

Older Adults' Frequency of Going Outside during the COVID-19 Pandemic: Associations with Physical Distancing, Health Status, and Fall Risk Factors

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Abstract

Research shows significant health benefits of going outside in late life. Using the 2019 and 2020 National Health and Aging Trend Study and its 2020 COVID-19 supplemental survey ($N = 3,857$, age 70+), we examined changes in the past-month frequency of going outside one's home/building during the COVID-19 pandemic in 2020 compared to the same time in 2019. We found that 57.0% reported no change in the frequency of going outside, 32.0% went out less frequently, and 11.0% went out more frequently. Logistic regression models showed that decreased frequency was associated with higher frequency of going outside in 2019, avoidance of contact with those outside their household (AOR = 1.51, 95% CI = 1.10, 2.06), dementia diagnosis, mobility device use, self-rated health (AOR = .85, 95% CI = .75–.97), and being 90+ years of age, female, non-Hispanic Black or Hispanic, divorced/separated. Older adults are likely to benefit from going outside more often when they can safely do so.

Keywords

COVID-19, older adults, going outside, avoiding people, mobility device use, fall worry

What this paper adds

- During the COVID-19 pandemic, 32% of US adults age 70+ decreased going-out frequency and 13% never/rarely went outside.
- Avoiding contact with non-household members and mobility aid use were correlates.
- Decrease was higher among previously active older adults, women, and Black and Hispanic older adults.

Applications of study findings

- Given the importance of physical activities and social participation for healthy aging, aging service providers need to help older adults increase these activities in safe environments.
- Diverse physical and social activities, transportation, and other mobility aids are important in assisting older adults to go outside more often.
- Aging service providers should pay particular attention to racial/ethnic minority older adults and those with mobility and cognitive health challenges.

Introduction

COVID-19 is a disease caused by a virus named SARS-CoV-2 that has quickly spread around the world since it was discovered in December 2019 in Wuhan, China (Centers for Disease Control and Prevention [CDC], 2022a). Older adults and people who have chronic illnesses, including cancer, diabetes, lung, kidney, and heart diseases, dementia or other neurological disorders, and other immunocompromised conditions, are at increased risk of severe illness from

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COVID-19 (CDC, 2022a). In the United States (U.S.) alone, more than 1 million people died from COVID-19 as of August, 2022 (CDC, 2022b).

Physical distancing (e.g., avoiding contact with others and curtailing social activities) has been an essential public health strategy to slow the person-to-person transmission of COVID-19. Physical distancing has been an especially important safety measure for older adults as they tend to have more chronic medical conditions that increase vulnerability to COVID-19 infection and result in worse clinical outcomes from infection than younger age groups (Bauer et al., 2021). Despite the importance of physical distancing for COVID-19 prevention, resulting home confinement and social isolation have had detrimental physical and mental health effects on people of all ages (Bhutan et al., 2021; Lipert et al., 2021; Meyer et al., 2020; Ong et al., 2021). Studies of older adults in many countries report decreased physical activity and increased sedentary behaviors during COVID-19 home confinement (Amanzio et al., 2021; Bohn et al., 2021; Carvalho et al., 2021; Fernández-García Á et al., 2021; Joseph et al., 2021; Lage et al., 2021; Sepulveda-Loyola et al., 2020).

Going outside, referring to movement from one's own dwelling to a place/location outside one's own dwelling, reflects older adults' daily physical activities and social engagements (e.g., taking a walk, working in garden/field, shopping, visiting family/friends, healthcare visit, volunteering, religious service attendance, traveling, or hobby activities) (Baker et al., 2003; Fujita et al., 2006; Shimokihara et al., 2022). Research has shown multiple benefits of going outside and related physical and social activities for older adults' physical and mental health. A study of frail Japanese older adults living at home found that controlling for other baseline differences, those who went outside four or more times a week were less likely to experience declines in basic activities of daily living and more likely to continue to reside at home 20 months later than those who went out less often (Kono et al., 2007). A study of a nationally representative sample of over 5000 U.S. older Medicare beneficiaries also found that higher frequency of going outside the home/building was associated with lower depressive symptoms at baseline and a year later even after controlling for baseline depressive symptoms (Choi et al., 2015). Conversely, a study of over 1200 older people (age 65+) who lived in a rural Japanese community found that compared to higher frequency going outside (once a day or more) at baseline, lower frequency going outside (once a week or less) was associated with greater incident mobility and instrumental activities of daily living disabilities and a lower rate of recovery from these disabilities 2 years later (Fujita et al., 2006).

Older adults' frequency of going outside was no doubt affected by the COVID-19 pandemic and physical distancing. A study of Finnish older adults found that their activity destinations, especially those facilitating outdoor

mobility (e.g., nature, services, events) and those related to daily chores (e.g., shopping and use of health and food services) and cultural/social visits, markedly declined in number during the first 2 months of the COVID-19 pandemic (Portegijs et al., 2021). The study showed that older adults' destinations during COVID-19 were predominantly for physical exercise located closer to home. A study of Japanese older adults also found that decreased frequency of going outside due to COVID-19 had detrimental effects on their psychological conditions—mental fatigue, not smiling as much as before, and anxiousness to go outside (Shimokihara et al., 2022). These informative studies show the importance of examining COVID-19's impact on older adults' daily lives. However, we found little research on the extent of COVID-19-related changes in the U.S. older adults' frequency of going outside. Older adults' frequency of going outside is also often affected by their physical, functional, and mental health statuses, including falls and fall worry, mobility assistive device use, pain, and depression/anxiety, and changes in these statuses (Choi et al., 2015, 2020; Cruz-Almeida et al., 2017; Gell et al., 2015; Schepker et al., 2016; Sehgal et al., 2021; Yu et al., 2020). These health-related factors as well as COVID-19-related factors should be considered when examining changes in older adults' frequency of going outside.

In the present study based on a representative sample of U.S. Medicare beneficiaries aged 70+, we examined: (1) changes (none, decrease, or increase) in the past-month frequency of going outside home/building during the COVID-19 pandemic in 2020 compared to the same time period in 2019; (2) the proportions of older adults who engaged in work, volunteering, or other activities as well as those reporting missed/canceled social engagements/activities during the pandemic; and (3) associations of decreased and increased frequencies of going outside with physical distancing needs and physical and mental health statuses. The study hypothesis was that controlling for sociodemographic variables, decreased frequency of going outside in 2020, compared to no change between 2019 and 2020, would be significantly associated with higher frequency of going outside in 2019, avoidance of contact with those outside their household in 2020, more diagnosed medical conditions, higher depression/anxiety symptom severity, fall incidents, fall worry, mobility aid use, and higher pain bothersomeness. Due to the lack of previous research, we did not pose any hypothesis regarding factors associated with increased frequency of going outside during the COVID-19 pandemic. Findings will provide empirical data on the extent of changes in the frequency of going outside during the COVID-19 pandemic, especially when vaccines were not yet available, and COVID-19-related and other factors associated with decreased or increased frequency of going outside among older adults.

Methods

Data and Sample

We used the public-use data files of the 2019 (Round 9 [R9]) and 2020 (Round 10 [R10]) National Health and Aging Trend Study (NHATS) and its R10 supplemental mail survey about participants' experiences during the COVID-19 pandemic. NHATS collects data annually from a nationally representative panel of Medicare beneficiaries age 65+. The initial sample persons (SPs) were first interviewed in 2011 and replenishment SPs were added in 2015 (Kasper & Freedman, 2021). R9 and R10 data were collected from May through October of 2019 and 2020, respectively. R10 (collected via telephone) includes data on 3961 SPs (3602 living in their own homes, 269 in residential care communities, and 99 in nursing homes, all age 70+). We linked the R9 NHATS SP data file to R10 NHATS SPs, focusing on the 3857 SPs, representing approximately 32 million Medicare beneficiaries aged 70+, who were living in their own homes or care communities and provided data on frequency of going outside in both 2019 and 2020. Given the complete quarantine of many nursing homes during the COVID-19 pandemic, older adults living in nursing homes were excluded from analyses.

The COVID-19 questionnaires were mailed from the end of June 2020 through the end of October 2020 following R10 data collection. Most questionnaires were completed in July and August 2020 although data collection continued through mid-January 2021. Of the 3857 who are the focus of the current study, 3204 provided data on avoidance of contact with those outside their household, online or in-person engagement in work, volunteering, and other activities, and missed/canceled social engagement. This study based on de-identified public-use data was exempt from the authors' institutional review board review.

Measures

Frequency of going outside and changes between 2019 and 2020: At both R9 and R10, SPs (or their proxies) were asked, "In the last month, how often did (you/SP) leave (your/his/her) home/building to go outside?" The response categories were: every day (7 days a week), most days (5–6 days a week), some days (2–4 days a week), rarely (once a week or less, or never). We generated the categories for frequency change (no change = 0, decreased = 1, or increased = 2) by comparing frequencies in R9 (pre-COVID) and R10 (during the COVID pandemic).

Physical and mental health statuses in 2020 or changes between 2019 and 2020: These included: (1) dementia diagnosis; (2) number (0–8) of diagnosed chronic medical conditions (heart attack or heart disease, hypertension, stroke, arthritis, osteoporosis, diabetes, lung disease, cancer); (3) past-month PHQ-4 score (0–12) for depression and anxiety (little interest or pleasure in doing things; felt down,

depressed, or hopeless; felt nervous, anxious, or on edge; unable to stop or control worrying; (Kroenke et al., 2009); (4) self-rated health (1 = poor through 5 = excellent); (5) fall incident in past 12 months (i.e., since R9 interview; none, once, 2+ times); (6) past-month worry about falling down (0 = none in both 2019 and 2020 or yes in 2019 but no in 2020; 1 = no in 2019 but yes in 2020; 2 = yes in both years); (7) past-month use of mobility device (cane, walker, wheelchair, or scooter) to "help get around more easily, safely, or on one's own" (0 = no in both 2019 and 2020 or yes in 2019 but no in 2020; 1 = no in 2019 but yes in 2020; 2 = yes in both years); and (8) past-month pain bothersomeness (0 = no in both 2019 and 2020 or yes in 2019 but no in 2020; 1 = no in 2019 but yes in 2020; 2 = yes in both years).

Avoidance of people: This was assessed with a single-item question whether or not SPs avoided contact with people not residing with them (for physical distancing) during the COVID-19 pandemic (no = 0, yes = 1).

Work/volunteering and other activities and missed/canceled social engagement: These were: (1) whether SPs engaged in online or in-person paid work (including self-employment), volunteering, religious services, and clubs, classes or other organized activities during the COVID-19 pandemic (0 = no engagement, 1 = online engagement, 2 = in-person engagement); and (2) whether SPs missed or canceled (a) birthday party, (b) wedding, (c) funeral, (d) religious celebrations, (e) planned vacation or trip, (f) visit with family or friend in the hospital, (g) visit with family or friend in a nursing home, assisted living, group home or other care community, and (h) sporting events, concerts, or plays (0 = no, 1 = yes, 9 = missing due to nonreturned survey or nonresponse to the question).

Sociodemographic variables: These were age group (70–74, 75–79, 80–84, 85–89, 90+ years); gender; race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, or Other); marital status (married/partnered, divorced/separated, widowed, never married); residence (in own home vs. care community [but not a nursing home]); and income in 2019 (up to \$29,999, \$30,000–\$42,999, \$43,000–\$65,999, \$66,000–\$99,999, or \$100,000+)

Analysis

All analyses were conducted with Stata/MP 17's *svy* function (College Station, TX) to account for NHATS's stratified, multistage sampling design (DeMatteis et al., 2021). All estimates presented in this study are weighted except sample sizes. First, using χ^2 test, we compared the 2019 and 2020 frequencies of going outside. Second, using χ^2 and ANOVA tests, we compared sociodemographic and physical and mental health characteristics of three groups of older adults—those whose frequency of going outside did not change between 2019 and 2020, those whose frequency of going outside in 2020 *decreased* from 2019, and those whose frequency of going outside in 2020 *increased* from 2019. χ^2

and t tests were also used to compare the decreased versus increased frequency groups. Third, we used χ^2 tests to compare the proportions in these three groups as well as the decreased versus increased groups who avoided contact with people not living with, participation in work, volunteering, and other activities and missed/canceled social engagements. Given the high numbers with missing data, work/volunteering/other activity participation and missed/canceled social engagements are reported for descriptive purposes only. Finally, we used two logistic regression models to examine the association of decreased (Model 1) or increased (Model 2) frequency of going outside in 2020 with frequency of going outside in 2019, avoiding contact with people not living with, physical and mental health statuses, and demographics as covariates. In Model 1, we excluded those who reported “never” going outside in 2019; in Model 2, we excluded those who reported going outside “every day” in 2019 to preclude floor and ceiling effects. Given that 653 SPs had missing data on avoiding contact with people not living with, we incorporated Stata’s missing data imputation procedures by creating 20 data sets in which missing values were replaced by imputed values before implementing the logistic regression models. The model was fit for each of the 20 data sets and results are aggregates of the 20 models that were combined using Rubin’s (1987) methods. Results are presented as adjusted odd ratios (AOR) with 95% confidence intervals (CIs).

Results

Past-month Frequency of Going Outside in 2019 and 2020

Table 1 shows that in 2019, 63.2% of SPs went outside every day, 21.7% on most days, 11.2% on some days, and 3.9% rarely or never. In 2020, 53.3% went outside every day, 18.9% went outside on most days, 14.8% on some days, and 13.0% rarely or never.

Sociodemographic and Health Characteristics by Changes in Going-outside Frequency

Table 2 shows that between 2019 and 2020, 57.0% of SPs reported no change in the frequency of going outside, 32.0% reported going outside less frequently (decrease), and 11.0% reported going outside more frequently (increase). More than three quarters of the no-change group were those who went out every day in 2019. Nearly 84% of the decreased frequency group were those who went out every day or most days in 2019, and nearly 88% of the increased group were those who went out most or some days in 2019 and the rest were those who rarely or never went outside in 2019.

Compared to the no-change group, both decreased and increased frequency groups (without any significant difference between them) included higher proportions of those age

Table 1. Past-Month Frequency of Leaving Home/Building to Go Outside (N = 3857).

	2019 N (%)	2020 N (%)
Every day (7 days a week)	2245 (63.2)	1856 (53.3)
Most days (5–6 days a week)	849 (21.7)	704 (18.9)
Some days (2–4 days a week)	542 (11.2)	639 (14.8)
Rarely (once a week or less often)	174 (3.1)	475 (9.8)
Never	47 (.8)	183 (3.2)
p (difference between 2019 and 2020)	<.001	

90+, women, racial/ethnic minorities, non-married persons, those with low income, and those living in care communities. Additional analysis showed the 90+ age group had the highest rates of mobility device use and dementia diagnosis. Both decreased and increased frequency groups also included higher proportions of those with dementia, other medical conditions, and lower self-rated health, and had higher PHQ-4 scores. The three groups did not differ in past-year fall incidents; however, both decreased and increased frequency groups included higher proportions of those with fall worry, those using mobility assistive devices, and those bothered by pain.

Avoidance of People, Work/Volunteering, Other Activities, and Missed/Canceled Social Engagement

Table 3 shows that about 70% of all three groups reported avoiding contact with people not residing with them, but 14% of the no-change group, 7.5% of the decreased frequency group, and 10.9% of the increased frequency group reported that they did not avoid contact with people not residing with them (with no statistically significant difference between the decreased and increased groups). The proportions of those who engaged in paid work, volunteering, religious services, and clubs, classes or other organized activities were generally low among all three groups. However, the no-change group had significantly higher rates of in-person engagement in all these activities than the decreased and increased frequency groups. The three groups did not differ in reporting missed/canceled birthday parties, weddings, funerals, religious celebrations, and visits to those in the hospital or long-term care facilities. However, the decreased and increased frequency groups included lower proportions of those reporting missed vacation/trip or other recreational activities than the no-change group, although these group differences should be interpreted with caution given missing data.

Correlates of Changes in Frequency of Going Outside between 2019 and 2020: Logistic Regression Results

Model 1 in Table 4 shows that decreased frequency of going outside was positively associated with high frequency of

Table 2. Sociodemographic and Health Characteristics by Changes in the Frequency of Going Outside between 2019 and 2020.

N (%)	No change 2109 (57.0%)	Decreased 1322 (32.0%)	Increased 426 (11.0%)	X ² /ANOVA p (all 3 groups)	X ² /t tests p (decreased v. increased)
Frequency of going outside in 2019 (%)					
Every day	78.4	57.7	—	<.001	
Most days	11.9	26.0	60.8		
Some days	6.7	13.6	27.6		
Rarely	2.1	2.7	9.5		
Never	0.9	—	2.1		
Age group (%)					
70–74	38.0	30.6	34.1	<.001	.462
75–79	30.0	28.7	25.5		
80–84	18.0	18.4	21.0		
85–89	9.3	12.8	11.6		
90+	4.7	9.5	7.8		
Female (%)	50.0	62.7	63.7	<.001	.763
Race/ethnicity (%)					
Non-Hispanic White	83.3	72.8	72.2	<.001	.090
Non-Hispanic Black	6.5	10.3	8.2		
Hispanic	5.2	10.1	8.0		
Other	5.0	6.8	11.6		
Marital status (%)					
				<.001	.285
Income (%)					
Up to \$29,999	26.7	38.6	39.7	<.001	.814
\$30,000–\$42,999	16.5	16.0	17.0		
\$43,000–\$65,999	19.1	15.6	16.7		
\$66,000–\$99,999	16.6	13.4	11.3		
\$100,000+	21.0	16.4	15.3		
Residence (%)					
In own home	97.0	92.0	94.4	<.001	.160
In residential care community	3.0	8.0	5.6		
Dementia diagnosis (%)					
	4.1	9.3	7.7	<.001	.325
No. of chronic medical conditions, M (SE.)					
	2.44 (.04)	2.87 (.05)	2.84 (.07)	<.001	.718
Depression and anxiety score (0–12), M (SE.)					
	1.51 (.06)	2.24 (.09)	1.90 (.15)	<.001	.054
Self-rated health (1 = poor to 5 = excellent), M (SE.)					
	3.47 (.04)	3.09 (.03)	3.13 (.06)	<.001	.491
No. of falls last 12 months (%)					
No fall	70.4	66.2	63.2	.091	.507
One	16.9	18.5	21.7		
More than one	12.8	15.3	15.1		
Fall worry change, 2019–2020 (%)					
No worry in both years or worry in 2019 but no worry in 2020	73.8	58.9	63.0	<.001	.340
No worry in 2019 but worry in 2020	9.2	12.7	9.6		
Worry in both years	17.0	28.4	27.4		
Mobility device use change, 2019–2020 (%)					
No use in both years or use in 2019 but no use in 2020	78.9	61.4	66.8	<.001	.149
No use in 2019 but use in 2020	4.3	8.0	6.3		
Use in both years	16.8	30.6	26.9		

(continued)

Table 2. (continued)

N (%)	No change 2109 (57.0%)	Decreased 1322 (32.0%)	Increased 426 (11.0%)	χ^2 /ANOVA p (all 3 groups)	χ^2 /t tests p (decreased v. increased)
Bothersome pain change, 2019–2020 (%)					
Not bothered in both years or bothered in 2019 but not in 2020	48.8	40.7	41.3	<.001	.949
Not bothered in 2019 but bothered in 2020	12.8	12.5	11.9		
Bothered in both years	38.4	46.8	46.8		

Note: Demographic variables, except income, dementia diagnosis, number of chronic conditions, depression and anxiety score, self-rated health, and the number of falls are from the 2020 survey

going outside in 2019 (some days [AOR = 2.49, 95% CI = 1.27, 4.85], most days [AOR = 4.43, 95% CI = 2.37, 8.29], or every day [AOR = 1.96, 95% CI = 1.05, 3.64] compared to rarely going outside); avoidance of contact with people not living with them (AOR = 1.51, 95% CI = 1.10, 2.06); having a diagnosis of dementia (AOR = 1.59, 95% CI = 1.16, 2.17); and mobility device use (AOR = 1.57, 95% CI = 1.04–2.38 for nonuse in 2019 but use in 2020 and AOR = 1.35, 95% CI = 1.07–1.70 for use in both 2019 and 2020); and negatively associated with higher self-rated health (AOR = .85, 95% CI = .75–.97). These results partially support the study hypothesis. Increased frequency of going outside was not associated with any of the above variables. Of sociodemographic variables, being 90+ years of age, female, non-Hispanic Black or Hispanic, divorced/separated, and living in a care community were associated with higher odds of decreased frequency of going outside, while being 90+ years of age was associated with lower odds of increased frequency of going outside.

Discussion

In this study, we examined the extent of decreased (or increased) frequency of going outside during the COVID-19 pandemic among a representative sample of U.S. older adults age 70+ and correlates of these changes. We found that 3.9% of older adults reported that they rarely or never went outside in 2019 compared to 13.0% during the COVID-19 pandemic. In total, 32.0% went outside less frequently in 2020 than during the same time period in 2019, while 57.0% reported no change, and 11.0% reported increased frequency of going outside.

A majority of those who increased going-outside frequency in 2020 went outside on most or some days in 2019, whereas a little over 10% were those who rarely/never went outside in 2019 (due possibly to health reasons) but went outside more often in 2020. This suggests that these older adults went outside more, not less, often, during the COVID pandemic likely to stay positive and healthy. A recent study based on in-depth interviews with older adults during the initial weeks of the COVID-19 pandemic found that staying

busy with hobby activities, gardening, and yard work was one of the primary themes for coping, highlighting their resilience and adaptability during COVID-19 (Fuller & Huseth-Zosel, 2021). A survey of more than 5800 older women age over 70 during the early part of the pandemic also found that staying active was selected most frequently (33%) among priorities related to physical well-being (Wegner et al., 2021).

Multivariable analyses show that decreased frequency of going outside, compared to no change, was more likely among those who used to go outside often (every day to some days) in 2019, indicating that the COVID-19 quarantine disproportionately affected active older adults. As expected, those who avoided contact with people outside their household were 50% more likely than those who reported no avoidance to have decreased their frequency of going outside. Of physical and mental health conditions, higher self-rated health was negatively associated with decreased frequency of going outside, but a diagnosis of dementia and mobility device use were positively associated. Older adults in general may have tried to avoid any situations requiring medical attention given reluctance to seek and/or delays in receiving healthcare during the COVID-19 pandemic (Muselli et al., 2022; Pines et al., 2021). Those with cognitive health challenges and those using mobility devices to get around may have been extra cautious given the COVID-related disruptions of personal assistance and transportation services that would make leaving the home more challenging in 2020 than in 2019.

Along with accessibility barriers, closure of in-person aging service programs (e.g., senior centers, adult day services) during the pandemic likely contributed to these older adults' decreased frequency of going outside. Our findings show that physical distancing may have been a double-edged sword for older adults (Faraji & Metz, 2021) as it protected them against COVID-19 infection but likely had negative impacts on their physical and mental health by limiting physical and social activities. However, number of medical conditions, fall incidents, fear of falls, and bothersomeness pain per se were not significantly associated with decreased frequency of going outside, which again suggests that COVID-19-related factors likely had stronger effects on these

Table 3. Avoidance of Contact with People and Activities During COVID-19 Outbreak in 2020 by Changes in the Frequency of Going Outside between 2019 and 2020 (%).

N (%)	No change 2109 (57.0%)	Decreased 1322 (32.0%)	Increased 426 (11.0%)	χ^2 p (all 3 groups)	χ^2 p (decreased v. increased)
Avoided non-household members during COVID-19 outbreak					
No	14.8	7.5	10.9	<.001	.252
Yes	68.9	70.5	68.3		
Missing	16.3	22.0	20.8		
Working for pay					
No	68.3	71.9	71.2	<.001	.684
Yes, online	3.6	3.6	2.9		
Yes, in-person	9.4	2.0	3.3		
Missing	18.7	22.5	22.5		
Volunteering					
No	69.2	69.9	67.6	.002	.106
Yes, online	3.8	4.0	2.4		
Yes, in-person	7.7	3.3	6.3		
Missing	19.3	22.8	23.7		
Attending religious services					
No	50.5	52.0	52.4	.052	.448
Yes, online	17.9	18.3	15.0		
Yes, in-person	11.2	7.4	9.1		
Missing	20.4	22.3	23.5		
Attending clubs, classes or other organized activities					
No	64.3	66.1	65.9	.003	.750
Yes, online	9.7	7.4	6.3		
Yes, in-person	6.8	3.2	4.3		
Missing	19.2	23.3	23.5		
Missed/canceled birthday party					
No	38.7	33.2	35.5	.074	.774
Yes	41.8	42.9	41.6		
Missing	19.5	23.9	22.9		
Missed/canceled wedding					
No	58.0	54.6	55.2	.337	.880
Yes	18.7	17.5	18.5		
Missing	23.3	27.9	26.3		
Missed/canceled funeral					
No	47.9	43.9	44.3	.224	.903
Yes	30.0	29.7	30.7		
Missing	22.1	26.4	25.0		
Missed/canceled religious celebrations					
No	31.5	32.4	34.5	.086	.760
Yes	48.0	43.0	42.5		
Missing	20.5	24.6	23.0		
Missed/canceled planned vacation or trip					
No	37.2	37.0	38.3	.043	.806
Yes	42.8	37.4	38.2		
Missing	20.0	25.6	23.5		
Missed/canceled visit with family or friend in hospital					
No	50.8	46.3	46.4	.293	.998
Yes	27.8	29.2	29.1		
Missing	21.4	24.5	24.5		

(continued)

Table 3. (continued)

N (%)	No change 2109 (57.0%)	Decreased 1322 (32.0%)	Increased 426 (11.0%)	χ^2 p (all 3 groups)	χ^2 p (decreased v. increased)
Missed/canceled visit with family or friend in care communities					
No	51.1	49.4	52.1	.318	.727
Yes	27.5	25.1	24.7		
Missing	21.4	25.5	23.2		
Missed/canceled sporting events, concerts, or plays					
No	39.1	41.2	43.7	.009	.735
Yes	40.5	33.6	32.9		
Missing	20.4	25.2	23.4		

older adults' decreased frequency of leaving their home/building.

In terms of age group differences, compared to those age 70–74, those age 90+ were significantly more likely to have decreased frequency of going outside and less likely to have increased such frequency, which is not surprising as the 90+ age group had the most mobility and cognitive health challenges. More women than men, non-Hispanic Blacks and Hispanics than non-Hispanic Whites, and divorced/separated than married/partnered individuals also decreased their frequency of going outside, even when physical health conditions were controlled. According to a study of a representative sample of U.S. older adults, compared to non-Hispanic Whites, non-Hispanic Blacks and Hispanics expressed significantly greater concerns about the COVID-19 pandemic, and higher proportions of them knew someone who had contracted or died from COVID-19 (Lin & Liu, 2021). Excess mortality from COVID and non-COVID causes in minority populations, especially Black and Hispanic older adults, were significantly higher than in non-Hispanic populations (Cronin & Evans, 2021; Ford et al., 2020; Rossen et al., 2021).

Given that physical activities and social participation are important components of healthy aging, reduced physical activity and social engagements from reduced going-out frequency are likely to have negative impact on older adults' physical and mental health (Douglas et al., 2017; Eckstrom et al., 2020; Lipert et al., 2021; Nuzum et al., 2020). Tele-delivered physical activities were recommended during the COVID-19 pandemic (Shahrbanian et al., 2020). COVID-19 vaccines became available since December 2020, and it has reduced the spread of COVID-19 infection and allowed people to participate in many of the activities that they did before the pandemic (CDC, 2021; Link-Gelles et al., 2022). Older adults need to be encouraged/supported for increased physical activity and social engagements for their physical and mental health benefits. Studies of older adults in Brazil and Israel showed that depressive symptoms increased or still prevailed even after getting vaccinated (Greenblatt-Kimron et al., 2022; Vidal Bravahieri et al., 2022). Increased physical activity might also be an effective strategy for boosting antibody responses. Previous research found a better

immunological response among older adults who sustained high physical activity levels in the weeks following influenza vaccination (Valenzuela et al., 2021). A recent study also showed that light- to moderate-intensity long-duration exercise (cycle ergometer or outdoor walk/jog aerobic exercise) enhanced antibody response across several vaccine formulations, including COVID-19 vaccination, four weeks post-immunization without an increase in side effects (Hallam et al., 2022).

The study's limitations are as follows: (1) self-reported frequencies of going outside may have been subject to recall bias; (2) the rate of missing data on social engagements during COVID-19 was high due to nonreturned surveys and nonresponses; (3) data in 2020 were collected mostly between June and August (i.e., the first three to 6 months of the COVID-19 pandemic), so the findings may not be generalizable to the following months; (4) although over 96% of U.S. older adults have Medicare coverage, those not covered by Medicare are least likely to have healthcare and social resources and are not represented in the study sample; and (5) the data set was limited to pre-vaccination period. Further research is needed to examine if older adults increased their frequency of going outside post-vaccination.

In conclusion, almost a third of US older adults reported decreased frequency of going outside during the COVID-19 pandemic than during the same time in the previous year. As physical distancing has been eased post-vaccination, creative means are required to encourage older adults to increase their frequency of going outside and in-person activities while ensuring their safety. Health and aging service providers should assist older adults, especially racial/ethnic minority older adults and those with mobility and cognitive health challenges, to go outside/outdoors and engage in physical/social activities (e.g., walk/other exercise, dancing, and gardening programs in the park when weather allows) more often. Many older adults also need education about physical and mental health benefits of going outside, and material support for doing so (e.g., safe transportation, diverse physical and social activities, personal protective equipment, safe footwear/mobility aids).

Table 4. Correlates of Decreased and Increased Frequency of Going Outside in 2020 Compared to 2019: Logistic Regression Results.

	Model 1 Decreased versus No change AOR (95% CI)	Model 2 Increased versus No change AOR (95% CI)
Frequency of going outside in 2019: versus Rarely		
Some days	2.49 (1.27–4.85)**	
Most days	4.43 (2.37–8.29)**	
Every day	1.96 (1.05–3.64)*	
Frequency of going outside in 2019: versus Never or rarely ^a		
Some days		.89 (.54–1.45)
Most days		.91 (.53–1.58)
Avoided non-household members during COVID-19: versus no	1.51 (1.10–2.06)*	.74 (.42–1.32)
Dementia diagnosis versus no diagnosis	1.59 (1.16–2.17)**	1.31 (.75–2.28)
No. of chronic medical conditions	1.05 (.96–1.14)	1.09 (.97–1.23)
Depression and anxiety score	1.03 (.98–1.09)	.92 (.85–1.00)
Self-rated health	.85 (.75–.97)*	1.20 (.99–1.44)
No. of falls in last 12 months: versus none		
One	.96 (.73–1.25)	.89 (.59–1.34)
More than one	.79 (.59–1.05)	.79 (.45–1.37)
Fall worry change, 2019–2020: versus no worry in both years or worry in 2019 but no worry in 2020		
No worry in 2019 but worry in 2020	1.37 (.93–2.01)	1.02 (.60–1.74)
Worry in both years	1.29 (.99–1.68)	1.20 (.54–1.91)
Mobility device use change, 2019–2020: versus No use in both years or use in 2019 but no use in 2020		
No use in 2019 but use in 2020	1.57 (1.04–2.38)*	1.29 (.72–2.32)
Use in both years	1.35 (1.07–1.70)*	.79 (.54–1.16)
Bothersome pain change, 2019–2020: versus Not bothered in both years or bothered in 2019 but not in 2020		
Not bothered in 2019 but bothered in 2020	1.07 (.76–1.52)	1.10 (.73–1.66)
Bothered in both years	1.03 (.85–1.25)	1.12 (.87–1.45)
Age group: versus 70–74		
75–79	1.16 (.87–1.55)	.64 (.38–1.07)
80–84	1.05 (.79–1.40)	.71 (.44–1.13)
85–89	1.26 (.96–1.66)	.61 (.36–1.05)
90+	1.61 (1.14–2.26)**	.52 (.30–.92)*
Female versus male	1.34 (1.07–1.68)**	.84 (.57–1.24)
Race/ethnicity: versus non-Hispanic White		
Non-Hispanic Black	1.52 (1.19–1.94)**	.80 (.51–1.26)
Hispanic	2.04 (1.36–3.05)**	.80 (.44–1.47)
Other	1.50 (.95–2.37)	2.48 (1.00–6.16)
Marital status: versus Married/partnered		
Divorced/separated	1.38 (1.02–1.87)*	1.10 (.62–1.97)
Widowed	1.07 (.83–1.38)	1.34 (.86–2.09)
Never married	.61 (.35–1.04)	1.22 (.52–2.89)
Income: versus up to \$29,999		
\$30,000–\$42,999	.92 (.71–1.19)	.94 (.55–1.62)
\$43,000–\$65,999	.87 (.65–1.15)	.80 (.47–1.37)
\$66,000–\$99,999	1.00 (.71–1.42)	.86 (.43–1.71)
\$100,000+	1.07 (.80–1.43)	.93 (.50–1.70)
In residential care community versus in own home	2.31 (1.55–3.45)***	.94 (.53–1.69)
Model statistics	$N = 3364; F(32,54.1) = 19.40; p < .001$	$N = 966; F(32,53.0) = 2.33; p = .003$

^aThose who “never” or “rarely” went out in 2019 were combined given the small number of the “never” cases in 2019.

* $p < .05$; ** $p < .01$; *** $p < .001$.

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References

- Amanzio, M., Canessa, N., Bartoli, M., Cipriani, G. E., Palermo, S., & Cappa, S. F. (2021). Lockdown effects on healthy cognitive aging during the COVID-19 pandemic: A longitudinal study. *Frontiers in Psychology, 12*, 685180. <https://doi.org/10.3389/fpsyg.2021.685180>
- Baker, P. S., Bodner, E. V., & Allman, R. M. (2003). Measuring life-space mobility in community-dwelling older adults. *Journal of the American Geriatrics Society, 51*(11), 1610–1614. <https://doi.org/10.1046/j.1532-5415.2003.51512.x>
- Bauer, P., Brugger, J., König, F., & Posch, M. (2021). An international comparison of age and sex dependency of COVID-19 deaths in 2020: A descriptive analysis. *Scientific Reports, 11*(1), 19143. <https://doi.org/10.1038/s41598-021-97711-8>
- Bhutan, S., Cooper, J. A., & Vanderlin, M. R. (2021). Self-reported changes in energy balance behaviors during COVID-19-related home confinement: A cross-sectional study. *American Journal of Health Behavior, 45*(4), 756–770. <https://doi.org/10.5993/AJHB.45.4.14>
- Bohn, L., Gomes, S., Net, E. S. Q., Lage, A. C. S. S., de Freitas, M. D. D. B., Magalhães, F. P., Mota, J., & Soares Miranda, L. (2021). Predictors of lower depression levels in older adults during COVID-19 lockdown. *Journal of Applied Gerontology, 40*(11), 1407–1416. <https://doi.org/10.1177/073346482111025116>
- Carvalho, J., Borges-Machado, F., Pizarro, A. N., Bohn, L., & Barros, D. (2021). Home confinement in previously active older adults: A cross-sectional analysis of physical fitness and physical activity behavior and their relationship with depressive symptoms. *Frontiers in Psychology, 12*, 643832. <https://doi.org/10.3389/fpsyg.2021.643832>
- Centers for Disease Control and Prevention (2021). *COVID-19 recommendations for older adults*. <https://www.cdc.gov/aging/covid19-guidance.html>
- Centers for Disease Control and Prevention (2022a). *COVID data tracker*. <https://covid.cdc.gov/covid-data-tracker/#datatracker-home>
- Centers for Disease Control and Prevention (2022b). *COVID-19*. <https://www.cdc.gov/coronavirus/2019-ncov/your-health/about-covid-19.html>
- Choi, N. G., Gell, N. M., DiNitto, D. M., Marti, C. N., & Kunik, M. E. (2020). Depression and activity-limiting fall worry among older adults: Longitudinal reciprocal relationships. *International Psychogeriatrics, 32*(4), 495–504. <https://doi.org/10.1017/S1041610219000838>
- Choi, N. G., Kim, J., DiNitto, D. M., & Marti, C. N. (2015). Perceived social cohesion, frequency of going out, and depressive symptoms in older adults: Examination of longitudinal relationships. *Gerontology & Geriatric Medicine, 1*, 2333721415615478. <https://doi.org/10.1177/2333721415615478>
- Cronin, C. J., & Evans, W. N. (2021). Excess mortality from COVID and non-COVID causes in minority populations. *Proceedings of the National Academy of Sciences, 118*(39), e2101386118. <https://doi.org/10.1073/pnas.2101386118>
- Cruz-Almeida, Y., Rosso, A., Marcum, Z., Harris, T., Newman, A. B., Nevitt, M., Satterfield, S., Yaffe, K., & Rosano, C. (2017). Associations of musculoskeletal pain with mobility in older adults: Potential cerebral mechanisms. *Journals of Gerontology: Series A, 72*(9), 1270–1276. <https://doi.org/10.1093/gerona/glx084>
- DeMatteis, J. M., Freedman, V. A., Jiao, R., & Kasper, J. D. (2021). *National health and aging trends study development of round 10 survey weights*. Johns Hopkins University School of Public Health. NHATS Technical Paper #28 https://nhats.org/sites/default/files/2021-07/NHATS_Round_10_Weights_Technical_Paper.pdf
- Douglas, H., Georgiou, A., & Westbrook, J. (2017). Social participation as an indicator of successful aging: An overview of concepts and their associations with health. *Australian Health Review, 41*(4), 455–462. <https://doi.org/10.1071/AH16038>
- Eckstrom, E., Neukam, S., Kalin, L., & Wright, J. (2020). Physical activity and healthy aging. *Clinics in Geriatric Medicine, 36*(4), 671–683. <https://doi.org/10.1016/j.cger.2020.06.009>
- Faraji, J., & Metz, G. A. S. (2021). Aging, social distancing, and COVID-19 risk: Who is more vulnerable and why? *Aging and Disease, 12*(7), 1624–1643. <https://doi.org/10.14336/AD.2021.0319>
- Fernández-García, Á. I., Marin-Puyalto, J., Gómez-Cabello, A., Matute-Llorente, Á., Subías-Perié, J., Pérez-Gómez, J., Lozano-Berges, G., Mañas, A., Guadalupe-Grau, A., González-Gross, M., Ara, I., Casajús, J. A., & Vicente-Rodríguez, G. (2021). Impact of the home confinement related to COVID-19 on the device-assessed physical activity and sedentary patterns of Spanish older adults. *BioMed Research International, 2021*, 5528866–5528868. <https://doi.org/10.1155/2021/5528866>
- Ford, T. N., Reber, S., & Reeves, C. V. (2020). *Race gaps in COVID-19 deaths are even bigger than they appear*. <https://www.brookings.edu/blog/up-front/2020/06/16/race-gaps-in-covid-19-deaths-are-even-bigger-than-they-appear/>
- Fujita, K., Fujiwara, Y., Chaves, P. H., Motohashi, Y., & Shinkai, S. (2006). Frequency of going outdoors as a good predictors for incident disability of physical function as well as disability recovery in community-dwelling older adults in rural Japan. *Journal of Epidemiology, 16*(6), 261–270. <https://doi.org/10.2188/jea.16.261>

- Fuller, H. R., & Huseth-Zosel, A. (2021). Lessons in resilience: Initial coping among older adults during the COVID-19 pandemic. *The Gerontologist*, 61(1), 114–125. <https://doi.org/10.1093/geront/gnaa170>
- Gell, N. M., Wallace, R. B., LaCroix, A. Z., Mroz, T. M., & Patel, K. V. (2015). Mobility device use in older adults and incidence of falls and worry about falling: Findings from the 2011-2012 National Health and Aging Trends Study. *Journal of the American Geriatrics Society*, 63(5), 853–859. <https://doi.org/10.1111/jgs.13393>
- Greenblatt-Kimron, L., Hoffman, Y., Ben-Ezra, M., Goodwin, R., & Palgi, Y. (2022). COVID-19 post-vaccination depression in older Israeli adults: The role of negative world assumptions. *Global Mental Health*, 1–4. <https://doi.org/10.1017/gmh.2022.11>
- Hallam, J., Jones, T., Alley, J., & Kohut, M. L. (2022). Exercise after influenza or COVID-19 vaccination increases serum antibody without an increase in side effects. *Brain, Behavior, and Immunity*, 102, 1–10. <https://doi.org/10.1016/j.bbi.2022.02.005>
- Joseph, R. P., Pituch, K. A., Guest, M. A., Maxfield, M., Peckham, A., Coon, D. W., Kim, W., & Langer, S. L. (2021). Physical activity among predominantly White middle-aged and older US adults during the SARS-CoV-2 pandemic: Results from a national longitudinal survey. *Frontiers in Public Health*, 9, 652197. <https://doi.org/10.3389/fpubh.2021.652197>
- Kasper, J. D., & Freedman, V. A. (2021). *National health and aging trends study user guide: Rounds 1-10 final release*. Johns Hopkins University School of Public Health. https://nhats.org/sites/default/files/2021-07/NHATS_User_Guide_R10_Final_Release.pdf
- Kono, A., Kai, I., Sakato, C., & Rubenstein, L. Z. (2007). Frequency of going outdoors predicts long-range functional change among ambulatory frail elders living at home. *Archives of Gerontology and Geriatrics*, 45(3), 233–242. <https://doi.org/10.1016/j.archger.2006.10.013>
- Kroenke, K., Spitzer, R. L., & Williams, J. B. (2009). An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics*, 50(6), 613–621. <https://doi.org/10.1176/appi.psy.50.6.613>
- Lage, A., Carrapatoso, S., Sampaio de Queiroz Neto, E., Gomes, S., Soares-Miranda, L., & Bohn, L. (2021). Associations between depressive symptoms and physical activity intensity in an older adult population during COVID-19 lockdown. *Frontiers in Psychology*, 12, 644106. <https://doi.org/10.3389/fpsyg.2021.644106>
- Lin, Z., & Liu, H. (2021). A national study of racial-ethnic differences in COVID-19 concerns among older Americans: Evidence from the Health and Retirement Study. *The Journals of Gerontology: Series B*, 77(7), e134–e141. [gbab171Epub ahead of print https://doi.org/10.1093/geronb/gbab171](https://doi.org/10.1093/geronb/gbab171)
- Link-Gelles, R., Levy, M. E., Gaglani, M., Irving, S. A., Stockwell, M., Dascomb, K., DeSilva, M. B., Reese, S. E., Liao, I. C., Ong, T. C., Grannis, S. J., McEvoy, C., Patel, P., Klein, N. P., Hartmann, E., Stenehjem, E., Natarajan, K., Naleway, A. L., Murthy, K., Rao, S., & Tenforde, M. W. (2022). Effectiveness of 2, 3, and 4 COVID-19 mRNA vaccine doses among immunocompetent adults during periods when SARS-CoV-2 Omicron BA.1 and BA.2/BA.2.12.1 sublineages predominated - VISION Network, 10 States, December 2021-June 2022. *MMWR. Morbidity and Mortality Weekly Report*, 71(29), 931–939. <https://doi.org/10.15585/mmwr.mm7129e1>
- Lipert, A., Kozłowski, R., Timler, D., Marczak, M., Musiał, K., Rasmus, P., Kamecka, K., & Jegier, A. (2021). Physical activity as a predictor of the level of stress and quality of sleep during COVID-19 lockdown. *International Journal of Environmental Research and Public Health*, 18(11), 5811. <https://doi.org/10.3390/ijerph18115811>
- Meyer, J., McDowell, C., Lansing, J., Brower, C., Smith, L., Tully, M., & Herring, M. (2020). Changes in physical activity and sedentary behavior in response to COVID-19 and their associations with mental health in 3052 US Adults. *International Journal of Environmental Research and Public Health*, 17(19), 6469. <https://doi.org/10.3390/ijerph17186469>
- Muselli, M., Cofini, V., Mammarella, L., Carmignani, C., Fabiani, L., Desideri, G., & Necozone, S. (2022). The impact of covid-19 pandemic on emergency services. *Annali di Igiene: Medicina Preventiva e di Comunità*, 34(3), 248–258. <https://doi.org/10.7416/ai.2021.2480>
- Nuzum, H., Stickel, A., Corona, M., Zeller, M., Melrose, R. J., & Wilkins, S. S. (2020). Potential benefits of physical activity in MCI and dementia. *Behavioural Neurology*, 2020, 7807856. <https://doi.org/10.1155/2020/7807856>
- Ong, J. L., Lau, T., Massar, S. A. A., Chong, Z. T., Ng, B. K. L., Koek, D., Zhao, W., Yeo, B. T. T., Cheong, K., & Chee, M. W. L. (2021). COVID-19-related mobility reduction: Heterogenous effects on sleep and physical activity rhythms. *Sleep*, 44(2), zsaal179. <https://doi.org/10.1093/sleep/zsaal179>
- Pines, J. M., Zocchi, M. S., Black, B. S., Celedon, P., Carlson, J. N., Moghtaderi, A., & Venkat, A., US, Acute Care Solutions Research Group (2021). The effect of the COVID-19 pandemic on emergency department visits for serious cardiovascular conditions. *The American Journal of Emergency Medicine*, 47, 42–51. <https://doi.org/10.1016/j.ajem.2021.03.004>
- Portegijs, E., Keskinen, K. E., Tuomola, E. M., Hinrichs, T., Saajanaho, M., & Rantanen, T. (2021). Older adults' activity destinations before and during COVID-19 restrictions: From a variety of activities to mostly physical exercise close to home. *Health & Place*, 68, 102533. <https://doi.org/10.1016/j.healthplace.2021.102533>
- Rossen, L. M., Ahmad, F. B., Anderson, R. N., Branum, A. M., Du, C., Krumholz, H. M., Li, S. X., Lin, Z., Marshall, A., Sutton, P. D., & Faust, J. S. (2021). Disparities in excess mortality associated with COVID-19 - United States, 2020. *Morbidity and Mortality Weekly Report*, 70(33), 1114–1119. <https://doi.org/10.15585/mmwr.mm7033a2>
- Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. New York: John Wiley & Sons.
- Schepker, C. A., Leveille, S. G., Pedersen, M. M., Ward, R. E., Kurlinski, L. A., Grande, L., Kiely, D. K., & Bean, J. F.

- (2016). Effect of pain and mild cognitive impairment on mobility. *Journal of the American Geriatrics Society*, 64(1), 138–143. <https://doi.org/10.1111/jgs.13869>
- Sehgal, M., Jacobs, J., & Biggs, W. S. (2021). Mobility assistive device use in older adults. *American Family Physician*, 103(12), 737–744.
- Sepúlveda-Loyola, W., Rodríguez-Sánchez, I., Pérez-Rodríguez, P., Ganz, F., Torralba, R., Oliveira, D. V., & Rodríguez-Mañas, L. (2020). Impact of social isolation due to COVID-19 on health in older people: Mental and physical effects and recommendations. *The Journal of Nutrition, Health, and Aging*, 24(9), 938–947. <https://doi.org/10.1007/s12603-020-1469-2>
- Shahrbanian, S., Alikhani, S., Ahmadi Kakavandi, M., & Hackney, A. C. (2020). Physical activity for improving the immune system of older adults during the COVID-19 pandemic. *Alternative Therapies in Health and Medicine*, 26(S2), 117–125.
- Shimokihara, S., Maruta, M., Akasaki, Y., Ikeda, Y., Han, G., Kamasaki, T., Tokuda, K., Hidaka, Y., Akasaki, Y., & Tabira, T. (2022). Association between frequency of going out and psychological condition among community-dwelling older adults after the COVID-19 pandemic in Japan. *Healthcare (Basel, Switzerland)*, 10(3), 439. <https://doi.org/10.3390/healthcare10030439>
- Valenzuela, P. L., Simpson, R. J., Castillo-García, A., & Lucia, A. (2021). Physical activity: A coadjuvant treatment to COVID-19 vaccination? *Brain, Behavior, and Immunity*, 94, 1–3. <https://doi.org/10.1016/j.bbi.2021.03.003>
- Vidal Bravallhier, A. A., Oliveira Rodrigues, N., Batiston, A. P., de Souza Pegorare, A., & Christofolletti, G. (2022). Impact of social isolation on the physical and mental health of older adults: A follow-up study at the apex of the COVID-19 pandemic in Brazil. *Dementia and Geriatric Cognitive Disorders*, 51(3), 279–284. <https://doi.org/10.1159/000525661>
- Wegner, L., Mendoza-Vasconez, A. S., Mackey, S., McGuire, V., To, C., White, B., King, A. C., & Stefanick, M. L. (2021). Physical activity, well-being, and priorities of older women during the COVID-19 pandemic: A survey of women's health initiative strong and healthy (WHISH) intervention participants. *Translational Behavioral Medicine*, 11(12), 2155–2163. <https://doi.org/10.1093/tbm/ibab122>
- Yu, Y., Chen, Z., Bu, J., & Zhang, Q. (2020). Do stairs inhibit seniors who live on upper floors from going out? *Health Environment Research & Design Journal*, 13(4), 128–143. <https://doi.org/10.1177/1937586720936588>