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Loneliness During the COVID-19 Pandemic: Implications for Mental Health and Substance Use

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Aim: Traumatic stressor events disrupt the normal daily functioning of individuals and groups, and the consequences of collective trauma magnify psychopathology and mental health issues. One overlooked mental health implication of traumatic stress is loneliness. The current study examines loneliness as a result of traumatic stress and its psychosocial correlates, including substance abuse and changes in daily health behaviors. **Design:** Cross-sectional, nationwide, online survey. **Methods:** This study was a cross-sectional, nationwide online survey that included 2,530 adults in the United States, 18-83 years old, and examined the associations between loneliness and psychosocial factors and substance use during the initial part of the COVID-19 pandemic. **Results:** Increased loneliness was associated with younger age, single marital status, and lower levels of education. Mental health disorders, including major depression, generalized anxiety, and somatization, were also associated with high levels of loneliness. Further, individuals with high levels of loneliness were more likely to report increased substance use, including alcohol and illicit drugs. **Discussion:** The findings of this study indicate that during times of collective traumatic events, high levels of loneliness are a risk factor for mental health and substance use. Further initiatives are warranted to create awareness and institute routine screenings for symptoms of loneliness to mitigate mental health distress and increases in substance abuse.

Keywords: loneliness, isolation, mental health, alcohol use, traumatic stress

Natural disasters, school and public shootings, community violence, domestic terrorism, and most recently, the COVID-19 pandemic are all profound instances of complex traumatic stressor events. While each of these stand alone, the COVID-19 pandemic was a global traumatic stressor event that invoked feelings of fear, uncertainty, and confusion, consequently disrupting one's sense of safety, stability, and security worldwide (Taylor, 2022). The collective trauma caused by the COVID-19 pandemic included all the devastating societal complications and disruptions to daily living that negatively affected individuals, families, and communities worldwide (Holman et al., 2023). Following the COVID-19 pandemic, the collective trauma included the broader psychological reactions to the traumatic event itself along with details of the event held in the collective memory of people (Hirschberger, 2018; Macias et al., 2021). The traumatic stressors associated with the COVID-19 pandemic, such as mandated social distancing, contributed to the risk of psychological vulnerability to psychopathology with detrimental impacts on mental health and well-being (Cordaro et al., 2021). However, the effects on mental health from traumatic stress associated with the pandemic often overlook loneliness and its psychosocial correlates to anxiety and depression symptomology and substance use (Cadigan et al., 2023). Understanding these associations can mitigate the onset and severity of loneliness and psychopathology for future traumatic stressor events (Vindegaard & Benros, 2020; Wang et al., 2020).

Loneliness is broadly defined as dissatisfaction with the quality of one's social relationships, and the perceived absence of connection co-occurs with psychological distress (Pinquart & Sorensen, 2001). The cognitive dissonance between an individual's desired level of social harmony and their perceived experience of lacking connection causes feelings of inadequacy, regardless of the objective quality of their social network (Burholt et al., 2017). This implies that an absence of social contact does not predict loneliness. Instead, discontent with the perceived intimacy of one's relationships produces loneliness.

Outside traumatic stressor events, a broad range of risk factors are associated with loneliness, and a comprehensive theoretical framework has yet to be fully developed (Clark et al., 2021). Previous studies suggest that loneliness is prevalent throughout all demographics and cultures (Hutten et al., 2021; Victor & Yang, 2012). There is a consistent pattern of loneliness across the human lifespan, and individuals under 18 and over 65 experience loneliness at higher rates than other age groups (Hawkley & Cacioppo, 2010). Furthermore, other demographic factors, such as sex, education level, socioeconomic status, ethnicity, and immigration status, are predictors of loneliness, with age increasing the likelihood of risk (Beutel et al., 2017; Bosma et al., 2015). Some key

factors influencing loneliness are physical health, mental health, and social support (Hawkley et al., 2008).

Loneliness combined with depression is associated with an increased morbidity risk, including major chronic health conditions and poor physical health (Stek et al., 2005). Specifically for older adults, social isolation is associated with a higher likelihood of premature mortality. It is related to an increased risk for secondary aging, such as cognitive decline and various forms of dementia, including Alzheimer's disease (Lara et al., 2019; Wilson et al., 2007). Social isolation is also associated with higher levels of psychological distress (Campagne, 2019).

Loneliness is a common predictor of well-being, and higher levels of loneliness are associated with mental health issues and psychopathology (Ernst et al., 2022). In addition, chronic isolation can undermine daily functioning and has been extensively linked with suicidality and self-harm (Mushtaq et al., 2014; Stravynski & Boyer, 2001). Several common mental health disorders demonstrate comorbidity with loneliness, particularly major depressive disorder (MDD) and generalized anxiety disorder (GAD; Muyan et al., 2016). In fact, social isolation resulted in a 25% increase in the global prevalence of depression and anxiety (World Health Organization, 2022).

While the literature is sparse regarding loneliness and traumatic stressor events prior to the pandemic (Palgi et al., 2012), loneliness during the pandemic has been linked to drug and alcohol abuse, and the relationship between loneliness and substance use is mediated by depression and anxiety (Horigian et al., 2020). This suggests that as loneliness levels increase, substance use also increases, and at least part of this relationship operates through poor mental health. It has been suggested that substances like alcohol and marijuana use temporarily alleviate feelings of social isolation (Ingram et al., 2020). As with mental health, the pandemic has caused an increase in substance use across a wide range of demographics (Fitzke et al., 2021). However, quality social support and relational connectedness can buffer the adverse effects that loneliness can have on mental health and daily functioning. Likewise, resilience and post-traumatic growth associated with traumatic stressor events are significantly related to social support derived from social connection (Hall et al., 2010; Xu & Ou, 2014).

The Study

While there is ample research about general social isolation and loneliness, less is known about social isolation and traumatic stressors caused by the pandemic, which is considered a historical traumatic stressor event (Usher et al., 2020). Given the adverse outcomes of loneliness within the general population, it is essential to understand the factors related to loneliness during the initial part of the COVID-19 pandemic. Similar studies have examined the relationship between loneliness, mental health, and substance use during the pandemic. The present study captures these factors while also examining other psychosocial factors, including stress, somatization, fatigue, quality of life, and changes in daily behaviors. Thus, the broad aim of this study was to investigate how loneliness during a historical traumatic stressor event (i.e., pandemic) affected U.S. adults. It was hypothesized that high levels of loneliness would correspond with poorer mental health and increased substance use.

Method

Study Setting and Sampling

Between April 14 and April 22, 2020, a total of 2,530 participants included in this study were recruited through a nationwide Facebook Sponsored Ads campaign, while the recommended stay-at-home initiatives were in place in the United States. The posted online campaign targeted the Facebook newsfeeds of 76,100 users 18 years of age or older, inviting individuals to participate voluntarily in an anonymous online study that evaluated the psychological responses to the COVID-19 pandemic. The post provided a link directing the participants to a Qualtrics survey. From the online post, 4,406 respondents clicked on the link, and 2,739 provided informed consent and completed the online survey. Participants were informed that they could skip any questions they were uncomfortable answering. Only participants who completed the UCLA Loneliness Scale portion of the survey are included in the current study (N = 2,530). The mean age of participants in this study's sample is 47.7 (SD = 12.9) years, ranging between 18 and 83 years, with 89.0% female and 91.3% White. Of the participants in this study, 28.7% (725) were single, 55.1% (1390) were married, and 16.1% (407) were divorced, separated, or single. Further, the education level breakdown for the participants in this study was 5.6% (141) with at most a high

school diploma, 30.4% (766) with some college, 31.5% (796) with a 4-year degree, and 32.5% (820) with a graduate or professional degree. This study was approved by the University Institutional Review Board (#7221).

Demographics

Participants were asked to provide information about their age, gender identity, race and ethnicity, marital status, education level, and if they had children under 18.

Instruments

Psychosocial Measures

Loneliness. Loneliness was assessed using the 20-item UCLA Loneliness Scale (UCLA; Russell et al., 1978). This measure assesses feelings of loneliness and social isolation using a 4-point Likert scale with responses ranging from *"I never feel this way"* (1) to "*I often feel this way"* (4), and total scores range between 20 to 80, with higher scores indicating greater loneliness. Examples of items from this scale include "How often do you feel left out?" and "How often do you feel isolated from others?" This is a reliable and validated scale (Russell, 1996; Russell et al., 1980). For this study, the overall scale (M = 44.9, SD = 11.7) provided excellent internal consistency (α = .94). The cut-offs for loneliness severity on the UCLA scale were adapted from Cacioppo and Patrick (2008), which included: Total score < 28 = No/Low Loneliness, Total score 28 - 43 = Moderate Loneliness, and Total score > 43 = High Loneliness.

Perceived Stress. Stress was measured using the Perceived Stress Scale (PSS; Cohen et al., 1983). The PSS assesses general life stressors using ten items within a 1-month time frame. Participants were asked to respond to each item using a 4-point Likert scale ranging from *"never"* (1) to *"very often"* (4), with total scores ranging between 10 and 40, with higher scores indicating greater stress. An example of an item on this scale is, "How often have you felt nervous and stressed?" The PSS is commonly used in both research and clinical practices and is shown to be a valid and reliable scale (Cohen et al., 1983; Lee, 2012). The overall scale (M = 19.3, SD = 7.4) for this study provided good internal consistency (α = .90).

Major Depressive Disorder. Major Depressive Disorder (MDD) was assessed using the Patient Health Questionnaire – Major Depression Subscale (PHQ-9; Spitzer et al., 2006). Using a scoring algorithm to determine if the participants meet the criteria for a provisional diagnosis of MDD, the PHQ-9 contains nine stated problems to which the respondents indicated if they have been bothered by these problems in the past two weeks using one of four options ranging from *"not at all"* (0) to *"nearly every day"* (3). An example of a problem is "Feeling down, depressed, or hopeless" (Spitzer et al., 1999). The PHQ-9 is a psychometrically sound questionnaire commonly used in research and clinical practices for general populations (Kroenke et al., 2010).

Generalized Anxiety Disorder. Generalized Anxiety Disorder was determined using the Patient Health Questionnaire – Generalized Anxiety Disorder Subscale (GAD-7; Spitzer et al., 2006). The GAD-7 is a brief screening tool commonly used in research and clinical practices that provides a provisional diagnosis of generalized anxiety disorder (GAD; Lowe et al., 2008). The GAD-7 includes seven statements in which participants indicated if they have been bothered by them in the past 2 weeks ranging from *"not at all"* (0) to *"nearly every day"* (3). This study used the scoring algorithm rather than the cut-off scores to determine if participants met the criteria for the GAD diagnosis.

Fatigue. Aspects of Fatigue were assessed using the Checklist of Individual Strength (CIS; Vercoulen et al., 1999). The CIS includes four domains: general fatigue, motivation, physical activity, and concentration. The composite scale consists of 20 items to which the participants respond to prompts such as "Thinking requires effort" on a 7-point Likert scale ranging from *"yes, that is true"* (7) to *"no, that is not true"* (0). The overall scale (M = 85.2, SD = 25.4) for this study provided good internal consistency (α = .94).

Quality of Life. Quality of Life was assessed using the World Health Organization Quality of Life BREF Scale (WHOQOL, 1996; WHOQOL-Group., 1998). The WHOQOL-BREF instrument uses 26 items to assess four specific domains related to the quality of life: physical health, psychological health, social relationships, and environment. Examples of items from this instrument include, "To what extent do you feel your life to be meaningful?" and "How satisfied are you with the support you get from your friends?" Using specific criteria to transform raw scores into standardized scores, the final scores range from 0 to 100, with higher values indicating better quality of life (WHOQOL, 1996).

Specific Measures Developed for the Current Study

Changes in Daily Behaviors. Changes in Daily Behaviors were assessed through specific items created by the researchers for this study. The participants were asked to indicate whether certain general daily health behaviors, including sleep, food consumption, and technology use, had *stayed the same*, *increased*, *decreased*, or *were not applicable* since before the pandemic began.

Changes in Substance Use Behaviors. Changes in Substance Use Behaviors were assessed through specific items created by the researchers for this study. The participants were asked to indicate whether certain substance use behaviors had *stayed the same*, *increased*, *decreased*, or *were not applicable* since before the pandemic began. The specific substance use behaviors assessed included: alcohol use, cigarette use, marijuana use, opioid drug use, illicit drug use, anti-anxiety medication use, and sleep aid use.

Data Collection and Data Analysis

The data collected for this study were weighted to the total U.S. population based on the 2018 U.S. Census Bureau population estimates by age, sex, and race/ethnicity (U.S. Census Bureau, 2020). Four age strata, two sex strata, and four race/ethnicity strata were used for the weighting procedure. To account for geographic clustering, a variable was also created based on the first two digits of the U.S. zip codes requested during data collection. Complex Sample Designs were used to conduct chi-square tests of independence for categorical comparisons and one-way ANOVAs for continuous variables, controlling for age, marital status, and education level and adjusting for population weights, strata, and clustering. Post-hoc comparisons are reported in the tables for variables with significant differences. The significance level was set at $\alpha = .05$, and pairwise deletion was used for any missing data points. A post-hoc power analysis using a one-way ANOVA, with $N = 2{,}530$, $\alpha = .05$, and moderate effect size, indicated adequate power $(1\text{-}\beta) = 1.00$. All analyses were conducted using SPSS version 27 (IBM, Inc., Chicago, IL).

Results

A total of 2,530 participants were included in the study and were placed into one of three comparison groups based on their total scores on the UCLA Loneliness Scale. The cut-off scores for loneliness severity on the UCLA scale were adapted from Cacioppo and Patrick (2008) and included: No/Low Loneliness (< 28; NLL; $n = 164$), Moderate Loneliness (28-43; ML; $n = 945$), and High Loneliness (> 43; HL; $n = 1{,}421$).

The comparisons of the demographic variables are shown in Table 1. There was a significant difference between the comparison groups when evaluating age, such that the participants in the NLL group were older than those in the ML and HL groups ($p = .014$). No significant differences were identified between the participants in the comparison groups when evaluating gender, race/ethnicity, living arrangements, or children under the age of 18 (all $ps > .05$). When comparing participants on marital status, there was a significant difference in proportions of participants in each of the comparison groups, such that there was a higher proportion of participants in the HL group were either Single or Divorced/Widowed and a higher proportion of participants in the NLL group who were Married ($p = .011$). Further differences were identified between the comparison groups based on education levels. A higher proportion of participants identified as having Some College (possibly being college students) were in the HL group. In contrast, many participants in the NLL group indicated having Graduate or Professional degrees ($p = .025$).

Age, marital status, and education level were included as covariates for the comparisons of psychosocial variables (see Table 2). There was a significant difference in levels of perceived stress between the participants in the three comparison groups. Those in the HL group had the highest mean score, followed by those in the ML group, and those in the NLL group had the lowest level of perceived stress ($p < .001$). When comparing rates of psychopathology, participants in the HL group had the highest proportion of individuals who met the criteria for major depressive disorder (MDD, 33.8%), generalized anxiety disorder (GAD, 25.3%), and somatization disorder (SD, 20.1%), compared to those in both the ML (MDD, 9.4%; GAD, 9.4%, SD, 9.8%) and NLL (MDD, 1.7%; GAD, 3.9%, SD, 1.6%) groups (all $ps < .01$). When comparing the four domains of the CIS, the participants in the HL group had significantly higher scores in all subscales (fatigue, concentration, motivation, and physical activity; all $ps \leqq .001$) compared to the participants in the NLL group. Further differences were identified when comparing the quality-of-life indices between the participants in the comparison groups on the four subscales of the WHOQOL-BREF. The participants in the NLL group reported significant-

ly better quality of life in the physical health (p = .013), psychological (p <.001), social relationships (p <.001), and environmental (p <.001) subscales compared to the participants in the HL comparison group.

The comparisons of the changes in general daily behaviors from before the onset of the pandemic also controlled for age, marital status, and education level and are shown in Table 3. There was a significant difference between comparison groups on the change in sleep, such that a higher proportion of the HL group indicated a decrease in sleep (p = .006). A question was asked about changes in eating behaviors. While no significant differences were identified between the groups based on junk food consumed, there was a difference in total food consumed. A greater proportion of participants in the HL group indicated an increase or a decrease in food consumption, while a greater proportion of participants in the NLL and ML groups reported no changes in food consumption (p = .011). Questions about changes in physical activity showed that a greater proportion of participants in the HL group indicated a decrease in outdoor physical activity (both p = .005). Changes in technology use also differed significantly among the comparison groups. A higher proportion of participants in the ML and HL groups reported increased news coverage (watched or read; p = .038). A higher proportion of the HL group reported a significant increase in TV watching (p = .015).

The last set of comparisons is focused on increases in substance use behaviors during the initial COVID-19 Pandemic (see Table 4). For these comparisons, only those individuals who indicated that they use those substances are included. There is a significant difference in the increased rates of alcohol use since the pandemic began for the participants in the ML (36.5%) and HL (39.5%) groups compared to the participants in the NLL group (18.4%; p = .002). Likewise, the HL group had higher rates of increased marijuana use (42.5%) as compared to the NLL group (30.9%) and ML group (37.7%; p = .002). Increases in opioid use were also significantly higher for those in the HL group compared to the NLL or ML groups (p = .006). While the overall number of participants who use illicit drugs is small, there was a significant increase noted in illicit drug use between the participants in the comparison groups, with the highest proportion (38.4%) in the HL group, followed by 20.5% in the NLL group, and 14.9% in the ML group (p = .003). Of the other substances compared, no significant differences in increases between the comparison groups were identified based on cigarette use, anti-anxiety medication use, or sleep aid use (all p > .05).

Discussion

The purpose of the study was to identify and profile individuals in the U.S. population who reported high levels of loneliness during the initial pandemic lockdown, and to examine how loneliness relates with mental health, pandemic concerns, and substance use. We found an effect of age, with the youngest participants expressing higher rates of loneliness. This is consistent with previous research on age as a risk factor for loneliness in studies that used the same measure, such as the UCLA-3 Loneliness Scale (von Soest et al., 2020). Younger populations tend to emphasize social group size and closeness of relationships as more critical facilitators of social support (Green et al., 2001). In the current study, younger individuals may have been more impacted by the pandemic as a result of loneliness since they were isolated from broader networks of social support. This finding adds to the literature that tends to focus solely on older adult populations traditionally identified as at risk for loneliness (Chawla et al., 2021).

Married individuals made up a large majority of the group with no/low loneliness (76.9%), while single and divorced/widowed participants showed the largest percentage in the high loneliness category. Research indicates that having a spouse increases overall well-being and reduces feelings of loneliness. It is likely that having a committed partner in residence during the COVID-19 lockdown provided built-in social connection and social support, reducing many married couples' levels of loneliness (Stack & Eschleman, 1998). Within education levels, individuals with a graduate or professional degree made up over half of the no/low loneliness group. This confirms previous findings, as education is associated with numerous factors that may be protective against loneliness, including increased well-being, broader social circles, greater job satisfaction, better health, and lower divorce rates (Oreopoulos & Salvanes, 2011). Conversely, adults without a college degree experienced more financial hardships and disproportionately lost their jobs during the lockdown; both are risk factors for loneliness and may help explain this result (Parker et al., 2021).

As expected, high loneliness scores were associat-

ed with stress, depression, anxiety, and somatization symptomology. Previous research has documented loneliness as a predictor of mental health issues and disorders, whereby perceived loneliness acts as a risk mechanism for the onset and a sustaining factor for maintaining psychopathology symptoms (Law et al., 2023). In addition, participants in the ML and HL groups had increased rates of alcohol use, marijuana use, opioid use, and illicit drug use, demonstrating higher levels of loneliness as a risk factor for maladaptive coping. However, in the current study, cigarette use, anti-anxiety medication use, and sleep aid use were not significantly different among loneliness comparison groups. Previous research findings on loneliness and substance abuse are mixed and inconsistent in the literature, depending on the type of substance being used and measured (Cadigan et al., 2023).

In addition, those reporting higher loneliness levels had more difficulty with sleep, focus, motivation, and physical activity than the ML or NLL groups. All four items from the CIS used in this study share symptoms of loneliness, anxiety, and depression. Recent research shows that perceived stress levels during the beginning of the pandemic increased globally, and women, students, and young adults were the most at-risk (Gamonal-Limacoco et al., 2022). Similarly, prevalence rates of GAD, which is related to loneliness and stress (Cordaro et al., 2021), were higher at the beginning of the pandemic than before the outbreak. Health and physical safety concerns and uncertainty about the future are examples of uncontrollable, pandemic-related worries that can help explain the increase in GAD symptoms. Notably, participants with HL reported depressive symptoms at a higher rate than perceived stress, GAD, or somatization disorder. Not surprisingly, the NLL group had the highest quality of life and best scores on physical health, psychological, social relationships, and environmental measures. This stable pattern of the results of the psychosocial comparisons confirms previous findings about the symptomology of loneliness and the broad domains of life that social isolation influences (Hawkley & Cacioppo, 2010; Jaremka et al., 2013).

Loneliness was a major mechanism of COVID-19 pandemic traumatic stress through the disruption and upending of general daily behaviors established prior to the onset of this traumatic stressor event. Perceived loneliness due to social isolation contributed to an upswing in psychological distress, psychopathology, and maladaptive coping via alcohol, marijuana, opioids, and illicit drug use. In addition, individuals experiencing higher levels of loneliness were sleeping less, eating more or less food compared to pre-pandemic functioning, and were less likely to be physically active. Last, participants reporting higher levels of loneliness showed increased smartphone use, internet use, and increased news consumption and TV watching. Collectively, these findings suggest that the use of alcohol, marijuana, opioids, illicit drugs, food consumption, and news consumption were behaviors that could temporarily alleviate or numb depression and/or anxiety symptoms and perceived loneliness. These findings on daily health behaviors are striking in that these changes are not typically associated with loneliness and can easily go unrecognized. This creates cause for concern in that individuals suffering from loneliness likely are not being screened for changes in general health behaviors. Therefore, these individuals with higher levels of loneliness are likely to elude screening, detection, and ultimately intervention and treatment (Gordy et al., 2021).

Finally, results showed that higher levels of loneliness were associated with increased alcohol consumption, marijuana, opioid, and illicit drug use. However, there were no significant associations between loneliness and the increased use of other substances such as cigarettes, anti-anxiety medications, or sleep aids. Previous studies showed a link between loneliness and substance use (Horigian et al., 2020) and between loneliness and regular alcohol use (Bragard et al., 2022), and are consistent with the findings in the current study.

Limitations

While the findings of this study have several practical implications for therapeutic interventions and bring awareness to the potential negative effects associated with high levels of loneliness, several factors in this cross-sectional study limited the interpretation of the data collected. Participants were recruited randomly via Facebook Ads, and respondents (N = 2,530) were 47.7 (SD = 12.9) years old, ranging between 18 to 83 years, with 89.0% being female and 91.3% white. Since this sample is not representative of the population, results must be interpreted accordingly. Secondly, this study was cross-sectional and used self-report measures, which may increase self-presentation bias. Further, since the participants were recruited through Facebook, it is plausible that

they may report greater levels of loneliness compared to individuals who do not frequent social media. That said, while loneliness has been connected to social media use, research suggests that lonely individuals often benefit from social media interactions (Song et al., 2014). While the UCLA Loneliness Scale is widely regarded as a reliable measure, confounding factors such as daily mood, environmental stressors, and potential distractions, which were further impacted by the pandemic, make the current study novel.

Future Directions

The present study's sample focused on individuals in the general population. However, more research on marginalized or at-risk groups experiencing loneliness during traumatic stressor events is warranted, including aging populations and those with other less typical mental health issues and disabilities. For example, individuals with intellectual and developmental disabilities are more likely to experience loneliness (Gilmore & Cuskelly, 2014; Perese & Wolf, 2009). There is also evidence that the COVID-19 pandemic disproportionately impacted these individuals due to issues such as a temporary lack of caregivers, restriction of visitors to group homes or long-term care settings, and the closing of day habilitations and vocational programs (Constantino et al., 2020). Further research is needed to assess loneliness trends due to the pandemic in these underrepresented populations.

Conclusion

In preparation for future traumatic stressor events, the consequences of loneliness can present challenges, yet preventative and early intervention strategies can be used to protect those most at risk. This study provides a nuanced depiction of loneliness during a time of traumatic stress with implications for mental health and coping behaviors. Our findings suggest that individuals with greater perceived loneliness, particularly young single adults, may experience increased levels of psychopathology (i.e., MDD and GAD) and maladaptive coping via increased alcohol and substance use. Therefore, in addition to screening for MDD and GAD, the use of screening tools for loneliness is recommended. Further, these individuals with higher levels of perceived loneliness were at increased risk for fatigue, lack of focus and motivation, and lethargy. Thus, it is important to screen and detect somatic complaints that can accompany feelings of loneliness and psychopathology. Given the important role that close social connections play in buffering loneliness, quality social support as a protective measure should be incorporated into prevention and early prevention strategies as well. For example, including early health promotion and treatment strategies for boosting opportunities for social interactions, improving social skills and social cognition, and enhancing social support (Masi et al., 2011) in the initial stages of collective trauma can help mitigate the unwelcomed experience of loneliness.

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Table 1

Demographic Comparisons (N = 2,530)

	No/Low loneliness 6.5% (*n* = 164)	Moderate loneliness 37.4% (*n* = 945)	High loneliness 56.2% (*n* = 1421)	Statistical comparison
Age				
	57.0 (3.3)[b,c]	47.9 (1.4)[a]	45.2 (1.5)[a]	*p* = .014
Gender				
Male	48.7% (11.6%)	46.1% (3.6%)	45.8% (3.8%)	*p* = .949
Female	51.3% (11.6%)	53.9% (3.6%)	54.2% (3.8%)	
Race/Ethnicity				
White	78.1% (7.8%)	65.4% (6.2%)	65.0% (6.2%)	*p* = .533
Black	3.4% (3.5%)	12.3% (6.4%)	11.8% (3.5%)	
Hispanic	16.8% (6.5%)	13.3% (3.1%)	17.9% (5.9%)	
Additional Races	1.7% (1.1%)	9.0% (4.0%)	5.3% (1.9%)	
Children under 18				
	18.3% (7.0%)	28.6% (3.1%)	29.9% (2.0%)	*p* = .330
Marital status				
Single	14.4% (4.4%)[b,c]	38.3% (6.1%)[a]	45.0% (3.4%)[a]	*p* = .011
Married	76.9% (7.2%)[b,c]	51.1% (5.7%)[a,c]	38.3% (3.1%)[a,b]	
Divorced/ Widowed	8.7% (5.9%)[c]	10.6% (1.2%)[c]	16.7% (1.0%)[b]	
Living arrangement				
Alone	6.0% (5.7%)	6.5% (3.3%)	9.2% (1.5%)	*p* = .614
With Others	94.0% (5.7%)	93.5% (3.3%)	90.8% (1.5%)	
Educational level				
High School or Less	3.5% (3.0%)[b]	13.4% (5.9%)[c]	6.3% (1.6%)	*p* = .025
Some College	13.9% (2.4%)[b,c]	25.3% (3.5%)[a,c]	38.2% (3.1%)[a,b]	
4-Year Degree	25.3% (4.5%)[c]	23.3% (3.7%)[c]	30.0% (1.8%)	
Graduate/Professional	57.3% (7.4%)[b,c]	38.1% (5.6%)[a,c]	25.5% (3.0%)[a,b]	

Note. Values shown are Means or Column Percentages (Standard Errors).
Post-hoc comparisons use alphabetical superscripts to denote significant group differences with a = No/Low Loneliness; b = Moderate Loneliness; and c = High Loneliness.

Table 2

Psychosocial Comparisons (Controlling for Age, Marital Status, and Education Level)

	No/Low loneliness 6.5% (n = 164)	**Moderate loneliness** 37.4% (n = 945)	**High loneliness** 56.2% (n = 1421)	**Statistical comparison**
Perceived stress	11.4 (0.44)[b,c]	15.9 (0.28)[a,c]	20.9 (0.31)[a,b]	$p < .001$
Major depressive disorder	1.7% (0.8%)[b,c]	9.4% (2.3%)[a,c]	33.8% (2.9%)[a,b]	$p = .001$
Generalized anxiety disorder	3.9% (1.5%)[b,c]	9.4% (1.6%)[a,c]	25.3% (1.5%)[a,b]	$p = .009$
Somatization disorder	1.6% (0.4%)[b,c]	9.8% (1.4%)[a,c]	20.1% (2.4%)[a,b]	$p < .001$
Checklist of individual strength				
Fatigue	25.1 (1.11)[b,c]	30.8 (1.00)[a,c]	38.5 (0.71)[a,b]	$p < .001$
Concentration	12.8 (0.78)[b,c]	17.0 (0.49)[a,c]	21.0 (0.50)[a,b]	$p < .001$
Motivation	11.3 (0.54)[b,c]	13.6 (0.41)[a,c]	16.9 (0.37)[a,b]	$p < .001$
Physical activity	9.8 (0.38)[b,c]	10.8 (0.34)[a,c]	13.6 (0.32)[a,b]	$p = .001$
Quality of life				
Physical health	82.8 (1.79)[b,c]	76.8 (0.77)[a,c]	67.9 (2.17)[a,b]	$p = .013$
Psychological	77.2 (1.09)[b,c]	66.4 (0.76)[a,c]	50.9 (1.58)[a,b]	$p < .001$
Social Relationships	79.4 (3.10)[b,c]	67.9 (0.96)[a,c]	43.0 (3.00)[a,b]	$p < .001$
Environmental	83.9 (1.39)[b,c]	71.9 (0.64)[a,c]	61.9 (0.97)[a,b]	$p < .001$

Note. Values shown are Means or Column Percentages (Standard Errors).
Post-hoc comparisons use alphabetical superscripts to denote significant group differences with a = No/Low Loneliness; b = Moderate Loneliness; and c = High Loneliness.

Table 3

Changes in Daily Behaviors (Controlling for Age, Marital Status, and Education Level)

	No/Low loneliness 6.5% (n = 164)	Moderate loneliness 37.4% (n = 945)	High loneliness 56.2% (n = 1,421)	Statistical comparison
Sleep per night				
Stayed the same	58.5% (4.8%)[c]	47.6% (4.5%)[c]	35.0% (2.6%)[a,b]	p = .006
Increased	18.6% (4.1%)	18.1% (2.0%)	24.0% (2.1%)	
Decreased	22.9% (5.8%)[c]	34.3% (3.6%)[c]	40.9% (1.6%)[a,b]	
Total food consumed daily				
Stayed the same	67.0% (7.9%)[b,c]	46.6% (4.1%)[a,c]	34.5% (3.7%)[a,b]	p = .011
Increased	24.4% (8.7%)[c]	40.8% (4.6%)[c]	48.8% (3.1%)[a,b]	
Decreased	8.6% (4.3%)[c]	12.6% (2.3%)[c]	16.7% (2.6%)[a,b]	
Junk food consumed daily				
Stayed the same	45.1% (8.8%)	40.7% (5.0%)	35.1% (2.5%)	p = .995
Increased	34.7% (9.3%)	42.3% (3.3%)	49.2% (3.8%)	
Decreased	20.2% (7.1%)	17.0% (2.4%)	15.6% (2.3%)	
Amount daily in-home physical activity				
Stayed the same	49.7% (5.2%)	40.2% (3.6%)	43.3% (3.3%)	p = .386
Increased	35.0% (5.7%)	39.6% (4.1%)	24.4% (1.8%)	
Decreased	15.3% (4.9%)	20.2% (3.1%)	31.0% (2.4%)	
Amount daily outdoor physical activity				
Stayed the same	39.4% (10.1%)	34.5% (4.5%)	24.4% (2.4%)	p = .005
Increased	36.7% (6.3%)[c]	37.7% (3.2%)[c]	26.6% (2.6%)[a,b]	
Decreased	23.8% (5.1%)[c]	27.9% (1.9%)[c]	49.0% (2.3%)[a,b]	
Smartphone use				
Stayed the same	46.8% (5.0%)	31.2% (6.0%)	23.4% (4.4%)	p = .165
Increased	46.4% (7.0%)	67.1% (5.9%)	74.2% (4.3%)	
Decreased	6.8% (5.7%)	1.7% (1.2%)	2.3% (0.7%)	
Internet use				
Stayed the Same	39.1% (8.2%)	31.8% (6.3%)	23.7% (3.6%)	p = .160
Increased	60.5% (8.2%)	66.9% (6.1%)	75.3% (3.6%)	
Decreased	0.4% (0.3%)	1.3% (0.8%)	1.0% (0.4%)	
TV watched (not news)				
Stayed the same	49.5% (8.6%)[c]	37.3% (5.7%)[c]	30.2% (3.1%)[a,b]	p = .015
Increased	48.5% (8.9%)[c]	57.3% (5.7%)[c]	63.7% (3.3%)[a,b]	
Decreased	2.0% (0.6%)	5.4% (2.2%)	6.1% (0.9%)	
News watched or read				
Stayed the same	47.1% (6.9%)[b,c]	30.1% (3.3%)[a,c]	20.3% (2.4%)[a,b]	p = .038
Increased	43.5% (5.1%)[c]	62.7% (2.6%)[a]	69.2% (3.3%)[a]	
Decreased	9.4% (2.3%)	7.2% (1.9%)	10.5% (1.9%)	

Note. Values shown are Means (Standard Errors).
Post-hoc comparisons use alphabetical superscripts to denote significant group differences with a = No/Low Loneliness; b = Moderate Loneliness; and c = High Loneliness.

Table 4

Substance Use Increases During Initial COVID-19 Pandemic (Based on Current Users; Controlling for Age, Marital Status, and Education Level)

	No/Low loneliness	Moderate loneliness	High loneliness	Statistical comparison
Alcohol use increase (n = 1,217 users)	18.4% (4.7%)[b,c]	36.5% (6.7%)[a]	39.5% (4.3%)[a]	p = .002
Cigarette use increase (n = 379 users)	14.9% (10.1%)	37.1% (9.1%)	34.7% (7.1%)	p = .237
Marijuana use increase (n = 448 users)	30.9% (11.7)[b,c]	37.7% (8.0%)[a]	42.5% (4.6%)[a]	p = .002
Opioid use increase (n = 117 users)	2.5% (3.4%)[c]	6.0% (4.3%)[c]	20.8% (10.5%)[a,b]	p = .006
Illicit drug use increase (n = 54 users)	20.5% (22.1%)	14.9% (7.3%)[c]	38.4% (18.9%)[b]	p = .003
Anti-anxiety medication use increase (n = 653 users)	45.2% (9.8%)	38.5% (6.6%)	34.4% (4.5%)	p = .631
Sleep aid use increase (n = 733 users)	44.6% (9.1%)	43.5% (8.8%)	42.0% (2.8%)	p = .851

Note. Values shown are Column Percentages (Standard Errors).
Post-hoc comparisons use alphabetical superscripts to denote significant group differences with a = No/Low Loneliness; b = Moderate Loneliness; and c = High Loneliness.