



Research paper

## Financial hardship and suicide ideation: Age and gender difference in a Korean panel study

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### ABSTRACT

**Backgrounds:** Socioeconomic factors influence suicide risk but a systematic understanding of the role of financial hardship is unclear. We examined whether financial hardship had cumulative or contemporaneous impacts on suicide ideation and any gender and age differences in a large Korean sample.

**Methods:** Data of 67,728 observations from 14,321 individuals were extracted from seven waves of Korean Welfare Panel Study. The association of financial hardship at baseline and its change over two years with suicide ideation was investigated using generalized estimation equation to account for repeated measurements within an individual, adjusting for other socioeconomic factors.

**Results:** Financial hardship was associated with suicide ideation but the magnitude of association varied across age and gender groups. Specifically, the impact of financial hardship was persistent over two years presenting a cumulative effect among men aged 50–64 years and  $\geq 65$  years; e.g., adjusted OR (adjusted odds ratio) = 3.87, 95 % CI = 2.71–5.54 for emergent hardship group vs adjusted OR = 4.22, 95 % CI = 3.00–5.93 for persistent group in those aged  $\geq 65$  years. Financial hardship increased the risk of suicide ideation incrementally with age, although the pattern was less clear among women.

**Limitations:** Financial hardship was identified as having changing nature, though it was assumed to occur over two years.

**Conclusion:** In general, financial hardship plays a role in amplifying suicide ideation in a contemporaneous way but also in a cumulative way, predominantly among late-middle-aged and elderly men. Monitoring and intervention for financial hardship would be a promising strategy for suicide prevention.

### 1. Introduction

Suicide is an important public health issue globally and in South Korea (hereafter, Korea). The suicide rate has increased rapidly in Korea after economic crisis in the late 1990s and has been ranked as the highest among the Organization for Economic Co-operation and Development (OECD) countries since 2003. In particular, the age-adjusted rate of suicide in Korea was 22.6 per 100,000 people in 2019, which was more than two times higher than the OECD average of 11.2 in 2017. In response, significant efforts in suicide prevention have been made

mostly focusing on health-care or public health measures but the suicide rate has remained constantly high. The suicide rate in a population may be a result from collective consequences and the long-standing epidemic of suicide in Korea merits socioeconomic explanation.

It is well known that socioeconomic status (SES) is associated with suicidal behaviour and suicide (Li et al., 2011; Maris, 2002; Nock et al., 2008; Turecki et al., 2019). In addition to conventional SES measures such as income, education and occupation, financial hardship was also reported to be associated with suicide and suicide behaviour. Financial hardship is defined as the extent to which a person experiences

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deprivation due to inadequate financial resources (Mack and Lansley, 1985). Problems with paying bills, shortage of food and clothing, or inadequate housing have been assessed as indicators of financial hardship. Financial hardship in relation to suicide has particular significance in the era of the COVID-19 pandemic. The impact of current pandemic is not universal and those who are socioeconomically disadvantaged disproportionately suffer from an increased risk of incidence of infection and from socio-economic consequences. An examination of financial hardship is relevant to recognize the severity of imminent financial deterioration triggered by economic crisis, as financial hardship is more reflective of situational difficulties than conventional SES measures, which are more likely to represent a stable construct.

Uncovering pathways of SES to health outcomes, a mediation of material route through financial hardship (WHO, 2010) was clarified in relation to cancer, CVD, obesity, cognitive function and mental health (Butterworth et al., 2009; Conklin et al., 2013; Lewis et al., 1998; Mirowsky and Ross, 1999; Tucker-Seeley and Thorpe Jr, 2019). Financial hardship in its own right has extra significance on suicide, because it is more responsive to everyday financial troubles (Conklin et al., 2013). When financial hardship leads to difficulties in meeting the basic requirements for living standard, feelings of frustration, worry and stress could be merged into losing control of situation and emotion, which often precedes suicide.

Most researches regarding the association between financial hardship and suicide focused on a single aspect of hardship; e.g. home eviction (Fowler et al., 2015; Serby et al., 2006), food insecurity (Davison et al., 2015), healthcare insecurity (Bisgaier and Rhodes, 2011) and debt problems (Meltzer et al., 2011) without considering concurrent hardships. Also, a number of researches have approached this issue by measuring financial hardship as one question of overall economic strain as part of life stress and difficulties (Bagge et al., 2013; Yen et al., 2005) and have neglected details of the financial hardship. Few studies in recent years have included different dimensions of multiple hardships simultaneously (Austin and Shanahan, 2020; Elbogen et al., 2020; Fiksenbaum et al., 2017; McKenzie et al., 2014). If we include studies on mental health, as a complement to suicide issues, some more studies reported the associations between various financial hardships and mental health (Butterworth et al., 2012; McKenzie et al., 2014; Tsuchiya et al., 2020). Despite the advances, they were also limited to cross-sectional design (Butterworth et al., 2012; Fiksenbaum et al., 2017; Tsuchiya et al., 2020), small sample size (Fiksenbaum et al., 2017), using counting measure alone (Fiksenbaum et al., 2017; McKenzie et al., 2014) and inadequate consideration of other covariates (e.g., omission of socioeconomic factors and depression) (Austin and Shanahan, 2020; Elbogen et al., 2020; Fiksenbaum et al., 2017).

Another major limitation in previous studies is that financial hardship was assessed at one time point (Austin and Shanahan, 2020; Butterworth et al., 2012; Fiksenbaum et al., 2017; Tsuchiya et al., 2020), although the situation is subject to change over time. Only a handful of studies focusing on mental health (Butterworth et al., 2009; Kiely et al., 2015; McKenzie et al., 2014; Mirowsky and Ross, 2001) with one study in suicide research (Elbogen et al., 2020) examined whether financial hardship accumulated to exert a long-lasting impact. Importantly, some studies have reported strong effect of emergent (new) hardship on mental health to the similar or even larger degree to that of persistent hardship (Butterworth et al., 2009; Kiely et al., 2015; Mirowsky and Ross, 2001) and the impact of financial hardship disappeared once it resolved (Butterworth et al., 2009; Mirowsky and Ross, 2001). This highlighted contemporaneous association indicating relatively rapid development and resolution of mental health problems. This is seemingly contradictory to cumulative socioeconomic hypothesis and a prior study reported that cumulative financial strain over two years amplified the association with suicide attempts (Elbogen et al., 2020). Thus, firm evidence has not been established about whether financial hardship exercises its impact closer to an event (suicide ideation) or carries a long-lasting impact, even though timely policy intervention is urgently

required in response to a financial crisis.

Further, the magnitude of association between financial hardship and suicide ideation may vary depending on age and gender. Some previous studies on mental health reported mixed findings; one study showed a different impact of financial hardship on depression by age groups (Mirowsky and Ross, 2001) while others did not (Butterworth et al., 2009; Levecque et al., 2011). Contrasting views were implicated on the significance of age; some argued that the experience of past hardships among elderly people may help them face new hardships (Gove et al., 1989), whereas others argued that elderly people who experience a larger number of ongoing economic hardships could be more depressed (Mirowsky and Ross, 2001). Thus, the evidence on age difference of the association between financial hardship and suicide ideation is still unclear, and extension of analysis to include a range of age groups would be key challenge for a better understanding of the association.

In the current study, we aimed to investigate whether an association between financial hardship and suicide ideation existed even after adjustment for covariates such as socioeconomic factors, whether financial hardship has accumulated over two years in an association with suicide ideation, and if the association differ by age groups and gender.

## 2. Methods

### 2.1. Study population

We used data from the Korean Welfare Panel Study (KOWEPS), an annual longitudinal panel study implemented in 2006, which represents the nation-wide Korean population. Participants were selected using a two-stage cluster sampling method, and detailed information was obtained about general characteristics, employment and economic status, welfare needs, social security status, and individual health behaviours and status (KIHASA, 2018). Further details of the KOWEPS was provided elsewhere (KISAH, 2013). Initially, 96,632 observations from 17,358 individuals aged 20 years were included from seven waves (2012 to 2018) of KOWEPS. Data were restructured to conceptualize a temporal order between explanatory and outcome variables; e.g., three main variables of interest were arranged as occurring SES in t-1 year, changes in financial hardship over t-1 and t year and suicide ideation in t year. Individuals were tracked over time in panel data and, for the analysis, repeated measures from the same individual were pooled as long as observations span two consecutive years. Data pooling was used mainly for preserving rare events such as changes in financial hardship (e.g. the number of resolved hardship among 20-49 aged men=12), particularly in age and gender stratified sample. The final sample comprised 67,728 observations from 14,321 individuals who took part for two consecutive surveys (t-1 and t year) and without missing values on any of variables in the analysis. Consequently, an individual contributed from a minimum of one observation to a maximum of six (a mean of observations per an individual = 4.7 (SD 1.67)). This study was exempted from ethical approval of the Institutional Research Board at Korea University, since this study conducted using secondary data without personal identifier (KUIRB-2020-0286-01).

### 2.2. Measurements

Suicide ideation was assessed by asking the following question: "Have you ever thought seriously about killing yourself over the past year?" Those who answered "Yes" to this question were classified as having experienced suicide ideation. Financial hardship was measured using the following questions: "In the last year, 1) Have you had difficulty paying rent or an involuntary move-out because you could not afford to pay the rent?; Have you had difficulty 2) paying utility bills; 3) using the heating system adequately in the winter; 4) using medical services when you or anyone else in your family needed to see a doctor; 5) paying

national health insurance premiums or maintaining eligibility; 6) eating nutritious food; and 7) Have you or anyone else in your family defaulted on credit?" The values of 1 and 0 were assigned to the answer of "Yes" and "No", respectively, to each item and the total score was calculated by summing the seven items. Financial hardship was defined in two ways: the change in financial hardship over two years and the count of financial hardship. First, to measure the change in financial hardship, the financial hardship status was dichotomized as no or yes (if the participant experienced at least one hardship among seven). Then, a change in hardship status over two years (a lag time of 1 year) was categorized into four groups 1) persistent (experiencing hardship in both years), (2) emergent (no hardship in year t-1 and presence of hardship in year t), (3) resolved (presence of hardship in year t-1 and no hardship in year t), and (4) no hardship (no hardship in both years). Second, the total count of financial hardship in year t-1 was used as a continuous and an ordinal term (none, 1-2, and 3+)

A range of covariates included socioeconomic (educational attainment, employment status, and income level), demographic (gender, age, and marital status) and mental and physical health status (depressive symptom and self-rated health status) at baseline. Marital status was categorized into married, single, and separated (divorced, widowed or separated). We classified educational attainment into three groups; middle school or below, high school, and college or above. Employment status was assessed in two categories: employed and unemployed or economically inactive. Income level was classified into low and high groups with the threshold defined as 60% of the median equivalized household income. The depressive symptom scale was measured using 11 items of the Center for Epidemiological Studies Depression Scale (CES-D) (Kohout et al., 1993). Participants were asked to respond to 11 items about how often they experienced specific depressive symptoms during the last week on a 4-point Likert scale. A score of  $\geq 16$  was defined as having depressive symptom (Kohout et al., 1993). Self-rated health status was collapsed into two categories; good (excellent or good) and poor (fair, poor or bad).

### 2.3. Statistical analyses

Basic characteristics of the study population and comparison of the level of suicide ideation were tested using Chi-square test. The association between financial hardship and suicide ideation was evaluated using generalized estimating equation (GEE) model to account for the inter-dependent observations within an individual by data pooling (Conner et al., 2004). As such, in the current study, the unit of analyses was observation. A series of adjustment for covariates were made in three steps. Model 1 examined crude associations; Model 2 was adjusted for potential confounding factors (marital status, self-rated health, depressive symptom and survey year); and Model 3 was the final model to test the influence of SES on the association between financial hardship and suicide ideation with additional adjustments for educational attainment, employment status, and income level. We tested interactions between financial hardship and gender/age groups separately and found associations between financial hardship and suicide ideation differed across these groups. Therefore, the analyses were done after stratification by gender and age groups (20-49, 50-64, and  $\geq 65$  years). We conducted multi-collinearity test because of possible correlation between SES and financial hardship variables. There was no indication of multicollinearity in any set of variables (all VIF values were less than 1.2) (data not presented). All statistical analyses were conducted using SAS software, version 9.4

### 3. Results

Out of 67,728 observations, 2,162 (3.19%) had experienced suicide ideation. Compared to men, women were older and were more likely to experience suicide ideation (2.65% for men vs 3.59% for women). Women were less educated, unemployed, and in lower income level and

reported poorer self-rated health status and more depressive symptom (Table 1). For financial hardship, resolved, emergent, and persistent financial hardship were found more frequently in women (6.46%, 5.26%, and 5.11%) than in men (5.29%, 4.36%, and 4.66%). Based on the single year measures, about 90% of observation did not experience financial hardship last year, and  $\leq 1.5\%$  experienced three and more financial hardship items. The mean number of hardships were 0.16 and 0.17 in men and women, respectively.

The prevalence of suicide ideation was 8.5% in those who had experienced financial hardship in t-1 year and 2.5% in those who had not. There were large differences in the prevalence of suicide ideation depending on age, gender, and other characteristics, particularly financial hardship and depressive symptom. For example, the prevalence of suicide ideation ranged from 1.2% in men aged 20-49 years with no financial hardship over two years, to 20.2% in men aged  $\geq 65$  years with three or more financial hardships (Table 2). In general, older groups experienced suicide ideation more than the younger groups in both gender. When participants were in adverse situations (e.g. more financial hardship, old age, lower SES, divorced, widowed, or separated status, poor self-rated health status, and depressive symptom), they had a higher proportion of suicide ideation.

The association between financial hardship and suicide ideation remained significant even after adjustment for the covariates including SES and depressive symptom among all age and gender groups (Table 3). Though other groups showed a similar magnitude of the association between suicide ideation and emergent hardship in year t alone and persistent hardship over two years, men aged 50-64 years and  $\geq 65$  years experiencing persistent hardship were at greater risk of suicide ideation than those experiencing emergent hardship. To illustrate, the adjusted OR was 4.22 (95% CI = 3.00–5.93) for the persistent hardship group but 3.87 (95% CI = 2.71–5.54) for the emergent group in those age  $\geq 65$  years. In addition, once financial hardship resolved in the second year, the impact became insignificant but the association remained significant among elderly men and women (aged  $\geq 65$  years). An increase in the number of hardships showed a corresponding increase in the association with suicide ideation but the pattern was not observed among younger groups aged 20-49 years. A one count increase in financial hardship was associated with a 1.39 (1.23-1.57) and 1.23 (1.11-1.36) times increase in the odds of suicide ideation in men and women aged  $\geq 65$  years, respectively, after full adjustment. The magnitudes of the association between financial hardship and suicide ideation became wider with age among men, but this pattern was less clear among women. Furthermore, the extent of decrease in OR after adjustment for SES variables was minimal in men and women aged  $\geq 65$  years.

## 4. Discussion

### 4.1. Main findings

Using a national representative data, the current study showed that financial hardship is associated with suicide ideation. Men aged 50-64 and  $\geq 65$  years experiencing persistent financial hardship over two years had larger risk of suicide ideation than those experiencing emergent hardship at year t alone, indicating a cumulative effect. This pattern of association was not observed for other age and gender groups. The magnitude of the association was dependent on age and gender and it became larger with age among men, but the pattern was less clear among women. In general, an increase in the number of financial hardships led to a significant increase in the risk of suicide ideation, showing an additive risk.

### 4.2. Methodological consideration

This study has several strengths. Using panel data with repeated measures of financial hardship and suicide ideation was instrumental in exploring the relationship between two time-varying factors. Financial

**Table 1**  
General characteristics of the study sample for men and women pooled over seven waves (2012-2018) in Korean Welfare Panel Study.

	Total N(%)	Men N(%)	Women N(%)	P-value
<b>Number of individuals</b>	14,321 (100.0)	6,272 (100.0)	8,049 (100.0)	<0.001
<b>Number of observations</b>	67,728 (100.0)	28,692 (100.0)	39,036 (100.0)	
<b>Age (years)</b>				
20-49	24,985 (36.9)	11,452 (39.9)	13,533 (34.7)	<0.001
50-64	16,071 (23.7)	7,259 (25.3)	8,812 (22.6)	
≥65	26,672 (39.4)	9,981 (34.8)	16,691 (42.8)	
<b>Suicide ideation</b>				
No	65,566 (96.8)	27,933 (97.4)	37,633 (96.4)	<0.001
Yes	2,162 (3.2)	759 (2.6)	1,403 (3.6)	
<b>Change in hardship<sup>a</sup></b>				
Absent over 2 years	57,053 (84.2)	24,588 (85.7)	32,465 (83.2)	<0.001
Resolved	4,041 (6.0)	1,518 (5.3)	2,523 (6.5)	
Emergent	3,304 (4.9)	1,250 (4.4)	2,054 (5.3)	
Persistent over 2 years	3,330 (4.9)	1,336 (4.7)	1,994 (5.1)	
<b>Number of hardships (Ordinal)</b>				
0	60,357 (89.1)	25,838 (90.1)	34,519 (88.4)	<0.001
1-2	6,406 (9.5)	2,455 (8.6)	3,951 (10.1)	
≥3	965 (1.4)	399 (1.4)	566 (1.4)	
<b>Number of hardships (Continuous)<sup>b</sup></b>	0.2±0.6	0.2±0.6	0.2±0.6	<0.001
<b>Educational level</b>				
≥ College	16,193 (23.9)	8,403 (29.3)	7,790 (12.0)	<0.001
High school	21,473 (31.7)	10,749 (37.5)	10,724 (27.5)	
≤Middle school	30,062 (44.4)	9,540 (33.2)	20,522 (52.6)	
<b>Household income</b>				
High	45,591 (67.3)	21,059 (73.4)	24,532 (62.8)	<0.001
Low	22,137 (32.7)	7,633 (26.6)	14,504 (37.2)	
<b>Employment status</b>				
Employed/self-employed	39,608 (58.5)	20,625 (71.9)	18,983 (48.6)	<0.001
Unemployed	28,120 (41.5)	8,067 (28.1)	20,053 (51.4)	
<b>Marital status</b>				
Married	43,961 (64.9)	21,183 (73.8)	22,778 (58.4)	<0.001
Never married	9,021 (13.3)	4,658 (16.2)	4,363 (11.2)	
Separated/divorce/ widowed	14,746 (21.8)	2,851 (9.9)	11,895 (30.5)	
<b>Self-rated health</b>				
Good	38,274 (56.5)	18,249 (63.6)	20,025 (51.3)	<0.001
Moderate/poor	29,454 (43.5)	10,443 (36.4)	19,011 (48.7)	
<b>Depressive symptom</b>				
No	58,098 (85.8)	25,963 (90.5)	32,135 (82.3)	<0.001
Yes	9,630 (14.2)	2,729 (9.5)	6,901 (17.7)	
<b>Survey year</b>				
2012	9,819 (14.5)	4,217 (14.7)	5,602 (14.4)	<0.001
2013	12,257 (18.1)	5,201 (18.1)	7,056 (18.1)	
2014	12,000 (17.7)	5,071 (17.7)	6,929 (17.8)	
2015				

**Table 1 (continued)**

	Total N(%)	Men N(%)	Women N(%)	P-value
2016	11,491 (17.0)	4,845 (16.9)	6,646 (17.0)	
	11,171 (16.5)	4,708 (16.4)	6,463 (16.6)	
2017	10,990 (16.2)	4,650 (16.2)	6,340 (16.2)	
	67,728 (100.0)	28,692 (42.4)	39,036 (57.6)	

a "Absent over 2 years" denotes no hardship both t-1 and t year. "Resolved" denotes hardship at t-1 and no hardship at t year. "Emergent" denotes no hardship at t-1 and hardship at t year. "Persistent over 2 years" denotes having hardship both t-1 and t year.

b While all other variables are presented in percentage and P-values were calculated from Chi-square test, Number of hardships(Continuous) was presented in mean ± standard deviation (SD) and P-value calculated from ANOVA test.

hardship was characterized as having changing nature. This enabled to examine cumulative and contemporaneous association of financial hardship with suicide ideation. Age differentiation was neglected in previous studies (Butterworth et al., 2009; Kiely et al., 2015; Mirowsky and Ross, 2001), but, in the current study, a full range of age groups were included and allowed us to observe considerable heterogeneity of financial impact on suicide ideation across age groups. Data pooling with repeated measures offered an opportunity for preserving and testing a rare transition (e.g. financial hardship over two years) in the age stratified sample. This study also has some limitations. We assumed that the impact of financial hardship lasts short as shown in most previous studies (Butterworth et al., 2012; Elbogen et al., 2020; Kiely et al., 2015). However, there may be a possibility that financial hardship may operate with a long-term lag outside the time frame of this study. Similarly, we did not consider the onset and duration of suicide ideation, as if the risk is same regardless of the existence of suicide ideation in earlier years. Nevertheless, modelling of pooled data with repeated measures provides advantages of a partial adjustment for pre-existing conditions by controlling for unobserved heterogeneity (Hsiao, 2007). Though the current study is based on longitudinal design across two years, the possibility of reverse causation cannot be excluded because of a partial overlap in the period between changes in financial hardship and suicide ideation. In other words, part of association in our result may reflect the influence of suicide ideation on changes in financial hardship. Another limitation concerns an omitted adjustment of past suicide ideation. This occurs mainly because past suicide ideation has strong association with past financial hardship and this led to selectively overadjust for a certain category of changes in hardship (e.g., resolved and persistent categories) (see discussion in Butterworth et al., 2009).

#### 4.3. Comparison with previous studies

In discussing multiple financial hardship issues, we include studies on mental health, as outcomes obtained from suicide research are sparse. In the current study, financial hardship was associated with suicide ideation, consistent with previous studies on suicide (Elbogen et al., 2020) and mental health (Butterworth et al., 2004; Butterworth et al., 2009; Fryers et al., 2003; Lahelma et al., 2006). We confirmed this finding using two different measures; changes and counts of multiple financial hardship. It is generally expected that those who experienced troubles meeting basic requirements such as paying bills or heating, or housing may experience stress and concerns and further suicide ideation. The current study provides further evidence with the application of changes in financial hardship in relation to suicide ideation. Emergent financial hardship (hardship in year t but not in year t-1) was strongly associated with suicide ideation to the similar degree of persistent hardship (hardship at both years) among women and men aged 20-49

**Table 2**  
Bivariate association of financial hardship, Socioeconomic status and health-related variables and suicide ideation for men and women pooled over seven waves (2012–2018) by age group in Korean Welfare Panel Study.

	Men			Women		
	20-49	50-64	≥65	20-49	50-64	≥65
	Total	Suicide ideation <sup>a</sup>	Total	Suicide ideation	Total	Suicide ideation
	N	N(%)	N	N(%)	N	N(%)
<b>Change in hardship</b>						
Absent over 2 years	10,093	122(1.2)	6,045	128(2.1)	8,450	166(2.0)
Resolved	521	12(2.3)	419	22(5.3)	578	40(6.9)
Emergent	417	24(5.8)	344	28(8.1)	489	56(11.4)
Persistent over 2 years	421	24(5.7)	451	64(14.2)	464	73(15.7)
P-value <sup>a</sup>		<0.001		<0.001		<0.001
<b>Number of hardships (Ordinal)</b>						
0	10,510	146(1.4)	6,389	156(2.4)	8,939	222(2.5)
1-2	810	28(3.5)	717	59(8.2)	928	90(9.7)
≥3	132	8(6.1)	153	27(17.6)	114	23(20.2)
P-value <sup>a</sup>		<0.001		<0.001		<0.001
<b>Number of hardships (Continuous)<sup>b</sup></b>	0.1±0.5	0.4±0.9	0.2±0.6	0.7±1.3	0.1±0.5	0.6±1.0
P-value		<0.001		<0.001		<0.001
<b>Educational level</b>						
≥ College	5,741	67(1.2)	1,655	35(2.1)	1,007	21(2.1)
High school	5,221	90(1.7)	3,135	94(3.0)	2,393	74(3.1)
≤Middle school	490	25(5.1)	2,469	113(4.6)	6,581	240(3.6)
P-value		<0.001		<0.001		0.027
<b>Household income</b>						
High	10,395	131(1.3)	5,976	127(2.1)	4,688	81(1.7)
Low	1,057	51(4.8)	1,283	115(9.0)	5,293	254(4.8)
P-value		<0.001		<0.001		<0.001
<b>Employment status</b>						
Employed/self-employed	9,669	124(1.3)	6,147	137(2.2)	4,809	101(2.1)
Unemployed	1,783	58(3.3)	1,112	105(9.4)	5,172	234(4.5)
P-value		<0.001		<0.001		0.002
<b>Marital status</b>						
Married	6,753	94(1.4)	5,993	124(2.1)	8,437	218(2.6)
Never married	4,187	78(1.9)	412	46(11.2)	59	6(10.2)
Separated/divorce/widowed	512	10(1.9)	854	72(8.4)	1,485	111(7.5)
P-value		0.128		<0.001		<0.001
<b>Self-rated health</b>						
Good	9,986	124(1.2)	4,853	77(1.6)	3,410	62(1.8)
Moderate/poor	1,466	58(4.0)	2,406	165(6.9)	6,571	273(4.2)
P-value		<0.001		<0.001		<0.001
<b>Depressive symptom</b>						
No	10,846	134(1.2)	6,607	136(2.1)	8,510	177(2.1)
Yes	606	48(7.9)	652	106(16.3)	1,471	158(10.7)
P-value		<0.001		<0.001		<0.001

a Respondents who responded to have suicide ideation.

b While all other variables are presented in percentage and P-values were calculated from Chi-square test, Number of hardships(Continuous) was presented in mean ± standard deviation (SD) and P-value calculated from ANOVA test.

**Table 3**

Multivariate association of change of financial hardship and suicide ideation in men and women pooled over seven waves (2012–2018) by age group in Korean Welfare Panel Study.

	20-49			50-64			≥65		
	Model 1 <sup>a</sup>	Model 2 <sup>b</sup>	Model 3 <sup>c</sup>	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
<b>Men</b>									
<b>Changes of hardship</b>									
Absent over 2 years	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)
Resolved	1.53(0.79-2.94)	1.31(0.68-2.53)	1.10(0.56-2.14)	2.11(1.27-3.51)*	1.10(0.65-1.85)	1.03(0.60-1.75)	3.29(2.24-4.85)*	2.27(1.53-3.36)*	2.05(1.39-3.03)*
Emergent	3.93(2.32-6.64)*	3.30(1.93-5.64)*	2.67(1.53-4.65)*	3.21(1.96-5.26)*	1.82(1.07-3.09)*	1.71(1.02-2.86)*	5.86(4.21-8.14)*	4.28(3.01-6.07)*	3.87(2.71-5.54)*
Persistent over 2 years	3.72(2.04-6.76)*	2.71(1.48-4.98)*	1.99(1.08-3.69)*	6.03(4.12-8.83)*	2.46(1.64-3.71)*	2.24(1.48-3.38)*	8.30(6.03-11.40)*	4.74(3.37-6.67)*	4.22(3.00-5.93)*
<b>Number of hardships (Ordinal)</b>									
0	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)
1-2	1.68(0.96-2.96)	1.41(0.83-2.41)	1.14(0.67-1.95)	2.75(1.87-4.03)*	1.37(0.92-2.02)	1.28(0.86-1.90)	3.26(2.47-4.32)*	2.23(1.68-2.96)*	2.01(1.52-2.65)*
≥3	3.22(1.16-8.95)*	2.11(0.76-5.90)	1.30(0.47-3.58)	5.51(3.34-9.08)*	2.39(1.43-4.00)*	2.11(1.26-3.54)*	6.63(3.89-11.30)*	3.40(1.94-5.96)*	3.01(1.74-5.20)*
<b>Number of hardships (Continuous)</b>									
	1.43(1.16-1.76)*	1.27(1.03-1.58)*	1.11(0.89-1.39)*	1.59(1.43-1.78)*	1.27(1.12-1.44)*	1.23(1.08-1.39)*	1.78(1.59-2.00)*	1.45(1.28-1.64)*	1.39(1.23-1.57)*
<b>Women</b>									
<b>Changes of hardship</b>									
Absent over 2 years	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)
Resolved	1.79(1.09-2.93)*	1.35(0.80-2.27)	1.25(0.74-2.12)	2.00(1.32-3.01)*	1.34(0.89-2.01)	1.20(0.80-1.80)	1.82(1.41-2.34)*	1.41(1.09-1.83)*	1.39(1.07-1.80)*
Emergent	4.01(2.71-5.93)*	2.80(1.84-4.27)*	2.60(1.71-3.96)*	3.85(2.68-5.53)*	2.87(1.98-4.16)*	2.59(1.79-4.55)*	3.66(2.94-4.55)*	3.07(2.45-3.85)*	3.01(2.39-3.78)*
Persistent over 2 years	4.88(3.36-7.10)*	2.95(2.01-4.34)*	2.67(1.77-4.03)*	5.47(3.81-7.86)*	3.19(2.24-4.55)*	2.66(1.84-3.83)*	4.12(3.23-5.25)*	3.05(2.37-3.92)*	2.97(2.30-3.83)*
<b>Number of hardships (Ordinal)</b>									
0	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)	1(Reference)
1-2	2.39(1.67-3.42)*	1.73(1.20-2.49)*	1.55(1.05-2.28)*	2.17(1.54-3.05)*	1.48(1.07-2.04)*	1.29(0.94-1.78)	1.99(1.63-2.43)*	1.57(1.29-1.92)*	1.52(1.25-1.85)*
≥3	3.22 (1.16-8.95)*	1.72(0.85-3.50)	1.53(0.78-2.99)	5.51(3.34-9.08)*	2.52(1.52-4.19)*	2.10(1.27-3.49)*	2.53(1.47-4.35)*	1.81(1.06-3.09)*	1.73(1.02-2.94)*
<b>Number of hardships (Continuous)</b>									
	1.45(1.28-1.66)*	1.23(1.07-1.41)*	1.18(1.03-1.36)*	1.46(1.29-1.65)*	1.27(1.12-1.43)*	1.19(1.06-1.35)*	1.41(1.28-1.55)*	1.26(1.13-1.39)*	1.23(1.11-1.36)*

a Model 1: unadjusted

b Model 2: adjusted for marital status, self-rated health, depressive symptom and survey year

c Model 3: Model 2+ Socioeconomic status(education level, household income and employment status)

\*  $p < 0.05$

years. Also, resolved hardship (hardship only in year t-1) did not show an association with suicide ideation, among relatively younger age groups in both men and women. This is in line with previous studies on mental health (Butterworth et al., 2009; Kiely et al., 2015; Mirowsky and Ross, 2001) which emphasized that recent experience of financial hardship causes adverse impact on mental health. This suggests that suicide ideation due to financial hardship may be transient and resolve rapidly after the period of hardship (Mirowsky and Ross, 2001). One possible explanation is that when financial hardship constitutes a short-term deficiency and the risk of suicide may only last for that time period (Butterworth et al., 2009; Kiely et al., 2015). This strong concurrent association in these age and gender groups implies that timely support could mitigate the short-term impact on suicide ideation during a time of financial crisis (Mckenzie et al., 2014) such as the economic recession triggered by the COVID-19 outbreak.

More importantly, men aged 50-64 and ≥65 years experiencing persistent financial hardship over two years were at greater risk of suicide ideation than those experiencing in year t (second year) only. In similar vein, among the elderly men and women (≥65 years), the impact of financial hardship experienced only in the prior year remained significant. This highlights a cumulative effect of financial hardship as noted in a US adult population (Elbogen et al., 2020). The prior study was limited to focus on a few specific dimensions of financial hardship (each of them separately) and some of them such as unemployment and low income were too broad to pin down exactly financial hardship as an

indicator of acute failure to meet minimum standard of living. An interpretation of our results may be that late-middle-aged and elderly men are less able to minimize or recover from the psychological impact of financial hardship in line with previous studies (Qin et al., 2003). The strong response to financial stress partly explains why suicide is most common among these groups (Turecki and Brent, 2016).

We observed additional effects on suicide ideation with an increase in the number of hardships. This finding is consistent with previous studies that reported associations between multiple financial hardships commonly in the form of ordinal categories and mental health problems (Bisgaier and Rhodes, 2011; Kahn and Pearlin, 2006; Kiely et al., 2015; Sternthal et al., 2011). Moreover, our study demonstrated a one-count increase in financial hardship was associated with 1.39(95% CI: 1.20-1.54) and 1.23(95% CI: 1.09-1.33) times increase in the odds of suicide ideation in elderly male and female elderly participants, respectively. This is an alarming figure considering the fact that, during the pandemic period, those from lower socio-economic status have experienced a markedly increased number of hardships, which in turn escalates the susceptibility to suicide; in Korea, about 50% of the working age population reported a decrease in their income and about 20% reported job loss or receiving no salary (Gyeonggi Public Health Policy Institute, 2020).

The association between financial hardship and suicide ideation varied with age, and the magnitude of association was pronounced in the older age group. In addition, inequalities in suicide ideation defined

by conventional SES measures were neither significant nor increased in old age (Supplementary table 1), while the inequalities defined by financial hardship were not reduced, even after adjustment for SES measures. This finding suggests that the association between financial hardship and suicide ideation is independent of SES in old age. This also addresses a challenge to a general belief, “the attenuation of socioeconomic inequalities in health in old age” (Huisman et al., 2013), which has been justified on the grounds that both in economic and health gaps become smaller in later life. However, the use of financial hardship as a marker for current material circumstances in this study shows that inequalities continue into old age. To date, there is no study reporting cumulative impact of financial hardship and widening of economic gap in suicide ideation in the elderly people. Though the explanation is tentative and needs future studies, we hypothesize that direct measurements of economic situation such as financial hardship are more closely linked to actual inability due to economic reasons in the elderly population compared to conventional SES. This provides further confirmation of a previous evidence that has shown advantages of hardship indicators such as car ownership and housing tenure over conventional SES indicators in measuring health inequalities in the elderly population (Grundy and Sloggett, 2003; Lorant et al., 2005). Alternatively, this finding can be viewed within the context of specific countries like Korea where progressive income redistribution including public pension is not favourable to the post-working population. In Korea, old people experience worsening of their economic condition, instead of reduction in hardship seen in most advanced countries (OECD, 2013). For example, about 13% and 3% of young and older women experienced financial hardship in Australia (Butterworth et al., 2009), whereas about 8% and 14% of young and older Korean women in the current study reported financial hardship. This explanation corresponds to the incomparably high level of suicide rate among elderly population in Korea; the average suicide rate of the Korean population was 22.6 per 100,000, while the elderly suicide rate ( $\geq 65$  years) was 48.6 per 100,000 in 2018.

## 5. Conclusion

Financial hardship was associated with suicide ideation. More specifically, impacts of financial hardship are short-term, except in men aged over 50 years for whom the impacts last longer. The seemingly contrasting observations of concurrent and cumulative impacts of financial hardship converge into an integrated conclusion that the risk of suicide ideation increases depending on the expectation of adversities and uncertainties that arise from age and gender-related material circumstances. In sum, financial hardship provides a substantial importance for a potential target for suicide intervention and for a relevant monitoring indicator during times of financial uncertainty such as later life in the Korean elderly population.

## Declaration of Competing Interest

The authors declare that they have no competing interest.

## Author contributions

Minjae Choi, Jiseun Lim and Myung Ki designed the study. Minjae Choi, Jiseun Lim and Myung Ki were involved in reviewing the literature, data collection, statistical analyses and drafted the manuscript. Minjae Choi, Jiseun Lim and Myung Ki interpreted the data and Jiseun Lim and Myung Ki contributed to the writing. Shu-Sen Chang and Minji Hwang revised the manuscript. Shu-Sen Chang and Cheong-Seok Kim read and commented on the manuscript. All authors approved the final manuscript.

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The funding bodies played no role of design, data collection, analyses and interpretation of the data.

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## Ethics approval and consent to participate

This study was exempted from ethical approval of the Institutional Research Board at Korea University, since this study conducted using secondary data without personal identifier (KUIRB-2020-0286-01).

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2021.07.102.

## References

- Austin, A.E., Shanahan, M.E., 2020. Material Hardship and Suicidal Behavior: Associations Among Parents and Non-parents. *Suicide and Life-Threatening Behavior*.
- Bagge, C.L., Glenn, C.R., Lee, H.-J., 2013. Quantifying the impact of recent negative life events on suicide attempts. *J. Abnorm. Psychol.* 122, 359.
- Bisgaier, J., Rhodes, K.V., 2011. Cumulative adverse financial circumstances: associations with patient health status and behaviors. *Health Soc. Work* 36, 129–137.
- Butterworth, P., Crosier, T., Rodgers, B., 2004. Mental health problems, disability and income support receipt: a replication and extension using the HILDA survey. *Aust. J. Labour Econ.* 7, 151–174.
- Butterworth, P., Olesen, S.C., Leach, L.S., 2012. The role of hardship in the association between socio-economic position and depression. *Aust. N. Z. J. Psychiatry* 46, 364–373.
- Butterworth, P., Rodgers, B., Windsor, T.D., 2009. Financial hardship, socio-economic position and depression: results from the PATH Through Life Survey. *Soc. Sci. Med.* 69, 229–237.
- Conklin, A.I., Forouhi, N.G., Suhrcke, M., Surtees, P., Wareham, N.J., Monsivais, P., 2013. Socioeconomic status, financial hardship and measured obesity in older adults: a cross-sectional study of the EPIC-Norfolk cohort. *BMC Public Health* 13, 1039.
- Conner, K.R., Meldrum, S., Wiczorek, W.F., Duberstein, P.R., Welte, J.W., 2004. The association of irritability and impulsivity with suicidal ideation among 15-to 20-year-old males. *Suicide Life Threat. Behav.* 34, 363–373.
- Davison, K.M., Marshall-Fabien, G.L., Tecson, A., 2015. Association of moderate and severe food insecurity with suicidal ideation in adults: national survey data from three Canadian provinces. *Soc. Psychiatry Psychiatr. Epidemiol.* 50, 963–972.
- Elbogen, E.B., Lanier, M., Montgomery, A.E., Strickland, S., Wagner, H.R., Tsai, J., 2020. Financial strain and suicide attempts in a nationally representative sample of US adults. *Am. J. Epidemiol.* 189, 1266–1274.
- Fiksenbaum, L., Marjanovic, Z., Greenglass, E., Garcia-Santos, F., 2017. Impact of economic hardship and financial threat on suicide ideation and confusion. *J. Psychol.* 151, 477–495.
- Fowler, K.A., Gladden, R.M., Vagi, K.J., Barnes, J., Frazier, L., 2015. Increase in suicides associated with home eviction and foreclosure during the US housing crisis: findings from 16 national violent death reporting system states, 2005–2010. *Am. J. Public Health* 105, 311–316.
- Fryers, T., Melzer, D., Jenkins, R., 2003. Social inequalities and the common mental disorders. *Soc. Psychiatry Psychiatr. Epidemiol.* 38, 229–237.
- Gove, W.R., Ortega, S.T., Style, C.B., 1989. The maturational and role perspectives on aging and self through the adult years: an empirical evaluation. *Am. J. Sociol.* 94, 1117–1145.

- Grundy, E., Sloggett, A., 2003. Health inequalities in the older population: the role of personal capital, social resources and socio-economic circumstances. *Soc. Sci. Med.* 56, 935–947.
- Gyeonggi Public Health Policy Institute, 2020. The 3rd Risk Awareness Survey of COVID 19 in Gyeonggi Province. Gyeonggi Public Health Policy Institute, Seongnam, South Korea in Korean.
- Hsiao, C., 2007. Panel data analysis—advantages and challenges. *Test* 16, 1–22.
- Huisman, M., Read, S., Towriss, C.A., Deeg, D.J., Grundy, E., 2013. Socioeconomic inequalities in mortality rates in old age in the World Health Organization Europe region. *Epidemiol. Rev.* 35, 84–97.
- Kahn, J.R., Pearlin, L.I., 2006. Financial strain over the life course and health among older adults. *J. Health Soc. Behav.* 47, 17–31.
- Kiely, K.M., Leach, L.S., Olesen, S.C., Butterworth, P., 2015. How financial hardship is associated with the onset of mental health problems over time. *Soc. Psychiatry Psychiatr. Epidemiol.* 50, 909–918.
- KISAHA, 2013. User's Guide the 8th Wave of the Korean Welfare Panel Study. The Korean Institute of Social and Health Affairs. Seoul, South Korea in Korean.
- Kohout, F.J., Berkman, L.F., Evans, D.A., Cornoni-Huntley, J., 1993. Two shorter forms of the CES-D depression symptoms index. *J. Aging Health* 5, 179–193.
- Lahelma, E., Laaksonen, M., Martikainen, P., Rahkonen, O., Sarlio-Lähteenkorva, S., 2006. Multiple measures of socioeconomic circumstances and common mental disorders. *Soc. Sci. Med.* 63, 1383–1399.
- Levecque, K., Van Rossem, R., De Boyser, K., Van de Velde, S., Bracke, P., 2011. Economic hardship and depression across the life course: the impact of welfare state regimes. *J. Health Soc. Behav.* 52, 262–276.
- Lewis, G., Bebbington, P., Brugha, T., Farrell, M., Gill, B., Jenkins, R., Meltzer, H., 1998. Socioeconomic status, standard of living, and neurotic disorder. *Lancet* 352, 605–609.
- Li, Z., Page, A., Martin, G., Taylor, R., 2011. Attributable risk of psychiatric and socioeconomic factors for suicide from individual-level, population-based studies: a systematic review. *Soc. Sci. Med.* 72, 608–616.
- Lorant, V., Kunst, A.E., Huisman, M., Costa, G., Mackenbach, J., 2005. Socio-economic inequalities in suicide: a European comparative study. *Br. J. Psychiatry* 187, 49–54.
- Mack, J., Lansley, S., 1985. *Poor Britain*. Allen & Unwin London.
- Maris, R.W., 2002. Suicide. *Lancet (London, England)* 360, 319–326.
- McKenzie, S.K., Gunasekara, F.I., Richardson, K., Carter, K., 2014. Do changes in socioeconomic factors lead to changes in mental health? Findings from three waves of a population based panel study. *J. Epidemiol. Commun. Health* 68, 253–260.
- Meltzer, H., Bebbington, P., Brugha, T., Jenkins, R., McManus, S., Dennis, M., 2011. Personal debt and suicidal ideation. *Psychol. Med.* 41, 771.
- Mirowsky, J., Ross, C.E., 1999. Economic hardship across the life course. *Am. Sociol. Rev.* 548–569.
- Mirowsky, J., Ross, C.E., 2001. Age and the effect of economic hardship on depression. *J. Health Soc. Behav.* 132–150.
- Nock, M.K., Borges, G., Bromet, E.J., Alonso, J., Angermeyer, M., Beautrais, A., Bruffaerts, R., Chiu, W.T., De Girolamo, G., Gluzman, S., 2008. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *Br. J. Psychiatry* 192, 98–105.
- OECD, 2013. *Pensions at a Glance 2013: OECD and G20 Indicators*. OECD Publishing, Paris, France.
- Qin, P., Agerbo, E., Mortensen, P.B., 2003. Suicide risk in relation to socioeconomic, demographic, psychiatric, and familial factors: a national register-based study of all suicides in Denmark, 1981–1997. *Am. J. Psychiatry* 160, 765–772.
- Serby, M.J., Brody, D., Amin, S., Yanowitch, P., 2006. Eviction as a risk factor for suicide. *Psychiatr. Serv.* 57, 273.
- Sternthal, M.J., Slopen, N., Williams, D.R., 2011. Racial disparities in health: how much does stress really matter? 1. Du Bois review: social science research on race 8, 95.
- Tsuchiya, K., Leung, C.W., Jones, A.D., Caldwell, C.H., 2020. Multiple financial stressors and serious psychological distress among adults in the USA. *Int. J. Public Health* 65, 335–344.
- Tucker-Seeley, R.D., Thorpe Jr, R.J., 2019. Material–psychosocial–behavioral aspects of financial hardship: a conceptual model for cancer prevention. *Gerontologist* 59, S88–S93.
- Turecki, G., Brent, D.A., 2016. Suicide and suicidal behaviour. *Lancet* 387, 1227–1239.
- Turecki, G., Brent, D.A., Gunnell, D., O'Connor, R.C., Oquendo, M.A., Pirkis, J., Stanley, B.H., 2019. Suicide and suicide risk. *Nat. Rev. Dis. Primers* 5, 1–22.
- WHO, 2010. *A Conceptual Framework for Action on the Social Determinants of Health*. World Health Organization, Geneva, Switzerland.
- Yen, S., Pagano, M.E., Shea, M.T., Grilo, C.M., Gunderson, J.G., Skodol, A.E., McGlashan, T.H., Sanislow, C.A., Bender, D.S., Zanarini, M.C., 2005. Recent life events preceding suicide attempts in a personality disorder sample: findings from the collaborative longitudinal personality disorders study. *J. Consult. Clin. Psychol.* 73, 99.