented in more than one row.

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Table 4. Changes in living arrangements according to cardiometabolic diseases among 49,695 WHI COVID-19 survey respondents*

	Overall (n=49,695)	Hypertension (n=34,884)	Diabetes (n=10,823)	CVD (n=9,401)
Has your living arrangement changed since March 2020? (yes)	3351 (6.9)	2402 (7.0)	816 (7.7)	806 (8.8)
What has changed? (yes)†				
I moved to live with other family members or friends	356 (0.7)	239 (0.7)	79 (0.8)	74 (0.8)
Other family or friends moved in with me	495 (1.0)	349 (1.0)	127 (1.2)	108 (1.2)
Some household members moved away to limit the possibility of infection	148 (0.3)	109 (0.3)	39 (0.4)	36 (0.4)
I moved out of shared housing to limit the possibility of infection	62 (0.1)	42 (0.1)	15 (0.1)	15 (0.2)
A care provider/companion now comes to help me	190 (0.4)	152 (0.5)	46 (0.4)	75 (0.8)
My care provider/companion no longer comes to help me	92 (0.2)	76 (0.2)	22 (0.2)	26 (0.3)
I have moved into a care facility	233 (0.5)	179 (0.5)	68 (0.7)	78 (0.9)
I have moved out of a care facility	61 (0.1)	41 (0.1)	15 (0.1)	19 (0.2)

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Other change	1404 (2.9)	981 (2.9)	322 (3.1)	319 (3.5)
No changes	45443 (93.1)	31805 (93.0)	9788 (92.3)	8353 (91.2)

*Frequencies and column percentages are shown. Percentages calculated based on the number of respondents to each question, after excluding for missingness.

†Participants could select more than one response; responses from a single participant could be presented in more than one row.

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