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Loneliness in the COVID-19 pandemic: Associations with age, gender and their interaction

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ABSTRACT

Loneliness is associated with mental health and thus is of particular concern in the COVID-19 pandemic, due to physical distancing restrictions and shelter-in-place orders. The current study assessed the associations of age, gender and their interaction with loneliness during the COVID-19 pandemic, controlling for other sociodemographic variables. A pooled sample of 3,012 English-speaking Canadian adults aged 18+ years completed a web-based survey in one of three waves between May 8 and June 23, 2020. Multivariable logistic regression was used to examine the associations of loneliness with age and gender controlling for marital status, household income, education, living alone, employment situation, and survey wave. A likelihood ratio test assessed the model with interaction between age and gender included. Approximately 8.4% of the sample reported feeling lonely 5+ days in the past week. The regression model with main effects found greater odds of loneliness among women than men (AOR = 1.76, 95%CI = 1.32, 2.34) and among all age groups younger than 60 years compared to those aged 60+ years ($p = 0.002$). In the final regression model, a significant interaction effect between age and gender on loneliness was found. The interaction showed that women had greater odds of loneliness than men among those aged 18–29 years (AOR = 3.53, 95%CI = 1.69, 7.37) and 60+ years (AOR = 2.62, 95%CI = 1.33, 5.17). Special consideration of loneliness among younger and older adult women is needed in service planning. Given inconsistencies with pre-pandemic studies, detailed data collected during the current crisis is essential to inform proactive resource allocation to prevent and treat mental health consequences of the pandemic.

1. Introduction

Loneliness is increasingly recognized as an important public health issue; however, it is still highly understudied in the academic literature (Lim et al., 2020). Often used interchangeably with the term ‘isolation’, loneliness is a distinct concept reflecting the *subjective* experience of a perceived discrepancy between actual and desired levels of social engagement (Brooke and Jackson, 2020; Lim et al., 2020). While isolation or being alone sometimes contributes to a sense of loneliness,

some people experience loneliness despite having close connections with friends and/or family. Loneliness has been found to impact both physical and mental health. Longitudinal studies have found loneliness to predict future depression, paranoia, and social anxiety; only the latter of these in turn predicted subsequent loneliness, demonstrating that loneliness is a definitive precursor or contributor to mental health symptoms (Cacioppo et al., 2010; Lim et al., 2016). Longitudinal studies have also found an association between loneliness and future incident coronary heart disease, stroke (Valtorta et al., 2016), cognitive decline

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(Donovan et al., 2017; Shankar et al., 2013) and dementia (Holwerda et al., 2014).

In March 2020, the World Health Organization (WHO) declared COVID-19 to be a global pandemic; nations around the world introduced public health measures to limit spread of the virus. While measures varied by province across Canada, by mid-to late-March most of Canada had implemented shelter-in-place orders and the shutdown of non-essential businesses, schools, and community gathering places. The first emergency aid bill was passed before the end of March to assist businesses and individuals impacted by closures. On March 16th, Canada began to close its borders to non-Canadians and on March 18th, Canada and the United States announced jointly that they would be closing their shared border to non-essential vehicle traffic. Flights were coordinated to repatriate Canadians stranded in foreign countries. In spite of public health interventions, the death toll from COVID-19 grew quickly, from 100 deaths by April 2nd, to 1,000 deaths by April 15th, to 5,000 deaths by May 12th (Canadian Press, 2020). The first wave of the pandemic in Canada peaked in late April and early May (Public Health Agency of Canada, 2020). Beginning in May, slow and staged easing of public health interventions was initiated but varied across provinces; many interventions (e.g., limitations to number of people gathering, masking requirements) were still in place when the second wave of the pandemic began in September. By July 2020 there were more than 13 million confirmed cases of the virus worldwide, with more than 100,000 of these cases in Canada (Canadian Press, 2020; WHO, 2020). In the context of the COVID-19 pandemic and the associated public health interventions designed to promote physical distancing and isolation, understanding who is most at risk of loneliness is particularly important in targeting mental health promotion efforts among the most vulnerable. The present study examines whether specific age and gender groups were more likely to experience loneliness during major lockdowns in the early days of the pandemic.

Pre-pandemic assessments of loneliness over the lifespan identified high risk for loneliness amongst the older adult population, but studies have also identified significant elevation in loneliness in early adulthood (Child and Lawton, 2019; Nicolaisen and Thorsen, 2017; Victor and Yang, 2012). Older adulthood often involves significant life transitions, including children leaving the home, retirement, death of a spouse, and physical ailments (Victor and Yang, 2012), all of which may contribute to feeling lonely. Adolescence and early adulthood are also a period of significant transition, including academic and vocational decisions and leaving one's childhood home, which may directly increase feelings of loneliness or may impact feelings of depression or anxiety and may in turn increase perceptions of loneliness. Pre-pandemic data have also examined gender differences in loneliness. Results have been inconsistent, with some studies identifying a greater risk of loneliness among men than among women (Barreto et al., in press; Fujimori et al., 2017; van den Broek, 2017) and others identifying a greater risk among women (Dong and Chen, 2017; Luhmann and Hawkey, 2016). A potential explanation for this inconsistency is that the association between gender and loneliness varies by age group. In a meta-analysis, Maes et al. (2019) found no gender difference in loneliness among middle-aged or older adults, but men were lonelier than women among young adults, and boys were lonelier than girls among children and adolescents.

In the early stages of the COVID-19 crisis, peer-reviewed journals published many editorial and commentary articles expressing concern about the potential impact of the pandemic on isolation and resulting loneliness among the older adult population, who were perceived as most vulnerable (e.g., Armitage and Nellums, 2020; Brooke and Jackson, 2020; Jawaid, 2020). However, data collected early in the pandemic suggested that young people were disproportionately affected by stress, depression, anxiety, and loneliness (Ahmed et al., 2020; Bu et al., 2020; Losada-Baltar et al., in press; Qiu et al., 2020). A survey of adults in the United Kingdom conducted between March 23rd and April 24th, 2020 found high levels of loneliness in the population, with highest levels reported by younger adults (Groarke et al., 2020). A

3-wave study of American adults, which included data collection before the introduction of public health measures, at the end of March 2020, and at the end of April 2020, reported no mean-level changes in loneliness across the population over time, although older adults showed a slight increase in loneliness between March and April, after physical distancing measures were introduced (Luchetti et al., 2020). Still, older adults reported less loneliness than their younger adult counterparts. A survey of adults in Israel conducted from March 15th to April 1st indicated that age was negatively associated with depression and anxiety, and that loneliness due to physical distancing measures was the primary risk factor for depression, anxiety and their comorbidity (Palgi et al., 2020). The authors speculated that older adults have greater experience with isolation and with life-threatening medical situations, reducing their sensitivity and facilitating a more effective response to these stressors. In terms of gender, while much of the early data from the COVID-19 pandemic found higher levels of loneliness among women than men (Bu et al., 2020; Barreto et al., in press), there were studies that found no association between gender and loneliness (e.g., Groarke et al., 2020). To our knowledge no studies have examined the interaction between age and gender for loneliness during the pandemic.

Given the existing pre-pandemic data on associations between age, sex or gender, and loneliness, and the apparent inconsistencies with early data collected during the COVID-19 pandemic, the aim of the current study was to assess the associations of age and gender and their interaction with loneliness, adjusting for other sociodemographic covariates, among Canadian adults during the COVID-19 pandemic. This information is needed to inform targeted programming to prevent and treat loneliness, and potentially related mental health symptoms, associated with the pandemic.

2. Material and methods

2.1. Sample and procedures

The pooled sample of 3,012 respondents was derived from three waves (Wave 1: May 8th–12th, 2020, $n = 1,005$; Wave 2: May 29th–June 1st, 2020, $n = 1,002$; Wave 3: June 19th–23rd, 2020, $n = 1,005$) of a national web-based survey of English-speaking Canadian adults aged 18 years and older. The survey was conducted by the Centre for Addiction and Mental Health (CAMH) in collaboration with Methodify by Delvinia, which made the survey available to members of its AskingCanadians online research panel. Sampling quotas for age, gender, and region based on Statistics Canada census data were included to enhance generalizability to the Canadian English-speaking population. Informed consent was obtained electronically at the start of the survey. The CAMH Review Ethics Board approved the study protocol.

2.2. Measures

2.2.1. Loneliness

Feeling lonely was assessed with a single item from the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977): 'In the past 7 days, how often have you felt lonely?' Response options included: 'rarely or none of the time (less than 1 day)', 'some or a little of the time (1–2 days)', 'occasionally or a moderate amount of the time (3–4 days)', and 'most or all of the time (5–7 days)'. Responses were converted to binary coding to allow for comparison of those who reported feeling lonely most or all of the time (5+ days) with those who reported feeling lonely less frequently (<5 days).

2.2.2. Sociodemographics

Sociodemographic variables included gender (woman/man), age (18–29 years, 30–39 years, 40–49 years, 50–59 years, 60+ years), marital status (married/living with partner, widowed/divorced/separated, never married), education (high school or less, some post-secondary, college diploma/degree, university diploma/degree), and

annual household income (less than \$40,000, \$40,000 to \$79,999, \$80,000 to \$119,999, \$120,000+, prefer not to answer). Whether the respondent lived alone (yes, no) was also included as a proxy measure of isolation. Current employment situation in the context of the pandemic was also included with the following response options: job/work location unchanged or have since returned to existing or new job/work location, not working before and after pandemic/no change (retired, student, paid leave, recently graduated), not currently working/laid off due to pandemic, currently working from home due to pandemic, other.

2.3. Statistical analyses

Chi-square tests were used to assess bivariate relationships between sociodemographic variables and loneliness. A multivariable logistic regression model was constructed to examine the associations of age and gender with loneliness, controlling for other sociodemographic variables. A two-way interaction was also tested to assess whether the association between gender and loneliness varied by age groups. A likelihood ratio test was used to examine whether including an age and gender interaction term significantly improved the fit of the model. Respondents with missing values on the variables of interest were excluded from regression models. Although the gender identity item in the survey included multiple categories other than man and woman, very few respondents (n = 21) self-identified their gender as something other than man or woman; thus, these few cases were excluded. All analyses were conducted using SAS software, Version 9.4 (SAS Institute Inc, 2016).

3. Results

Approximately 8.4 percent of the sample reported feeling lonely at least 5 days in the past week. Table 1 presents self-reported loneliness by wave and by each of the sociodemographic variables. Based on chi-square analyses, loneliness was significantly more prevalent among younger adults aged 18–29 years than among older adults aged 60+ years and among women than among men. Those who were never or were previously married, those with a household income below \$40,000, those with less than or up to a high school education, those living alone, and those who were not currently working or were laid off due to the pandemic were more likely to report loneliness. No association was found between loneliness and survey wave.

The multivariable logistic regression model with main effects only (see Table 2) found greater odds of loneliness among women than men (AOR = 1.76, 95%CI = 1.32, 2.34) and among all groups aged 18 through 59 years compared to those aged 60+ years, with the highest odds found among those aged 18–29 years (AOR = 2.73, 95%CI = 1.60, 4.67). The model also found higher odds of being lonely among those who live alone than those living with others (AOR = 1.85, 95%CI = 1.29, 2.65) and those who were never married (AOR = 2.05, 95%CI = 1.37, 3.05) or were previously married (AOR = 2.57, 95%CI = 1.63, 4.03) than married people. Higher odds of being lonely were also found among those not currently working or laid off due to the pandemic than those working in the same job or work location as before the pandemic (AOR = 1.70 95%CI = 1.13, 2.56).

Table 3 presents self-reported loneliness by both age and gender. To assess the potential interaction between age and gender, the multiplicative interaction term was added to the model (see Table 2) and found to be significant (p = 0.04). We compared the multivariable logistic regression model with and without the interaction term using a likelihood ratio test, which provided evidence that the interaction significantly improved the fit of the model (X²(4) = 10.41, p = 0.03. The gender by age interaction on loneliness (see summary of interaction in Table 4) indicated greater odds of loneliness among women than men, but only among those aged 18–29 years (AOR = 3.53, 95%CI = 1.69, 7.37) and 60+ years (AOR = 2.62, 95%CI = 1.32, 5.17).

Table 1
Feeling lonely 5+ days in past week by sociodemographic risk factors and survey wave among Canadian English-speaking adults aged 18+ years (n = 2,991).

Variables	Total sample n = 2,991 n (%)	Felt lonely 5+ of past 7 days n = 251 n (%)	Felt lonely <5 of past 7 days n = 2,740 n (%)	X ²
Age				**
18–29 years	398 (13.3%)	55 (13.8%)	343 (86.2%)	
30–39 years	769 (25.7%)	69 (9.0%)	700 (91.0%)	
40–49 years	400 (13.4%)	33 (8.3%)	367 (91.7%)	
50–59 years	515 (17.2%)	44 (8.5%)	471 (91.5%)	
60+ years	909 (30.4%)	50 (5.5%)	859 (94.5%)	
Gender				**
Man	1497 (50.1%)	90 (6.0%)	1407 (94.0%)	
Woman	1494 (49.9%)	161 (10.8%)	1333 (89.2%)	
Marital status				**
Married/Living with partner	1832 (61.3%)	82 (4.5%)	1750 (95.5%)	
Widowed/Divorced/Separated	377 (12.6%)	56 (14.9%)	321 (85.1%)	
Never Married	745 (24.9%)	110 (14.8%)	635 (85.2%)	
Household income (CAD)				**
Less than \$40,000	382 (12.8%)	59 (15.5%)	323 (84.5%)	
\$40,000-\$79,999	737 (24.6%)	72 (9.8%)	665 (90.2%)	
\$80,000-\$119,999	672 (22.5%)	55 (8.2%)	617 (91.8%)	
\$120,000+	721 (24.1%)	34 (4.7%)	687 (95.3%)	
Prefer not to answer	479 (16.0%)	31 (6.5%)	448 (95.5%)	
Education				*
High school or less	341 (11.5%)	36 (10.6%)	305 (89.4%)	
Some post-secondary (college, technical university, etc.)	465 (15.7%)	44 (9.5%)	421 (90.5%)	
College diploma/degree	587 (19.8%)	51 (8.7%)	536 (91.3%)	
University diploma/degree	1578 (53.1%)	120 (7.6%)	1458 (92.4%)	
Live alone				**
Yes	625 (20.9%)	102 (16.3%)	523 (83.7%)	
No	2356 (78.8%)	148 (6.3%)	2208 (93.7%)	
Employment situation				*
Job/work location unchanged or have since returned to existing or new job/work location	818 (27.3%)	62 (7.6%)	756 (92.4%)	
Not working before or after pandemic/No change (retired, student, paid leave, recently graduated)	843 (28.2%)	62 (7.4%)	781 (92.6%)	
Not currently working/laid off due to pandemic	419 (14.0%)	52 (12.4%)	367 (87.6%)	
Currently working from home due to pandemic	754 (25.2%)	56 (7.4%)	698 (92.6%)	
Other	157 (5.2%)	19 (12.1%)	138 (87.9%)	
Survey wave				NS
1 (May 8 to 12, 2020)	1002 (33.5%)	86 (8.6%)	916 (91.4%)	
2 (May 29 to June 1, 2020)		84 (8.5%)	905 (91.5%)	

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Table 1 (continued)

Variables	Total sample n = 2,991 n (%)	Felt lonely 5+ of past 7 days n = 251 n (%)	Felt lonely <5 of past 7 days n = 2,740 n (%)	X ²
	989 (33.1%)			
3 (June 19 to 23, 2020)	1000 (33.4%)	81 (8.1%)	919 (91.9%)	

Note: X² = chi-square; *p < 0.01, **p < 0.001, NS = not significant (p > 0.05); discrepant totals are due to missing data.

4. Discussion

The findings suggest that particular demographic groups may be especially vulnerable to loneliness during the COVID-19 self-isolation and shelter-in-place orders. The study found loneliness to be highest among the youngest adults (aged 18–29 years) and lowest among the oldest adults (aged 60+ years). General-population lifespan studies conducted before the pandemic typically found greater loneliness among older than younger adults, with some studies showing an increased prevalence among younger adults as well, though sometimes not as high as the prevalence found among older adults (Child and Lawton, 2019; Nicolaisen and Thorsen, 2017; Victor and Yang, 2012). However, the negative association of age with loneliness during the pandemic is consistent with other studies conducted on the COVID-19 pandemic, which have found younger people to be at greater risk for symptoms of stress, depression, anxiety, and loneliness (Ahmed et al., 2020; Bu et al., 2020; Losada-Baltar et al., in press; Qiu et al., 2020).

The higher rate of loneliness among younger adults may be due to a reduction in social interactions during shelter-in-place orders. There are age differences in how satisfaction is derived from social relationships; where young adults value the size of their social networks and quantity of interactions, older adults value the quality of their social networks and interactions (Nicolaisen and Thorsen, 2017). It may be that the quantity of social interactions has been more severely impacted by physical distancing than the quality of such interactions. Additionally, the pandemic may have affected the types of social interactions that are more valued by younger people. Among young adults, having fewer personal contacts with whom to socialize is linked to loneliness (Child and Lawton, 2019) and these have likely been reduced by physical distancing protocols. The pandemic has also affected people’s daily routines, with these effects likely more extreme for those in the younger age groups compared with those in the oldest age group, which likely includes many retirees who do not have work or other responsibilities outside the home that have been impacted by the pandemic.

Bivariate and multivariate analyses of the current data indicated that loneliness was more prevalent among women than men, which is consistent with studies from other countries conducted during the COVID-19 pandemic (Bu et al., 2020; Losada-Baltar et al., 2020). It may be that shelter-in-place orders interfere with women’s preferred coping strategies, making women more vulnerable to the negative mental health impacts of the pandemic. Women rely more extensively than men on social support and emotion-focused coping when faced with a stressor (Ptacek et al., 1994; Rosario et al., 1988). Limited access to friends and family during the crisis may be impeding strategies used predominantly by women to cope with the isolation imposed by the pandemic.

The current study also examined the interaction between age and gender in relation to loneliness during the pandemic. Adjusting for other relevant variables, the interaction between age and gender significantly improved the fit of the regression model. Stratified analysis of the interaction indicated that women faced greater odds of loneliness than men, but only among the youngest adults, who were the age group at highest risk of loneliness, and among the oldest adults, who were the age

Table 2

Multivariable logistic regression model (main effects only) of feeling lonely 5+ days in the past week among Canadian English-speaking adults aged 18+ years.

Variables	Adjusted ORs ^a	Felt lonely 5+ days in past 7 days (n = 2,935)			Joint test p-value
		95% CI ^b	p-value		
Age					0.0017
60+	Ref	–	–		
18–29 years	2.73	1.60	4.67	0.0002	
30–39 years	2.58	1.60	4.15	0.0001	
40–49 years	2.08	1.23	3.53	0.0063	
50–59 years	1.95	1.22	3.14	0.0056	
Gender					0.0001
Man	Ref	–	–		
Woman	1.76	1.32	2.34	0.0001	
Marital status					<.0001
Married/Living with partner	Ref	–	–		
Widowed/Divorced/Separated	2.57	1.63	4.03	<0.0001	
Never Married	2.05	1.37	3.05	0.0004	
Household income (CAD)					0.2964
\$120,000+ Less than \$40,000	Ref	–	–		
\$40,000–\$79,999	1.57	0.94	2.62	0.0838	
\$80,000–\$119,999	1.29	0.82	2.04	0.2700	
Prefer not to answer	1.42	0.90	2.24	0.1331	
Education					0.5836
University diploma/degree	1.03	0.61	1.75	0.9093	
High school or less	Ref	–	–		
Some post-secondary (college, technical university, etc.)	1.21	0.79	1.86	0.3866	
College diploma/degree	1.20	0.81	1.77	0.3595	
Live alone					0.0009
No	Ref	–	–		
Yes	1.85	1.29	2.65	0.0009	
Employment situation					0.0380
Job/work location unchanged or have since returned to existing or new job/work location	Ref	–	–		
Not working before or after pandemic/No change (retired, student, paid leave, recently graduated)	1.25	0.81	1.91	0.3116	
Not currently working/laid off due to pandemic	1.70	1.13	2.56	0.0117	
Currently working from	0.99	0.67	1.47	0.9527	

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Table 2 (continued)

Variables	Adjusted ORs ^a	Felt lonely 5+ days in past 7 days (n = 2,935)		
		95% CI ^b	p-value	Joint test p-value
home due to pandemic				
Other	1.77	0.98	3.19	0.0569
Survey wave				0.8882
1	Ref	–	–	
2	1.05	0.76	1.46	0.7551
3	0.97	0.70	1.36	0.8650

Notes.

Ref = reference category.

Bolded figures indicate statistical significance at the 95% level.

^a Adjusted odds ratio.

^b 95% confidence intervals.

Table 3

Feeling lonely 5+ days in past week by age and gender among Canadian English-speaking adults aged 18+ years (n = 2,991).

Age group	Gender	Total sample n = 2,991 n	Felt lonely 5+ of past 7 days n = 251 n (%)	Felt lonely <5 of past 7 days n = 2,740 n (%)
18–29	Man	162	10 (6.2%)	152 (93.8%)
	Woman	236	45 (19.1%)	191 (80.9%)
30–39	Man	421	38 (9.0%)	383 (91.0%)
	Woman	348	31 (8.9%)	317 (91.1%)
40–49	Man	206	15 (7.3%)	191 (92.7%)
	Woman	194	18 (9.3%)	176 (90.7%)
50–59	Man	252	15 (6.0%)	237 (94.1%)
	Woman	263	29 (11.0%)	234 (89.0%)
60+	Man	456	12 (2.6%)	444 (97.4%)
	Woman	453	38 (8.4%)	415 (91.6%)

Table 4

Summary of gender by age interaction on feeling lonely 5+ days in past week.

	Felt lonely 5+ days in past 7 days		
	AOR ^a	95% CI ^b	
Woman vs Man (Ref) at age = 18–29 years	3.53	1.69	7.37
Woman vs Man (Ref) at age = 30–39 years	1.02	0.61	1.72
Woman vs Man (Ref) at age = 40–49 years	1.25	0.60	2.62
Woman vs Man (Ref) at age = 50–59 years	1.93	0.99	3.78
Woman vs Man (Ref) at age = 60+ years	2.62	1.33	5.17

Notes.

Bolded figures indicate statistical significance at the 95% level.

^a Adjusted odds ratio; adjusted for marital status, household income, education, living alone, employment situation, and survey wave.

^b 95% confidence intervals.

group at lowest risk of loneliness. In contrast, studies of gender over the lifespan conducted prior to the pandemic typically found that boys and men had greater odds of loneliness, but only among children, adolescents and young adults (Maes et al., 2019). It may be that younger women (more commonly single and never-married) and older women (more likely to be previously married or widowed) typically reach out to multiple others beyond their immediate family for social support, whereas middle-aged women typically rely on a spouse or common-law partner, who is still present throughout the pandemic and available to provide support. Thus, among younger and older women, physical distancing may have restricted access to their sources of social support, interfering with emotion-focused coping that would otherwise be a primary means to alleviate stressors associated with the pandemic.

An additional finding of the current study was that those not currently working due to the pandemic were lonelier compared to those whose job or work location was unaffected by the pandemic or had since

returned to a job or work location. This finding is consistent with previous evidence that being employed is a protective factor against loneliness in young- and middle-aged adults even after controlling for income (Luhmann and Hawkey, 2016; Matthews et al., 2019).

Several potential limitations of the current study should be considered. As a cross-sectional study, causality could not be inferred. As a web-based panel survey, the study may have excluded potential respondents without access to or with limited knowledge of Internet technology; however, this potential bias was likely minimal given a recent Statistics Canada, 2019 report indicating that 94% of Canadians have home Internet access. There is also evidence to suggest that, compared to computer-assisted telephone surveys, web-based self-report surveys have higher rates of self-disclosure for sensitive items (Milton et al., 2017) and higher levels of data reliability, potentially due to reduced privacy concerns and elimination of an experimenter effect (Braunsberger et al., 2007). There may also have been a non-response bias; it cannot be determined if eligible respondents who declined to participate would have responded similarly to those who did. This study did not examine people’s experiences of social isolation during the pandemic. Future research should examine the relationship between social isolation and loneliness in the context of the pandemic. The study also examined adults aged 60+ years in a single age category due to low levels of self-reported loneliness in men and women aged 70+ years, precluding separate analysis and interpretation of this older age group. Where possible, future research should assess potential differences in loneliness between these two older age categories.

Features of the study design may have contributed to the findings and should be explored in future research. The current study examined the odds of feeling lonely 5+ days in the past week, a criterion on the more severe end of the spectrum. Pre-pandemic studies have identified a linear relationship between loneliness and adverse mental health outcomes, which would suggest that individuals experiencing lower levels of loneliness may still be at risk for adverse mental health outcomes (Cacioppo et al., 2010; Lim et al., 2016; Shankar et al., 2013). Another methodological consideration is the use of a direct versus indirect measure of loneliness. Multiple-item scales can assess multidimensional facets of loneliness, and often take an indirect approach to measurement by refraining from use of the term ‘lonely’ or ‘loneliness’. Single-item measures like the CES-D item used here are by necessity direct measures. As a result, single-item measures may promote under-reporting of loneliness due to stigma, which may disproportionately affect certain groups. For this reason, use of a single-item direct measure is a limitation of the current study. Nicolaisen and Thorsen (2014) found that when responding to the CES-D single-item direct measure of loneliness, the youngest (18–29 years) and oldest (65–81 years) participants reported being most lonely; however, when these same participants responded to a multi-item indirect measure of loneliness, a positive association between age and loneliness was found, with the oldest participants reporting more loneliness. Men were more likely to report loneliness on the indirect measure, though only among younger age groups (18–29 years, 30–49 years). Consistent with the results reported here, women were more likely to report loneliness on the direct measure.

The true impact of the COVID-19 pandemic on mental health is yet to be seen, but there is mounting evidence to suggest that stress, anxiety, depression, and loneliness are major consequences of the crisis (Ahmed et al., 2020; Bu et al., 2020) and may persist beyond the current period of high risk for virus exposure. Loneliness is a risk factor for mental health (e.g., depression, paranoia, cognitive decline, dementia) and physical health problems (e.g., coronary heart disease, stroke) (Cacioppo et al., 2010; Donovan et al., 2017; Holwerda et al., 2014; Lim et al., 2016; Shankar et al., 2013; Valtorta et al., 2016). Understanding who is most vulnerable to loneliness during the crisis is essential for needs assessment and proactive resource allocation, as we plan for health needs during and in the aftermath of the pandemic (Holmes et al., 2020). The present study suggests that special consideration of loneliness among younger and older adult women should be taken into

account in service planning and development of targeted interventions. As the current data were collected via web-based surveys, they may be particularly informative in the development of online education and treatment initiatives to provide self-help and counselling services to vulnerable groups including those identified here. The COVID-19 crisis is an unprecedented global event and, as the current data indicate, we cannot rely on pre-pandemic data to guide us. More detailed information, including assessment of interactions between known risk factors, such as age and gender, for mental health symptoms including loneliness, will assist in global efforts to heal from the stress and trauma of COVID-19.

Author contributions

HAH, TEM, SW, CMW, YTN, and DJ were involved in survey procurement and development. CMW and AJM conceptualized the study. AJM conducted analyses. All authors interpreted analyses. CMW developed the first manuscript draft. All authors were involved in final revisions of the manuscript.

Declaration of competing interest

The authors declare no conflict of interest.

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