Financial train, health behaviors, and psychological well-being of family caregivers of older adults during the COVID-19 pandemic

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A B S T R A C T

Objectives: This study aims to examine the change in financial strain, health behaviors, and psychological well-being of family caregivers of older adults during the COVID-19 pandemic and explore the differences in mental health outcomes by gender, race, and relationship status.

Methods: Using the 2020 National Health and Aging Trends Study COVID-19 supplement, our sample included 2026 family caregivers of older adults. Structural equation modeling was conducted.

Results: Caregivers with financial strain showed worse mental health than those with no financial strain. Female or adult children caregivers reported significantly less time walking, more financial strain, and a higher level of negative mental health outcomes compared to male or spouse caregivers; non-White caregivers reported greater positive mental health outcomes compared to White caregivers during the pandemic.

Discussion: Health professionals should consider the financial and mental health impact of COVID-19 among family caregivers when designing and delivering caregiver support programs.

Innovation: This study provides nationally representative estimates of several important health behaviors and health outcomes for caregivers of older adults during and after the COVID-19 pandemic, helping to fill the knowledge gap about the characteristics of caregivers whose health and well-being were most affected by the pandemic.

1. Introduction

The COVID-19 pandemic has deeply affected the care that older adults receive worldwide and has caused a radical change in the model of care for older adults. Before this pandemic, engaging in social activities, performing cognitive and physical activities, and having a productive daily routine had been the mainstay therapy, especially for adults with dementia [1,2]. However, strict social isolation was recommended during COVID-19, especially for older people with the highest risk for severe COVID-19 disease and death [3,4], eliminating many community activities and restricting visitors to the home. Previous quarantines in human history had a negative psychological impact on outcomes such as anger, depression, and loneliness in the general population [5-7]. This overall lack of social connection for caregivers is concerning since social support has been identified as protective against the stress of the caregiving role [8,9]. However, the effects on caregiver well-being had not been well-studied for prior global crises.

Friend and family caregivers ("caregivers") refer to those individuals who provide unpaid or informal care. These caregivers undertake multifaceted roles, and common tasks include administering medication, providing emotional support, assisting with activities of daily living, managing finances, and advocating for the needs of the care recipients [10]. This pivotal role ensures that the care recipients receive appropriate medical attention and support, enhancing their overall quality of life [11]. Providing care to older adults poses a range of physical, psychological, and social stressors for friend and family caregivers, threatening the overall health of these caregivers [12,13]. This, in turn, may compromise their ability to continue in their caregiver role [14]. Additionally, caregiving is associated with negative financial impacts, including the direct costs of providing care (e.g., care supplies, medications) [13,15], the financial consequences of care decisions around caregiving (e.g., legal fees for guardianship or power of attorney) [11], and constraints on choices arising from the financial status (e.g., limited employment options) [16-18]. Depending on the nature of the

health conditions and needs of the care recipients, families may face increased household utility costs, home modification expenses, medical costs, and transportation costs. Cost estimates often omit or underestimate the substantial hidden unpaid costs associated with caregiving, including loss of earnings by family members as they reduce or cease employment to provide care for their older relatives [8].

Caregivers providing unpaid care were vulnerable to changes in health behaviors due to modifications in caregiving during the COVID-19 pandemic [19,20]. Using data from a sample of 835 participants, Greaney and colleagues [19] found that caregivers experienced changes in moderate-intensity physical activity, vigorous physical activity, sedentary behavior, and screen time during the pandemic. The majority reported increased sedentary behavior as well as increased screen time. Caregivers living with their care recipient were more likely to report increased weekday screen time and sedentary behavior than respondents not living with the care recipient [20]. Factors associated with these reported changes in behavior need to be explored in future research [19,20].

1.1. Impact of COVID-19 on psychological well-being among caregivers

Caregivers are at high risk for adverse health outcomes related to the COVID-19 pandemic [21,22]. Pre-pandemic research has shown that multicomponent strategies such as avoiding isolation, attending family and group support meetings, and sharing the burden of care with other family members were useful for releasing caregiving stress [2]. COVID-19-related epidemiological control measures, such as lockdowns and social distancing, increased social isolation and decreased access to healthcare among family caregivers and care recipients [22-24]. Using data from the Survey of Health, Aging and Retirement in Europe (SHARE), Bergmann and Wagner [23] analyzed the effects of COVID-19 on the physical and mental health and the unmet care needs of both caregivers and care recipients across Europe and Israel. They found that adult children caregivers who increased the frequency of providing personal care reported significantly more mental health strains, that is, feeling sad/depressed and anxious/nervous more often since the pandemic outbreak. Concerning receiving care, about one out of five care recipients had difficulty obtaining adequate care from outside the household during the pandemic. With the low numbers of caregivers and care recipients, this study lacked a comprehensive understanding of the underlying causes of why mental health declined for caregivers as well as for those who intensified their caregiving activities during the first phase of the pandemic [23]. The current study explored the interplay between financial strain, health behavior factors, and mental health outcomes among family caregivers.

1.2. Mental health outcome differences across various caregivers groups

Previous research also indicates differences in psychological well-being by caregiver gender, race, and relationship status (spouse vs. adult children) [10,24]. The majority of caregivers for older adults are women. Gender disparities play a significant role in caregiving responsibilities. Historically, caregiving has been seen as a predominantly female role, perpetuating traditional gender roles and expectations [25]. Women are often expected to take on caregiving responsibilities, both within their families and the broader societal context. Consequently, women are more likely to face financial setbacks due to reduced work hours or leaving the workforce to prioritize caregiving. Women experience greater negative consequences of caregiving [26]. Compared with male caregivers, female caregivers face higher levels of caregiving stress, have fewer social resources, and report lower levels of psychological and physical health [27]. The COVID-19 pandemic has further highlighted gender-related issues in caregiving. With the closure of public facilities, many working women found themselves shouldering the bulk of caregiving responsibilities at home, leading to a significant decline in female workforce participation [18]. Additionally, women in the healthcare

sector faced higher exposure to the virus due to their caregiving roles, putting them at greater risk of infection [22].

Using Round 5 of the National Health and Aging Trends Study and the National Study of Caregiving ($N = 1436$), Moon and colleagues found that non-Hispanic black and Hispanic caregivers of foreign-born care recipients were more likely to report better psychological well-being and self-rated health compared to their counterparts [10]. Compared to spouse caregivers, adult children caregivers can be of any gender and age, ranging from young adults to middle-aged adults, and they often do not live with the care recipient, potentially facing the challenge of providing care from a distance [28]. They may still be actively employed and must balance work and caregiving responsibilities [29]. Adult children caregivers may have their own families and financial obligations, making caregiving a more complex task [28]. Despite the differences between spouse caregivers and children caregivers, a rapid review of the impact of COVID-19 on caregivers' health during COVID-19 found that most studies did not indicate the relationship between caregivers and care recipients [2]. Knowledge about the characteristics of caregivers whose health and well-being were most affected by the pandemic will help healthcare personnel, health promotion programmers, and policymakers design programs and policies targeting caregivers most in need of education and assistance.

1.3. Theoretical framework

The current study is grounded in Pearlin's stress process model [30], which many researchers use to examine how providing care influences caregivers' physical, emotional, and social health [31-33]. Pearlin's stress process model adapted for this study is shown in Fig. 1. Pearlin's model includes four domains: the background and context of stress, the stressors, the mediators of stress, and the outcomes of stress [30]. Primary stressors consist of objective indicators of stress (e.g., dependencies in activities of daily living) and subjective indicators of stress (e.g., caregivers' perception of role overload). Secondary stressors include role strains (e.g., family or job conflicts, economic problems, and constriction of social life) and intra-psychic strains (e.g., a sense of self and role captivity). Secondary stressors are no less important than primary stressors but are not related directly to the care recipient's illness [30]. For example, role strains are often experienced in association with the caregiver role, such as family or job conflicts, economic problems, and constriction of social life. Adult children caregivers may experience two types of role conflicts. One conflict may be between the caregiver role and family roles, such as being a spouse and a parent; the other conflict may be between the caregiver and employee roles.

1.4. Current study

As shown in Fig. 1, the current study is grounded in Pearlin's stress process model [30]. The main goal of this analysis was to examine 1) changes in financial strain, health behaviors, and psychological well-being of caregivers for older adults during the COVID-19 pandemic, 2) differences in caregiver outcomes by caregiver gender, race, and relationship status (spouse versus adult children) and 3) the association of financial strain, health behaviors, and psychological wellbeing of the caregivers during the pandemic.

2. Methods

2.1. Data source and study sample

We used data from the National Health and Aging Trends Study (NHATS) COVID-19 supplement for Family Members and Friends (FF). NHATS is conducted by a research institute and sponsored by the National Institute on Aging (U01AG032947). The study contains a nationally representative sample of Medicare beneficiaries aged 65 and older in the United States. The participants give annual in-person
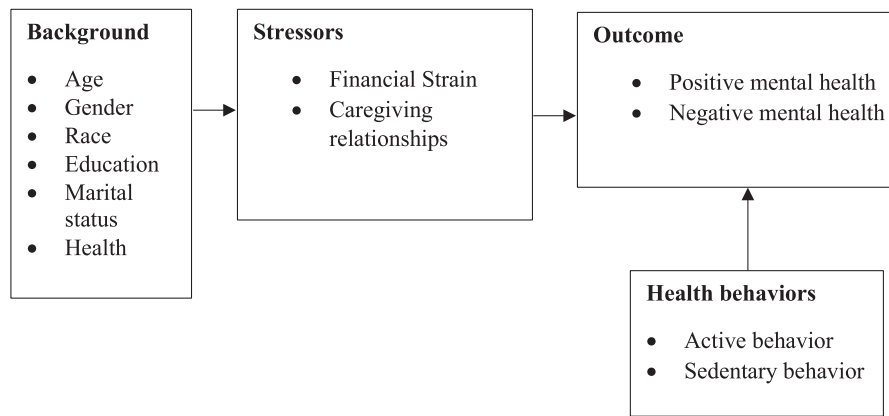
Fig. 1. Conceptual framework and study variables (adapted from Pearlin et al., 1990).

interviews to collect information on disablement and its consequences [34]. The NHATS COVID-19 FF data was collected in 2020 by a mailed survey. This file includes data from 2062 family members or friends associated with the 3257 Sample Persons (SP) in the final NHATS COVID-19 SP file [35]. We characterized the FF sample by demographic variables (age, gender, race, marital status, and education), self-reported health, and caregiver relationship.

2.2. Variables and measurements

The outcome of interests included the level of positive mental outcome (measured by cheerful, peaceful and full of life) and the level of negative mental outcome (measured by bored, lonely, upset, lack of interest, down, nervous and worry). The independent variables were financial strain and health behavior variables, including walking, vigorous activity, eating, sleeping, and watching TV. Health behavior variables were further grouped into active behaviors (walking and vigorous activity) or sedentary behaviors (eating, sleeping, and watching TV). The covariates included age, gender, race, education, marital status, and self-reported health.

2.2.1. Dependent variables

Negative mental health outcome. The mental health outcome variables were derived from the Patient Health Questionnaire (PHQ-9) that has been previously validated by NHATS research team [35]. Participants were asked, "During the COVID-19 outbreak, in a typical month, how often have you felt: 1) bored, 2) lonely, 3) upset, 4) little interest or pleasure in doing things, 5) down, depressed or hopeless, 6) nervous, anxious or hopeless, 7) been unable to stop or control worrying, each on a scale from 1 never to 5 every day?" The variable negative mental health outcome is calculated as the mean of all these variables, ranging from 0 to 5. The negative mental health subscale is reliable with Cronbach α = 0.86 (95% CI: 0.85, 0.87) [36].

Positive mental health outcome. Participants were asked, "During the COVID-19 outbreak, in a typical month, how often have you felt 1) Cheerful, 2) Peaceful, 3) Full of life, each on a scale from 1 never to 5 every day?" The variable positive mental health outcome is calculated as the mean of all these variables, ranging from 0 to 5. The positive mental health subscale is reliable with Cronbach α = 0.88 (95% CI: 0.87, 0.89).

2.2.2. Independent variable

Financial strain. Participants were asked, "Has your household had any financial difficulties because of the COVID-19 outbreak?" [35]. No was coded 0; yes was coded 1.

Health behavior variables. Participants were asked, "During the COVID-19 outbreak, in a typical week, have you spent more or less time than you did before the outbreak: walking for exercise, doing vigorous activities, eating including snacking, watching TV or online programs or

movies, and sleeping?" [35] The same (didn't do before and during) was coded as 0, more was coded as 1, and less was coded as 2.

2.2.3. Covariates

Covariates included age (coded in years, ranging from 18 to 82), gender (men coded as 1 and women coded as 2), marital status (married coded as 1, separated, divorced, widowed, and never married all coded as 0), education (range from 1 no school completed to 8 master's professional or doctor's degree), race (White was coded as 1 and non-white was coded as 2), and self-rated physical health (level of physical health on a 5-point scale ranging from 1 poor to 5 excellent).

2.3. Analysis

Descriptive information comparing adult children caregivers and spouse caregivers was computed for all study variables and is shown in Table 2. We described all study variables using means and frequency. Descriptive information about the comparison of genders (Male vs. Female) and races (White vs. non-White) was computed for financial and behavioral variables. Because all the variables are categorical, we described all the variables using frequencies and proportions. We also conducted univariate comparisons across groups using *t*-tests and chi-square tests.

Structural equation modeling was built on the complete data in R using the 'lavaan' package predicting psychological wellbeing and behavioral changes. We built confirmatory factor analysis models on both endogenous (or explanatory) and exogenous (or response) variables. First, we conducted exploratory factor analyses for ordinal data on the endogenous variable side to obtain the latent factors that explain the common features in behavioral change variables. Two latentgfactor analysis showed two common latent factors related to mental health, which represented positive mental health (cheerful, peaceful, and full of life) and negative mental symptoms (bored, lonely, upset, loss of interest, down, nervous, and worry). Thus, we constructed a two-factor confirmatory factor analysis measurement model for ordinal data to measure the participants' mental health levels. For these models, we used both standardized variables (mean = 0, SD = 1) and the actual values of the variables. We considered factor loadings >0.4 in the standardized indicator models clinically meaningful. All indicators had positive loadings on latent factors, meaning that a higher value of a latent factor led to higher intensities of relevant behaviors or mental health levels.

Next, we built a structural model to establish the relationship between financial strain, behavioral changes, and mental health levels. The measurements of behavioral changes and mental health levels were obtained from the confirmatory factor analysis models described above. We measured behavioral changes by two latent factors: active behavior and sedentary behavior. Mental health levels were measured by two

latent factors: positive mental health and negative mental health. We included demographic variables, including gender, age, race, education, marital status, and self-reported health in the structural model as covariates. We obtained the parameter estimation using the weighted least square mean and variance adjusted estimator by the default setting in the 'lavaan' package for ordinal data. Chi-square test, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker Lewis Index (TLI), and Standardized Root Mean Square Residual (SRMR) were used to assess model fit with the following values: RMSEA <0.08, CFI >0.90, TLI ≥ 0.95, and SRMR <0.08 [36].

3. Results

3.1. Findings of the bivariate analysis

The descriptive statistics and comparisons by gender, race and caregiving relationship are displayed in Table 1. Compared to spouse caregivers, adult children caregivers were more likely to be younger, non-White, not married, and in better physical health. Additionally, compared to spouse caregivers, adult children caregivers reported 1) significantly less walking and engaging in vigorous activity during the pandemic than before the pandemic; 2) significantly more eating, sleeping, and alcohol consumption during the pandemic than before the pandemic; and 3) a significantly higher level of negative health outcome and worse financial strain during the pandemic than before the pandemic.

Compared to White caregivers, non-White caregivers were more likely to be younger, female, not married, and report worse physical health. Non-White caregivers were more likely to experience financial difficulties during the pandemic than before. Additionally, compared to White caregivers, non-White caregivers reported: 1) less walking and

engaging in vigorous activity during the pandemic than before the pandemic, 2) significantly changed eating, sleeping patterns, and time spent watching TV (more or less) during the pandemic than before the pandemic. Compared to male caregivers, female caregivers were more likely to be younger, non-White and not married. In addition, female caregivers were more likely to report changed walking or vigorous activity patterns, changed sleeping patterns (more or less), and reported eating more and spending more time watching TV during the pandemic than before.

3.2. Results from the structural equation model

The structural equation model revealed adequate model fit predicting positive and negative mental health outcomes (Chi-square = 1347.512, degree of freedom = 105, $p < 0.001$; CFI = 0.982; TLI = 0.990; RMSEA = 0.063; SRMR = 0.053).

The final model (shown in Table 2) indicated that financial strain, active and sedentary behaviors were strongly associated with both positive and negative mental health levels. Caregivers who experienced financial difficulties had more severe negative mental health symptoms (B = 0.508, $p < 0.001$) and lower positive mental health levels (B = −0.388, $p < 0.001$)) than those who experienced no financial difficulties. Active behavior had a strong negative association with negative mental health levels (B = −0.150, $p < 0.001$) and a strong positive association with positive mental health levels (B = 0.142, $p < 0.001$). In contrast, sedentary behavior had a strong positive association with negative mental health levels (B = 0.333, $p < 0.001$) and a strong negative association with positive mental health levels (B = −0.204, $p < 0.001$). During the pandemic, caregivers who engaged in more active behavior (walking, vigorous activity) had fewer negative mental health symptoms and higher positive mental health features than those who

Table 1
Bivariate comparisons across gender, race and relationship of family caregivers, $N = 2056$, NHATS, 2020.

	Gender			Race			Relationship		
	Male ($n = 616$) Mean(SD)/ N (%)	Female ($n = 1440$) Mean(SD)/ N (%)	p	White ($n = 1613$) Mean(SD)/ N (%)	Non-White ($n = 443$) Mean(SD)/ N (%)	p	Adult Children ($n = 1057$) Mean(SD)/ N (%)	Spouse ($n = 649$) Mean(SD)/ N (%)	p
Age	65.15 (14.58)	63.46 (13.06)	0.013	64.94 (13.48)	60.37 (13.23)	<0.001	57.3 (8.82)	75.96 (7.24)	<0.001
Gender (Female)	–	–	–	1110 (68.82)	330 (74.49)	0.024	736 (69.63)	427 (65.79)	0.110
Race (White)	503 (81.66)	1110 (77.08)	0.024	–	–	–	797 (75.40)	564 (96.90)	<0.001
Marital Status (Married)	465 (75.85)	1001 (69.80)	0.006	1243 (77.36)	223 (50.68)	<0.001	677 (64.23)	639 (98.61)	<0.001
Education	5.57 (1.92)	5.65 (1.86)	0.439	5.74 (1.86)	5.21 (1.87)	<0.001	5.75 (1.81)	5.57(1.95)	0.048
Self-reported health	3.69 (0.94)	3.97 (0.92)	0.914	3.76 (0.91)	3.45 (0.93)	<0.001	3.81 (0.90)	3.57 (0.92)	<0.001
Relationship (Spouse)	222 (40.88)	427 (36.71)	0.110	564 (41.44)	85 (24.64)	<0.001	–	–	–
Financial strain									
Yes	92 (16.14)	210 (15.73)	0.876	188 (12.40)	114 (29.31)	<0.001	196 (19.56)	43 (7.26)	<0.001
No	478 (83.86)	1125 (84.27)		1328 (87.60)	275 (70.69)		806 (80.44)	549 (92.74)	
Walking									0.004
More	97 (18.73)	284 (23.55)	<0.001	318 (23.38)	63 (17.31)	<0.001	225 (24.62)	89 (17.15)	
Same	280 (54.05)	535 (44.36)		688 (50.59)	127 (34.89)		421 (46.06)	265 (51.06)	
Less	141(27.22)	387 (32.09)		354 (26.03)	174 (47.80)		268 (29.32)	165 (31.79)	
Vigorous activity									
More	59 (11.35)	113 (10.85)	0.003	133 (10.82)	39 (11.75)	<0.001	111 (13.04)	28 (0.06)	<0.001
Same	299 (57.50)	514 (49.38)		697 (56.71)	116 (34.94)		443 (52.06)	253 (55.36)	
Less	162 (31.15)	414 (39.85)		399 (32.47)	177 (53.31)		297 (34.90)	176 (38.51)	
Eat									<0.001
More	126 (21.47)	439 (31.63%)	<0.001	424 (27.25)	141 (33.13)	<0.001	328 (13.04)	132 (6.13)	
Same	403 (68.65)	833 (60.01)		1013 (65.10)	223 (53.22)		609 (52.06)	429 (55.36)	
Less	58 (9.88)	116 (8.36)		119 (7.65)	55 (13.13)		91 (34.90)	54 (38.51)	
TV									0.144
More	255 (43.59)	673 (49.52)	0.045	713 (46.54)	215 (52.18)	<0.001	489 (48.27)	272 (44.96)	
Same	300 (51.28)	632 (46.50)		763 (49.80)	169 (41.02)		480 (47.38)	314 (51.90)	
Less	30 (5.13)	54 (3.97)		56 (3.66)	28 (6.80)		44 (4.34)	19 (3.14)	
Sleep									
More	73 (12.29)	226 (16.20)	0.012	212 (13.56)	87 (20.42)	<0.001	155 (15.00)	82 (13.23)	<0.001
Same	481 (80.98)	1044 (74.84)		1261 (80.68)	264 (61.97)		774 (74.93)	512 (82.58)	
Less	40 (6.73)	125 (8.96)		90 (5.76)	75 (17.61)		104 (10.07)	26 (4.19)	

Table 2

Standardized and unstandardized coefficients for mental health outcomes from the structural equation model, $N = 2056$.

Model	Negative Mental Health			Positive Mental Health		
	B	*b*	*p*	*B*	*b*	*p*
Financial Strain	0.508	0.444	<0.001	−0.388	−0.140	<0.001
Relationship	−0.068	−0.059	0.474	−0.006	−0.003	0.948
Active Behavior	−0.150	−0.131	<0.001	0.142	0.130	<0.001
Sedentary Behavior	0.333	0.292	<0.001	−0.204	−0.186	<0.001
Age	−0.018	−0.192	<0.001	0.013	0.147	<0.001
Gender (Female)	0.262	0.107	<0.001	−0.147	−0.063	0.014
Education	0.008	0.013	0.626	−0.030	−0.052	0.059
Race (Non-White)	−0.216	−0.075	0.004	0.262	0.095	<0.001
Marital Status (Married or Living Together)	0.115	0.042	0.125	−0.009	−0.003	0.907
Self-reported Health	−0.262	−0.242	<0.001	0.298	0.287	<0.001

Notes. B=Unstandardized coefficients, b = standardized coefficients.
Model fit: Chi-square = 1347.512, degree of freedom = 105, $p < 0.001$; CFI = 0.982; TLI = 0.990; RMSEA = 0.063; SRMR = 0.053.

engaged in less active behaviors. In contrast, caregivers who engaged in more sedentary behavior (eating, watching TV, and sleeping) during the pandemic experienced more negative mental health symptoms and lower positive mental health features than those who engaged less in sedentary behaviors. Older female caregivers experienced higher negative mental health levels ($B = 0.262$, $p < 0.001$) and lower positive mental health levels ($B = −0.147$, $p < 0.001$) during the pandemic than their male counterparts. Compared to White caregivers, non-White caregivers experienced lower negative mental health levels ($B = −0.216$, $p < 0.001$) and higher positive mental health levels ($B = 0.262$, $p < 0.001$) during the pandemic than before. Negative mental health levels were negatively associated with age ($B = −0.018$, $p < 0.001$) and self-reported health ($B = −0.262$, $p < 0.001$). Positive mental health levels were positively associated with age ($B = 0.013$, $p < 0.001$) and self-reported health ($B = 0.298$, $p < 0.001$). Fig. 2 presents the measurement model pathways from each latent factor (negative mental outcome, positive mental outcome, active behavior, and sedentary behavior) to the variables and the structure model pathways that predict mental health outcomes from sedentary and active behaviors. The unstandardized coefficient values are on the arrows and are the same as those in Table 2. It is worth mentioning that, there is a statistically significant positive association between active behavior and sedentary behavior (covariance = 0.128, $p < 0.001$), which indicates that caregivers who conduct more walking and physical activities also tend to conduct more in sedentary behaviors, like eating and/or sleeping.

4. Discussion and conclusion

4.1. Discussion

Our findings indicate that financial strain is associated with worse mental health outcomes among caregivers. Furthermore, caregivers who were female or adult children were worse off than their counterparts regarding financial strain, walking behavior, and mental health outcomes, while non-White caregivers reported greater positive mental health outcomes compared to their counterparts during the pandemic.

Our finding that financial strain is associated with worse mental health outcomes for caregivers is not surprising given the positive correlation found between financial strain and mental health for adults, in general [37,38]. In the context of Pearlin's stress process model [30], both finances and caregiving present stressors that can potentially intervene along the stress process. In this way, there can be a cumulative

nature to the stress process, highlighting even a greater need for intervention to help caregivers' wellbeing.

In our study, caregiving was associated with poorer outcomes (less walking, more financial strain, and worse mental health) for female caregivers than male caregivers. This is consistent with previous findings showing that females have greater intensity in their caregiving burdens than men (e.g., spend more hours caregiving, assisting with more personal care) [39-41]. Rrecent global systematic review found a negative association between unpaid labor and mental health among employed women [42]. Matud (2004) showed that women tend to use more emotional and avoidance strategies than men, which may contribute to worse mental health [43]. Additionally, the mediating role of health-promoting behaviors such as exercise may be more pronounced for female caregivers than for male caregivers [44]. Finding time to engage in health-promoting behaviors when providing intense caregiving is often difficult [45,46].

Adult children caregivers had more negative outcomes than spouse caregivers. This is not surprising given spouse caregivers more often face the challenge of caregiving from a distance [28], are employed [29], and have other financial and caregiving responsibilities related to the families they have created (e.g., spouse, children) [28]. Pearlin's stress process model shows that stressors like these (e.g., caregiving, balancing other family responsibilities) can have a cumulative effect on mental health [30]. Our data was from the United States and another study showing similar poorer mental health outcomes for younger caregivers was from the United Kingdom [47]. In these western cultures, the societal norms do not support caring for aging parents as much as in other eastern cultures where there is the concept of "filial piety," which describes adult childrens' loving attitude and obligation toward their parents [48,49]. Such findings may differ in countries with a stronger culture of caring for one's parents and other older adults. For example, a previous study using data from China found that adult children who cared for their parents showed fewer depressive symptoms than non-caregiving adult children [50].

An unexpected finding in this research was that non-White caregivers experienced lower negative mental health and higher positive mental health levels compared to White caregivers during the pandemic than before. Research about mental health during the pandemic for adults in the U.S. suggests that mental health worsened more for individuals from racial minority groups [47,48]. One explanation for our finding that should be explored in future research may be related to coping strategies from lived experiences in non-White caregiver groups [48] and reliance on religion or prayer [50]. Our work shed light on the experiences of underrepresented demographic groups, particularly in caregiving research. Our study's innovation lies in its exploration of the intersections between demographic factors and caregiver outcomes, with a particular emphasis on non-White caregivers. By delving into these connections, we contribute to a more inclusive understanding of caregiving dynamics. Additionally, there may be positive aspects of caregiving regarding mental health. For example, recent research showed that caregivers in China had fewer depressive symptoms and greater life satisfaction than non-caregivers [31]. Future research should explore the potential mental health benefits of caregiving in the U.S. and the experiences of non-White caregivers, which can advance equity and inclusivity within the caregiving discourse while informing more targeted interventions to support these underserved populations. This may involve longitudinal studies to track caregivers' evolving needs and outcomes, qualitative inquiries to delve deeper into the cultural nuances shaping caregiving practices, and collaborative efforts with community organizations to implement culturally sensitive support interventions.

Employers, health systems, and public health systems can assist with such financial strain among caregivers by implementing evidence-based financial preparedness programs for their constituents [51,52]. Additionally, given the close association we found between financial strain and negative mental outcome, more resources aimed at improving mental health could help caregivers cope with their role as caregivers.
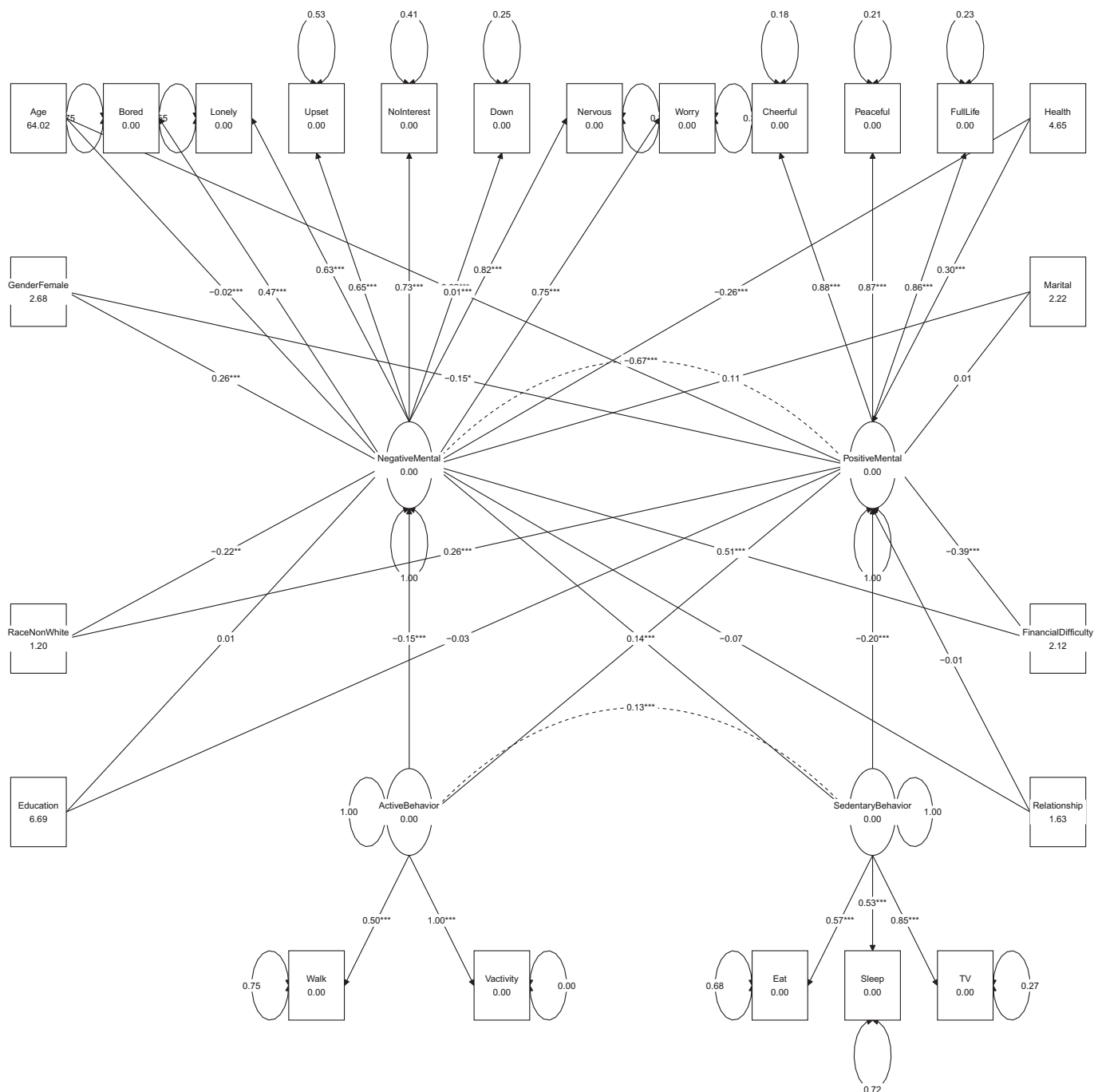
Fig. 2. Results of the final structural eqation model

Addressing social isolation is also important since many caregivers report feeling socially isolated from famil members and friends [53]. During the pandemic, many employers recognized the need for greater mental health resources for their employees and increased mental health insurance benefits, provided training for managers to notice signs of distress, and allowed mental health days [54]. Continuation of such policies after the pandemic could especially benefit employees caring for older adults. While public policies and programs that support caregivers exist, such as the National Family Caregiver Support Program (U.S. Department of Health and Human Services, 2023) and the Caregiver Advise, Record, Enable (CARE) Act (passed in over 40 U.S. states [55-57], more legislative initiatives focused on supporting adult children caregivers, specifically through financial assistance and mental health counseling, may decrease the burden for this type of caregiver often considered part of the sandwich generation—those caring for their children and their older parent(s) simultaneously [25].

Educational programs aimed at preparing caregivers for their role can also help them feel supported and learn skills to help their care recipients more effectively, thus easing some of the strain for both the caregiver and care recipient [58,59]. Furthermore, interventions focused specifically on improving caregiver mental health have been shown to be effective in minimizing depressive symptoms and anxiety in caregivers [60,61]. When program planners design such caregiver educational and health interventions, they should consider their target population of caregivers. For example, as our study shows, adult children caregivers are more vulnerable to financial stress than spouse caregivers [62-65]. For this population, programs can tailor their content and delivery to effectively assist adult children caregivers in coping

with their caregiving-related challenges.

This study is subject to a few limitations. First, the cross-sectional nature of the analysis did not allow for establishing causal relationships between financial strain, health behaviors, and mental health outcomes among caregivers. Second, the study design did not allow for testing mediating pathways, but health behaviors may mediate between financial strain and mental health outcomes. If this is the case, we estimated only part of the associations between financial strain and mental health unrelated to behavioral factors. Future studies using longitudinal analysis can further explore the interplay of these associations and the mediation effect of health behaviors. In addition, NHATS only surveyed Medicare beneficiaries aged 65 and older, which limited the understanding of caregivers of individuals not covered by Medicare. Groups aged 65 and older not covered by Medicare include those covered by other coverage such as military coverage (8.9%) or private insurance (40.9%, although this is lower because some of this group also has Medicare) or are uninsured (1%) [66]. Lastly, we did not use additional measures of caregiving status besides the caregiving relationship. Evaluating other caregiving characteristics (e.g., caregivers of care recipients with certain diseases) was beyond the scope of the current manuscript but could be the focus of future research.

4.2. Innovation

The project innovates in its use of the NHATS national datasets to investigate the complex interplay between financial factors, behavioral factors, and mental health outcomes among the family caregivers. Our study provides nationally representative estimates of several important health behaviors and health outcomes for caregivers of older adults during and after the COVID-19 pandemic, helping to fill the knowledge gap about the characteristics of caregivers whose health and well-being were most affected by the pandemic.

4.3. Conclusion

With the burden on caregivers growing each year, understanding the needs of diverse groups of caregivers, especially adult children, non-White and female caregivers, may be one way healthcare providers and public health officials can improve the health of and strain on caregivers and support them in this critical role [66,67]. We found that adult children, non-White and female caregivers were financially worse off and engaged more in sedentary behavior than spouse, White and male caregivers; financial strain was positively correlated with a high level of negative mental health only among White caregivers during the pandemic; and non-White caregivers experienced lower negative mental health levels and higher positive mental health levels during the pandemic than before. The prevalence of negative mental health outcomes and its association with financial strain for adult children caregivers during and after the pandemic suggest the need for greater financial support and education. This study indicated there are areas of improvement necessary for helping caregivers. With the COVID-19 pandemic highlighting society's reliance on caregivers, future research and policies should continue improving on the policies and practices implemented to support caregivers and include a concerted effort on the part of the healthcare system, community groups, and government.

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CRediT authorship contribution statement

Yujun Liu: Writing – review & editing, Writing – original draft, Supervision, Project administration, Data curation, Conceptualization. **M. Courtney Hughes:** Writing – review & editing, Writing – original draft, Conceptualization. **Heng Wang:** Writing – review & editing,

Writing – original draft, Methodology, Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pecinn.2024.100290.

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