

Psychosocial implications of early COVID-19 restrictions on older adults in a small-town region in Southwestern, Pennsylvania (USA)

Tiffany F. Hughes,¹ Xinhui Ran,² Fang Fang,³ Erin Jacobsen,⁴ Beth E. Snitz,⁵ Chung-Chou H. Chang,⁶ and Mary Ganguli⁷

¹Department of Graduate Studies in Health and Rehabilitation Sciences, Youngstown State University, One University Plaza, Youngstown, OH 44555, USA

²Department of Biostatistics, School of Public Health, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, PA 15261, USA

³EVMS-Sentar Health Analytics and Delivery Science Institute, Eastern Virginia Medical School, 855 W. Brambleton Avenue, Norfolk, VA 23510, USA

⁴Department of Psychiatry, School of Medicine, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, PA 15261, USA

⁵Department of Neurology, School of Medicine, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, PA 15261, USA

⁶Department of Biostatistics, School of Public Health, and Department of Medicine, School of Medicine, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, PA 15261, USA

⁷Departments of Psychiatry and Neurology, School of Medicine, and Department of Epidemiology, School of Public Health, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, PA 15261, USA

Abstract

Objectives: The restrictions put in place in 2020 to mitigate the spread of the coronavirus disease 2019 limited or eliminated social connections that are vital for psychosocial well-being. The objectives of this research were to examine the impact of early pandemic-related restrictions on feelings of loneliness, depression, and anxiety as well as social activity disruption and their concomitant associations in a sample of community-dwelling older adults residing in a small-town region in the USA.

Design and Setting: Cross-sectional data collected from an ongoing population-based cohort study in Southwestern, Pennsylvania.

Participants: Analyses included 360 adults aged 65 years and older whose annual study assessment occurred during the first 120 days of pandemic-related restrictions.

Measurements: Self-reported feelings of loneliness, depression, and anxiety due to the pandemic-related restrictions were each measured using a single question. Depressive symptoms and anxiety were also assessed with the modified Center for Epidemiologic Studies-Depression and Generalized Anxiety Disorder-7 item tools. Disruption in a variety of common social activities was also assessed.

Results: Feeling lonely affected 36% of participants who were more likely to be female, not currently married, and living alone. Giving up in-person visits with family was associated with significantly higher odds of feeling lonely, and feeling lonely was associated with significantly higher odds of feelings of anxiety and depression.

Conclusions: Loneliness is a serious outcome of pandemic-related restrictions among older adults, potentially linked to loss of connection with family, and may be associated with increased feelings of depression and anxiety.

Keywords: loneliness, social activity, depression, anxiety, pandemic restrictions, COVID-19

Introduction

Social connection is vital to health and well-being. Isolation and loneliness are related, yet distinct measures of social *disconnection*. Social isolation

is defined “as the *objective* lack or paucity of social contacts and interactions with family members, friends or the wider community” (Valtorta and Hanratty, 2012). Loneliness is the *subjective* negative perception of being alone or disconnected from others (Hawkey and Cacioppo, 2010). Social disconnection is associated with increased mortality and poor physical and mental health outcomes (Cacioppo *et al.*, 2010; Courtin and Knapp, 2017; Hawkey and Cacioppo, 2010; Holt-Lunstad *et al.*,

Correspondence should be addressed to: Tiffany F Hughes, Youngstown State University, One University Plaza, Youngstown, OH 44555, USA. Phone: 330-941-2970; Fax: 330-941-1898. Email: tfhughes@ysu.edu Received 06 Jun 2022; revision requested 25 Jun 2022; revised version received 23 Aug 2022; accepted 28 Sep 2022. First published online 10 November 2022.

2010; Leigh-Hunt *et al.*, 2017; Luanaigh and Lawlor, 2008). Estimates suggest that both isolation and loneliness are increasing in prevalence among adults (Varrella, 2021) and are serious threats to public health on par with or even exceeding obesity, physical inactivity, smoking, and air pollution (Holt-Lunstad, *et al.*, 2010).

Disruption of social connection due to the physical distancing recommendations to mitigate the spread of the novel coronavirus disease 2019 (COVID-19) brought increased attention to social isolation and loneliness among all age groups. The “stay-at-home” orders and social distancing guidelines during the initial phase of the pandemic resulted in the abrupt cancellation, postponement, or modification of opportunities for social interaction that provide companionship, support, and resources (Smith *et al.*, 2020). Thus, a paradox emerged wherein interventions to lower risk of exposure to the coronavirus at the same time increased risk for isolation and loneliness (Smith *et al.*, 2020). Due to greater risk of complications and mortality if infected with the novel coronavirus (Centers for Disease Control and Prevention, 2021), along with other characteristics (e.g. more likely to live alone or to be retired or physical impaired; Holt-Lunstad, 2017), older adults were more likely to be isolated and/or choose to give up social activities to minimize risk of exposure.

This report focuses on older adults assessed during the first 120 days of pandemic-related restrictions in 2020, which included the most restrictive periods of the pandemic to-date beginning with the state of Pennsylvania’s Governor’s “stay-at-home” order on March 23, 2020, and including the “red” and “yellow” phases of restrictions through June 5, 2020, in Allegheny County, PA where the study participants reside (<https://www.governor.pa.gov/process-to-reopen-pennsylvania/>). We sought to examine the psychosocial health effects of pandemic-related restrictions on older adults during this period by specifically describing the characteristics of those who felt lonely and the cross-sectional associations of feelings of loneliness with activity disruption (potential predictors/antecedents of loneliness) and depression and anxiety (potential outcomes of loneliness).

Methods

Study design and participants

The Monongahela-Youghiogheny Healthy Aging Team (MYHAT), based in Allegheny County, Pennsylvania, follows an age-stratified randomly

selected population-based cohort annually for the development of mild cognitive impairment and dementia. This report includes MYHAT participants from the original cohort aged 65+ years enrolled between 2006 and 2008 (Ganguli *et al.*, 2009) as well as a new, younger subcohort aged 65–74 years enrolled between 2016 and 2019 meeting the same eligibility criteria. At study entry and annually thereafter, participants complete a detailed assessment including basic demographic information, health history and lifestyle behaviors, health service utilization, self-report of memory function, a battery of neuropsychological tests, mental health and psychosocial well-being, a neurological exam, medication review, and blood pressure, as previously described (Ganguli *et al.*, 2020).

In March 2020, after “stay-at-home” orders were imposed by the Governor of the state of Pennsylvania, a telephone survey was added to the MYHAT protocol to assess the impact of the COVID-19 pandemic restrictions on emotional health, activities, services, and general well-being. The survey was administered by trained interviewers, along with other select segments of the study assessment that were modified from in-person to telephone administration. The COVID-19 survey and all study procedures were approved by the University of Pittsburgh Institutional Review Board; all participants had previously provided written informed consent.

This study focuses on data from the COVID-19-related telephone survey and depressive and anxiety symptoms collected during the first 120 days of the pandemic-related restriction period between March 23 and July 20, 2020.

Measures

FEELINGS OF LONELINESS

Participants were asked “In general, to what extent are the restrictions making you feel lonely?” Response choices included “not at all,” “some-what,” or “to a great extent.” We combined “some-what” and “to a great extent” into one category and compared it to “not at all” based on the distribution of responses.

DISRUPTION OF SOCIAL ACTIVITIES

Participants reported which specific activities from a list that were disrupted due to the restrictions, including having to give up or change (i.e. do in a different way, such as virtually). These activities included working, volunteering, in-person visits, or group socializing with family or friends living outside the household, attending church or religious services, going out for entertainment, exercising in a gym or other facility, walking outdoors, going to

restaurants and bars, nonessential shopping, and planned travel. Participants who did not engage in a given activity before the pandemic indicated that the question did not apply and were excluded from the analyses for that activity.

FEELINGS OF DEPRESSION AND ANXIETY

Participants reported the extent (not at all, somewhat, to a great extent) that the pandemic-related restrictions made them feel depressed or nervous/anxious. The “somewhat” and “to a great extent” responses were combined and compared to “not at all.”

The study annual assessment also includes a modified version of the Center for Epidemiological Studies Depression scale (mCES-D; Radloff, 1977) to measure number of depressive symptoms in the past week (1 = present, 0 = absent; range 0–20), and the generalized anxiety disorder assessment (GAD-7; Spitzer *et al.*, 2006) to measure frequency of anxiety symptoms in the past two weeks (0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day; range 0–21). We categorized depressive symptoms as <4 vs. ≥ 4 and anxiety symptoms as <7 vs. ≥ 7 , which is the 90th percentile of this sample for each measure.

Statistical analyses

We first describe the proportion of participants who felt lonely, who experienced disruption (either gave up or changed) in each social activity after excluding those who did not participate in that activity before the pandemic, and who felt depressed or anxious due the pandemic restrictions, as well as the proportion who had ≥ 4 depressive and ≥ 7 anxiety symptoms. We used χ^2 analyses or Fisher’s exact test to characterize differences by sociodemographic measures (age, sex, education, race, marital status, and living arrangement) for these measures. Logistic regression models, adjusted for age, sex, race, and education, were used to examine the association between disruption in each social activity and feeling lonely among those who engaged in the activity prior to the pandemic. The odds of feeling lonely (somewhat/to a great extent vs. not at all) in relation to having to give up or change engagement in each social activity was compared to no change (reference group). Since the size of the effect may differ depending on if the activity was changed or given up, we examined each separately relative to no change in engagement. Similarly, logistic regression analyses, adjusted for age, sex, race, and education, were used to examine if the participant’s perception of feeling lonely due to the restrictions was associated with depression or anxiety, in four separate models. Two models had depression as the outcome

(i) based on the extent that the pandemic restrictions made participants feel depressed (not at all vs. somewhat or great extent) and (ii) the mCES-D binary score (<4 vs. ≥ 4 symptoms). Two models had anxiety as the outcome (iii) based on the extent that the pandemic restrictions made participants feel anxious (not at all vs. somewhat or great extent) and (iv) the GAD-7 binary score (<7 vs. ≥ 7 symptoms). Analyses were completed using R statistical package, version 3.6.3 (R Core Team, 2020).

Results

A total of 360 participants’ annual assessments occurred in the first 120 days of pandemic restrictions (March 23–July 20, 2021) in Southwestern, Pennsylvania. Each participant completed the modified assessment over the telephone, including the newly added COVID-19 survey, once during this period. Among these participants, 198 (55%) were 65–74, 102 (28%) were 75–84, and 60 (17%) were 85 + years old; 221 (61%) were female; 227 (63%) had completed more than high school education (vs. \leq high school); and 334 (93%) identified as White (vs. non-White). Partial data were available for marital status ($n = 281$) and living arrangement ($n = 280$) where 44.8% were married (vs. unmarried) and 39.3% lived alone (vs. not alone).

Sociodemographic characteristics of participants feeling lonely due to the pandemic-related restrictions

Feeling at least somewhat lonely due to the restrictions was reported by 131 (36.4%) of participants with 13 (3.6%) reporting that they felt lonely to a great extent. Females, those not currently married, and those living alone were significantly more likely to feel lonely compared to males, those who were currently married, and living with others, respectively (Table 1).

Sociodemographic characteristics of participants who reported disruption of social activities due to pandemic-related restrictions and the association with feeling lonely

The majority [334 (92.8%)] of participants reported that the recommendation for social distancing changed the way that they spent their time. Among those who engaged in each activity prior to the pandemic, we found that changing or giving up going to restaurants and bars and going out for entertainment was reported by nearly all participants, with attending church, visiting friends, exercising, shopping for nonessential items, volunteering, and visiting family

Table 1. Sociodemographic characteristics of participants who reported feeling lonely in the first 120 of the COVID-19 pandemic-related restrictions

	FEELING LONELY		
	SOMEWHAT/GREAT EXTENT $N(\%)$	NOT AT ALL, $N(\%)$	<i>P</i> -VALUE
All ($n = 360$)	131 (36.4)	229 (63.6)	—
Age			
65–74 years	74 (37.4)	124 (62.6)	0.13
75–84 years	30 (29.4)	72 (70.6)	
85 + years	27 (45.0)	63 (55.0)	
Sex			
Female	96 (43.4)	125 (56.6)	0.001
Male	35 (25.2)	104 (74.8)	
Education			
≤ High School	52 (39.1)	81 (60.9)	0.48
> High School	79 (34.8)	148 (65.2)	
Race			
White	123 (36.8)	211 (63.2)	0.68
Non-White	8 (30.8)	18 (69.2)	
Married ($n = 281$)			
Yes ($n = 126$)	29 (23.0)	97 (77.0)	<0.001
No ($n = 155$)	74 (47.6)	81 (52.3)	
Live alone ($n = 280$)			
Yes ($n = 110$)	53 (48.2)	57 (51.8)	0.002
No ($n = 170$)	49 (28.8)	121 (71.2)	

p-value estimated using χ^2 analyses or Fisher's exact test. *p*-value <0.05 considered statistically significant.

also being given up or changed by the majority of participants. Fewer participants gave up or changed work, travel plans, or walking outdoors. We found no differences in disruption of any social activities by sociodemographic characteristics (Supplemental Table 1).

Table 2 shows the proportion of those who gave up or changed their engagement in each activity that also felt lonely due to the restrictions. Results from the adjusted logistic regression models show that giving up in-person visits with family was significantly associated with an approximately twofold higher odds of feeling lonely due to the restrictions, compared to no change in this activity. Disruption in other activities had similar or larger effect sizes in relation to feeling lonely, but were not statistically significant. These included having to give up or change visiting with friends in-person and giving up walking outdoors (Table 2).

Sociodemographic characteristics of participants feeling depressed or anxious and the association with feeling lonely

Table 3 shows that among all 360 participants, 71 (19.7%) felt depressed and 112 (31.1%) felt anxious/nervous due to the restrictions. Regarding depressive and anxiety symptoms in the preceding weeks, 50 (13.9%) participants had 4 or more depressive symptoms in the past week (mean 1.42

(SD 2.41)), and 37 (10.3%) participants had scores of 7 or higher for anxiety (mean 2.39 (SD 3.06)). No significant differences were found by sociodemographic characteristics in feeling depressed or anxious either due to restrictions or when measured with the mCES-D or GAD-7 (χ^2 or Fisher's Exact test; data not shown). However, both depressive feelings and anxiety were associated with significantly higher odds, with about equal strength, of feeling lonely in models adjusted for age, sex, education, and race (Table 3).

Discussion

In this population-based study of older adults from a small town region in Southwestern, Pennsylvania, USA, we found over a third felt lonely due to restrictions implemented to reduce the spread of the novel SARS-CoV-2 virus during the first 120 days of the pandemic beginning with the Governor's stay-at-home order. Females, those not currently married, and those living alone were more likely to report feelings of loneliness due to the pandemic restrictions compared to their comparison groups. Disruption of in-person visits with family was associated with feelings of loneliness, and feeling lonely was concurrently associated with feelings of depression and anxiety. While our cross-sectional study

Table 2. Association between disruption of social activities (vs. no change) and feeling lonely in the first 120 days of COVID-19 pandemic-related restrictions

FEELING LONELY		
	SOMEWHAT/GREAT EXTENT <i>N</i> (%)	ODDS RATIO (95% CONFIDENCE INTERVAL) [^]
Eating Out (<i>n</i> = 343)		
Change (<i>n</i> = 165)	58/165 (35.2)	inestimable
Give Up (<i>n</i> = 174)	66/174 (37.9)	inestimable
No change (<i>n</i> = 4)	0/4 (0.0)	(1.0, Ref.)
Visiting Friends In-Person (<i>n</i> = 351)		
Change (<i>n</i> = 200)	76/200 (38.0)	2.51 (1.02, 7.17)
Give Up (<i>n</i> = 120)	45/120 (37.5)	2.50 (0.97, 7.33)
No change (<i>n</i> = 31)	6/31 (19.4)	(1.0, Ref.)
Entertainment (<i>n</i> = 306)		
Change (<i>n</i> = 37)	13/37 (35.1)	5.58 (0.83, 112.84)
Give Up (<i>n</i> = 260)	99/260 (38.1)	6.04 (1.02, 116.25)
No change (<i>n</i> = 9)	1/9 (11.1)	(1.0, Ref.)
Nonessential Shopping (<i>n</i> = 343)		
Change (<i>n</i> = 105)	32/105 (30.5)	0.88 (0.42, 1.86)
Give Up (<i>n</i> = 185)	76/185 (41.1)	1.34 (0.69, 2.72)
No change (<i>n</i> = 53)	16/53 (30.2)	(1.0, Ref.)
Visiting Family In-Person (<i>n</i> = 350)		
Change (<i>n</i> = 226)	79/226 (35.0)	1.26 (0.69, 2.37)
Give Up (<i>n</i> = 60)	29/60 (48.3)	2.19 (1.03, 4.74)
No change (<i>n</i> = 64)	19/64 (29.7)	(1.0, Ref.)
Attending Church (<i>n</i> = 277)		
Change (<i>n</i> = 175)	67/175 (38.3)	1.07 (0.33, 3.77)
Give Up (<i>n</i> = 89)	34/89 (38.2)	1.13 (0.33, 4.14)
No change (<i>n</i> = 13)	5/13 (38.5)	(1.0, Ref.)
Travel (<i>n</i> = 264)		
Change (<i>n</i> = 8)	3/8 (37.5)	1.27 (0.24, 5.72)
Give Up (<i>n</i> = 133)	55/133 (41.4)	1.59 (0.93, 2.77)
No change (<i>n</i> = 123)	39/123 (31.7)	(1.0, Ref.)
Volunteer (<i>n</i> = 145)		
Change (<i>n</i> = 34)	11/34 (32.4)	1.14 (0.34, 3.93)
Give Up (<i>n</i> = 87)	34/87 (39.1)	1.38 (0.49, 4.14)
No change (<i>n</i> = 24)	7/24 (29.2)	(1.0, Ref.)
Exercise (<i>n</i> = 134)		
Change (<i>n</i> = 36)	14/36 (38.9)	0.67 (0.16, 2.72)
Give Up (<i>n</i> = 83)	34/83 (41.0)	0.82 (0.22, 3.04)
No change (<i>n</i> = 15)	8/15 (53.3)	(1.0, Ref.)
Walk Outdoors (<i>n</i> = 260)		
Change (<i>n</i> = 58)	19/58 (32.8)	0.97 (0.50, 1.86)
Give Up (<i>n</i> = 21)	11/21 (52.4)	2.49 (0.92, 6.83)
No change (<i>n</i> = 181)	62/181 (34.3)	(1.0, Ref.)
Work (<i>n</i> = 69)		
Change (<i>n</i> = 21)	5/21 (23.8)	0.44 (0.10, 1.78)
Give Up (<i>n</i> = 18)	8/18 (44.4)	1.43 (0.38, 5.37)
No change (<i>n</i> = 30)	10/30 (33.3)	(1.0, Ref.)

[^]Logistic regression adjusted for age, gender, education, and race.

design does not allow inferences about the direction of the associations between these measures, these results do provide evidence of the extent that feelings of loneliness, depression, and anxiety as well as and disruption in social activities were related to the pandemic restrictions.

Prior to the pandemic, there were sociodemographic differences in loneliness among older adults

(Dahlberg *et al.*, 2018). We set out to examine if these differences persisted or changed in the early phase of the pandemic restrictions. In our sample, loneliness was not equally distributed across socio-demographic groups. This is similar to pre-pandemic differences (Dahlberg *et al.*, 2018) and aligns with the work of others that the COVID-19 pandemic affected some older adults more than

Table 3. Associations between feeling lonely in the first 120 days of the COVID-19 pandemic-related restrictions and depression and anxiety

	DEPRESSED DUE TO RESTRICTIONS (SOMEWHAT/GREAT EXTENT)	mCES-D (≥ 4 SYMPTOMS)	ANXIOUS DUE TO RESTRICTIONS (SOMEWHAT/GREAT EXTENT)	GAD-7 (≥ 7 SYMPTOMS)
Overall	71/360 (19.7%)	50/360 (13.9%)	112/360 (31.1%)	37/360 (10.3%)
Lonely Somewhat/Great Extent, <i>n</i> (%)	52/71 (73.2%)	37/50 (74%)	62/112 (55.4%)	24/37 (64.9%)
Lonely, Somewhat/Great Extent Not at all	OR 7.83, 95%CI: (4.32, 14.76) [^] (1.0, Ref.)	OR 6.37, 95%CI: (3.25, 13.18) [^] (1.0, Ref.)	OR 3.14, 95%CI: (1.95, 5.09) [^] (1.0, Ref.)	OR 3.73, 95%CI: (1.81, 8.03) [^] (1.0, Ref.)

[^]Logistic regression adjusted for age, sex, education, and race.

mCES-D = modified Center for Epidemiologic Studies; GAD-7 = Generalized Anxiety Disorder Assessment-7.

others, including females and those living alone (AARP Foundation & United Health Foundation, 2020; Seifert and Hassler, 2020). However, one study reported that men had greater odds of loneliness compared to women during the pandemic (Choi *et al.*, 2021). We found no age differences in loneliness, comparing the 65–74, 75–84, and 85+ years age groups within this sample of adults. Prepandemic studies of loneliness in later life suggest that loneliness is more likely to affect the oldest-old (Beam and Kim, 2020) and that this may persist into the pandemic (Frenkel-Yosef *et al.*, 2020). However, it has also been suggested that the oldest-old were less likely to feel lonely due to the restrictions (or to experience an increase in feeling lonely) since their engagement in social activities was already low before the pandemic (Luchetti *et al.*, 2020). Although our sample did not include adults younger than 65 years, it is noteworthy that reports suggest that pandemic-related loneliness was higher among younger adults compared to older adults (Losada-Baltar *et al.*, 2021), which may be due to greater resilience among older adults (Fuller and Huseth-Zosel, 2021) as compared to younger individuals. The overall proportion feeling lonely is within the range of other studies examining loneliness among older adults (Choi *et al.*, 2021; Fierloos *et al.*, 2021; Polenick *et al.*, 2021) and is lower than reports of the proportion of younger adults feeling lonely during the early pandemic (Varma *et al.*, 2021).

We also examined the extent that social activities were disrupted by the restrictions and whether disruption in any particular activity was associated with feeling lonely during this most restrictive period of the pandemic. In our sample, we found that those who gave up visiting with family in-person were more likely to feel lonely compared to those who did not change this activity. Although the effects for disruption in visiting friends in person and walking

outdoors did not reach statistical significance in relation to feeling lonely, the size of the effects are noteworthy and should be followed up with in a larger cohort. The nationally representative Understanding America Study (UAS) found that canceling or postponing social activities was associated with increased feelings of loneliness among adults aged 50 years and older, but not all types of social restrictions were related to loneliness (Choi *et al.*, 2021). Similarly, we found that disruption in some, but not all activities, is associated with loneliness. Having to give up in-person visits with family was especially important during this restrictive period (Frenkel-Yosef *et al.*, 2020). Social interactions with close ties may be particularly meaningful for older adults to feel connected (Carstensen, 1995; Taylor, 2020). Having to give up walking outdoors may also provide a sense of connection with others through casual encounters with “weak” or “peripheral” ties (Huxhold *et al.*, 2020). In exploratory analyses, we also found that giving up or changing shopping for nonessential items was significantly associated with feeling socially isolated due to the pandemic restrictions in a logistic regression model adjusted for age, sex, education, and race (OR 2.58, $p = 0.002$). Similar to walking outdoors, exchanging social pleasantries through casual encounters while shopping may lower risk of feeling disconnected or lonely. Moreover, these encounters provide exchanges with a variety of social ties that is linked to better well-being in late life (Fingerman *et al.*, 2020; Holt-Lunstad *et al.*, 2010; Thomas, 2012). Future work should examine if disruption in different types of activities is differentially associated with emotional loneliness related to the loss of intimate relationships versus social loneliness related to the loss of social network (Lampraki *et al.*, 2022; Weiss, 1973).

Evidence suggests that loneliness is one of the strongest predictors of depression, anxiety, and

post-traumatic stress disorder during the pandemic (González-Sanguino *et al.*, 2020; Kovacs *et al.*, 2021; Palgi *et al.*, 2020), but this evidence comes primarily from studies conducted in younger samples (Sampogna *et al.*, 2021; Weissbourd *et al.*, 2021) and may be different for older adults (Vahia *et al.*, 2020; Xiong *et al.*, 2020). Therefore, we examined the associations of feeling lonely due to the pandemic restrictions with depression and anxiety among adults aged 65 years and older residing in a lower socioeconomic, small-town region in Southwestern, Pennsylvania. Our results support an association between feeling lonely and feeling depressed or anxious due to restrictions during this most restrictive period of the pandemic. These results, along with others (Kotwal *et al.*, 2021; Polenick *et al.*, 2021), highlight the potentially negative short-term impact of the COVID-19 social activity restrictions on symptoms of depression and anxiety for some older adults. The proportion feeling depressed or anxious due to the pandemic restrictions in this sample also aligns with national data where one in five older adults (aged 50–80 years) reported worse depression or sadness and 28% worse anxiety or worry (Gerlach *et al.*, 2021). Further, since loneliness could affect longer term cognitive and physical health among older adults through pathways related to depression or anxiety (Holt-Lunstad, 2017), future studies should examine if older adults who felt lonely in the early phases of the pandemic are at greater risk for poor physical and cognitive health outcomes over time (Vahia *et al.*, 2020).

We focused our analyses on participants whose annual assessments fell during the first 120 days of the Pennsylvania stay-at-home order since this included, but was not limited to, the most restrictive period to-date of the COVID-19 pandemic. Even within this brief period, we may have missed variations in the study measures related to changing restrictions both within and among participants since each participant was only assessed once. It is possible that the effect of the restrictions on the study measures could have worsened over the 120 days or, alternatively, could have weakened due to adaptation over this time period. Due to the telephone assessment format during the period described here, we were unable to administer our standard in-person cognitive assessments, including the full health assessment, and some previously assessed variables (e.g. living arrangement) were not included from the beginning of modifying the assessment. Nonetheless, focusing on this time period provides a useful snapshot that sheds light on the emotional well-being of socially restricted older adults in this socioeconomically distressed small-town area. This snapshot will also serve as a

backdrop for studying longer term outcomes of the pandemic restrictions in this population.

A strength of this work is that we assessed the specific impact of the pandemic-related restrictions on feeling lonely, engagement in social activities, and feeling depressed and anxious, using focused questions rather than instruments that more broadly assess these constructs and could be partially unrelated to the pandemic. It is possible that this method underestimated the impact of restrictions if participants did not recognize or want to admit the extent that the pandemic was affecting them. However, the opposite may also have been true since the pandemic forced isolation universally and may have reduced the stigma of loneliness and participants may have expected to be lonely (Van der Velpen *et al.*, 2022). The social activities included in these analyses varied in the degree to which they could involve social interaction with others, where some (e.g. exercise) could be done alone while others (e.g. walking outdoors, and shopping) could be more representative of being connected with the community and society. These findings should be interpreted in the context of sample characteristics as our results likely do not generalize to clinical samples, older adults in higher-income communities with different resources and environments, those in more ethnically diverse communities, or to those in congregate living situations. For example, the relatively lower level of depression and anxiety as measured by the mCES-D and GAD-7 scales, respectively, is typical for older adults living in the community, but cannot be generalized to older adults in other settings. Finally, these being cross-sectional data, we cannot determine the directions of the observed associations, e.g. whether loneliness led to feelings of depression or anxiety or feelings of anxiety or depression led to feeling lonely. However, these and other similar findings raise concern about the potential negative effects of social disconnection due to the pandemic restrictions among older adults (Killgore *et al.*, 2020). Ongoing follow-up of the entire cohort using the full in-person assessment will allow us to address these larger questions.

In conclusion, the restrictions during the early days of the COVID-19 pandemic in Pennsylvania restricted the social activities of over 90% of our community-dwelling older adult sample, but only about a third reported feeling lonely. Loss of in-person contact with family and friends as well as peripheral ties with the community was likely linked to feelings of loneliness. Those who felt lonely were also more likely to also feel depressed or anxious due to the pandemic restrictions and to have more depressive or anxiety symptoms in the preceding weeks. Those in whom pandemic mitigation strategies increased feelings of loneliness may

be at risk for both short- and long-term deleterious effects on health. These individuals may be a target for interventions, such as providing alternative means of socialization, e.g. telephone check-ins and virtual events for isolated older adults. Planning for future pandemics and other natural disasters should consider the emotional toll of social restrictions, especially for select subgroups of the population, and weigh the potential harm versus benefits of these restrictions when designing and implementing health and social policies.

Acknowledgements

Thank you to all MYHAT staff for recruitment, data collection, and data management and to the older adults who participated in the study and made this work possible.

Conflict of interest

None.

Source of funding

The Monongahela-Youghiogheny Healthy Aging Team study is supported in part by the National Institute on Aging under research grant R37#AG023651 (PI: Mary Ganguli).

IRB

The study was approved by the University of Pittsburgh Institutional Review Board protocol number 19040058.

Supplementary material

To view supplementary material for this article, please visit <https://doi.org/10.1017/S1041610222000977>

References

- AARP Foundation & United Health Foundation.** (2020). The Pandemic Effect: A Social Isolation Report. Available at: <https://connect2affect.org/the-pandemic-effect/>
- Beam, C. R., and Kim, A. J.** (2020). Psychological sequelae of social isolation and loneliness might be a larger problem in young adults than older adults. *Psychological Trauma: Theory, Research, Practice, and Policy*, 12(S1), S58–S60. doi: [10.1037/tra0000774](https://doi.org/10.1037/tra0000774)
- Cacioppo, J. T., Hawkley, L. C. and Thisted, R. A.** (2010). Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago health, aging, and social relations study. *Psychology and Aging*, 25, 453–463. doi: [10.1037/a0017216](https://doi.org/10.1037/a0017216)
- Carstensen, L. L.** (1995). Evidence for a life-span theory of socioemotional selectivity. *Current Directions in Psychological Science*, 4, 151–156. doi: [10.1111/1467-8721.ep11512261](https://doi.org/10.1111/1467-8721.ep11512261)
- Centers for Disease Control and Prevention.** (2021). COVID-19 Risks and Vaccine Information for Older Adults. Available at: <https://www.cdc.gov/aging/covid19/covid19-older-adults.html>
- Choi, E. Y., Farina, M. P., Wu, Q., and Ailshire, J.** (2021). COVID-19 social distancing measures and loneliness among older adults. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*. Advance online publication. doi: [10.1093/geronb/gbab009](https://doi.org/10.1093/geronb/gbab009)
- Courtin, E. and Knapp, M.** (2017). Social isolation, loneliness and health in old age: a scoping review. *Health & Social Care in the Community*, 25, 799–812. doi: [10.1111/hsc.12311](https://doi.org/10.1111/hsc.12311)
- Dahlberg, L., Agahi, N. and Lennartsson C.** (2018). Lonelier than ever? Loneliness of older people over two decades. *Archives of Gerontology and Geriatrics*, 75, 96–103. doi: [10.1016/j.archger.2017.11.004](https://doi.org/10.1016/j.archger.2017.11.004)
- Fierloos, I. N. et al.** (2021). Socio-demographic characteristics associated with emotional and social loneliness among older adults. *BMC Geriatrics*, 21, 114. doi: [10.1186/s12877-021-02058-4](https://doi.org/10.1186/s12877-021-02058-4)
- Fingerman, K. L., Huo, M., Charles, S. T. and Umberson, D. J.** (2020). Variety is the spice of late life: social integration and daily activity. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, 75, 377–388. doi: [10.1093/geronb/gbz007](https://doi.org/10.1093/geronb/gbz007)
- Frenkel-Yosef, M., Maytles, R., and Shrira, A.** (2020). Loneliness and its concomitants among older adults during the COVID-19 pandemic. *International Psychogeriatrics*, 32, 1257–1259. doi: [10.1017/S1041610220003476](https://doi.org/10.1017/S1041610220003476)
- Fuller, H. R. and Huseth-Zosel, A.** (2021). Lessons in resilience: initial coping among older adults during the COVID-19 pandemic. *The Gerontologist*, 61, 114–125. doi: [10.1093/geront/gnaa170](https://doi.org/10.1093/geront/gnaa170)
- Ganguli, M., Hughes, T.F., Jia, Y., Lingler, J., Jacobsen, E., and Chang, C. H.** (2020). Aging and functional health literacy: a population-based study. *The American Journal of Geriatric Psychiatry*, 29, 972–981. doi: [10.1016/j.jagp.2020.12.007](https://doi.org/10.1016/j.jagp.2020.12.007)
- Ganguli, M., Snitz, B., Vander Bilt, J., and Chang, CC.** (2009). How much do depressive symptoms affect cognition at the population level? The Monongahela-Youghiogheny Healthy Aging Team (MYHAT) study. *International Journal of Geriatric Psychiatry*, 24, 1277–1284. doi: [10.1002/gps.2257](https://doi.org/10.1002/gps.2257)
- Gerlach, L., Solway, E., Singer, D., Kullgren, J., Kirch, M., and Malani, P.** (2021). *Mental Health among Older Adults Before and during the COVID-19 Pandemic*: University of Michigan National Poll on Healthy Aging. doi: [10.7302/983](https://doi.org/10.7302/983)

- González-Sanguino C. *et al.*** (2020). Mental health consequences during the initial stage of the 2020 Coronavirus pandemic (COVID-19) in Spain. *Brain Behavior and Immunology*, 87, 172–176. doi: [10.1016/j.bbi.2020.05.040](https://doi.org/10.1016/j.bbi.2020.05.040)
- Hawkey, L. C. and Cacioppo, J. T.** (2010). Loneliness matters: a theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine*, 40, 218–227. doi: [10.1007/s12160-010-9210-8](https://doi.org/10.1007/s12160-010-9210-8)
- Holt-Lunstad, J.** (2017). The potential public health relevance of social isolation and loneliness: prevalence, epidemiology, and risk factors. *Public Policy & Aging Report*, 27, 127–130. doi: [10.1093/ppar/prx030](https://doi.org/10.1093/ppar/prx030)
- Holt-Lunstad, J., Smith, T. B. and Layton, J. B.** (2010). Social relationships and mortality risk: a meta-analytic review. *PLOS Medicine*, 7, e1000316. doi: [10.1371/journal.pmed.1000316](https://doi.org/10.1371/journal.pmed.1000316)
- Huxhold, O., Fiori, K. L., Webster, N. J. and Antonucci, T. C.** (2020). The strength of weaker ties: an underexplored resource for maintaining emotional well-being in later life. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, 75, 1433–1442. doi: [10.1093/geronb/gbaa019](https://doi.org/10.1093/geronb/gbaa019)
- Killgore, W. S., Cloonan, S. A., Taylor, E. C. and Dailey, N. S.** (2020). Loneliness: a signature mental health concern in the era of COVID-19. *Psychiatry Research*, 290, 113117. doi: [10.1016/j.psychres.2020.113117](https://doi.org/10.1016/j.psychres.2020.113117)
- Kotwal, A. A. *et al.*** (2021). Social isolation and loneliness among San Francisco Bay Area older adults during the COVID-19 shelter-in-place orders. *Journal of the American Geriatrics Society*, 69, 20–29. doi: [10.1111/jgs.16865](https://doi.org/10.1111/jgs.16865)
- Kovacs, B., Caplan, N., Grob, S. and King, M.** (2021). *Social Networks and Loneliness during the COVID-19 Pandemic: Socius*. doi: [10.1177/2378023120985254](https://doi.org/10.1177/2378023120985254)
- Lampraki, C., Hoffman, A., Roquet, A. and Jopp, D. S.** (2022). Loneliness during COVID-19: development and influencing factors. *PLoS ONE*, 17, e0265900. doi: [10.1371/journal.pone.0265900](https://doi.org/10.1371/journal.pone.0265900)
- Leigh-Hunt, N. *et al.*** (2017). An overview of systematic reviews on the public health consequences of social isolation and loneliness. *Public Health*, 152, 157–171. doi: [10.1016/j.puhe.2017.07.035](https://doi.org/10.1016/j.puhe.2017.07.035)
- Losada-Baltar, A., Jiménez-Gonzalo, L., Gallego-Alberto, L., del Pedroso-Chaparro, M. S., Fernandes-Pires, J. and Márquez-González, M.** (2021). We are staying at home. Association of self-perceptions of aging, personal and family resources, and loneliness with psychological distress during the lock-down period of COVID-19. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 76, e10–e16. doi: [10.1093/geronb/gbaa048](https://doi.org/10.1093/geronb/gbaa048)
- Luanagh, C. O. and Lawlor, B. A.** (2008). Loneliness and the health of older people. *International Journal of Geriatric Psychiatry*, 23, 1213–1221. doi: [10.1002/gps.2054](https://doi.org/10.1002/gps.2054)
- Luchetti, M. *et al.*** (2020). The trajectory of loneliness in response to COVID-19. *American Psychologist*, 75, 897–908. doi: [10.1037/amp0000690](https://doi.org/10.1037/amp0000690)
- Palgi, Y. *et al.*** (2020). The loneliness pandemic: loneliness and other concomitants of depression, anxiety and their comorbidity during the COVID-19 outbreak. *Journal of Affective Disorders*, 275, 109–111. doi: [10.1016/j.jad.2020.06.036](https://doi.org/10.1016/j.jad.2020.06.036)
- Polenick, C. A., Perbix, E. A., Sawli, S. M., Maust, D. T., Birditt, K. S. and Brooks, J. M.** (2021). Loneliness during the COVID-19 pandemic among older adults with chronic conditions. *Journal of Applied Gerontology*, 40, 804–813. doi: [10.1177/0733464821996527](https://doi.org/10.1177/0733464821996527)
- R Core Team** (2020). *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. Available at: <https://www.R-project.org/>
- Radloff, L. S.** (1977). The CES-D scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385–401.
- Sampogna, G. *et al.*** (2021). Loneliness in young adults during the first wave of COVID-19 lockdown: results from the multicentric COMET study. *Frontiers in Psychiatry*, 12, 788139. doi: [10.3389/fpsy.2021.788139](https://doi.org/10.3389/fpsy.2021.788139)
- Seifert, A. and Hassler, B.** (2020). Impact of the COVID-19 pandemic on loneliness among older adults. *Frontiers in Sociology*, 5, 590935. doi: [10.3389/fsoc.2020.590935](https://doi.org/10.3389/fsoc.2020.590935)
- Smith, M. L., Steinman, L. E. and Casey, E. A.** (2020). Combatting social isolation among older adults in the time of physical distancing: the COVID-19 social connectivity paradox. *Frontiers in Public Health*, 8, 403. doi: [10.3389/fpubh.2020.00403](https://doi.org/10.3389/fpubh.2020.00403)
- Spitzer, R. L., Kroenke, K., Williams, J. B. and Löwe, B.** (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of Internal Medicine*, 166, 1092–1097. doi: [10.1001/archinte.166.10.1092](https://doi.org/10.1001/archinte.166.10.1092)
- Taylor, H. O.** (2020). Social isolation's influence on loneliness among older adults. *Clinical Social Work Journal*, 48, 140–151. doi: [10.1007/s10615-019-00737-9](https://doi.org/10.1007/s10615-019-00737-9)
- Thomas, P. A.** (2012). Trajectories of social engagement and mortality in late life. *Journal of Aging Health*, 24, 547–568. doi: [10.1177/0898264311432310](https://doi.org/10.1177/0898264311432310)
- Vahia, I. V., Jeste, D. V. and Reynolds, C. F.** (2020). Older adults and the mental health effects of COVID-19. *Journal of the American Medical Association*, 324, 2253–2254. doi: [10.1001/jama.2020.21753](https://doi.org/10.1001/jama.2020.21753)
- Van der Velpen, I. *et al.*** (2022). Determinants of social health trajectories during the COVID-19 pandemic in older adults: the Rotterdam study. *International Psychogeriatrics*, 1–15. doi: [10.1017/S104161022100289.1](https://doi.org/10.1017/S104161022100289.1)
- Varma, P., Junge, M., Meaklim, H. and Jackson, M. L.** (2021). Younger people are more vulnerable to stress, anxiety and depression during COVID-19 pandemic: a global cross-sectional survey. *Progress in Neuropsychopharmacology and Biological Psychiatry*, 109, 110236. doi: [10.1016/j.pnpbp.2020.110236](https://doi.org/10.1016/j.pnpbp.2020.110236)
- Varrella, S.** (2021). *Feeling of Loneliness among Adults 2021, by Country*. Hamburg: Statista.
- Valtorta, N. and Hanratty, B.** (2012). Loneliness, isolation and the health of older adults: do we need a new research agenda? *Journal of the Royal Society of*

Medicine Supplement, 105, 518–522. doi: [10.1258/jrsm.2012.120128](https://doi.org/10.1258/jrsm.2012.120128)

Weiss, R. S. (1973). *Loneliness: The Experience of Emotional and Social Isolation*. Cambridge, MA: The MIT Press.

Weissbourd, R., Batanova, M., Lovison, V. and Torres, E. (2021). Loneliness in America. How the pandemic has deepened an epidemic of loneliness and what we can do

about it. Available at: <https://mcc.gse.harvard.edu/reports/loneliness-in-america>

Xiong, J. et al. (2020). Impact of COVID-19 pandemic on mental health in the general population: a systematic review. *Journal of Affective Disorders*, 277, 55–64. doi: [10.1016/j.jad.2020.08.001](https://doi.org/10.1016/j.jad.2020.08.001)