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Full length article

Digital inequality in communication during a time of physical distancing: The case of COVID-19

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ABSTRACT

In times of physical distancing, such as during the COVID-19 pandemic, people are likely to turn to digital communication to replace in-person interactions. Yet, persisting digital inequality suggests that not everyone will be equally able or disposed to increasing digital communication during a public health crisis. Using survey data from a national sample of U.S. participants ($N = 2,925$) that we collected during the early months of the pandemic, we analyzed how sociodemographics, living arrangements, and Internet experiences and skills relate to increases and decreases in various digital communication methods. We find that people privileged in their socioeconomic status, their Internet skills and online experiences are more likely to increase and less likely to decrease digital communication during the pandemic. The findings illustrate how digital inequalities can put already disadvantaged groups at greater risk of diminished social contact during a public health crisis. We discuss the theoretical implications of our findings for digital inequality research, the practical implications for inclusive crisis responses, and directions for future research.

1. Introduction

Over the last several decades, digital technologies have evolved to become key channels for interpersonal communication and interaction for sustaining relationships and exchanging emotional and material support (Rainie & Wellman, 2012). However, the diffusion of digital technologies is marked by disparities across sociodemographic groups in terms of people's nature of access, degrees of skill, and varieties of use (DiMaggio et al., 2004; Robinson et al., 2015). These variations in digital experiences predict who is likely to benefit from access to the Internet, in terms of health, finances, political participation (Jackson et al., 2001) and interpersonal communication and support (Rains & Tsetsi, 2017). During a time when public spaces are closed down and in-person interactions are reduced, such as during the COVID-19 pandemic, digital communication may provide the means to sustain interpersonal relationships and organize everyday life, but such communication and its benefits might not be equally accessible for everyone.

Emerging research on the COVID-19 pandemic anticipates that the effects of digital inequality and pandemic conditions will be reciprocal; for example, those who may benefit the most from access to digital health services and remote social support are groups already disadvantaged in their Internet access, skills, and support (Beaunoyer et al., 2020;

Robinson et al., 2020). In one of few empirical studies on the pandemic and digital inequalities to date, lower quality of Internet access and lower Internet skills correlated with less use of the Internet for both communication and information purposes related to COVID-19 during the early period of physical distancing in the Netherlands (van Deursen, 2020). Whether digital communication overall, not only related to COVID-19, increased or decreased for different groups remains to be studied, which is the gap in the literature that this paper addresses.

We collected survey data from 2,925 U.S. adults during the early months of the COVID-19 pandemic when physical distancing and lockdown measures were in place in most parts of the United States (Centers for Disease Control and Prevention, 2020). The third most populous country in the world, the United States saw a rapid rise in cases of COVID-19 in the early months of 2020, reaching 100,000 deaths from the disease by the end of May 2020, more than any other country at the time (AJMC, 2021). Lockdown measures in the country differed by state. The majority of states had implemented a stay-at-home order by the end of March, starting with California, which was the first state to implement such an order, on March 19 (Centers for Disease Control and Prevention, 2020). By looking at sociodemographics, living arrangements, and Internet experiences and skills, we examine who in the U.S. is more likely to increase and more likely to decrease digital communication

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during a time when in-person social interactions were limited. As such, this study contributes to digital inequality scholarship by examining digital communication habits by people of different backgrounds during physical distancing.

2. Digital inequality during a time of physical distancing

Typically, researchers have assessed digital inequality during times when people are presumed to use digital technologies in concert with in-person interactions and the availability of public venues. Digital experiences and habits are likely to shift during a time of widespread physical distancing. Reports have shown that people's use of video chat, instant messaging, social media, and other methods increased during the early months of the pandemic (e.g., [Anderson & Vogels, 2020](#); [Global-WebIndex, 2020](#), pp. 10–14; [Ipsos, 2020](#)), likely to make up for a lack of in-person interactions. As anticipated by other work as well ([Beaunoyer et al., 2020](#)), those who are able to adopt online alternatives and supplements to typically offline activities such as work, school, healthcare, and communication with family and friends quickly are likely to fare better during a public crisis involving physical distancing.

Given inequalities in Internet access, skills, and uses that preceded the COVID-19 pandemic, it is likely that not everyone will be equally prepared or disposed to increasing digital communication while engaging in physical distancing ([Robinson et al., 2020](#)). Already vulnerable groups are likely to be least prepared to manage shifts necessary during the pandemic and digital inequalities are one way that the crisis might disproportionately impact those groups. Who can afford Internet access during job layoffs and who has the skills and support to take up new digital habits at a rapid pace, among other factors, may shape who is able to avoid some of the repercussions of the crisis. Even for those with sufficient access and skills, different habits of use (e.g., using the Internet for entertainment versus information-seeking or social support) could mean some people benefit less from digital avenues to learn about the crisis, engage in telemedicine, and use online channels to give and receive support from their social network ([Beaunoyer et al., 2020](#); [van Deursen, 2020](#)). In the following section, we assess these potentials for inequalities to magnify between the more and less digitally privileged by reviewing the literature on the state of digital inequalities before the pandemic.

2.2. Factors influencing differences in digital communication during COVID-19

Digital inequality research theorizes several interlocking factors shaping who benefits from the diffusion of digital technologies. People are differently disposed to benefitting from digital technologies based not only on who has quality, dependable, and autonomous access to the Internet, but also on who has the skills to use digital technologies and toward what ends they use such technologies ([DiMaggio et al., 2004](#)). Existing digital inequality may shape changes in digital communication during the COVID-19 pandemic along disparities of sociodemographics, personal living situations during lockdown, and Internet access and skills.

Sociodemographics may predict changes in digital communication based on different abilities to maintain Internet access during a pandemic ([Gonzales, 2016](#)). A quarter of Americans do not have broadband Internet access at home, and almost one-fifth do not own a smartphone ([Anderson, 2019](#)). These numbers are higher among lower-income Americans, those living in rural areas, and racial and ethnic minorities ([Anderson & Kumar, 2019](#); [Perrin & Turner, 2019](#)), as well as older adults, a quarter of whom say they do not use the Internet at all ([Anderson & Perrin, 2017](#)). In lieu of home broadband, lower-income and minority populations in the United States are more dependent on their smartphones for Internet access ([Pew Research Center, 2018](#)), with smartphone dependence corresponding to a smaller range of digital activities ([Tsetsi & Rains, 2017](#)). Even before the

COVID-19 pandemic, studies showed these groups were more likely to experience disruptions in their smartphone and home Internet access, due to unstable incomes and a reliance on budget devices and service plans ([Gonzales, 2016](#); [Marler, 2019](#)). Additionally, minorities and those of lower incomes tend to rely more on public options for Internet access, such as libraries and community centers ([Dailey et al., 2010](#)), which may be closed during the pandemic. These groups may thus struggle to keep up with the increased utility of digital communication for maintaining relationships and finding information and support during the pandemic ([Beaunoyer et al., 2020](#); [Robinson et al., 2020](#); [van Deursen, 2020](#)).

Gender may play a role in digital communication use during lockdown. Previous research has shown that men use the Internet more for informational purposes, and women more for social and expressive purposes ([Jackson et al., 2001](#)). Researchers have referred to the gendered norms around technology use in this regard ([Kelan, 2007](#)), where women are often expected to use communication technologies to maintain social networks and fulfill domestic needs, such as keeping up with community ties and facilitating childcare ([Fischer, 1994](#); [Ling & Yttri, 2002](#)). As such, we might expect women to increase digital communication during the pandemic to maintain communication with social networks when in-person contact is unavailable. Nevertheless, regarding COVID-19 communication, one study found men more engaged digitally than women ([van Deursen, 2020](#)). Whether such gender differences during pandemic conditions apply across national contexts remains an open question.

Race and ethnicity may also shape who uses the Internet more or less across different methods during a time of physical distancing. The question of social media use is motivated by studies that have shown African Americans and Hispanics using social media at equal or greater rates than Whites over time, even as minorities lagged in other domains of Internet access and use ([Hargittai & Litt, 2011](#)). Digital communication over social media may be significant during the pandemic for sharing information and providing support within interpersonal networks. As such, minorities with higher rates of social media use may maintain their use and not decrease it during lockdown.

Besides sociodemographic factors, availability of in-person social interactions through people's living arrangements might also motivate some more than others to turn to digital communication for social connection when sheltering in place. Such a variable is new to digital inequality research, as studies tend to consider inequalities during periods when in-person contact is not restricted. Fewer opportunities exist for in-person social interactions for those living alone, who may thus be more inclined to use digital media for social connection. Typically, people living alone have more active social lives than those living with a partner, and digital media is an important tool for them to cultivate and maintain such connections ([Klinenberg, 2012](#)). Parents and guardians of children may take up digital communication to keep connected to schools for remote learning. Industry reports show that 65 percent of parents had increased their social media use during the pandemic, compared to 40 percent of households without children ([The Harris Poll, 2020](#)). Besides the living arrangements that may affect one's social interactions within the household, those who continue to engage in face-to-face social activities outside the household (e.g., meeting up with friends, attending social gatherings) may feel less need to turn to digital methods for social connection during times of physical distancing.

Digital inequality scholarship suggests that besides disparities in access to technology, people also need to possess adequate skills to be able to reap the benefits of digital media use ([DiMaggio et al., 2004](#)). Less digitally-literate people face challenges in adopting novel digital communication methods ([Hargittai & Micheli, 2019](#); [Hsieh, 2012](#); [Yu et al., 2017](#)), which may be further exacerbated when adoption must occur at a rapid pace like during a pandemic. In support of these predictions, an empirical study found that more privileged Dutch Internet users in terms of their Internet access and skills were more likely to use the Internet to inform themselves and communicate with others about the COVID-19 pandemic ([van Deursen, 2020](#)). Inequalities in Internet

skills are thus likely to shape who is able to increase digital communication to connect with others outside the home during a time of physical distancing.

2.3. Research questions

The current study examines who is more likely to increase and to decrease digital communication during a time of physical distancing where options are fewer for in-person social interactions than is usually the case. Specifically, we investigate how the case of the COVID-19 pandemic shapes digital inequality by evaluating how sociodemographics and home situations, and Internet experiences and Internet skills relate to changes in digital communication. We formulate the following two research questions:

RQ1: How do sociodemographic factors and living arrangements relate to changes in digital communication during the COVID-19 pandemic, specifically looking at (a) increases; and (b) decreases in digital communication?

RQ2: How do Internet experiences and Internet skills relate to changes in digital communication during the COVID-19 pandemic, specifically looking at (a) increases; and (b) decreases in digital communication?

3. Material and methods

We surveyed 2,925 US adults during the early months of the Coronavirus pandemic in 2020 (April 4–8, $N = 1,374$; May 4–9, $N = 1,551$). To distribute our questionnaire, we worked with the online research company Cint which relies on a double opt-in national panel of Internet users. Respondents received a modest financial compensation for their participation. We set quotas for age, gender, education level, and region to arrive at a sample approximating U.S. Census figures. Our final sample includes participants from all 50 U.S. states plus Washington, DC. At the time of the first data collection, nine states had no stay-at-home guidelines in place, while seven states had no such guidelines in place at the time of the second data collection (Centers for Disease Control and Prevention, 2020). We note that our sample includes Internet users only, but this serves the purpose of our study to examine who is more likely to increase and to decrease digital communication during the COVID-19 pandemic. We discuss possible limitations of this research design for understanding digital inequality more generally in the Discussion section.

3.1. Measures: Independent variables

3.1.1. Sociodemographics

We measured age by asking for birth year and subtracted that from 2020. We included the gender options male, female, and other, which we recoded into a female category (1 vs. 0 for others). Following U.S. Census conventions, we measured race and ethnicity with two questions. We first asked whether the respondent was of Hispanic or Latino descent, after which we asked about race with the categories White, Black or African American, Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, and/or other. We created dummy variables from these (combining the Native categories into one). For education level, we asked respondents to report their highest level of school completed out of six options, which we recoded into: completed high school or less, attended some college, completed college or more. We measured household income through 13 categories ranging from less than \$10,000 to \$200,000 or more, which we recoded into midpoint values. We collapsed people who were working full time, working part time, self-employed, or in the military into a dummy variable reflecting being employed. To measure metropolitan status, we asked if people lived in a big city, the suburbs or outskirts of a big city, a town or a small city, or a rural area, and created three dummy variables representing

rural, suburban, and urban residence.

3.1.2. Living arrangements and in-person experiences

To record people's living arrangements, we asked whether people lived with other adults, and if they lived with children under the age of 18. Based on this, we created a dummy variable reflecting whether people lived alone and without children, and another reflecting the presence of children in the household. To control for face-to-face communication with people outside the household, we measured if people had gone out for non-essential social activities since the start of the Coronavirus pandemic. Specifically, we asked about: meeting with friends; attending religious services; going to the movies; theatre or a concert; going to a bar or cafe; and going out for beauty and care services. We recoded these into one dummy variable indicating if someone had gone out for any non-essential social outing during the lockdown period.

3.1.3. Internet experiences and skills

To measure frequency of Internet use, in the first survey we asked how often respondents used the Internet on weekdays and on weekends, either on a computer, tablet or phone. We used a slightly different question in the second survey, where we asked separately for each method (i.e., computer, tablet, and phone) how often respondents used the Internet at home. Answer options for both questions included almost constantly, several times a day, about once a day, several times a week, and less often. We recoded the answers into one dichotomous variable reflecting frequent Internet use as those who use the Internet several times a day or almost constantly on both weekdays and weekends, regardless of device, versus everyone else. For Internet skills, we used an established and validated index to measure people's Internet know-how (Hargittai & Hsieh, 2012). We asked respondents to report their understanding of six Internet-related terms on a 1–5 point scale ranging from no understanding to full understanding (e.g., "PDF", "cache"). We took the average of the items as the Internet skills score (Cronbach's $\alpha = .90$). Finally, to measure people's quality of Internet access during the pandemic, we asked if respondents had been worried about Internet access more than usual since the Coronavirus outbreak, even if only in a minor way (1 vs. 0 not worried).

3.2. Measures: Dependent variable

3.2.1. Changes in digital communication

The digital communication methods we asked about were: voice calls; video calls; text messages (via any messaging app); email; social media; and online games. To measure people's changes in digital communication during COVID-19, we asked: "Compared to before the Coronavirus pandemic, has your communication with friends and family who do not live in your household increased, decreased or remained the same for these methods?" Answer options under each method were "more", "about the same", or "less". We recoded these into binary variables reflecting an increase for "more" as compared to "same" or "less" responses; and a decrease for "less" compared to "same" or "more" responses, for each method. We asked respondents to exclude work-related communication.

3.3. Sample characteristics

Table 1 displays the sample characteristics. The mean age of participants is 46, and just over half of the sample is female (55%). The majority of respondents identified as White (67%), followed by Hispanic (14%), African-American (12%), Asian (5%) and Native American (2%). Our sample includes people with varying education levels and from rural, suburban, and urban areas. During the surveyed period of the COVID-19 lockdown, 23% of the sample reported having gone out for non-essential activities (see earlier description in this section for a detailed list of these activities). Our sample includes people with varying

Table 1
Sample characteristics.

	Percent	Mean	SD	N
<i>Sociodemographics</i>				
Age		46.43	16.51	2919
Female	54.7			2924
<i>Race and ethnicity</i>				
White	67.2			2917
African-American	11.7			2917
Hispanic	14.1			2923
Asian	5.0			2917
Native American	1.8			2917
<i>Education</i>				
High school or less	49.1			2925
Some college	18.8			
Bachelor's degree or more	32.1			
Household income		\$59,462	\$51,486	2020
Metropolitan status				2924
Rural	17.4			
Suburban	37.6			
Urban	44.9			
<i>Living arrangements and in-person experiences</i>				
Living alone	21.5			2925
Child(ren) in household	32.3			2925
Going out for any social activity	23.4			2925
<i>Internet experiences and skills</i>				
Frequent Internet use	92.6			2923
Internet skills (range 1–5)		3.73	1.18	2923
Worrying about Internet access	14.7			2923

levels of Internet use and skills, with 15% of the sample worrying about Internet access during the pandemic. Overall, our sample consists of people with diverse sociodemographic backgrounds and Internet experiences.

3.4. Data analysis

To give context to how sociodemographics and living arrangements play a role in people's Internet experiences during the pandemic, we first present linear and logistic regression models with frequent Internet use, Internet skills, and worry about Internet access during the pandemic as outcomes (Table 2). Then, to answer our research questions, we present the results of logistic regression analyses exploring who is more likely to increase (Table 3) and to decrease (Table 4) communication via voice calls, video calls, text messages, email, social media, and online games. In the first set of models (Models 1), we included sociodemographic factors as well as in-person experiences to examine who increases and who decreases these digital communication methods during the pandemic. Next, we added Internet experiences and Internet skills to the regression models to see if these make a significant independent contribution to understanding who increased and who decreased digital communication (Models 2). In the regression analyses, we used the log transformation of income given that a unit change at the upper end likely makes a smaller difference than a unit change at the lower end. We also controlled for the different time points at which we collected data. The main findings are robust to controlling for differences in implementation of stay-at-home orders across states during the first and second data collection.

4. Results

4.1. Internet experiences and skills during the COVID-19 pandemic

Table 2 shows the results of the regression models with Internet experiences and skills as outcomes. We found that higher age, being Native American, and living in rural areas was related to lower likelihood of being a frequent Internet user, while higher household income was related to higher chances of frequent Internet use. Regarding Internet skills, older age and identifying as female was related to having

Table 2
Regression models: Internet experiences and skills.

	Frequent Internet use (N = 2901)		Internet skills (N = 2897)		Worrying about Internet access (N = 2901)	
	b	SE	b	SE	b	SE
Intercept	0.64	0.91	2.47	0.27	0.17	0.69
Time of data collection	0.63***	0.15	-0.09*	0.04	-0.43***	0.11
<i>Sociodemographics</i>						
Age	-0.01*	0.01	-0.01***	0.00	-0.02***	0.00
Female	0.05	0.15	-0.34***	0.04	-0.31**	0.11
<i>Race and ethnicity</i>						
African-American	-0.26	0.22	0.10	0.07	-0.01	0.18
Hispanic	-0.30	0.21	0.02	0.06	0.54***	0.14
Asian	-0.41	0.34	-0.06	0.09	0.20	0.24
Native American	-0.90*	0.41	0.04	0.15	-0.18	0.45
<i>Education</i>						
Some college	0.02	0.19	0.24***	0.06	0.18	0.15
Bachelor's degree or more	0.28	0.20	0.37***	0.05	0.37**	0.14
Household income (log)	0.24**	0.09	0.11***	0.03	-0.12	0.07
Employed	-0.11	0.17	0.23***	0.05	-0.04	0.12
<i>Metropolitan status</i>						
Rural	-0.54**	0.19	-0.11	0.06	0.22	0.16
Suburban	-0.32	0.17	0.09*	0.05	0.13	0.12
<i>Living arrangements and in-person experiences</i>						
Living alone	-0.33	0.18	0.16**	0.05	-0.25	0.16
Child(ren) in household	0.01	0.19	0.10*	0.05	0.14	0.13
Going out for any social activity	-0.04	0.18	0.02	0.05	0.50***	0.12
Adjusted R ²			0.14			
Nagelkerke R ²			0.05		0.07	

Note. b = unstandardized (logistic) regression coefficient; SE = standard error. The reference category for race and ethnicity is "White", for education level "High school or less", and for metropolitan status "Urban". * p < .05. ** p < .01. *** p < .001.

lower Internet skills, while higher levels of education, greater household income, being employed, and living in suburban areas was related to higher Internet skills.

With respect to living arrangements, those living alone and people who had children in their household had higher Internet skills. While Internet use and Internet skills have been modelled in previous digital inequality research (e.g., Hargittai, 2010; Hargittai et al., 2018), insight into who worries about Internet access is a particularly relevant addition of our study in the context of the COVID-19 pandemic, based on the potential for inequalities in Internet access to widen during the pandemic, as we discussed in our literature review (for related work on technology maintenance, see Gonzales, 2016). Here, older age and identifying as female was related to lower likelihood of worrying about Internet access, while Hispanics and those with a Bachelor's degree or more (vs. high school or less) were more likely to worry about Internet access. Notably, those who had left their home for any social activity during the pandemic were also more likely to worry about Internet access.

4.2. Changes in digital communication during the COVID-19 pandemic

Fig. 1 shows the changes in people's digital communication during the pandemic. With all digital communication methods, more than half of respondents reported not having changed their frequency of communication during the pandemic. When looking at the changes, people were overall more likely to increase their digital communication than to decrease it. We found that 41% of the sample used text

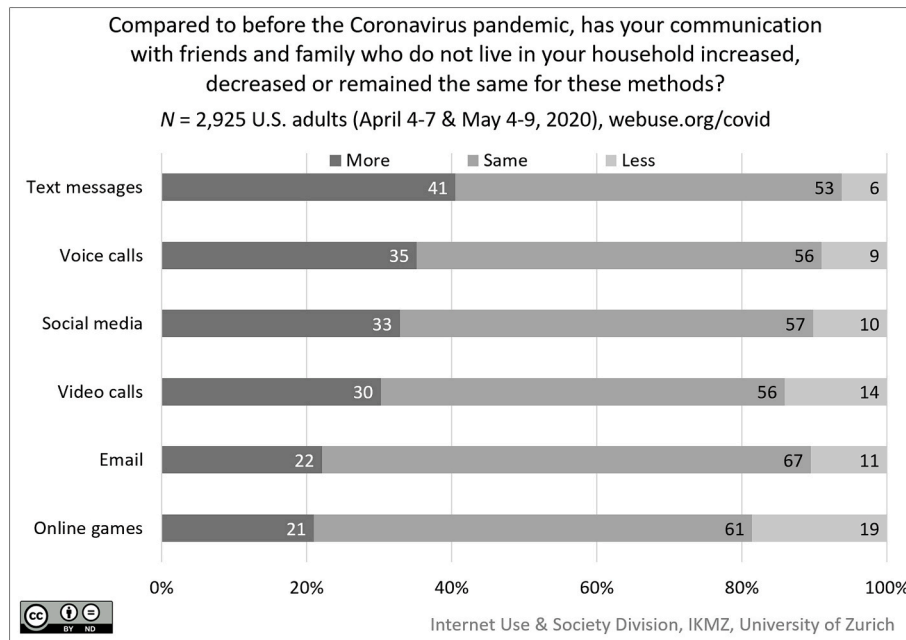


Fig. 1. Changes in digital communication during COVID-19.

messaging more often, which was followed by an increase in voice calls (35%), social media (33%), video calls (30%), email (22%), and online games (21%). When considering all digital communication methods together, 64% had increased any method, and 45% had only increased digital communication without decreasing any method. There were also respondents who had reduced digital communication. While a small number (6%) used text messaging less often, more people reduced their communication over voice calls (9%), social media (10%), email (11%), video calls (14%), and online games (19%). When considering all digital communication methods together, 30% had decreased any method, and 11% had only decreased digital communication without increasing any method.

4.3. Who increased and who decreased digital communication during the COVID-19 pandemic?

Our first research question asks who was more likely to increase (RQ1a) and to decrease (RQ1b) digital communication methods during the pandemic when looking at sociodemographic factors and living arrangements (Models 1, Tables 3 and 4). Overall, the results from Models 1 show that older age was related to lower likelihood to have increased digital communication, specifically when it comes to video calls, text messaging, social media, and online games. At the same time, older age was also related to higher likelihood to have decreased digital communication over video calls, social media, and online games. We also found gender effects showing that women were more likely to have increased communication over video calls and text messages, while men were more likely to do so over online games. Regarding race and ethnicity, in comparison to Whites, African Americans were more likely to have decreased digital communication overall, except for social media. Asian Americans were more likely to have increased text messaging, email, and online games, but more likely to decrease voice calls. Native Americans were less likely to have increased voice calls, but more likely to have increased social media. Hispanics were more likely to have decreased online games as a means of communication.

When looking at differences by education and income, higher education levels were associated with an increase in voice calls and video calls. Additionally, people who attended some college were more likely to have increased text messaging compared to high-school only graduates, while those with a Bachelor's degree or higher were more likely to

have increased emails. Having a Bachelor's degree also explained lower likelihood to have decreased digital communication, specifically for voice calls, video calls, text messaging, and email. Higher household income was associated with higher likelihood to have increased voice calls, video calls, and text messages, and lower likelihood to have decreased these modes of communication. Higher household income was also related to lower likelihood to have decreased communication over social media and online games. As for employment status, working people were more likely to have increased email communication with friends and family. Additionally, people living in rural areas were less likely to have increased voice calls, video calls, text messaging, and email, compared to those in urban areas.

Regarding living arrangements, we found that people living alone were more likely to have increased video calls, social media, and online games. Those living with children were also more likely to have increased digital communication, specifically through voice calls, video calls, social media and online games. Concerning in-person experiences, people who had gone out for any social outing were more likely to have increased communication over email and online games, but also more likely to have decreased video calls.

4.4. How do Internet experiences and skills explain changes in digital communication during the COVID-19 pandemic?

Our second research question asks how Internet experiences and Internet skills relate to increases (RQ2a) and to decreases (RQ2b) in digital communication during the pandemic (Models 2, Tables 3 and 4). We found that frequent Internet users were more likely to have increased digital communication for all methods. Higher levels of Internet skills also related to higher likelihood to have increased voice calls, video calls, social media, and online games. At the same time, people with higher levels of Internet skills were also less likely to have decreased digital communication for all examined methods. People with concerns about Internet access during the COVID-19 lockdown were more likely to have increased email. Moreover, these people were more likely to increase, as well as to decrease, the use of text messaging and online games, meaning that their use of these digital communication methods was more likely to change during the pandemic. Overall, both frequency of use and Internet skills were related to changes in digital communication.

Table 3
Logistic regression models: Increase in digital communication.

	Voice calls (N = 2892)				Video calls (N = 2892)				Text messages (N = 2893)			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE
Intercept	-3.06***	0.55	-3.83***	0.58	-2.75***	0.58	-3.72***	0.62	-1.89***	0.51	-2.69***	0.54
Time of data collection	-0.03	0.08	-0.03	0.08	0.00	0.09	-0.02	0.09	-0.17*	0.08	-0.18*	0.08
<i>Sociodemographics</i>												
Age	0.00	0.00	0.00	0.00	-0.02***	0.00	-0.02***	0.00	-0.01***	0.00	-0.01**	0.00
Female	0.15	0.08	0.19*	0.08	0.20*	0.09	0.24**	0.09	0.25**	0.08	0.28***	0.08
<i>Race and ethnicity</i>												
African-American	-0.17	0.13	-0.17	0.13	-0.19	0.14	-0.20	0.14	0.07	0.12	0.07	0.13
Hispanic	0.02	0.12	0.01	0.12	-0.16	0.13	-0.15	0.13	0.12	0.11	0.10	0.12
Asian	-0.16	0.18	-0.15	0.19	-0.04	0.19	-0.02	0.19	0.38*	0.18	0.40*	0.18
Native American	-0.47	0.33	-0.42	0.33	-1.00*	0.41	-0.95*	0.41	-0.04	0.30	0.02	0.30
<i>Education</i>												
Some college	0.36**	0.11	0.33**	0.11	0.42***	0.12	0.40***	0.12	0.22*	0.11	0.20	0.11
Bachelor's degree or more	0.62***	0.10	0.57***	0.10	0.81***	0.11	0.76***	0.11	0.16	0.10	0.12	0.10
Household income (log)	0.20***	0.05	0.19***	0.05	0.25***	0.05	0.22***	0.05	0.17***	0.05	0.16***	0.05
Employed	0.05	0.09	0.03	0.09	0.00	0.10	-0.02	0.10	0.04	0.09	0.03	0.09
<i>Metropolitan status</i>												
Rural	-0.35**	0.12	-0.33**	0.12	-0.49***	0.13	-0.46***	0.13	-0.35**	0.11	-0.34**	0.11
Suburban	-0.14	0.09	-0.14	0.09	-0.15	0.09	-0.15	0.10	-0.13	0.09	-0.13	0.09
<i>Living arrangements and in-person experiences</i>												
Living alone	0.13	0.11	0.13	0.11	0.35**	0.13	0.36**	0.13	0.14	0.11	0.12	0.11
Child(ren) in household	0.32***	0.10	0.31**	0.10	0.35***	0.10	0.33***	0.10	0.11	0.09	0.10	0.09
Going out for any social activity	0.14	0.10	0.13	0.10	-0.08	0.10	-0.07	0.10	0.02	0.09	0.00	0.09
<i>Internet experiences and skills</i>												
Frequent Internet use			0.52**	0.18			0.80***	0.21			0.65***	0.17
Internet skills			0.11**	0.04			0.14***	0.04			0.05	0.04
Worrying about Internet access			0.18	0.12			-0.08	0.12			0.36**	0.11
Nagelkerke R ²	0.07		0.08		0.14		0.15		0.05		0.06	

	Email (N = 2892)				Social media (N = 2892)				Online games (N = 2890)			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE
Intercept	-2.34***	0.62	-3.18***	0.66	-0.50	0.54	-1.35*	0.57	-0.85	0.62	-2.07**	0.67
Time of data collection	-0.18	0.09	-0.14	0.09	-0.18*	0.08	-0.19*	0.08	-0.03	0.10	-0.03	0.10
<i>Sociodemographics</i>												
Age	0.00	0.00	0.00	0.00	-0.02***	0.00	-0.02***	0.00	-0.03***	0.00	-0.03***	0.00
Female	-0.10	0.09	-0.04	0.10	0.10	0.09	0.13	0.09	-0.33***	0.10	-0.28**	0.10
<i>Race and ethnicity</i>												
African-American	0.13	0.15	0.14	0.15	0.19	0.13	0.20	0.13	0.12	0.15	0.12	0.15
Hispanic	0.21	0.13	0.15	0.13	0.15	0.12	0.15	0.12	0.24	0.13	0.22	0.13
Asian	0.45*	0.19	0.45*	0.19	0.32	0.18	0.34	0.18	0.40*	0.20	0.42*	0.20
Native American	-0.17	0.38	-0.13	0.38	0.74*	0.30	0.80**	0.30	0.56	0.33	0.64	0.33
<i>Education</i>												
Some college	-0.03	0.13	-0.05	0.13	0.20	0.11	0.18	0.11	-0.05	0.13	-0.08	0.13
Bachelor's degree or more	0.40***	0.12	0.34**	0.12	0.18	0.11	0.13	0.11	0.11	0.12	0.03	0.13
Household income (log)	0.07	0.06	0.07	0.06	0.05	0.05	0.03	0.05	0.08	0.06	0.06	0.06
Employed	0.23*	0.10	0.22*	0.11	0.16	0.09	0.15	0.09	-0.01	0.11	-0.02	0.11
<i>Metropolitan status</i>												
Rural	-0.45**	0.15	-0.45**	0.15	-0.15	0.12	-0.13	0.12	-0.19	0.15	-0.17	0.15
Suburban	0.03	0.10	0.02	0.10	-0.01	0.09	-0.01	0.09	-0.05	0.11	-0.06	0.11
<i>Living arrangements and in-person experiences</i>												
Living alone	0.19	0.13	0.17	0.13	0.39**	0.12	0.39**	0.12	0.33*	0.15	0.33*	0.15
Child(ren) in household	0.18	0.11	0.16	0.11	0.25**	0.10	0.24*	0.10	0.32**	0.11	0.30**	0.11
Going out for any social activity	0.38***	0.11	0.33**	0.11	0.18	0.10	0.16	0.10	0.42***	0.11	0.38***	0.11
<i>Internet experiences and skills</i>												
Frequent Internet use			0.42*	0.20			0.74***	0.19			0.94***	0.25
Internet skills			0.07	0.04			0.09*	0.04			0.13**	0.05
Worrying about Internet access			0.79***	0.12			0.20	0.12			0.43***	0.13
Nagelkerke R ²	0.06		0.08		0.10		0.11		0.13		0.15	

Note. b = unstandardized logistic regression coefficient; SE = standard error. The reference category for race and ethnicity is "White", for education level "High school or less", and for metropolitan status "Urban". * p < .05. ** p < .01. *** p < .001.

5. Discussion

In this study, we ask how digital inequality influences people's digital communication with friends and family outside the household during a time of physical distancing brought on by a public health crisis. First, we evaluated how sociodemographics and living arrangements

related to Internet experiences and skills. A notable finding is that people who had gone out for non-essential social activities were more likely to worry about Internet access. We then evaluated how sociodemographics and living arrangements, as well as Internet experiences and skills, explain who increased and who decreased digital communication during the COVID-19 pandemic. Overall, our findings show that

Table 4
Logistic regression models: Decrease in digital communication.

	Voice calls (N = 2892)				Video calls (N = 2892)				Text messages (N = 2893)			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE
Intercept	0.53	0.80	1.11	0.83	-0.09	0.70	0.67	0.73	0.03	0.96	0.93	1.00
Time of data collection	0.05	0.13	0.05	0.13	0.19	0.11	0.19	0.11	0.38*	0.16	0.41*	0.16
<i>Sociodemographics</i>												
Age	0.00	0.00	0.00	0.00	0.02***	0.00	0.02***	0.00	0.01	0.01	0.01	0.01
Female	0.10	0.14	0.04	0.14	-0.15	0.11	-0.23*	0.12	-0.19	0.16	-0.27	0.17
<i>Race and ethnicity</i>												
African-American	0.43*	0.19	0.45*	0.19	0.53**	0.16	0.55***	0.17	0.60**	0.22	0.60**	0.22
Hispanic	0.22	0.19	0.21	0.19	0.25	0.16	0.24	0.17	0.20	0.24	0.14	0.24
Asian	0.78**	0.28	0.76**	0.28	0.25	0.29	0.22	0.29	-0.09	0.48	-0.16	0.48
Native American	-0.46	0.61	-0.46	0.61	0.05	0.42	0.04	0.43	0.62	0.49	0.60	0.50
<i>Education</i>												
Some college	-0.18	0.17	-0.13	0.18	-0.28	0.15	-0.22	0.15	-0.31	0.22	-0.26	0.22
Bachelor's degree or more	-0.82***	0.20	-0.75***	0.20	-0.88***	0.16	-0.79***	0.16	-0.68**	0.23	-0.59*	0.23
Household income (log)	-0.25***	0.08	-0.23**	0.08	-0.26***	0.07	-0.22**	0.07	-0.31**	0.09	-0.26**	0.09
Employed	0.07	0.15	0.11	0.15	0.17	0.13	0.23	0.13	-0.06	0.18	0.01	0.18
<i>Metropolitan status</i>												
Rural	-0.06	0.18	-0.09	0.18	0.01	0.15	-0.03	0.15	0.07	0.22	-0.01	0.22
Suburban	-0.19	0.15	-0.18	0.15	-0.03	0.13	-0.01	0.13	0.09	0.18	0.08	0.18
<i>Living arrangements and in-person experiences</i>												
Living alone	0.14	0.18	0.12	0.18	-0.08	0.14	-0.12	0.14	-0.29	0.19	-0.32	0.19
Child(ren) in household	-0.11	0.16	-0.10	0.16	-0.17	0.14	-0.16	0.15	-0.39	0.22	-0.40	0.22
Going out for any social activity	-0.27	0.17	-0.26	0.17	-0.29*	0.14	-0.29*	0.15	0.06	0.19	0.05	0.19
<i>Internet experiences and skills</i>												
Frequent Internet use			-0.21	0.23			-0.26	0.19			-0.49*	0.24
Internet skills			-0.20**	0.06			-0.26***	0.05			-0.28***	0.07
Worrying about Internet access			0.02	0.20			0.09	0.17			0.43*	0.22
Nagelkerke R ²	0.05		0.06		0.09		0.10		0.07		0.09	
	Email (N = 2892)				Social media (N = 2892)				Online games (N = 2890)			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE
Intercept	-0.32	0.77	0.73	0.80	-0.87	0.81	0.13	0.84	-1.43*	0.65	-0.68	0.67
Time of data collection	0.09	0.13	0.08	0.13	0.36**	0.13	0.39**	0.13	0.11	0.10	0.11	0.10
<i>Sociodemographics</i>												
Age	0.00	0.00	-0.01*	0.00	0.02***	0.00	0.02***	0.00	0.03***	0.00	0.02***	0.00
Female	0.09	0.13	-0.02	0.13	-0.01	0.13	-0.09	0.13	0.07	0.10	-0.01	0.10
<i>Race and ethnicity</i>												
African-American	0.57**	0.17	0.62***	0.18	0.24	0.20	0.25	0.20	0.55***	0.15	0.58***	0.15
Hispanic	0.29	0.17	0.29	0.18	0.11	0.19	0.06	0.20	0.44**	0.14	0.41**	0.15
Asian	-0.36	0.38	-0.39	0.38	0.15	0.32	0.10	0.32	0.29	0.24	0.25	0.25
Native American	-1.05	0.73	-1.05	0.73	-0.55	0.61	-0.63	0.61	-0.05	0.40	-0.06	0.40
<i>Education</i>												
Some college	-0.29	0.17	-0.21	0.17	-0.24	0.18	-0.18	0.18	-0.19	0.14	-0.12	0.14
Bachelor's degree or more	-0.96***	0.19	-0.83***	0.19	-0.23	0.17	-0.14	0.17	-0.22	0.13	-0.13	0.13
Household income (log)	-0.14	0.07	-0.10	0.07	-0.22**	0.08	-0.17*	0.08	-0.12*	0.06	-0.08	0.06
Employed	-0.12	0.14	-0.04	0.14	-0.08	0.15	-0.02	0.15	-0.15	0.11	-0.08	0.11
<i>Metropolitan status</i>												
Rural	0.28	0.17	0.23	0.17	0.07	0.17	0.00	0.17	-0.03	0.14	-0.08	0.14
Suburban	0.11	0.14	0.14	0.15	0.03	0.14	0.03	0.15	-0.11	0.11	-0.09	0.11
<i>Living arrangements and in-person experiences</i>												
Living alone	0.19	0.17	0.16	0.18	-0.10	0.16	-0.12	0.16	-0.10	0.13	-0.15	0.13
Child(ren) in household	0.01	0.15	0.02	0.15	-0.30	0.17	-0.30	0.17	-0.03	0.13	-0.01	0.13
Going out for any social activity	-0.21	0.16	-0.19	0.16	-0.13	0.16	-0.15	0.16	-0.23	0.13	-0.25	0.13
<i>Internet experiences and skills</i>												
Frequent Internet use			-0.26	0.21			-0.65**	0.20			-0.26	0.17
Internet skills			-0.37***	0.06			-0.27***	0.06			-0.30***	0.05
Worrying about Internet access			0.00	0.19			0.31	0.18			0.34*	0.14
Nagelkerke R ²	0.06		0.09		0.05		0.08		0.07		0.09	

Note. b = unstandardized logistic regression coefficient; SE = standard error. The reference category for race and ethnicity is "White", for education level "High school or less", and for metropolitan status "Urban". *p < .05. **p < .01. ***p < .001.

those with existing social and digital privilege fared better in maintaining or increasing levels of digital communication with friends and family outside the home than did those already disadvantaged. Thus, digital inequality appears to be a contributing factor to the broader unequal unfolding of the crisis in terms of the negative impacts experienced across more and less privileged groups. We discuss the

contributions of our findings to the study of digital inequality during crisis periods, as well as unresolved questions, implications for crisis responses, study limitations, and the potential for future research.

One way that the disadvantages of the COVID-19 pandemic may weigh disproportionately on the already underprivileged is through a relative inability to replace in-person communication with digital

communication (Robinson et al., 2020). Our analyses support these concerns, as we found that people with greater existing socioeconomic and digital privilege had better chances of increasing their digital communication and lesser chances of decreasing such communication. Younger people, those with higher income and education, and people with more Internet skills and experiences were more likely to have taken up digital communication. In turn, their counterparts were more likely to have decreased digital communication. A possible reason for why some people decreased their digital communication during the pandemic, rather than using it at the same frequency as before, could be the loss of in-person digital support and places of free Internet access due to lockdown measures. Family and peers are key sources of digital support (Eynon & Geniets, 2016; Hunsaker et al., 2019; Micheli et al., 2019), which is important for Internet adoption as well as its continued use (Hsieh et al., 2010). People who are dependent on in-person digital help from their networks might thus experience more difficulties in keeping up with digital communication when such support sources are less accessible. Moreover, during the early months of the pandemic, the closure of public places that offer free Internet access (e.g., libraries, community centers) may have disadvantaged those who more often rely on such services, such as minorities and those with lower incomes (Dailey et al., 2010). Others may have struggled with regular access if they had mainly depended on workplace access that was not available during lockdowns. Our finding that worrying about Internet access was related to going out for non-essential social activities also suggests that this may have been the reason for people to leave their homes. Overall, our results indicate that marginalized groups may be at greater risk of social disconnection when opportunities for in-person interactions are severely limited.

Increasing digital communication during a time of physical distancing may not always reflect relative socioeconomic and digital privilege. As an example, in our study, women were more likely to increase their communication with family and friends outside the household than were men across several digital communication methods, with men only more likely to have increased communication by online games. Our findings contrast with previous work showing that men are more likely to use the Internet for communication about COVID-19 than women, such as in asking for or providing advice via social media, or starting online fundraisers (van Deursen, 2020). A potential explanation for this discrepancy is that van Deursen (2020) focused on communication activities specific to COVID-19 on user-generated content platforms, while our study focused on digital communication with family and friends more generally. Given that we focused on interactions with family and friends, our findings more closely align with and appear to support the claim that women use technology more than men to connect socially (Jackson et al., 2009).

With respect to gender, we also found that men were more likely to have increased their use of online games for communication. While our survey asked about online games as a means of communicating with friends and family, the finding that being male only related to increasing online games as means of such communication may point to a general disposition of men toward increasing online gaming during periods of social disconnection. This may include turning to online gaming for coping with negative emotions (Beutel et al., 2011), such as might arise during a public health crisis. Women may turn to different activities for this purpose of coping or may experience a trade-off in available time for online games due to their higher uptake of other means of communication or their increased role in care activities during the pandemic (Power, 2020).

A number of potential implications for crisis responses emerge from our findings. In line with van Deursen's (2020) findings, we found that people privileged in Internet skills and experiences are more active in communicating across digital channels than their counterparts during a period of physical distancing. Our work also confirms scholarly concerns about the digital exclusion of older populations during the pandemic (e.g., Robinson et al., 2020). When movement restrictions occur, the less

tech-savvy may also experience difficulties in accessing informal sources of support for technology uses such as family and peers (Hunsaker et al., 2019; Micheli et al., 2019), making it harder for them to take up digital communication. One way to mitigate expanding inequalities during a public health crisis could be to improve public access to the Internet, boost Internet skills among disadvantaged populations, or to improve infrastructures for remote digital support (Beaunoyer et al., 2020; Seifert et al., 2020).

In line with previous studies of race and technology use in the United States (Pew Research Center, 2019), including during the COVID-19 pandemic (Campos-Castillo & Laestadius, 2020), we found social media to be an exception in terms of the disparities that emerged for African Americans, with African Americans no more likely to have decreased social media communication than Whites, unlike all other methods. Similarly, Native Americans were more likely than Whites to have increased communication over social media, though not by other methods. Thus, social media may present a unique channel for retaining communication and information sharing within those groups who are otherwise disadvantaged in their Internet access and use.

In addition to the social inequalities and Internet access and skills disparities that were ongoing prior to the pandemic, COVID-19 and the stay-at-home guidelines might have presented new barriers and motivators that impacted how individuals used digital media. People living alone were more likely to increase digital communication, including video calls, which suggests that this might be a way to make up for the loss of in-person interactions as one has the opportunity to see the other person even if not in physical proximity. Those living with children had increased their use of voice calls, video calls, social media and online games during the pandemic, which may be explained by the transition to homeschooling and caregivers trying to keep their children connected to family and peers. Social media and online games may also have been a leisure activity and source of relaxation for caregivers and their children during lockdown. Overall, these findings suggest that contextual experiences such as living arrangements are important to understanding people's communication methods during physically-distanced times.

5.1. Limitations and Directions for future research

In this section, we address limitations of the study that stem from its particular research design and suggest avenues for future research. First, we relied on cross-sectional data, and thus we cannot draw conclusions about long-term implications of the COVID-19 pandemic on changing digital inequalities. On the one hand, digital inequalities may be reinforced because of the pandemic and physical distancing measures as digitally disadvantaged people may further lag behind during a time when technology becomes fundamental for everyday life. On the other hand, the pandemic may also have motivated some to adopt digital media for communication and other activities, and thus may be an opportunity for some to become more acquainted and comfortable with communication technologies. While the overall results of our study show that certain social groups clearly turned towards or away from digital communication during a period of lockdown, future research will need to examine what the lasting implications are of these changing digital communication patterns for digital inequalities.

As another limitation, we note that we cannot draw conclusions about changes in digital communication as being positive or negative, as we did not distinguish between voluntary and involuntary changes in people's digital media use, nor particular outcomes associated with these changes. While some might experience difficulties in accessing and using digital communication during the pandemic, for others a decrease in digital communication may point towards people taking time off to spend with their proximate family and unplug, something that research has shown to be a goal of an increasing number of people (Baym et al., 2020; Hiniker et al., 2016; Ytre-Arne et al., 2020). At the same time, increases in digital communication may mean increased social connection and gratifying experiences for some, while others may have been

forced to take up digital communication to coordinate stressful life logistics. Increased digital communication may also reflect unhealthy media habits. To understand people's changing digital media uses fully during a time of physical distancing, future research could aim to explore how people use digital communication for various goals (e.g., information seeking, communication, entertainment; van Deursen, 2020) and the extent to which digital interactions are gratifying experiences.

Third, our study focuses mainly on digital communication with friends and family in the private sphere, and excludes work-related communication. During the pandemic, a large majority of Americans holding jobs that allow for telework shifted to working from home, and such people have relied heavily on digital means for communication such as video calls (Parker et al., 2020). A report by the Pew Research Center showed that over one-third of American teleworkers expressed feeling worn out by the amount of time spent on such calls (Parker et al., 2020), which could explain why some might be hesitant to turn to this particular communication method for private socializing. Future research could consider how shifts to telework and increasing reliance on digital communication for work and everyday life more generally may interplay with concerns of digital inequality scholarship. Moreover, the lasting impact of changing patterns of digital media uses, and potentially the overuse of digital communication methods (e.g., "Zoom fatigue"), brought on by the pandemic on people's wellbeing is worth considering as well and could be a fruitful avenue for the burgeoning field of research on digital detoxing and disconnection (Nguyen, 2020; Nguyen et al., 2020).

Finally, our sample also presents limitations. Given that our sample only includes Internet users, we cannot speak to the experiences of people who are not online and thus could not have ended up in our study. Given that our research questions concern the use of digital media, the sample was appropriate. Nonetheless, as digital media became front and center of communication during COVID-19 lockdowns, those who are not online at all would have likely suffered from not having access to mediated communication methods that became essential. Research on the digital divide in particular will hopefully investigate the repercussions for non-users and what can be done in the future to avoid them being left behind.

While our sample includes respondents with varying sociodemographic backgrounds, Internet experiences and skills, our findings are limited to the U.S. context. We encourage future work to examine the changes in digital media uptake during the pandemic in other countries with different digital infrastructures and different pandemic circumstances to gain a global understanding of digital inequalities and their implications during COVID-19. In countries that have been more severely affected by the virus or where more strict physical distancing guidelines were in place, people may have been more reliant on digital communication for social connection than elsewhere with differing patterns of increases and decreases in methods used.

6. Conclusions

The COVID-19 pandemic offers a unique case for studying digital communication behaviors during widespread physical distancing. While digital communication offers the promise of replacing in-person interactions and thus enhancing safety during a disease outbreak, our existing knowledge of digital inequalities predicts that not everyone will be able to take up digital communication equally during such a crisis. Our findings in the U.S. context confirm these concerns, showing inequalities emerging between people who are more and less privileged in their socioeconomic status and Internet skills and experiences. Digital inequality may thus join other axes of inequality to place the burden on already disadvantaged groups in terms of who is likely to suffer the worst consequences of the pandemic and who is likely to avoid them with the aid of digital communication. In preparing for and responding to public health crises, practitioners should adapt nuanced mitigation

strategies to address the role of digital inequalities in magnifying the severity of the crisis for particular groups.

Author statement

Minh Hao Nguyen: Conceptualization; Methodology; Investigation; Data curation; Formal analysis; Visualization, Writing – Original draft, Writing – Review & Editing. **Eszter Hargittai:** Conceptualization; Methodology; Investigation; Resources; Data curation; Formal analysis; Writing – Original Draft; Writing – Review & Editing; Supervision, Project administration, Funding acquisition. **Will Marler:** Conceptualization; Methodology; Writing – Original draft, Writing – Review & Editing.

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