

## Better Together: Social Contact and Loneliness Among US Older Adults During COVID-19

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### Abstract

**Objectives:** COVID-19 resulted in older adults' greater reliance on technology to contact friends and families. However, less is known regarding the association between frequency of varying modes of communication and loneliness among older adults during COVID-19, and current findings are mixed. Therefore, this study aimed to advance this understanding. **Methods:** Using the National Health and Aging Trends Study COVID-19 supplement data, multinomial regression analyses assessed how the frequency of four modes of contact (i.e., phone calls; electronic and social messaging such as emails/texts/social media messages; video calls; in-person visits) during the COVID-19 pandemic was associated with feelings of loneliness among older adults compared to pre-pandemic ( $n=2564$ ).

**Results:** Compared to never/less than once a week in-person visits, daily in-person visits were associated with lower odds of reporting more frequent loneliness during COVID-19 versus "about the same" as pre-COVID-19 while controlling for demographics, access to information and communication technologies (ICTs), digital literacy, and health covariates. Compared to those who reported never/less than once a week contact by electronic and social messaging, more frequent contact was associated with higher odds of reporting more frequent loneliness during COVID-19 versus "about the same" as pre-COVID-19 while controlling for other variables in the model. Phone calls and video calls were not significantly related to loneliness. **Discussion:** Results suggest that ICTs may not decrease loneliness among older adults. This paper discusses potential reasons and barriers, including digital exclusion, and provides recommendations to mitigate the negative effects of social isolation through technology for older adults.

**Keywords:** social networks, information and communication technologies, ICTs, NHATS

## Background

The development of a novel coronavirus, severe acute respiratory syndrome coronavirus (SARS-CoV-2), also known as coronavirus disease (COVID-19) in early 2019 resulted in a global pandemic (Wu et al., 2020). Social distancing, isolation, and quarantine measures were implemented to prevent its spread. Although helpful in slowing/decreasing the virus's spread, these strategies have been associated with negative psychological impacts such as stress, anxiety, depression, and loneliness (Brooks et al., 2020). That is, the recommended limited interactions and engagement with one's social network may increase loneliness among older adults and pose a risk for physical (Holt-Lunstad et al., 2015) and mental (Donovan et al., 2017; Nguyen et al., 2020) health. The current study examined how the frequency of varying modes of contact (i.e., phone calls; electronic and social messaging such as emails/texts/social media messages; video calls; and in-person visits) with family and friends (FF) was associated with changes in reported loneliness during COVID-19, compared with pre-pandemic loneliness, among community-dwelling older Medicare beneficiaries.

### *Loneliness*

Loneliness refers to the inconsistency between an individual's wanted and experienced social connectedness (Perlman & Peplau, 1981). This is related to isolation, which refers to the limited number and irregularity of contact with one's social network (Cornwell & Waite, 2009). Although the concepts are related, it is possible to experience loneliness despite having a large social network; conversely, isolated individuals may not experience loneliness (Cacioppo & Cacioppo, 2018). The consequences of high prevalence rates of older adults' loneliness suggest a critical need for further examination (Berg-Weger & Morley, 2020). Loneliness can impact both physical and mental health outcomes (Miyawaki, 2015) such as depression, cardiovascular disease, reduced quality of life, and poorer health (Courtin & Knapp, 2017; Landeiro et al., 2017). Compared to other

leading mortality risks (i.e., obesity, smoking) among older adults, loneliness has the highest prevalence (Holt-Lunstad et al., 2017). The increased risk of severe illness and/or death among older adults due to COVID-19 led to an increased risk of loneliness and isolation among this age group (Brooks et al., 2020). Alternatively, social connectedness can buffer these effects and is associated with higher longevity (Thomas, 2012). Interpersonal connections and contact are essential needs related to positive physical and mental health outcomes (Baumeister & Leary, 1995; Bruce et al., 2019). For instance, more frequent in-person contact with FF was associated with greater positive well-being and less loneliness among older adults during the pandemic (Hu & Qian, 2021). Yet, to comply with the COVID-19 safety guidelines, individuals have had to change how they remain connected with members of their social network.

#### *Modes of Connectedness*

Older adults are generally receptive to using information and communication technologies (ICTs) such as e-mail, internet, social networking sites, and voice/video technology to connect with others (Chopik, 2016). For example, most (91%) adults aged 65 years and older report cellphone ownership (Pew Research Center, 2019a). However, compared with younger adults, older adults are less likely to engage with ICTs. While internet use among older adults is higher than in the past (73%), usage remains lower than other age groups (Pew Research Center, 2019b). This is due to affordability, unfamiliarity with technological platforms, and cognitive and/or physical limitations (Seifert et al., 2021).

This is problematic because COVID-19 has required older adults' to shift from in-person contact to a reliance on virtual forms of communication (e.g., email, social media, and video technologies). Indeed, when compared with pre-pandemic modes of contact, one study found that in-person visits decreased significantly, use of electronic and social messaging and phone calls remained constant, and video contact increased (Freedman et al., 2022). Despite the capacity of ICTs to overcome loneliness, there is growing concern that many older adults experience digital exclusion

(Seifert et al., 2021). Without the necessary technical skills and/or lack of devices and support, loneliness remains a risk that can be heightened when social distancing is needed. Further, although ICT usage has shown positive benefits among older adults (e.g., reduced loneliness; Chen, 2020), those differ by electronic/virtual mode.

Although studies have assessed how various forms of contact during the pandemic relate to mental well-being among older adults, current findings are mixed. Using web-based and other communication technologies is considered effective in combatting loneliness among older adults during COVID-19 (Chen, 2020). In-person communication is preferred, but alternative communication modes allow continued involvement within one's social network (Yuan et al., 2016). Before COVID-19, studies showed that older adults who reported greater phone use experienced less loneliness (Petersen et al., 2016), but when compared to in-person interactions, phone use was related to greater loneliness (Jin & Park, 2013). Contrastingly, Hu & Qian (2021) found that more frequent contact via electronic and social messaging and video modes was associated with a greater likelihood of experiencing loneliness and of a greater magnitude when compared to pre-COVID-19. Digital access/restrictions and/or limitations in technological knowledge were suggested as potential underlying reasons. Indeed, Fingerman et al. (2021) found that although in-person visits with FF during COVID-19 decreased, reliance on phone calls or electronic and social messaging with FF did not increase among older adults.

Another study that spanned 27 countries found that while in-person contact with FF during COVID-19 was related to mental health benefits among older adults, digital communication was associated with worsened mental health (Skalacka & Pajestka, 2021). Authors attribute that to a discrepancy between older adults' desire to relieve feelings of loneliness and the reminder of being alone after using ICTs. Similarly, phone contact among older adults who lived alone was associated with greater negative affect (Fingerman et al., 2021). As such, communication with FF through ICTs might reaffirm an older adult's inability to connect in-person with their social network (Dickinson &

Gregor, 2006). Greater engagement with others through ICTs may inhibit the benefits experienced from in-person engagement (Bruce et al., 2019).

These mixed findings regarding ICTs and loneliness among older adults point to a more considerable challenge. While social exclusion and loneliness are serious concerns among this population, digital exclusion is too (Seifert et al., 2020). Digital divides in internet use and technology adoption inhibit many older adults from reaping the benefits of ICTs. For example, older adults were less likely to report that technology helped them stay connected with FF during the pandemic and reported less use of video conferencing than their younger counterparts (McClain et al., 2021). Inequality in physical access to ICTs, demographics (e.g., education, income, gender), lack of ICT-related skills, and availability of social support, have been suggested as contributors (Fang et al., 2019). This study builds on prior research by examining how varying modes of contact with FF are associated with changes in loneliness during COVID-19 compared to pre-pandemic, while controlling for potential contributors of digital exclusion.

### **Theoretical Framework**

This study was guided by the Need-to-Belong Theory, which posits that a sense of belonging, fostered from interpersonal interactions, is central to healthy well-being (Baumeister & Leary, 1995). Loneliness can result from this unmet fundamental need. According to the theory, feelings of social connectedness are derived from the quantity of members or frequency of contact with one's social network and the quality and meaning of those connections (Baumeister & Leary, 1995). Therefore, in-person contact fosters higher quality interactions and may be perceived as stronger and more meaningful than other communication modes. Previous literature suggests that social support moderates negative health outcomes (Holt-Lunstad et al., 2017), yet when access to support is limited, such as during a global pandemic, risks to well-being are magnified (Berg-Weger & Morley, 2020). Given existing research, the extent to which using ICTs for communication helps combat

feelings of loneliness remains unclear. Based on these mixed findings, we hypothesized that, after controlling for demographics, social network size, accessibility to ICTs, and digital literacy:

1. More frequent in-person visits with FF, compared with less than once a week/never, will be associated with lower odds of more frequent loneliness during COVID-19 compared with pre-pandemic.
2. More frequent ICT interactions (i.e., phone calls, electronic and social messaging, video calls), compared with less than once a week/never usage, will be associated with greater odds of more frequent loneliness during COVID-19 compared with pre-pandemic.

## Methods

### Data

Data for this study came from the National Health and Aging Trends Study (NHATS), a nationally representative panel study of Medicare beneficiaries 65 years and older in the United States (Kasper & Freedman, 2021). To address COVID-19, NHATS conducted a supplemental self-administered mailed questionnaire survey to 3691 eligible NHATS respondents who completed a round 10 telephone interview (Freedman & Hu, 2020). The questionnaires were mailed between June and October, 2020, with most completed in July and August (Freedman & Hu, 2020). The COVID-19 datafile was merged with Rounds 1, 5, and 10 datafiles from NHATS to extract respondents' demographic information and other study variables.

A total of 3257 respondents or proxies completed the supplemental study (Freedman & Hu, 2020), among which 3007 were community-dwellers. Only 2566 community-dwelling participants who answered the survey themselves ( $n=2465$ ) or took some help from their proxies ( $n=101$ ) were included in this study. Full proxy surveys were excluded from the present study. Among those 2566 participants, only those who had non-missing information about how they contacted their friends and family (FF) during COVID-19 (e.g., phone calls; electronic and social messaging including



email/texts/social media messages; video calls; in-person visits) were included. A total of 2365 respondents visited their FF in-person, 2280 used video calls, 2298 used electronic and social messaging, and 2425 used a phone. After accounting for all missing data and deleting two influential outliers, there were 1895 self-respondents and 55 filled out the questionnaire with some proxy-help.

## Measures

### *Dependent variable*

**Feelings of loneliness** during COVID-19 compared to pre-pandemic was assessed by asking respondents: *How often did you feel lonely in a typical week during the COVID-19 outbreak? Is this more often, less often, or about the same as a typical week before the COVID-19 outbreak started?* Response categories included *more often* (score=2), *less often* (score=0), and *about the same* (score=1); a higher score indicated more feelings of loneliness. Due to the lack of loneliness scales (such as UCLA 3-item Loneliness Scale) in the questionnaire, this self-reported comparison item was used.

### *Independent variables*

**Frequency of mode of contact** was a derived variable created by asking four different questions: *During the COVID-19 outbreak, in a typical week, how often have you been in contact with family and friends not living with you by: a. phone calls; b. emails, texts, or social media messages, including Facebook messages; c. video calls including Zoom, FaceTime, and other online videos; and d. in person visits.* Response categories for each mode included *at least daily* (score=4), *a few times a week* (score=3), *about once a week* (score=2), *less than once a week*, and *never*. In this study, the last two categories were recoded as "*less than once a week/never* (score=1)", where a higher score indicated more frequent contact with FF. Similarly, emails, texts, or social media messages, including Facebook messages, were referred to as "electronic and social messaging" modes of contact.

### **Control variables**

**Respondent age** was a derived variable calculated by recording the respondents' date of birth. **Gender** was reported as either *male* or *female*. **Race/ethnicity** was recategorized as *non-Hispanic White* and *Other (non-Hispanic Black, non-Hispanic Other, and Hispanic)*. **Marital status** was recategorized into three groups: *married/partnered*, *widowed*, and *divorced/separated/never married*. **Education** was dichotomized to represent *less than bachelor's degree* and *bachelor's and higher degrees*. **Depression/sadness** during the COVID-19 outbreak was assessed by asking participants how sad or depressed they felt about the outbreak in a typical week. The four response categories were dichotomized as: *not at all= no sadness/depression*; *mild, moderate, and severe = sadness/depression*. Since participants' ability to see and hear things are associated with the use of ICTs and preferred mode of contact, presence of **vision** and **hearing impairment** were also controlled for in this study, and assessed as the ability to see things close up and hear well-enough to use the telephone, respectively. Responses were recorded as *yes/no*. Cognitive status was assessed by asking if the participant had doctor/physician diagnosed dementia/Alzheimer's Disease. Social network size (Holaday et al., 2020) and household size (Fingerman et al., 2021) are also associated with loneliness. For each participant, NHATS recorded the names of up to 5 people they "talk to about important things," including children, spouses, or household members. Using this information, **social network size** was the number of people in the participant's social network, ranging from 0-5. Similarly, **household size** was recorded as the total number of members in the household, which was dichotomized as *living alone* and *living with others* in this study. Although social distancing measures increased the use of ICTs, accessibility and digital literacy issues remain a concern. Therefore, these were also controlled for in this study. Participants' **accessibility to ICTs** was determined using information regarding participants' access to working i) *cellphone*, ii) *other phone that was not a cell phone*, iii) *computer*, and iv) *touch screen tablet computer (e.g., an iPad)* in their home. Responses were recorded as *yes/no* for the first two ICTs. The last two ICTs also included an extra response category: "Yes, but doesn't know how to use." This category only consisted of

1.69% and 1.28% of respondents for computer and tablet, respectively, so this was combined with “no” responses. **Accessibility to ICTs** can also be considered as a proxy for income for this study. Polenick et al. (2021) found that the COVID-related financial hardship was associated with greater loneliness. Therefore, **change in income** during COVID-19 was controlled for in this study, which was assessed by asking if participants “monthly income had gone up, down, or stayed about the same compared to a typical month before the COVID-19 outbreak started.” Following Chung et al. (2021), participants’ **digital literacy** was assessed by asking if they learned a new technology/program to go online during COVID-19 and recorded as yes/no.

### Statistical Analysis

Data were read into SAS v9.4, cleaned, assessed for out-of-range errors, and merged to create study variables as described above. Multiple imputation was used to handle missing data. Of the total 2566 participants, 1952 respondents had complete data for all study variables. Of those respondents with incomplete data, 2.92% were missing data on loneliness ( $n=75$ ), 7.83% on in-person visits ( $n=201$ ), 5.49% on phone calls ( $n=141$ ), 10.44% on electronic and social messaging ( $n=268$ ), 11.15% on video calls ( $n=286$ ), 1.13% on race/ethnicity ( $n=29$ ), 0.90% on education ( $n=23$ ), 2.34% on depression ( $n=60$ ), 0.04% on cognition and vision impairment ( $n=1$ ), 0.08% on hearing impairment ( $n=2$ ), 0.12% on social network ( $n=3$ ), 1.91% on change in income during COVID-19 ( $n=49$ ), 8.11% on digital literacy ( $n=208$ ), 0.04% on access to computer and cellphone ( $n=1$ ), and 0.08% on access to a touch screen tablet computer ( $n=2$ ).

General descriptive and bivariate analyses were conducted to identify associations between individual predictor variables and loneliness. A multinomial logistic regression model was chosen over ordinal regression as it allows for an assessment of how each independent variable (each mode of contact i.e., phone calls, electronic and social messaging, video calls, and in-person visits) affects the odds of reporting a given category of the dependent variable (less loneliness, about the same loneliness, more loneliness compared to pre-COVID-19) compared to each of the others. In addition,

the proportional odds assumption for ordinal regression was violated, which suggests multinomial regression as a better fit. Advanced diagnostics included checking for multicollinearity and influential observations using VIF, DFFITS, DFBETAs, Cook's distance, and studentized residuals. No issues of multicollinearity were found. However, following Allison (2012), two influential outliers were identified and removed from the analysis. Data were weighted and robust standard errors were calculated (using the proc survey commands in SAS) to account for the complex sampling design used in NHATS. A domain statement was used to generate findings for the analytical sample that only included community-dwelling self-respondents.

### **Multiple Imputation**

Multiple imputation techniques were used to address missing data. Fully conditional specification logistic, discriminant, and regression methods were used with thirty imputations. All variables included in the analyses were used in the imputation models, and all variables with missing data were imputed (Kontopantelis et al., 2017). Procedures for imputing missing data with complex sample elements (including cluster, strata, and weight variables) were followed, as described by Heeringa, West, and Berglund (2010). This technique resulted in a final analytic sample of 2,564.

## **Results**

### **Sample Characteristics**

The characteristics of respondents overall and by feelings of loneliness are presented in Table 1. Column percentages are included in the table to allow for direct comparisons of loneliness level across each level of the categorical predictors; means and standard errors are provided for numeric predictors. On average, respondents were 77 years old and had 2.6 people in their social network. The majority of respondents were female (54.86%), had less than a bachelor's degree (60.95%), identified as non-Hispanic White (85.88%), were married (59.15%), had someone else in the household (71.60%), reported feeling depressed/sad during the COVID-19 outbreak (73.18%), and did not learn a new technology/program to go online during COVID-19 (68.12%). The majority of

participants had access to a working cell phone (94.52%), other phone that was not a cell phone (67.96%), computer (80.35%), and a touch screen tablet computer (e.g., iPad; 57.86%) in their home. Most respondents reported having felt “about the same” amount of loneliness as pre-COVID-19 (75.00%), but a substantial number also reported feeling lonely more often during COVID-19 (22.16%) compared to pre-pandemic. Daily contact with FF was reported via several modes, including electronic and social messaging (31.44%), phone calls (34.25%), video calls (2.93%), and in-person visits (5.27%). Although the demographic characteristics followed a similar pattern for each specific subgroup of loneliness, reports of more loneliness were comparatively higher among females than other subgroups (less often: 52.92%; about the same: 50.68%; more often: 69.27%) and non-Hispanic White participants (91.28%). Similarly, the average social network size was slightly smaller (2.13) and larger (3.01) among those who reported feeling lonely less and more often during COVID-19, respectively. Additionally, more participants learned a new technology/program to go online during COVID-19 (49.61%) for the group that reported more feelings of loneliness. For further details, see Table 1.

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Insert Table 1 about here

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### **Regression Findings**

Findings from the multinomial regression model are presented in Table 2. Among the four modes of contact assessed in this study, only two modes (i.e., electronic and social messaging and in-person visits) significantly predicted loneliness reported during COVID-19, after controlling for the effects of other variables in the model. Phone calls and video calls were not significantly related to a difference in loneliness during COVID-19. Compared to those who used electronic and social messaging less than once a week/never, those who used it about once a week (OR=2.06), a few times a week (OR=1.82), or daily (OR=2.68) had higher odds of reported loneliness more often during COVID-19 versus “about the same” as pre-COVID-19. In contrast, the odds of reporting

loneliness more often during COVID-19 were significantly lower among those who reported having daily (vs. once a week/never) in-person visits (OR=0.31).

Among the control variables, the odds of reporting loneliness more often when compared to “about the same” as pre-COVID-19 were higher in females (OR=1.50) than males and lower in respondents of “Other” race/ethnicities (OR=0.59) than non-Hispanic White, respectively. Similarly, those who did not learn a new technology/program to go online during COVID-19 (OR=0.63), those who lived with others in the same household (OR=0.51), and those who did not feel sad/depressed during COVID-19 (OR=0.28) had lower odds of reporting loneliness more often. Contrastingly, respondents whose monthly income had gone down during COVID-19 had higher odds of reporting loneliness more often (OR=2.80).

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Insert Table 2 about here

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## Discussion

This study examined how four modes of contact (i.e., in-person visits, electronic and social messaging, phone calls, video calls) were associated with loneliness during COVID-19, compared to pre-pandemic, among older adults. In support of our hypothesis (1), daily in-person contact with FF was associated with lower odds of more frequent feelings of loneliness during COVID-19 compared to pre-COVID-19. In partial support of our hypothesis (2): (a) greater frequency of contact with FF by electronic and social messaging, compared with those who reported less than once a week/never usage, was associated with higher odds of reporting loneliness during COVID-19 versus pre-COVID-19 and (b) frequency and usage of phone calls and video calls with FF were not significantly related to loneliness during COVID-19. This is similar to previous findings that, while in-person contact with FF improved well-being for older adults, other forms of contact like electronic and social messaging

do not, and modes of contact such as phone calls and video calls were unrelated to loneliness (Fingerman et al., 2021; Hu & Qian, 2021).

The results of this study support the Need-to-Belong theory (Baumeister & Leary, 1995). Descriptive results showed that about 1 and 5 respondents reported increased feelings of loneliness during COVID-19 when compared to pre-pandemic. Findings suggest that limited interactions and engagement with FF resulted in increased feelings of loneliness for a significant portion of the population. This is consistent with previous research which showed the deleterious effects that social distancing, isolation, and quarantine have on loneliness (Brooks et al., 2020). Given the adverse risks related to loneliness, including increased mortality (Holt-Lunstad et al., 2017), this study is particularly important.

The positive benefits that close interpersonal relationships can have on overall well-being when these connections are satisfied were observed. First, in-person interactions were associated with less loneliness during COVID-19 compared to pre-pandemic. This suggests that older adults' emotional and connectivity needs are satisfied when in-person contact is viable. Because in-person contact with FF shows positive benefits for reduced loneliness among older adults, results suggest that ways to safely increase exposure to the physical presence of FF during a pandemic should continue to be explored.

When in-person visits are impossible during quarantine or isolation recommendations, ICTs are often the go-to choice to serve as a conduit between an older adult and their FF to reduce loneliness (Chen, 2020; Yu et al., 2021). However, our study suggests that a higher frequency of certain ICT usage (i.e., electronic and social messaging) to stay connected with FF was associated with greater odds of more frequent feelings of loneliness during COVID-19 as opposed to pre-COVID-19. Several possible reasons exist for why electronic and social messaging are related to increased odds of loneliness.

Nowland and colleagues (2017) suggest that social messaging among older adults is related to increased loneliness when usage is coupled with information and news reports. For instance, older adults who more regularly utilized electronic and social messaging may have had greater exposure to the negative effects of the pandemic. Additionally, the benefits of online social engagement are often felt when experienced in tandem with offline interactions (Nowland et al., 2017). It is possible that older adults who regularly engaged in texting with FF were less likely to have quality in-person interactions prior to the pandemic which increased feelings of loneliness.

Further, phone calls and video calls were not associated with loneliness. These findings are consistent with other studies that have assessed in-person communication and ICT modes on the mental well-being of older adults during COVID-19 (Fingerman et al., 2021; Hu & Qian, 2021; Skalačka & Pajestka, 2021). Despite the advantage of seeing FF with video calls, most participants in this study (70.19%) indicated using this platform less frequently (i.e., once a week or never). This is consistent with a recent survey showing that older adults used video conferencing platforms at a much lower rate than other age groups during the pandemic (McClain et al., 2021). It is unclear whether this is due to not having the needed technology, unfamiliarity with such applications, and/or technical and design problems that make using this platform difficult for older adults. It is also important to note that this non-significant finding might indicate that phone and video call usages are a viable option for older adults in relation to loneliness. Older adults who regularly utilized these platforms were not significantly more or less lonely. This suggests that they were able to, in some respects, successfully replace in-person interactions.

In addition, descriptive findings showed that compared to non-Hispanic White older adults, respondents of "Other" race/ethnicities reported less loneliness during COVID-19, as opposed to pre-pandemic. This could be due to the larger social networks and decreased risks of isolation found within non-White communities prior to the pandemic (Holaday et al., 2020). It is also possible that participation in religious activities and coresidence within multigenerational households provide



protective benefits (Holaday et al., 2020). However, when feelings of isolation (a measure of loneliness) was compared across White, Black and Hispanic older adults separately, Miyawaki (2015) found that Black older adults felt more isolated on average than their White and Hispanic counterparts and the latter two groups did not differ significantly. Therefore, dichotomization of the race/ethnicities variable in our study might have suppressed the similarities/differences across separate races and Hispanic ethnicity. Therefore, future studies are recommended with larger representative sample sizes that incorporate separate racial and ethnic categorizations to better understand how mode of contact is related to loneliness across racial and ethnic groups separately.

Finally, this research also highlights an important reality for many older adults. Unmeasured barriers of ICTs, including technological literacy and physical and cognitive limitations, can contribute to the digital exclusion that increases or fails to reduce loneliness. Additionally, affordability, lack of skills needed to use ICTs, and/or access to high-speed internet can create challenges that fuel an older adult's inability to reap the positive social connectivity benefits of digital social connections with FF. Although controlled for, it is essential to note that almost 20% and 42% of respondents indicated not having a computer or tablet, respectively. Further, nearly 68% reported that they had not learned a new technology/program for online use during COVID-19. These descriptive statistics suggest potentially important barriers between ICT usage and loneliness. This highlights the need to discern whether feelings of loneliness associated with various modes of ICT are due to unfamiliarity regarding participation, barriers to digital inclusion, and/or limitations in technological adoptions among older adults.

### **Limitations and Strengths**

Although this study addresses a critical gap in the current literature, it is not without its limitations. Lack of variables in the COVID-19 mailed questionnaire to create loneliness scales, such as the UCLA 3-item Loneliness Scale, restricted the authors to use single-item self-reported loneliness during the COVID-19 pandemic compared to pre-pandemic. Collecting information that

provides an opportunity to create and use multidimensional scales is encouraged in future studies to decrease the likelihood of underreporting due to associated stigma with loneliness (Ong et al., 2016; Shiovitz-Ezra & Ayalon, 2012). Additionally, the cross-sectional design limits our ability to discern causal or directional conclusions. Although loneliness was assessed compared to pre-COVID-19, the frequency of modes of contact with FF and feelings of loneliness were only measured at one point in time. It is possible that ICT usage became more normative as the pandemic ensued which could have significant implications on the study's findings. Future studies are encouraged to directly identify loneliness trajectories among older adults during COVID-19 across varying modes of contact and risk categories. Additionally, the study relied on respondent's self-reported memories of previous interactions rather than concurrent assessments. This can create a discrepancy between actual and mistaken contact. Finally, studies should consider how ICT usage and associations with well-being will change with a more diverse sample and with future cohorts.

Despite its limitations, this study has several strengths. Using data extrapolated during COVID-19 allowed us to explore how different modes of contact are associated with loneliness during a pandemic and compare feelings of loneliness pre-pandemic. This study also expands previous literature by utilizing a nationally representative sample. Separately examining the associations of various ICT modes is another strength of this study. Future research should address how relationships between different modes of contact are associated with well-being and explore how such feelings change over time.

## **Conclusion**

Considering the adverse health outcomes associated with loneliness (Donovan et al., 2017; Holt-Lunstad et al., 2015; Nguyen et al., 2020), finding alternative strategies to combat loneliness during the COVID-19 pandemic and promote well-being can be helpful for older adults. ICT usage provides opportunities for social engagement and helps people remain socially active. However, this study highlighted potential inequalities in digital privilege and suggests that older adults may not be

receiving the benefits of social connection provided by ICT usage. This study calls attention to the action needed to i) better understand the potentially complex relationships between ICT usage and well-being of older adults and, ii) enhance the efficacy of ICTs to reduce loneliness among older adults.

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## Tables

**Table 1***Characteristics of Participants Overall and by Feelings of Loneliness*

| Characteristics                  | Total sample    | Loneliness reported during COVID-19 |                |              |
|----------------------------------|-----------------|-------------------------------------|----------------|--------------|
|                                  |                 | Less Often                          | About the Same | More Often   |
| n (%) or mean (SE)               | n=1950          | n=56(2.84)                          | n=1499(75.00)  | n=395(22.16) |
| <b>Age in years</b>              | 77.17(0.13)     | 76.59(0.52)                         | 77.36(0.14)    | 76.62(0.25)  |
| <b>Social network size</b>       | 2.60(0.05)      | 2.13(0.14)                          | 2.48(0.05)     | 3.01(0.09)   |
| <b>Gender</b>                    |                 |                                     |                |              |
| Female                           | 1091(54.86)     | 31(52.92)                           | 781(50.68)     | 2791(69.27)  |
| Male                             | 859(45.14)      | 25(47.08)                           | 718(49.32)     | 116(30.73)   |
| <b>Race/ethnicity</b>            |                 |                                     |                |              |
| non-Hispanic White               | 1598<br>(85.88) | 36(71.67)                           | 1219(84.76)    | 343(91.46)   |
| Other                            | 352(14.12)      | 20(28.33)                           | 280(15.24)     | 52(8.54)     |
| <b>Education</b>                 |                 |                                     |                |              |
| Less than bachelor's degree      | 1211(60.95)     | 39(73.60)                           | 967(63.06)     | 205(52.19)   |
| Bachelor's degree and higher     | 739(39.05)      | 17(26.40)                           | 532 (36.94)    | 190(47.81)   |
| <b>Marital status</b>            |                 |                                     |                |              |
| Married                          | 1050(59.15)     | 28(54.36)                           | 820(60.20)     | 202(56.20)   |
| Separated/Divorced/Never Married | 309(15.63)      | 11(23.92)                           | 225(14.45)     | 73(18.52)    |
| Widowed                          | 591(25.23)      | 17(21.72)                           | 454(25.34)     | 120(25.27)   |

**Household size**

|                    |             |           |             |            |
|--------------------|-------------|-----------|-------------|------------|
| Living alone       | 611(28.40)  | 19(36.43) | 441(25.99)  | 151(35.52) |
| Living with others | 1339(71.60) | 37(63.57) | 1058(74.01) | 244(64.48) |

**Depressed/Sad**

|     |             |           |            |            |
|-----|-------------|-----------|------------|------------|
| No  | 536(26.81)  | 10(14.86) | 505(33.45) | 21(5.91)   |
| Yes | 1414(73.18) | 46(85.14) | 994(66.55) | 374(94.09) |

**Presence of technology at home****Computer**

|     |             |           |             |            |
|-----|-------------|-----------|-------------|------------|
| No  | 456(19.65)  | 19(32.61) | 370(21.00)  | 67(14.76)  |
| Yes | 1494(80.35) | 37(67.39) | 1129(79.40) | 328(85.24) |

**Cell phone**

|     |             |           |             |            |
|-----|-------------|-----------|-------------|------------|
| No  | 136(5.48)   | 3(3.42)   | 118(6.56)   | 15(2.08)   |
| Yes | 1814(94.52) | 53(96.58) | 1381(93.44) | 380(97.92) |

**Other phone**

|     |             |           |             |            |
|-----|-------------|-----------|-------------|------------|
| No  | 519(32.04)  | 16(37.04) | 392(31.21)  | 111(34.20) |
| Yes | 1431(67.96) | 40(62.96) | 1107(68.79) | 284(65.80) |

**Tablet**

|     |             |           |            |            |
|-----|-------------|-----------|------------|------------|
| No  | 929(42.14)  | 29(46.79) | 749(44.54) | 151(33.43) |
| Yes | 1021(57.86) | 27(53.21) | 750(55.46) | 244(66.57) |

**Digital literacy**

|     |             |           |             |            |
|-----|-------------|-----------|-------------|------------|
| No  | 1381(68.12) | 44(83.89) | 1126(72.77) | 211(50.38) |
| Yes | 569(31.88)  | 12(16.11) | 373(27.23)  | 184(49.61) |

**Cognitive impairment**

|     |             |           |             |            |
|-----|-------------|-----------|-------------|------------|
| No  | 1901(97.87) | 53(95.41) | 1463(98.05) | 385(97.57) |
| Yes | 49(2.13)    | 3(4.60)   | 36(1.95)    | 10(2.43)   |

**Change in income during**

**COVID**

|           |             |           |             |            |
|-----------|-------------|-----------|-------------|------------|
| No change | 1770(88.59) | 46(79.06) | 1383(90.44) | 341(83.55) |
| Decreased | 139(9.04)   | 9(19.41)  | 89(7.38)    | 41(13.36)  |
| Increased | 41(2.37)    | 1(1.53)   | 27(2.19)    | 13(3.09)   |

**Hearing impairment**

|     |             |            |             |            |
|-----|-------------|------------|-------------|------------|
| No  | 1936(99.15) | 56(100.00) | 1487(99.18) | 393(98.95) |
| Yes | 14(0.85)    | 0(0.00)    | 12(0.82)    | 2(1.05)    |

**Vision impairment**

|     |             |           |             |            |
|-----|-------------|-----------|-------------|------------|
| No  | 1703(87.02) | 53(94.82) | 1313(87.38) | 337(84.82) |
| Yes | 247(12.98)  | 3(5.18)   | 186(12.62)  | 58(15.19)  |

**Mode of contact and frequency of use****Electronic and social messaging**

|                             |            |           |            |            |
|-----------------------------|------------|-----------|------------|------------|
| Never/less than once a week | 637(27.14) | 20(34.22) | 546(31.18) | 71(12.55)  |
| About once a week           | 213(11.20) | 6(14.77)  | 162(11.43) | 45(9.97)   |
| Few times a week            | 572(30.23) | 24(42.96) | 421(28.95) | 127(32.91) |
| Daily                       | 528(31.44) | 6(8.05)   | 370(28.44) | 152(44.58) |

**Phone calls**

|                             |            |           |            |            |
|-----------------------------|------------|-----------|------------|------------|
| Never/less than once a week | 202(11.22) | 7(20.69)  | 167(11.89) | 28(7.73)   |
| About once a week           | 314(15.72) | 8(17.12)  | 252(16.41) | 54(13.17)  |
| Few times a week            | 743(38.81) | 20(30.43) | 552(37.26) | 171(45.14) |
| Daily                       | 691(34.25) | 21(31.76) | 528(34.43) | 142(33.95) |

**Video calls**

|                             |             |           |             |            |
|-----------------------------|-------------|-----------|-------------|------------|
| Never/less than once a week | 1431(70.19) | 41(78.65) | 1147(73.02) | 243(59.52) |
| About once a week           | 263(14.69)  | 7(9.48)   | 177(13.21)  | 79(20.38)  |
| Few times a week            | 204(12.19)  | 5(8.42)   | 141(11.27)  | 58(15.77)  |

|       |          |         |          |          |
|-------|----------|---------|----------|----------|
| Daily | 52(2.93) | 3(3.45) | 34(2.50) | 15(4.33) |
|-------|----------|---------|----------|----------|

**In-person visits**

|                             |             |           |            |            |
|-----------------------------|-------------|-----------|------------|------------|
| Never/less than once a week | 1138(59.71) | 31(55.60) | 849(57.84) | 258(66.59) |
|-----------------------------|-------------|-----------|------------|------------|

|                   |            |           |            |           |
|-------------------|------------|-----------|------------|-----------|
| About once a week | 411(20.23) | 14(21.62) | 322(20.66) | 75(18.60) |
|-------------------|------------|-----------|------------|-----------|

|                  |            |          |            |           |
|------------------|------------|----------|------------|-----------|
| Few times a week | 302(14.79) | 8(14.49) | 240(15.46) | 54(12.57) |
|------------------|------------|----------|------------|-----------|

|       |          |         |          |         |
|-------|----------|---------|----------|---------|
| Daily | 99(5.27) | 3(8.29) | 88(6.05) | 8(2.24) |
|-------|----------|---------|----------|---------|

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*Note.*  $n$  = number of participants; SE = standard error; all numbers are unweighted, and percentages and means are weighted; percentages may not add up to 100 because of rounding; electronic and social messaging includes communication via email, text, or social media messages; “Other” race/ethnicities include non-Hispanic Black, non-Hispanic Other, and Hispanic

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**Table 2**

*Multinomial Logistic Regression Results Comparing Loneliness Among US Older Adults During COVID-19*

| Variables   | Loneliness (About the Same vs More Often) |      |      | Loneliness (About the Same vs Less Often) |      |      |      |       |
|---|---|------|------|---|------|------|------|-------|
|   | <i>p</i> -value                           | OR   | CI   | <i>p</i> -value                           | OR   | CI   |      |       |
| <b>Mode and frequency of contact</b>                                |   |      |      |   |      |      |      |       |
| <b>Phone calls (Ref=&lt; once a week/never)</b>                     |   |      |      |   |      |      |      |       |
| About once a week   | 0.24                                      | 0.69 | 0.37 | 1.28                                      | 0.52 | 0.65 | 0.18 | 2.43  |
| Few times a week  | 0.80                                      | 0.93 | 0.54 | 1.61                                      | 0.25 | 0.50 | 0.15 | 1.65  |
| Daily   | 0.26                                      | 0.68 | 0.35 | 1.34                                      | 0.47 | 0.65 | 0.19 | 2.15  |
| <b>Electronic and social messaging (Ref=&lt; once a week/never)</b> |   |      |      |   |      |      |      |       |
| About once a week   | 0.02                                      | 2.06 | 1.15 | 3.68                                      | 0.99 | 0.99 | 0.34 | 2.93  |
| Few times a week  | 0.02                                      | 1.82 | 1.12 | 2.94                                      | 0.94 | 0.97 | 0.42 | 2.23  |
| Daily   | 0.001                                     | 2.68 | 1.53 | 4.71                                      | 0.08 | 0.38 | 0.13 | 1.13  |
| <b>Video calls (Ref=&lt; once a week/never)</b>                     |   |      |      |   |      |      |      |       |
| About once a week   | 0.38                                      | 1.20 | 0.70 | 1.82                                      | 0.81 | 0.89 | 0.33 | 2.36  |
| Few times a week  | 0.54                                      | 1.17 | 0.70 | 1.94                                      | 0.49 | 1.50 | 0.47 | 4.82  |
| Daily   | 0.58                                      | 1.21 | 0.61 | 2.41                                      | 0.26 | 2.32 | 0.52 | 10.26 |
| <b>In-person visits (Ref=&lt; once a week/never)</b>                |   |      |      |   |      |      |      |       |
| About once a week   | 0.10                                      | 0.73 | 0.51 | 1.06                                      | 0.89 | 0.94 | 0.39 | 2.28  |
| Few times a week  | 0.22                                      | 0.75 | 0.48 | 1.19                                      | 0.72 | 0.82 | 0.27 | 2.49  |
| Daily   | 0.004                                     | 0.31 | 0.14 | 0.68                                      | 0.67 | 1.32 | 0.36 | 4.81  |
| <b>Age in years</b>   | 0.71                                      | 1.00 | 0.97 | 1.02                                      | 0.08 | 0.95 | 0.91 | 1.01  |
| <b>Social network size</b>  | 0.18                                      | 1.08 | 0.96 | 1.22                                      | 0.88 | 0.98 | 0.75 | 1.28  |
| <b>Gender (Ref=Male)</b>  |   |      |      |   |      |      |      |       |
| Female  | 0.04                                      | 1.50 | 1.02 | 2.21                                      | 0.94 | 1.02 | 0.53 | 1.98  |
| <b>Race/ethnicity (Ref= non-Hispanic White)</b>                     |   |      |      |   |      |      |      |       |

|  |        |          |          |      |           |             |      |      |
|--|--------|----------|----------|------|-----------|-------------|------|------|
| Other  | 0.02   | 0.5<br>9 | 0.3<br>8 | 0.91 | 0.44      | 1.40        | 0.58 | 3.36 |
| <b>Education (Ref=Bachelor's &amp; higher)</b>       |        |          |          |      |           |             |      |      |
| Less than bachelor's degree                          | 0.35   | 0.8<br>7 | 0.6<br>4 | 1.18 | 0.24      | 1.64        | 0.71 | 3.80 |
| <b>Marital status (Ref=Married/Partnered)</b>        |        |          |          |      |           |             |      |      |
| Separated/Divorced/NM                                | 0.70   | 1.0<br>8 | 0.7<br>4 | 1.58 | 0.51      | 1.47        | 0.46 | 4.70 |
| Widowed  | 0.33   | 0.8<br>1 | 0.5<br>3 | 1.24 | 0.60      | 1.37        | 0.41 | 4.51 |
| <b>Household size (Ref=Living alone)</b>             |        |          |          |      |           |             |      |      |
| Living with others                                   | 0.001  | 0.5<br>1 | 0.3<br>5 | 0.74 | 0.62      | 0.78        | 0.29 | 2.09 |
| <b>Depressed/Sad (Ref=Yes)</b>                       |        |          |          |      |           |             |      |      |
| Not depressed/sad                                    | <.0001 | 0.1<br>4 | 0.0<br>9 | 0.22 | 0.00<br>2 | 0.28        | 0.13 | 0.61 |
| <b>Accessibility to ICTs (Ref= Yes)</b>              |        |          |          |      |           |             |      |      |
| No computer  | 0.26   | 1.2<br>8 | 0.8<br>2 | 2.00 | 0.49      | 1.27        | 0.64 | 2.54 |
| No cellphone   | 0.27   | 0.7<br>0 | 0.3<br>7 | 1.32 | 0.21      | 0.33        | 0.06 | 1.89 |
| No other phone                                       | 0.90   | 0.9<br>8 | 0.6<br>6 | 1.44 | 0.72      | 1.14        | 0.55 | 2.40 |
| No touch screen tablet computer                      | 0.79   | 0.9<br>6 | 0.6<br>9 | 1.33 | 0.33      | 0.74        | 0.40 | 1.38 |
| <b>Digital literacy (Ref=Yes)</b>                    |        |          |          |      |           |             |      |      |
| No   | 0.01   | 0.6<br>3 | 0.4<br>5 | 0.89 | 0.34      | 1.62        | 0.58 | 4.52 |
| <b>Cognitive impairment (Ref= Yes)</b>               |        |          |          |      |           |             |      |      |
| No   | 0.15   | 0.5<br>7 | 0.2<br>6 | 1.23 | 0.30      | 0.46        | 0.10 | 2.07 |
| <b>Change in income during COVID (Ref=No change)</b> |        |          |          |      |           |             |      |      |
| Decreased  | 0.30   | 1.3<br>3 | 0.7<br>7 | 2.31 | 0.03      | 2.80        | 1.14 | 6.87 |
| Increased  | 0.22   | 1.5<br>8 | 0.7<br>6 | 3.28 | 0.40      | 1.92        | 0.42 | 8.91 |
| <b>Hearing impairment (Ref=Yes)</b>                  |        |          |          |      |           |             |      |      |
| No   | 0.38   | 1.7<br>8 | 0.4<br>7 | 6.72 | 0.00      | 0.0000<br>9 | 0.00 | 0.00 |
| <b>Vision impairment (Ref=Yes)</b>                   |        |          |          |      |           |             |      |      |
| No   | 0.41   | 1.2<br>1 | 0.7<br>6 | 1.93 | 0.71      | 0.84        | 0.33 | 2.16 |

Note. NM=never married; ICT= information and communication technologies; OR=odds ratio;

CI=confidence interval; Ref=reference group; electronic and social messaging includes

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communication via email, text, or social media messages; “Other” race/ethnicities include non-Hispanic Black, non-Hispanic Other, and Hispanic

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