Age Differences in Psychological Distress After Multiple Disaster Exposures: The Effect of Multidimensional Negative COVID-19 Impacts

Zhirui Chen PhD [ID] and Zhen Cong PhD [ID]

Environmental Health Sciences, School of Public Health, University of Alabama at Birmingham, Birmingham, AL, USA

Abstract

Objective: This study examined how the multidimensional negative coronavirus disease (COVID-19) impacts contextualized the age differences in psychological distress following exposures to tornadoes and the COVID-19 pandemic.

Methods: Data were from a 2-wave panel study conducted at T1 (October 2020–August 2021) and T2 (May–August 2022). Latent class analysis was conducted to explore the patterns of negative COVID-19 impacts based on a sample of 1134 at T1. Negative binomial regressions were performed to examine the age differences in psychological distress at T2, based on the working sample (N = 554), as well as the moderating effect of identified class membership, with baseline psychological distress controlled.

Results: Three latent classes were identified: class 1 "low overall impacts," class 2 "moderate overall impacts with high emotional distress," and class 3 "severe overall impacts." Individuals ages 65 and over reported lower psychological distress at T2 relative to those ages 18–34 and 35–49. However, compared to people ages 18–34, 35–49, and 50–64, those ages 65 and over reported the greatest increases in T2 psychological distress if they had experienced moderate or severe overall COVID-19 impacts at T1.

Conclusion: There is a pressing need for mental health interventions that are tailored to multi-disaster scenarios and age-related differences in long-term disaster recovery.

SDMPH
SOCIETY FOR DISASTER MEDICINE & PUBLIC HEALTH

The coronavirus disease (COVID-19) pandemic has caused an unprecedented public health disaster to human society, and people have experienced worsening mental health and increased distress associated with COVID-19.[1] Besides, the long-term persistence of COVID-19 increases the frequency of multi-disaster scenarios, that is, the overlap between the pandemic and other disasters (eg, climate hazards), which could jeopardize public health response and compromise post-disaster recovery.[2] Following disasters, the experience of mental health recovery can vary by age. Older age has been found to be associated with better psychological health at the initial stage of the pandemic response,[3,4] but it is unclear whether the age-related advantages can be maintained after multiple experiences of COVID-19 and other disaster types.

In addition to the increased risk of cumulative disasters, the COVID-19 pandemic has resulted in profound impacts on multiple life domains, including physical and mental health, employment, health care, housing, and social interactions.[5] The chronic and complex COVID-19 impacts tend to increase the risk for long-term psychological outcomes, especially among older adults[6]; however, there is a dearth of longitudinal research examining how the age differences in post-disaster mental health recovery are affected by the multidimensional COVID-19 impacts. Using the 2-wave panel data collected from individuals who had experienced tornadoes and the COVID-19 pandemic, the present study aimed to examine the age differences in psychological distress after multiple disaster exposures. Besides, latent class analysis was used to explore the typologies of negative COVID-19 impacts across economic, health, social, and emotional domains, based on which we further investigated how the identified class membership moderated the aforementioned age differences.

Theoretical Frameworks

This study was guided by 3 theoretical frameworks: (1) Life course perspective, (2) socioemotional selectivity theory (SST), and the (3) Strength and Vulnerability Integration (SAVI) model. According to the life course perspective, older adults often have more experience with disasters or other stressful life events that allow them to take a comparative view of the current situation and become more optimistic about disaster recovery; also, social roles in late adulthood determine that older adults do not face multiple responsibilities following disasters and thus experience less psychological distress in the recovery process.[7] SST posits that, as people age, they tend to perceive future time as limited and have an increased preference for

emotionally meaningful goals.[8] As a result, older adults are generally more skilled at emotion regulation, which enables them to avoid experiencing negative emotions in stressful contexts.[9] Based on SST, the SAVI model suggests that the age-related enhancement in emotion regulation may be attenuated when older adults experience high levels of sustained and unavoidable stress, which will lead to prolonged psychological distress and delayed recovery from the event.[10] Overall, these theoretical frameworks assume that older adults generally have greater psychological resilience than their younger counterparts after stressful events, including cumulative disaster exposures, but the age-related strengths may be diminished in the face of some stressors that are complex, chronic, and rare in previous life experiences, such as the multidimensional COVID-19 impacts.

Age and Mental Health Following Disasters

Empirical studies have identified the unique strengths of older adults in mental health recovery from disasters, including the COVID-19 pandemic. Although people of all age groups experience some increases in mental health problems at the beginning of the pandemic outbreak, older adults tend to develop fewer problems than younger and middle-aged adults.[3,11] In the early months of the pandemic response, older adults can gradually recover from initial problems and maintain good mental health,[12] whereas younger people are more likely to experience psychological distress and related symptoms.[13,14] Even though some younger adults have faster improvements than older people in certain mental health issues, the age differences still persist over time.[15]

Although the old-age strengths in post-disaster mental health have been well documented, existing studies primarily focused on the age differences after experiencing a single disaster, with limited research on multiple disaster exposures. Acierno et al. examined the residents in Florida counties who experienced the 2004 hurricanes, reporting that older adults had fewer symptoms of post-traumatic stress disorder (PTSD), anxiety, and depression than younger and middle-aged adults.[16] Cherry et al. also found that compared to older adults, the storm-related stressors were more disturbing for younger and middle-aged adults after Hurricanes Katrina and Rita.[17] These works suggest that older adults could maintain the age-related advantages in mental health after exposure to cumulative natural hazards, beyond which little is known about the overlap of other disaster types, especially the multi-disaster scenarios during the COVID-19 pandemic.

Multidimensional COVID-19 Impacts and Mental Health Outcomes

The COVID-19 pandemic has dramatically affected human life across a range of domains. Due to the COVID-19 economic crisis, people are facing serious problems with finances, employment, and housing.[5] In the health domain, health insurance coverage has been severely disrupted, and health care utilization has dropped significantly during the pandemic.[18] With regard to social life, the COVID-19 pandemic caused various problems with transportation systems, Internet access, and social interactions.[5,19] The economic, health, and social impacts of COVID-19 can further lead to widespread emotional vulnerability and mental illness.[1] Given these intertwined impacts, existing studies have used latent class analysis to capture the full dimensions and underlying patterns of negative COVID-19 impacts, as well as have found the associations between class memberships and mental health outcomes.[6,20] For example, Frounfelker et al. explored the

typologies of positive and negative aspects of experiencing social distancing and identified 5 classes; they further reported that individuals in Hardships class were more likely to report a significant impact of COVID-19 on mental health than those in Low Impact class.[21] Likewise, Luk et al. explored the multidimensional impact of COVID-related stressors and yielded 4 classes; compared to those in Minimal COVID-related Impact class, people in Serious Financial Stress class reported higher levels of perceived stress, anxiety, and depressive symptoms.[22] These studies suggest that individuals experiencing a more severe level of COVID-19 impacts are at higher risk for psychological distress than those who are less affected by the pandemic. As the pandemic persists, negative COVID-19 impacts may further increase the incidence of mental health conditions,[4] and their long-standing effects can vary across the adult life span.

Older Adults in Response to Multidimensional COVID-19 Impacts

In general, older adults exhibit greater psychological resilience than their younger counterparts in response to stressful situations.[10] However, the COVID-19 pandemic has provided a stressful disaster context with long-lasting impacts on nearly every aspect of personal life, which may compromise the age-related strengths and lead to prolonged psychological distress among older adults.[23,24] In response to the multidimensional COVID-19 impacts, Grasso et al. found that older adults who reported cumulated adverse COVID-19 experiences in work, home life, and emotional and physical health domains had higher rates of PTSD, anxiety, and depression than the older subpopulation who was less affected in multiple life domains.[6] To sum up, theoretical frameworks and existing studies suggest the diminished age-related advantages in coping with the complex and chronic COVID-19 impacts, but the differences between older people and their younger counterparts in experiencing multidimensional COVID-19 impacts and associated long-term mental health effects after cumulative disaster exposures remain unclear.

Study Hypotheses

Based on the above discussions, some hypotheses on age differences in mental health in the multi-disaster scenario of tornadoes and the COVID-19 pandemic were developed, with a focus on negative COVID-19 impacts. First, older adults will report a lower level of psychological distress than their younger counterparts after experiencing tornadoes and the COVID-19 pandemic, and they can maintain this advantage over time. Second, there are latent classes of multiple COVID-19 impacts that reflect varying degrees of negative experiences, and people who experience more severe COVID-19 impacts will report greater psychological distress. Third, in face of severe and complex COVID-19 impacts, the age-related strengths in mental health will diminish, and older adults may exhibit greater psychological distress than their younger counterparts in the long run.

Methods

Sample

A 2-wave panel study was conducted to examine participants' vulnerability and resilience to multiple disaster exposures (ie, tornadoes and the COVID-19 pandemic) in Texas, Tennessee, and

Alabama, USA. The first wave of data collection took place between October 2020 and August 2021 (T1). In Texas, address-based random sampling was adopted to choose around 25 000 addresses from selected zip codes affected by the Dallas tornado of October 2019. Since the Tennessee (Nashville–Cookeville) tornado of March 2020 and Alabama tornadoes of March 2021 occurred in relatively population-sparse areas, approximately 10 000 addresses were identified centering on each tornado track. The recruiting mails were sent to the selected addresses, with options to participate in the study via an online platform, mail-in-survey, and telephone interview. A total of 1297 participants completed the baseline survey. Participants who agreed to be contacted again for follow-up surveys were sent an email or mail between May and August 2022 (T2), resulting in 655 respondents who completed the baseline and follow-up surveys with an attrition rate of 49.50%. In the present study, 101 respondents with missing values in analytical variables were excluded, so the working sample for a 2-wave panel analysis consisted of 554 participants. Respondents to the Texas survey contributed to the major missingness (N = 100), as the planned missing was used at T1 to avoid overburdening respondents,[25] and thus 29.78% of the participants were not presented COVID-19-related questions. Since the planned missing data are missing completely at random, listwise deletion was used to handle missing values.

Measures

Age

Age was categorized into 4 groups based on the continuous age at T1: 0 = "65 and over (older age, reference)"; 1 = "18–34 (young age)"; 2 = "35–49 (early middle-age)"; and 3 = "50–64 (late middle-age)."

Psychological distress

Psychological distress was measured at T1 and T2 by the 6-question Kessler Psychological Distress Scale. Participants were asked to rate how often in the past 4 weeks they felt: (1) so sad nothing could cheer you up, (2) nervous, (3) restless or fidgety, (4) hopeless, (5) everything was an effort, and (6) worthless, with answers from 0 = "None of the time" to 4 = "All of the time." The sum of the 6 items ranged from 0 to 24, and a higher score indicated a higher level of psychological distress. Cronbach's alphas for the scale were 0.89 at T1 and 0.91 at T2.

Indicators of negative COVID-19 impacts

At T1, participants were asked about how much difficulty they had as a result of the COVID-19 pandemic in (1) disrupted working, (2) financial problems, (3) disrupted transportation, (4) Internet access and bandwidth problem, (5) loss of health insurance, (6) shortage of food, water, clothing, or other necessities, (7) problems getting medicines or medical attention for conditions related to COVID-19, (8) problems getting medicines or medical attention for conditions other than COVID-19, (9) crowded or unsanitary living conditions, (10) family arguments, (11) embarrassment or humiliation, (12) fear of crime, (13) inadequate information from the authorities, (14) feeling insecure, (15) feeling vulnerable, (16) feeling isolated, and (17) insufficient social support. The answers ranged from 0 = "none"; 1 = "a little"; 2 = "some"; 3 = "a lot"; to 4 = "extreme." Because of the skewness of item measures, the answers 1–4 were combined into "Have difficulty." Therefore, 17 dichotomous indicators of negative COVID-19 impacts were created (0 = "No difficulty"; 1 = "Have difficulty").

Covariates

Several critical demographic variables, tornado-related home damage, and survey location were controlled. Gender was a dichotomous variable (0 = "Male"; 1 = "Female"). Education was categorized into 3 groups: 0 = "Some college or below (reference)"; 1 = "Undergraduate degree"; and 2 = "Graduate or professional degree." Marital status was a binary variable (0 = "Unmarried"; 1 = "Married"). Ethnicity was measured by the question: "Are you of Hispanic, Latino, or Spanish origin?" (0 = "No"; 1 = "Yes"). Race was a dichotomous variable (0 = "Others"; 1 = "White"). Tornado damage to respondents' homes was a binary variable (0 = "No damage"; 1 = "Have damage"). Survey location included: 0 = "Texas (reference)"; 1 = "Tennessee"; and 2 = "Alabama.". All the covariates were measured at T1.

Analysis Strategy

First, latent class analysis (LCA) was used to explore the typologies of negative COVID-19 impacts. LCA is a person-centered data analytic approach to categorize latent population groups based on their answers to observed categorical indicators.[26] LCA was performed based on 1134 out of 1297 respondents at T1 for greater generalizability, who provided valid answers regarding all the 17 items of COVID-19 impacts. Mplus 8.3 was used to obtain (1) LCA model fit indices based on which optimal number of classes was identified, and (2) posterior probabilities of class membership that were used to assign the respondents into different classes. Second, univariate analyses were used to describe the characteristics of the working sample. Third, a regression-based approach for cross-sectional and longitudinal data was used to test the hypotheses. Since the outcome variables, psychological distress at T1 and T2, were not normally distributed, and the conditional variance exceeded the conditional mean (ie, overdispersion), negative binomial regression was chosen.[27] Cross-sectional analysis was first conducted with psychological distress at T1 as the outcome variable to examine the initial age differences. Then, 2 models were performed with psychological distress at T2 as the outcome variable while controlling for psychological distress at T1. This approach allows us to predict the residualized change between panel waves and produces stronger evidence for the long-term effects of variables at T1.[28] Model 1 included the key variables and control variables. The interaction between age and latent classes was added in Model 2. The univariate and regression analyses were performed using Stata 15.

Results

LCA Result

Fit indices for different LCA models were presented in Table 1. The 3-class model had the highest entropy score, indicating that it exhibited better class separation than other models. The Lo-Mendell-Rubin likelihood ratio test showed that a 3-class model had a better fit than a 2-class model, and 4 classes were not really needed. The 3-class model also demonstrated reasonable class proportions and great interpretability, as illustrated in Figure 1. Therefore, a 3-class model was chosen as the optimal class solution.

Among a sample of 1134 respondents at T1, class 1 "low overall impacts" consisted of 39.24% (N = 445) of the respondents. People in this group had generally lower probabilities of experiencing all the negative COVID-19 impacts than the other 2 classes (range 0.02–0.52, less than 0.30 in most items). Class 2 "moderate overall impacts with high emotional distress" comprised 47.71% (N = 541)

Table 1. Fit indices for potential latent class models (N = 1134)

Model	Log-likelihood	AIC	BIC	aBIC	Entropy	LMR P value	Class proportions
1-Class	−10977.48	21988.96	22074.53	22020.53			1.00
2-Class	−9741.40	19552.80	19728.97	19617.80	0.803	< 0.001	0.48/0.52
3-Class	**−9282.71**	**18671.42**	**18938.19**	**18769.85**	**0.858**	**< 0.001**	**0.13/0.48/0.39**
4-Class	−9129.54	18401.07	18758.45	18532.93	0.848	0.079	0.10/0.32/0.45/0.12

AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; aBIC, Adjusted Bayesian Information Criterion; LMR, Lo-Mendell-Rubin likelihood ratio test.
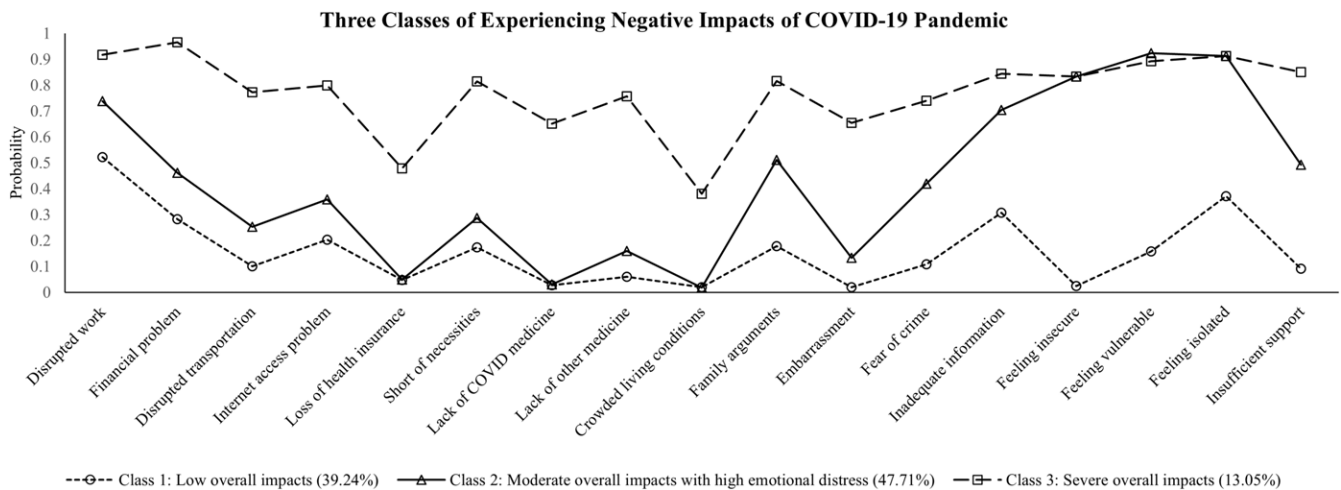
Figure 1. Three classes of experiencing negative impacts of the COVID-19 pandemic.

of the respondents. This group had moderate probabilities of experiencing most COVID-19 impacts and a high rate of feeling insecure (0.83), feeling vulnerable (0.92), and feeling isolated (0.91). Class 3 (N = 148, 13.05%) was characterized as "severe overall impacts," which represented the respondents with the highest probabilities of experiencing most COVID-19 impacts compared to the other 2 classes (range 0.38–0.97, more than 0.70 in most items).

Working Sample Characteristics

Table 2 summarized the characteristics of the working sample (N = 554). The average scores of psychological distress were 4.68 (SD = 4.59) at T1 and 4.46 (SD = 4.96) at T2. People ages 18–34 made up 34.66% of the sample, followed by those ages 35–49 (25.45%), 50–64 (21.12%), and 65 and over (18.77%). Class 1 "low overall impacts" consisted of 36.82% of the working sample, 50.18% of the working sample were in class 2 "moderate overall impacts with high emotional distress," and 13.00% of them were in class 3 "severe overall impacts."

Regression Analyses Results

The results of negative binomial regressions were presented in Table 3. The cross-sectional evidence showed that compared to those ages 65 and over, people ages 18–34 (B = 0.66, P < 0.001), ages 35–49 (B = 0.64, P < 0.001), and ages 50–64 (B = 0.48, P < 0.001) had greater psychological distress at T1. Relative to people in the "low overall impacts" class, those in the "moderate overall impacts with high emotional distress" class (B = 0.70, P < 0.001) and the "severe overall impacts" class (B = 0.98, P < 0.001) had a higher level of psychological distress at T1. The

panel analyses examined the predictors of T2 psychological distress with baseline psychological distress controlled. Model 1 showed that compared to those ages 65 and over, individuals ages 18–34 (B = 0.33, P < 0.05) and those ages 35–49 (B = 0.30, P < 0.05) had a higher level of psychological distress at T2 with covariates and T1 psychological distress controlled. The interaction between age and latent classes was added in Model 2 and reached statistical significance. As shown in Figure 2, older adults showed the greatest increases in T2 psychological distress than their younger counterparts when they were in the "moderate overall impacts with high emotional distress" class and the "severe overall impacts" class.

Discussion

As hypothesized, older adults had better mental health than their younger counterparts after experiencing tornadoes and the COVID-19 pandemic. This finding is in line with prior literature[11,16] and may be explained by the life course perspective and socioemotional selectivity theory. It is noteworthy that our finding extends previous research by focusing on multi-disaster scenarios during the COVID-19 pandemic. The overlap of the COVID-19 pandemic and other disasters provides a challenging context for post-disaster recovery, because emergency responses frequently conflict with COVID-19 restrictions, and the pandemic also strains health care and the economy.[2] Even under such circumstances, older adults' advantages over those ages 18–34 and 35–49 in mental health can be maintained over time, which provide strong evidence for resilience in older adults and suggest that post-disaster mental health services should focus more on people under age 50 who are more likely to experience delayed

Table 2. Characteristics of working sample (N = 554)

Variables	N	Percent (%)	Mean (SD)	Range
Psychological distress at T1	554		4.68 (4.59)	0–24
Psychological distress at T2	554		4.46 (4.96)	0–24
Age				
18–34	192	34.66		
35–49	141	25.45		
50–64	117	21.12		
65+	104	18.77		
Latent classes of negative COVID-19 impacts				
"Low overall impacts" class	204	36.82		
"Moderate overall impacts with high emotional distress" class	278	50.18		
"Severe overall impacts" class	72	13.00		
Gender				
Male	219	39.53		
Female	335	60.47		
Educational level				
Some college or below	124	22.38		
Undergraduate degree	225	40.61		
Graduate or professional degree	205	37.00		
Marital status				
Unmarried	256	46.21		
Married	298	53.79		
Hispanic				
No	510	92.06		
Yes	44	7.94		
Race				
White	459	82.85		
Others	95	17.15		
Tornado damage to home				
No damage	317	57.22		
Have damage	237	42.78		
Survey location				
Texas	226	40.79		
Tennessee	191	34.48		
Alabama	137	24.73		

recovery.[15] Although people ages 50–64 reported more psychological distress at T1, they were not significantly different from those ages 65 and over at T2, which may be because the coping strategies and resources of people in late middle-age allow them to gradually recover over an extended process.[12,17]

Consistent with prior studies,[20,22] 3 distinct latent classes of negative COVID-19 impacts and their associations with psychological distress were identified. A detailed discussion of the 3 latent classes can be found elsewhere.[29] This study suggested that respondents who experienced moderate or severe overall COVID-19 impacts had more pronounced psychological distress at T1 relative to those with low impacts, which may be due to abrupt disruptions and resource losses in multiple life domains.[21] It is noted that the latent classes did not predict psychological distress at T2, but a further examination revealed the age differences in experiencing the long-term mental health effects of multidimensional negative COVID-19 impacts, as discussed below.

Although older adults were generally more resilient than their younger counterparts after exposures to tornadoes and the COVID-19 pandemic, they reported the greatest increases in T2 psychological distress after experiencing moderate or severe overall COVID-19 impacts. This finding is in line with the SAVI model.[10] In response to the chronic COVID-19 impacts across multiple domains, age-related enhancement in emotion-focused coping strategies tends to be attenuated or even dissipated over time, and thus older adults exhibited worse mental health relative to their younger counterparts.[23,24] During the long process of recovery from tornadoes and the COVID-19 pandemic, younger and middle-aged adults may be less affected by pandemic-related stressors, and their overall higher levels of psychological distress relative to older adults might be attributed to the age-related vulnerability to ongoing non-pandemic stressors, such as interpersonal conflicts and daily stressors related to work and family.[3]

Limitations and Implications

First, the subsamples in Texas, Tennessee, and Alabama may experience different degrees of multiple disaster exposures, because (1) the tornado in Texas occurred in urban areas, and the outbreaks in Tennessee and Alabama occurred in population-sparse areas; (2) COVID-19 confirmed cases, death toll, and public health responses vary among these states; and (3) the tornado in

Table 3. Predicting psychological distress: negative binomial regressions (N = 554)

	Cross-sectional evidence (outcome: psychological distress at T1)		Panel evidence (outcome: psychological distress at T2)			
			Model 1		Model 2	
	B	SE	B	SE	B	SE
Psychological distress at T1	–	–	0.08***	0.01	0.08***	0.01
Age (*ref* = 65+)						
18–34	0.66***	0.13	0.33*	0.14	1.04***	0.24
35–49	0.64***	0.13	0.30*	0.15	0.93***	0.26
50–64	0.48***	0.13	0.25	0.15	0.85**	0.27
Latent classes (*ref* = class 1)						
Class 2	0.70***	0.10	0.19	0.11	0.88**	0.25
Class 3	0.98***	0.13	0.27	0.16	1.71***	0.46
Female (*ref* = male)	0.07	0.08	−0.00	0.10	0.01	0.10
Educational level (*ref* = some college or below)						
Undergraduate degree	−0.12	0.11	−0.04	0.12	−0.10	0.12
Graduate or professional degree	−0.29*	0.12	−0.11	0.13	−0.14	0.13
Married (*ref* = unmarried)	−0.17	0.09	−0.15	0.10	−0.19	0.10
Hispanic (*ref* = no)	−0.10	0.15	−0.07	0.17	−0.11	0.17
White (*ref* = others)	−0.06	0.11	−0.12	0.13	−0.11	0.13
Tornado damage to home (*ref* = no)	0.10	0.09	0.08	0.10	0.11	0.10
Survey location (*ref* = Texas)						
Tennessee	0.11	0.10	−0.10	0.11	−0.10	0.11
Alabama	−0.13	0.11	−0.18	0.13	−0.13	0.13
Age × latent classes (*ref* = 65+ × class 1)						
18–34 × class 2	–	–	–	–	−0.87**	0.30
18–34 × class 3	–	–	–	–	−1.78***	0.50
35–49 × class 2	–	–	–	–	−0.71*	0.31
35–49 × class 3	–	–	–	–	−1.86**	0.54
50–64 × class 2	–	–	–	–	−0.81*	0.33
50–64 × class 3	–	–	–	–	−1.16*	0.57

Class 1 "low overall impacts"; class 2 "moderate overall impacts with high emotional distress"; class 3 "severe overall impacts"; *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.
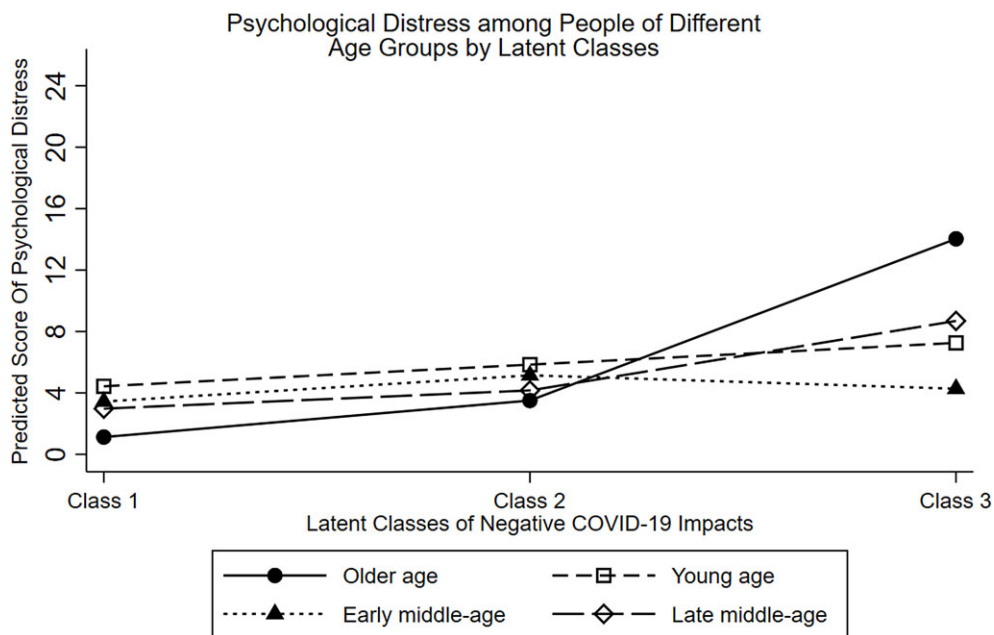

Figure 2. Psychological distress among people of different age groups by latent classes.

Texas occurred before the outbreak of COVID-19 while the tornadoes in Tennessee and Alabama occurred during the pandemic. Besides, the time intervals between the tornado outbreak and first data collection in Texas and Tennessee were approximately a year, but that for Alabama was 4 months, which may cause some nuanced differences in baseline measures. Accordingly, even if survey location, tornado damage, and baseline psychological distress were controlled in data analysis to reduce potential bias from those limitations, we should interpret the results with more caution. Second, some possible confounders, such as pre-existing mental health conditions, exposure to threat, and risk perception,[30,31] were not taken into account due to the lack of relevant variables in the data set. Third, this study merely declared the observation of psychological resilience in older adults after experiencing tornadoes and the COVID-19 pandemic without empirically explaining the mediating process of resilience, due to the lack of relevant variables. Based on existing literature and theoretical frameworks, more mediation analyses are needed to identify the real reasons for the age-related strengths in rebounding from and adapting to multiple disaster exposures, with important confounders controlled.

Regardless of the limitations, this study is the first to examine the age differences in psychological distress following cumulative exposures to the COVID-19 pandemic and other disasters and how such age differences are contextualized by multidimensional COVID-19 impacts. Our findings highlight the strengths of older adults in post-disaster recovery and have important implications for public health policymaking and practice. Instead of predominantly focusing on older adults' vulnerabilities and excluding them from disaster-response activities, current disaster-related policy and intervention efforts should recognize the age-related strengths in mental health and engage experienced and resilient older adults in community recovery work and capacity building for disaster risk reduction. For instance, resilient older adults can provide emotional support to others in the post-disaster recovery process, and this kind of voluntary work will allow older adults to feel greater competence and self-esteem as helpers in stressful disaster contexts.[32] It should be noted that, despite the resilience of older adults in mental health recovery, older adults are still at higher risks for COVID-19 and for long-term psychological distress if experiencing multidimensional COVID-19 impacts. Therefore, for those vulnerable older adults, disaster-related practitioners ought to assess their difficulties and special needs in multiple life domains and provide tailored social services and mental health programs on a long-term basis. The COVID-19 pandemic is not the last global public health disaster we shall confront, and there will be more complex disaster scenarios as global warming and climate change continue. It is important to develop new public policy and mental health intervention strategies tailored to multi-disaster scenarios,[33] with the multidimensional disaster impacts and age-related differences in long-term recovery taken into account.

References

1. **Pfefferbaum B, North CS.** Mental health and the Covid-19 pandemic. *N Engl J Med.* 2020;383(6):510-512. doi: 10.1056/NEJMp2008017

2. **Phillips CA, Caldas A, Cleetus R, et al.** Compound climate risks in the COVID-19 pandemic. *Nat Clim Chang.* 2020;10(7):586-588. doi: 10.1038/s41558-020-0804-2

3. **Klaiber P, Wen JH, DeLongis A, Sin NL.** The ups and downs of daily life during COVID-19: age differences in affect, stress, and positive events. *J Gerontol B.* 2021;76(2):e30-e37. doi: 10.1093/geronb/gbaa096

4. **Vahia IV, Jeste DV, Reynolds CF.** Older adults and the mental health effects of COVID-19. *JAMA.* 2020;324(22):2253-2254. doi: 10.1001/jama.2020.21753

5. **The Impact of Coronavirus on Households Across America**. Harvard T.H. Chan School of Public Health. Published September 2020. Accessed October 5, 2023. https://cdn1.sph.harvard.edu/wp-content/uploads/sites/21/2020/09/NPR-RWJF-Harvard-National-Report_092220_Final1-4.pdf

6. **Grasso DJ, Briggs-Gowan MJ, Carter AS, et al.** Profiling COVID-related experiences in the United States with the epidemic-pandemic impacts inventory: linkages to psychosocial functioning. *Brain Behav.* 2021;11(8):e02197. doi: 10.1002/brb3.2197

7. **Adams V, Kaufman SR, Van Hattum T, Moody S.** Aging disaster: mortality, vulnerability, and long-term recovery among Katrina survivors. *Med Anthropol.* 2011;30(3):247-270. doi: 10.1080/01459740.2011.560777

8. **Carstensen LL, Isaacowitz DM, Charles ST.** Taking time seriously: a theory of socioemotional selectivity. *Am Psychol.* 1999;54(3):165. doi: 10.1037/0003-066X.54.3.165

9. **Carstensen LL, Fung HH, Charles ST.** Socioemotional selectivity theory and the regulation of emotion in the second half of life. *Motiv Emot.* 2003;27(2):103-123. doi: 10.1023/A:1024569803230

10. **Charles ST.** Strength and vulnerability integration: a model of emotional well-being across adulthood. *Psychol Bull.* 2010;136(6):1068-1091. doi: 10.1037/a0021232

11. **Daly M, Sutin AR, Robinson E.** Longitudinal changes in mental health and the COVID-19 pandemic: evidence from the UK Household Longitudinal Study. *Psychol Med.* 2022;52(13):2549-2558. doi: 10.1017/S0033291720004432

12. **Pierce M, McManus S, Hope H, et al.** Mental health responses to the COVID-19 pandemic: a latent class trajectory analysis using longitudinal UK data. *Lancet Psychiatry.* 2021;8(7):610-619. doi: 10.1016/S2215-0366(21)00151-6

13. **Fernández RS, Crivelli L, Guimet NM, et al.** Psychological distress and mental health trajectories during the COVID-19 pandemic in Argentina: a longitudinal study. *Sci Rep.* 2022;12(1):1-10. doi: 10.1038/s41598-022-09663-2

14. **McPherson KE, McAloney-Kocaman K, McGlinchey E, et al.** Longitudinal analysis of the UK COVID-19 Psychological Wellbeing Study: trajectories of anxiety, depression and COVID-19-related stress symptomology. *Psychiatry Res.* 2021;304:114138. doi: 10.1016/j.psychres.2021.114138

15. **Fancourt D, Steptoe A, Bu F.** Trajectories of anxiety and depressive symptoms during enforced isolation due to COVID-19 in England: a longitudinal observational study. *Lancet Psychiatry.* 2021;8(2):141-149. doi: 10.1016/S2215-0366(20)30482-X

16. **Acierno R, Ruggiero KJ, Kilpatrick DG, et al.** Risk and protective factors for psychopathology among older versus younger adults after the 2004 Florida hurricanes. *Am J Geriatr Psychiatry.* 2006;14(12):1051-1059. doi: 10.1097/01.JGP.0000221327.97904.b0

17. **Cherry KE, Brown JS, Marks LD, et al.** Longitudinal assessment of cognitive and psychosocial functioning after Hurricanes Katrina and Rita: exploring disaster impact on middle-aged, older, and oldest-old adults. *J Appl Biobehav Res.* 2011;16(3-4):187-211. doi: 10.1111/j.1751-9861.2011.00073.x

18. **Moynihan R, Sanders S, Michaleff ZA, *et al.*** Impact of COVID-19 pandemic on utilisation of healthcare services: a systematic review. *BMJ Open.* 2021;11(3):e045343. doi: 10.1136/bmjopen-2020-045343

19. **Kessel VP, Baronavski C, Scheller A, Smith A.** In their own words, Americans describe the struggles and silver linings of the COVID-19 pandemic. Published March 5, 2021. Accessed October 5, 2023. https://www.pewresearch.org/2021/03/05/in-their-own-words-americans-describe-the-struggles-and-silver-linings-of-the-covid-19-pandemic/

20. **Goldstein E, Brown RL, Lennon RP, Zgierska AE.** Latent class analysis of health, social, and behavioral profiles associated with psychological distress among pregnant and postpartum women during the COVID-19 pandemic in the United States. *Birth.* 2023;50(2):407-417. doi: 10.1111/birt.12664

21. **Frounfelker RL, Li ZY, Santavicca T, *et al.*** Latent class analysis of COVID-19 experiences, social distancing, and mental health. *Am J Orthopsychiatry.* 2022;92(1):121. doi: 10.1037/ort0000593

22. **Luk JW, Stangl BL, Schwandt ML, *et al.*** A person-centered approach to capture health disparities and multidimensional impact of COVID-related stressors. *Am Psychol.* 2023;78(3):321-332. doi: 10.1037/amp0001044

23. **Scott SB, Sliwinski MJ, Blanchard-Fields F.** Age differences in emotional responses to daily stress: the role of timing, severity, and global perceived stress. *Psychol Aging.* 2013;28(4):1076. doi: 10.1037/a0034000

24. **Wrzus C, Müller V, Wagner GG, *et al.*** Affective and cardiovascular responding to unpleasant events from adolescence to old age: complexity of events matters. *Dev Psychol.* 2013;49(2):384. doi: 10.1037/a0028325

25. **Little TD, Rhemtulla M.** Planned missing data designs for developmental researchers. *Child Dev Perspect.* 2013;7(4):199-204. doi: 10.1111/cdep.12043

26. **McCutcheon AL.** *Latent class analysis.* Sage; 1987.

27. **Taylor HO, Taylor RJ, Nguyen AW, Chatters L.** Social isolation, depression, and psychological distress among older adults. *J Aging Health.* 2018;30(2):229-246. doi: 10.1177/0898264316673511

28. **Blair C, Raver CC, Berry DJ.** Two approaches to estimating the effect of parenting on the development of executive function in early childhood. *Dev Psychol.* 2014;50(2):554. doi: 10.1037/a0033647

29. **Chen Z, Cong Z**. Age differences in experiencing negative impacts of the COVID-19 pandemic: A latent class analysis. *Int J Disaster Risk Reduct.* 2023;96:103957. doi: 10.1016/j.ijdrr.2023.103957

30. **Brooks SK, Dunn R, Amlôt R, *et al.*** Social and occupational factors associated with psychological distress and disorder among disaster responders: a systematic review. *BMC Psychol.* 2016;4(1):1-13. doi: 10.1186/s40359-016-0120-9

31. **Rahman MA, Hoque N, Alif SM, *et al.*** Factors associated with psychological distress, fear and coping strategies during the COVID-19 pandemic in Australia. *Glob Health.* 2020;16:95. doi: 10.1186/s12992-020-00624-w

32. **Shrira A, Palgi Y, Hamama-Raz Y, *et al.*** Previous exposure to the World Trade Center terrorist attack and posttraumatic symptoms among older adults following Hurricane Sandy. *Psychiatr Interpers Biol Process.* 2014;77(4):374-385. doi: 10.1521/psyc.2014.77.4.374

33. **Leppold C, Gibbs L, Block K, *et al.*** Public health implications of multiple disaster exposures. *Lancet Public Health.* 2022;7(3):e274-e286. doi: 10.1016/S2468-2667(21)00255-3

34. **Chen Z.** Age Differences in Preparing For, Responding To, and Recovering from the COVID-19 Pandemic: The Strengths of Older Adults (Doctoral dissertation, The University of Texas at Arlington). 2022.