



# The changes in feeling of loneliness after retirement among baby boomers and pre-boomers in Taiwan: Do work-family conflict before retirement and social engagement after retirement matter?

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## ABSTRACT

**Significance:** Few studies have analyzed how loneliness-related factors differ across generations for older adults in non-Western societies. Building upon the stress process model, this study aimed to explore the relationships between work-family conflict before retirement, social engagement after retirement and changes in loneliness after retirement among retirees across two birth cohorts (Baby Boomers and pre-Boomers) in Taiwan.

**Methods:** Data from the Taiwan Health and Retirement Study, a nationwide retired cohort sample collected from two waves between 2015/2016 and 2018/2019, was analyzed. A total of 2370 retirees aged 50–74 years were included in the analysis after excluding those who died or were lost to follow-up. Multivariate multinomial logistic models were used to estimate four types of changes in loneliness: (1) remaining not lonely, (2) becoming not lonely, (3) becoming lonely, and (4) remaining lonely.

**Results:** About two-thirds of the retirees remained not lonely, and less than 10% maintained their feelings of loneliness across two waves. Multinomial logit models showed that both cohorts who experienced work-family conflict before retirement and stressful life events after retirement had higher odds of remaining lonely than those who remained not lonely. However, an increase in social engagement, especially social contact, appeared to be a protective factor against becoming and remaining lonely for both cohorts. Yet, work-related characteristics before retirement were significantly related to the changes in loneliness among pre-Boomers rather than Baby Boomers.

**Conclusions:** The results suggest that work-family conflict before retirement produces an exacerbating effect; in contrast, social engagement after retirement is beneficial to not feeling lonely across two birth cohorts in Taiwan. This investigation highlights the importance of social stressors occurring before retirement because these have an effect on retirees' feelings of loneliness beyond individual socioeconomic status.

## 1. Introduction

Along with the steady increase in the proportion of persons aged over 65, late-life mental health problems have received increasing attention among health researchers and policymakers worldwide. Feelings of loneliness do not seem to meet the specific clinical criteria required to diagnose psychiatric diseases, such as depression and dementia. However, it has been suggested as an antecedent to the development of psychiatric illnesses (Mushtaq, Shoib, Shah, & Mushtaq, 2014), cardiovascular diseases (Valtorta, Kanaan, Gilbody, Ronzi, & Hanratty,

2016), poor physical function and quality of life for individuals and their families (Takagi & Saito, 2020), and even a contributor to the increased risk of mortality (Holt-Lunstad, Smith, & Layton, 2010).

Loneliness is characterized by a condition in which an individual endures emotional distress due to a feeling of being excluded or isolated from other persons and/or when a social partner is absent due to scheduled activities (McWhirter, 1990; Perlman & Peplau, 1981). Such a latent definition of loneliness covering both emotional and social domains is often considered as the psychological embodiment of social isolation (Perlman & Peplau, 1981). Given that populations are aging,

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this significant demographic transition affects older adults' social and family relationships, which may lead to an increase in the severity of loneliness (Cacioppo & Cacioppo, 2018).

The stress process model (Pearlin, 1989; Pearlin, Schieman, Fazio, & Meersman, 2005) indicates that socioeconomically disadvantaged groups are more likely to suffer from mental health problems than others based on the vulnerable characteristics inherent to their social position. These problematic situations or adverse conditions are often socially patterned and disproportionately experienced by low social status groups. Kahn and Pearlin (2006) used a retrospective sample of 1167 older adults to explore a possible 'long reach' from social stressors, such as financial strain experienced at ages before 18 years old, 18–35, 35–50, and 50–65, and their longitudinal impacts to various indicators of health outcomes later in life, including depressive symptoms. Their findings found that such hardship experienced at different age periods during the life course produces cumulative negative effects on mental health. Individuals with low social positions and insufficient economic resources are thus more likely to juggle "life and work" in areas where they may find it challenging to reach out and receive support, even when feeling isolated and severely lonely (Coursolle, Sweeney, Raymo, & Ho, 2010). Accordingly, we hypothesize that work-family conflict before retirement might be a stressor cumulatively and profoundly influencing mental health, such as loneliness, after retirement.

The employment transition in later life, namely retirement, may accentuate stressors such as the conflict between work and family before retirement. The stressors are assumed to be associated with subsequent perceptions of the situation, namely feelings of loneliness after retirement, and such perceptions may further contribute to psychological distress in retired people (Allen, French, Dumani, & Shockley, 2020; Coursolle, Sweeney, Raymo, & Ho, 2010; Wheaton, 1990). Specifically, prior studies have indicated that work-family conflict might be a stressor (Lazarus & Folkman, 1984; Pearlin et al., 2005) in the experience of deleterious psychological states during retirement in older people (Allen et al., 2020; Coursolle et al., 2010; Segel-Karpas, Ayalon, & Lachman, 2018; Shin, Park, Amano, Kwon, & Kim, 2020). This stressor represents the accumulation of an individual's difficulty in balancing work and family before retirement. The impact of work-family conflict is associated with self-rated health in Europe (Borgmann, Krollb, Mutersa, Rattaya, & Lamperta, 2019), and such conflict may be enhanced cumulatively through the life course on mental health (Grzywacz & Bass, 2003). Studies have investigated such conflict in workplace loneliness (Öge, Çetin, & Top, 2018); however, little has known about its cumulative influences on loneliness even after retirement.

Nevertheless, a related series of studies has indicated that social relationships and social engagement may reduce mental health problems (Lam et al., 2020), including loneliness (Rinderknecht, Doan, & Sayer, 2021). Prior research has suggested that being socially active among older adults was inversely associated with loneliness over time (McHugh Power, Steptoe, Kee, & Lawlor, 2019; Park, Jang, Chiriboga, & Chung, 2020). Teh and Tey (2019) analyzed data gathered from a cohort sample of 3841 Chinese older adults, followed for six years. Their findings suggest significant associations between loneliness and social activities. Although that study was based on a Chinese population, its analyses did not include factors related to work and family-related stressors in various birth cohorts; therefore, loneliness often associated with social and cohort contexts was not assessed. As a result, minimal research has been conducted to explore whether such effects are related to the changes in loneliness in different birth cohorts and even fewer during their retirement transition (Lam et al., 2020).

Baby Boomers are the generation born between 1951 and 1965 who experienced the rapid global revival after World War II. The significant social changes contributed to their higher levels of education and better employment in professional and managerial positions. Thus, the socioeconomic context of this boomer generation is distinctly different from that of the preceding generation, and a particular focus has been given to the generation's retired population (Deaton & Paxson, 2000; Frey, 2010;

Percheski, 2008).

For example, economic development proliferated in Taiwan after World War II, with GDP per capita (US\$) increasing from \$154 in 1951 to \$2389 in 1980, \$14,908 in 2000, and \$28,371 in 2020, nearly doubling every 20 years. The life expectancy at birth grew from 57.4/60.3 years in males/females in 1952 to 77.7/84.2 years in 2019, respectively, an increase of more than 20 years. However, the fertility rate (per 1000) has dropped dramatically from 7.04 in 1951 to 0.99 in 2020, almost the lowest in the world (National Statistics, Republic of China (Taiwan), 2021). These rapid developments have made the baby boomers in Taiwan face a steady stream of challenges in society.

The above experience may vary across different age groups. For instance, specific birth cohorts affect the social resources that shape social risk factors related to mental health (Deaton & Paxson, 2000; Frey, 2010; Lam et al., 2020). Given the rapid economic growth in Taiwan, baby boomer retirees were more economically active mid-career than their pre-boomer counterparts. As a result, the baby boomers were more likely to develop a conflict between work achievement and their role as a family caregiver (Deaton & Paxson, 2000; Frey, 2010), recognized as the sandwich generation (Kao & Stuijbergen, 1999).

Therefore, we hypothesized that feelings of loneliness are associated with low social class and material factors, such as individual possessions and resource deprivation (Shin et al., 2020), and these associations are more substantial in Baby boomers than in pre-boomers. However, to our knowledge, no relevant research has explored the similarities and differences in work-family conflict, social engagement and their effects on the feelings of loneliness between Baby Boomers and pre-Boomers, particularly in non-Western societies. To be specific, the purpose of the study was to examine work-family conflict before retirement versus social engagement and life events after retirement and their relative effects on the changes in loneliness among retirees in Taiwan.

## 2. Methods

### 2.1. Data source and participants

The data for this analysis were retrieved from the Taiwan Health and Retirement Study (THRS), a nationally representative survey at the baseline assessment in 2015/2016 and the follow-up in 2018/2019 to examine the effects of retirement on the physical, social, and psychological health of retirees aged 50–74 years in Taiwan. Data were collected by the Health Promotion Administration of the Ministry of Health and Welfare in Taiwan from 2015 to 2019. The baseline sample was derived using a three-stage sampling framework. A total of 3141 older adults were interviewed in person from 2015 to 2016, with a follow-up interview conducted between 2018 and 2019 for surviving participants.

Fig. 1 shows the inclusion and exclusion criteria of the participants in the study. The analyzed sample was restricted to adult respondents who had only one retirement experience and complete self-reported data on feelings of loneliness. This selection criterion yielded 2370 valid older adults serving as the analyzable sample, composing 75.5% of the baseline sample. Among the missing participants, 2.7% were lost due to mortality, 19.4% lost to follow-up, and 2.5% lost due to second-time retirement or unreported data on loneliness.

Attrition is of great concern, especially in longitudinal research. Past studies have indicated that those lost to follow-up are more likely to report poorer health than the retained sample, resulting in a "healthier" study sample and introducing a "health selection effect". Thus, we analyzed the differences in personal backgrounds and self-rated health between the continuing participants and dropouts. The results indicated that those who died or were lost to follow-up were mostly males (61.9% vs. 54.1%), slightly younger (64.2 vs. 64.6 years old), never married or divorced (11.5% vs. 8.4%), living alone (7.7% vs. 5.4%), and with fewer feelings of loneliness (75.6% vs. 80.7%). As for educational level,

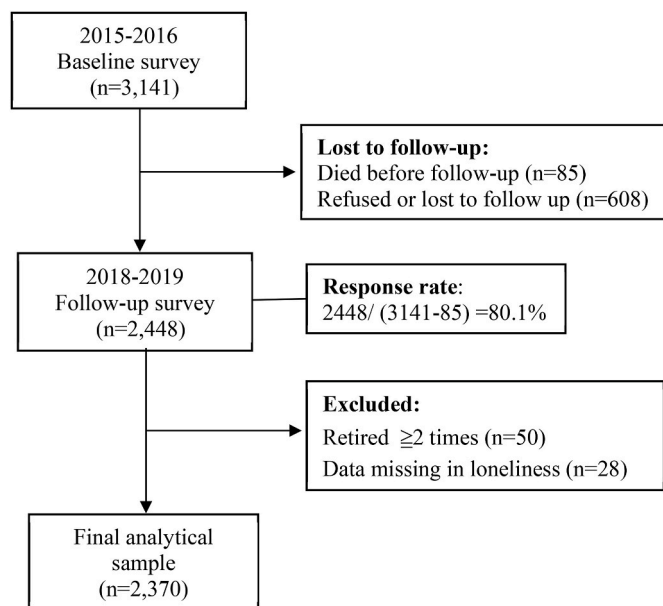


Fig. 1. Participants in the health and retirement survey in Taiwan from 2015 to 2019.

occupation before retirement, and self-rated health, no significant differences were found between the study sample and those lost to follow-up (see Supplement Table S1). Namely, there was no health-selection effect and social class disparity in our study participants.

## 2.2. Study design

This study was a population-based follow-up study with 2-wave surveys conducted on retirees in Taiwan during 2015–2019. The purpose of the study was to examine four factors, two life stressors and two types of social engagement, on the changes in loneliness when controlling for other critical covariates. Thus, the outcome variable was the changes in feelings of loneliness, whereas the study variables were all assessed at baseline in order to present the temporal relationship.

## 2.3. Measurements

### 2.3.1. Dependent variable

The measurements used to assess *feelings of loneliness* were identical at baseline and follow-up assessments, using the same coding scheme to assess emotional loneliness. Retired people were asked whether they had been feeling lonely during the past two weeks, and their answers were dichotomized as suggested from prior studies (de Jong Gierveld & van Tilburg, 1999; Holi, 2003): “feelings of loneliness (coded as 1)”, including slightly serious, serious, and very serious feelings of loneliness, and “no feelings of loneliness (coded as 0).” We grouped the responses from the baseline and follow-up assessments into four categories: (1) remaining not lonely, when they responded ‘no’ to the question in both surveys, (2) becoming not lonely, when they responded ‘yes’ to the question at baseline but ‘no’ at the follow-up survey, (3) becoming lonely, when they responded ‘no’ to the question at baseline but ‘yes’ at the follow-up survey, and (4) remaining lonely, when they responded ‘yes’ in both surveys. Among these four groups, we brought particular attention to the social qualities of each group. In other words, the group of retirees who remained not lonely was somehow distinct from the other three groups.

### 2.3.2. Independent variables

The variables of interest were divided into two parts: life stressors and social engagement, in which the former is a risk factor and the latter,

a protective factor; all variables were assessed at baseline. First, *life stressors* included two major types: work-family conflict before retirement and stressful life events during the past 12 months (after retirement). *Work-family conflict* was measured by a three-item scale asking older adults to report the frequency of stressors that occurred from work and its resulting conflict with family before retirement, including “Felt stress while working,” “Work demand affected family life,” and “Family life affected work.” The responses ranged from ‘always’ to ‘never’ rated on a five-point scale. Higher scores were associated with more significant conflict between work and family before retirement. The average scores ranged from 1 to 5 and yielded very good internal consistency and reliability ( $\alpha = 0.76$ ). As for *stressful life events*, thirty items of life events were listed and dichotomized (0 = no; 1 = yes). Participants reported whether they had experienced any item out of the 30 life events in the past year. We categorized the number of stressful life events into two levels: 0 and 1 or more events. The questions or items for the above two measurements are provided in Supplement Tables S2 and S3.

Second, *social engagement* was assessed using two variables: volunteering and social contacts after retirement. Being a volunteer characterizes older adults as having a productive role (Baker, Cahalin, Gerst, & Burr, 2005; Burr, Mutchler, & Caro, 2007; Glass et al., 1995, 1999; Wang, Karp, Winblad, & Fratiglioni, 2002). *Volunteering* was measured by asking participants whether they were undertaking any volunteer work after retirement with a yes/no response. *Social contacts after retirement* were measured by asking participants how many people they often stayed in contact with after retirement? Responses were divided into four groups: none, about 1–5, about 6–10, and more than 11. Thus, we used the median to calculate the number of social contacts, such as 0 = none, 3 = about 1–5, 8 = about 6–10, and 11 = more than 11.

Third, other work-related characteristics before retirement included occupation, retirement plans, and time since retirement. There were five categories under *occupation*: non-technical, semi-technical, technical, professional, and senior professional managers, as self-reported by each respondent (Elstad & Krokstad, 2003). These were then combined into three categories in the analysis as non-technical, technical, and professional to reduce the number of groups. A *retirement plan* was defined by asking participants to report whether they had prepared for each of the 20 related activities before retirement, such as financial management, home renovation, life-long learning, hobby development, and social participation (see Supplement Table S4). Responses were dichotomized as “yes” or “no” for each activity. Then, “having a retirement plan” was coded for those who responded ‘yes’ to at least one activity. Finally, *time since retirement* was divided into three categories: less than 5 years, 5–9.99 years, and 10 years and above.

### 2.3.3. Covariates

A set of related variables, such as gender, age, educational attainment, marital status, living arrangements, and caregiving for a child, were also included and assessed at the baseline assessment. The analyses were stratified by gender and two *birth cohort* groups: Baby Boomers born in 1951–1965 (aged 50–64 years) and pre-Boomers born in 1941–1950 (aged 65–74 years). The highest *educational attainment* of the participants was divided into elementary school or below, high school, and college or above. *Spouse/partner status* (yes/no) was categorized by the question, “What is your current marital status (married, widowed, never married, separated, divorced)?” We grouped the subjects with a partner as having a spouse/partner. This categorization was necessary due to the small sample of individuals with no spouse. *Living arrangements* included two categories: living alone and with others. *Self-rated health* was measured by a question, “Generally speaking, what do you think of your current health status?” The responses were rated on a 5-point Likert scale from very poor (1) to very good (5). Finally, *caregiving* was defined by whether the respondents were providing personal care for young children after retirement.

## 2.4. Analytical strategy

We examined the changes in loneliness from baseline to the follow-up assessment separately for the 1215 pre-Boomers and 1155 Baby Boomers. First, we began with bivariate analyses that characterized the sample profile by birth cohort and gender. Then, multivariate multinomial logit models were used to estimate the adjusted relative risk ratios (RRR) of factors that were likely to change loneliness. Multivariate models were estimated after merging data from the baseline and follow-up assessments of the THRS surveys, accounting for sampling weights and clustering in the survey design.

Multinomial logistic regression is an extension of binomial logistic regression with more than two categories of categorical outcomes. Although the interpretation of multinomial logistic regression is similar to binomial logistic regression, the estimation procedure is not equivalent. In binomial logistic regression, the odds of being in a particular category versus not being in that category are predicted and conditional to the other categories.

In the multivariate models, we assessed changes in loneliness with a categorical indicator that distinguished feelings of loneliness conducted in baseline and follow-up assessments. To be specific, there were four categories: (1) remaining not lonely at two-time points, (2) becoming not lonely, (3) becoming lonely, and (4) remaining lonely at two-time points. We also stratified the analyses by birth cohort to test for

potential differences in different birth cohorts. Missing data in the regression models were subject to leastwise deletion. Variables used in the multivariate multinomial logit models may be highly correlated. We employed analyses of the variance inflation factor (VIF) to assess multicollinearity. VIFs less than 4 were not considered as a multicollinearity concern. All models were estimated separately for females and males using SAS software version 9.4 (SAS Institute, Cary, NC, USA).

## 3. Results

Table 1 presents the characteristics of the participants in the two birth cohorts. Many differences were observed between the Baby Boomer and pre-boomer cohorts, including sociodemographic factors, retirement plans, volunteer work, and caregiving. The two primary study variables: work-family conflict before retirement and social contacts after retirement, were also significantly different between the birth cohorts. Compared with the pre-Boomer cohort, a higher portion of the Baby Boomers graduated from high school and above (76.6% vs. 57.5%), reported having a retirement plan (38.4% vs. 26.4%), and was involved in volunteer work (34.5% vs. 29.7%). In addition, the average score of work-family conflict was higher among baby boomers than pre-Boomers.

Changes in loneliness were categorized into four groups: remaining not lonely, becoming not lonely, becoming lonely, and remaining lonely.

**Table 1**  
Baseline information of the retired sample by birth cohort (n = 2370).

Variables in baseline	Total (n = 2370)		Baby Boomers (n = 1155)		Pre-Boomers (n = 1215)		p value
	n	%	n	%	n	%	
Gender							<.001
Male	1283	54.1	568	49.2	715	58.8	
Female	1087	45.9	587	50.8	500	41.2	
Age [mean (SD); range: 50–74]	64.62	(5.49)	60.02	(3.29)	68.99	(3.03)	<.001
Education							<.001
Elementary or below	786	33.2	270	23.4	516	42.5	
High school	1173	49.5	653	56.6	520	42.8	
College and above	409	17.3	231	20.0	178	14.7	
Marital status							<.001
Currently married	1935	81.7	971	84.1	964	79.4	
Widowed	236	10.0	67	5.8	169	13.9	
Never married/separated/divorced	198	8.4	117	10.1	81	6.7	
Major occupation before retirement							.031
Non-technical	525	22.3	230	20.0	295	24.5	
Technical	1285	54.5	646	56.0	639	53.0	
Professional	549	23.3	277	24.0	272	22.6	
Time since retirement							<.001
Less than 5 years	952	40.7	650	57.1	302	25.2	
5–9.99 years	542	23.2	256	22.5	286	23.9	
10 years and more	844	36.1	233	20.5	611	51.0	
Life events in baseline							.627
0	1861	78.5	907	78.5	954	78.5	
1	421	17.8	201	17.4	220	18.1	
2 and more	88	3.7	47	4.1	41	3.4	
Living alone	127	5.4	54	4.7	73	6.0	.150
Had a retirement plan	764	32.2	443	38.4	321	26.4	<.001
Volunteer work after retirement	759	32.0	398	34.5	361	29.7	.013
Caregiving in child care	567	23.9	253	21.9	314	25.8	.025
Self-rated health	2370	3.35 (0.87)	1155	3.40 (0.85)	1215	3.31 (0.89)	.009
[mean (SD); range: 1–5]							
Work-family conflict before retirement	2325	2.25 (0.87)	1133	2.34 (0.85)	1192	2.17 (0.89)	<.001
[mean (SD); range: 1–5]							
Social contacts after retirement	2362	7.07 (3.76)	1148	6.97 (3.76)	1214	7.18 (3.76)	.181
[mean (SD); range: 0–11]							
<b>Changes in loneliness, 2015–2019</b>							<b>.003</b>
Remain not lonely	1582	66.8	793	68.7	789	64.9	
Becoming not lonely	250	10.6	136	11.8	114	9.4	
Becoming lonely	331	14.0	140	12.1	191	15.7	
Remaining lonely	207	8.7	86	7.5	121	10.0	

Percentages and means are weighted. Percentages may not sum to 100 owing to rounding.

Chi-square tests were used for testing the significance of categorical variables and t-tests for continuous variables by birth cohort.

\*Baby Boomers: born 1951–1965, age 50–64; Pre-Boomers: born 1941–1950, age 65–74.

About two-thirds of the retirees (68.7% of Baby Boomers and 64.9% of pre-Boomers) remained not lonely, and loneliness persisted for less than 10% of retirees in both cohorts. Noticeably, approximately one-seventh of retirees (12.1% of Baby Boomers and 15.7% of pre-Boomers) reported they were becoming lonely, and about 10% transitioned from being lonely to not lonely. Regarding the changes in loneliness by gender (see Supplement Table S5), men were more likely to remain not lonely (72.5% vs. 64.9% in Baby Boomers and 68.0% vs. 60.6% in pre-Boomers). In contrast, women were more likely to become lonely (14.0% vs. 10.2% in Baby Boomers and 19.0% vs. 13.4% in pre-Boomers) and maintain feelings of loneliness (8.9% vs. 6.0% in Baby Boomers and 12.0% vs. 8.5% in pre-Boomers, respectively).

We have summarized the individual characteristics and work-related factors stratified by the four groups to present the changes in loneliness in the Baby Boomer (Table 2) and pre-Boomer cohorts (Table 3). Results show that gender, spousal status, life events, living alone, work-family conflict before retirement, and social contacts after retirement were significant factors related to the differences among the four groups in both cohorts. However, the level of education, primary occupation before retirement, retirement plan, and involvement in volunteer work after retirement were contributing factors only in the pre-Boomer cohort.

Finally, multinomial logit models with cohort stratification were used to examine the differences between the Baby Boomers and pre-Boomers. Table 4 presents the effects of life stressors and social engagement on the four categories. For the Baby Boomers, results show they were more likely to be in the group of remaining lonely if they experienced greater work-family conflict before retirement (RRR = 1.52;  $p < .01$ ) compared with being in the group of remaining not lonely (reference group). As expected, an increase in social contacts was a protective factor for being in the groups of remaining lonely (RRR = 0.84;  $p < .001$ ) and becoming lonely (RRR = 0.91;  $p < .001$ ) compared with being in the reference group. Similarly, the pre-Boomers who experienced work-family conflict before retirement had higher odds of being in the group of remaining lonely (RRR = 1.45), and social contacts also appeared to be a protective factor from being in the group of remaining lonely (RRR = 0.86;  $p < .001$ ) compared with the reference group.

Noticeably, compared to the group of remaining not lonely, an increase in stressful life events was found to be higher odds of being in the groups of remaining and becoming lonely in the pre-Boomer cohort. Unlike Baby Boomers, pre-Boomers with technical jobs had lower odds of being in the group of remaining lonely (RRR = 0.46;  $p < .05$ ) and becoming lonely (RRR = 0.64;  $p < .05$ ) compared with the reference group with non-technical jobs. As expected, good health was a protective factor for being in the group that remained lonely for both cohorts. However, unexpectedly, living without a spouse/partner at baseline (RRR = 1.92;  $p < .05$ ) was associated with being in the group of becoming not lonely in both cohorts compared with the reference group. In addition, living alone was a risk factor for being in the group of becoming lonely only among Baby Boomers, and caregiving for children was associated with lower odds of being in the group who remained lonely also among Baby Boomers but not pre-Boomers.

Regarding gender differences (see Supplement Table S6), similar to before, work-family conflict before retirement was a risk factor for being in the group of remaining lonely and social contacts after retirement was a protector for both genders. However, stressful life events were only associated with becoming or remaining lonely in females (RRR = 1.52 and 1.95, respectively). Noticeably, some covariates had different effects on gender. For example, male retirees with higher occupational positions (technical or professional jobs) had significantly lower odds of being in the group of remaining lonely. Female retirees with higher educational attainment or retirement plans were less likely to be in the group of remaining lonely. Time since retirement and living alone were associated with higher odds of being in the group of becoming lonely in male retirees.

**Table 2**  
Bivariate analysis for factors associated with the changes in loneliness in Baby Boomers<sup>a</sup>.

Variables in baseline	Remaining not lonely (n = 793) %	Becoming not lonely (n = 136) %	Becoming lonely (n = 140) %	Remaining lonely (n = 86) %	p value
Gender					<b>.026</b>
Male	72.5	11.3	10.2	6.0	
Female	64.9	12.3	14.0	8.9	
Age [mean (SD); range: 50–64]	60.11 (3.28)	59.84 (3.37)	59.86 (3.18)	59.71 (3.48)	.559
Education					.168
Elementary or below	65.6	11.5	12.2	10.7	
High school	71.2	11.3	11.2	6.3	
College and above	64.9	13.4	14.7	6.9	
Spouse/partner					<b>&lt;.001</b>
Yes	71.2	10.8	12.1	6.0	
No	55.4	16.9	12.5	15.2	
Major occupation before retirement					.106
Non-technical	62.2	13.5	14.8	9.6	
Technical	72.0	10.2	10.7	7.1	
Professional	66.1	14.1	13.4	6.5	
Time since retirement					.639
<5 years	69.1	12.0	12.5	6.5	
5–9.99 years	70.7	10.9	9.8	8.6	
10 years and more	65.2	12.5	13.7	8.6	
Life events in baseline					<b>&lt;.001</b>
0	71.8	9.3	12.2	6.7	
1 and more	57.3	21.0	11.7	10.1	
Living alone					.012
Yes	50.0	14.8	24.1	11.1	
No	69.6	11.6	11.5	7.3	
Having a retirement plan					.168
Yes	71.6	12.2	9.9	6.3	
No	66.9	11.5	13.5	8.2	
Volunteer work after retirement					.078
Yes	73.4	9.8	11.1	5.8	
No	66.2	12.8	12.7	8.3	
Caregiving in child care					.146
Yes	73.9	10.7	10.7	4.7	
No	67.2	12.1	12.5	8.2	
Self-rated health [mean (SD); range: 1–5]	3.49 (0.82)	3.22 (0.95)	3.28 (0.81)	3.00 (0.77)	<b>&lt;.001</b>
Work-family conflict before retirement [mean (SD); range: 1–5]	2.28 (0.84)	2.65 (0.78)	2.27 (0.90)	2.55 (0.84)	<b>&lt;.001</b>
Social contacts after retirement [mean (SD); range: 0–11]	7.51 (3.68)	6.01 (3.65)	6.06 (3.75)	4.96 (3.43)	<b>&lt;.001</b>

Percentages and means are weighted. Percentages may not sum to 100 owing to rounding.

Chi-square tests were used for testing the significance of categorical variables and t-tests for continuous variables by birth cohort.

<sup>a</sup> Baby Boomers: born 1951–1965, age 50–64; Pre-Boomers: born 1941–1950, age 65–74.

#### 4. Discussion

This study used a cohort sample of retirees to investigate the effects of work-family conflict before retirement and social engagement after retirement on the changes in loneliness after retirement while simultaneously taking stressful life events and socioeconomic status into consideration. We found that work-family conflict before retirement was significantly associated with being in the group of remaining lonely after retirement when birth cohort and gender were analyzed. In contrast, social engagement after retirement, in particular social contacts, was found to serve as a protective factor that decreased the risks of being in the group of remaining lonely for both cohorts and genders.

Also, our analysis illustrated some cohort differences: being employed with a non-technical rather than technical occupation and living alone were risk factors for being in the group of remaining feelings of loneliness for pre-Boomers. In contrast, living without a spouse/partner was a risk factor for being in the group of remaining lonely only in Baby Boomers, and providing care for children appeared could reduce the risk of being in such a group as well in Baby Boomers. However, volunteer work after retirement did not affect changes in feelings of loneliness among Taiwanese retirees.

Using a large cohort of retirees from Taiwan, the results of this study support the stress process model (Pearlin, 1989; Pearlin et al., 2005). We found a significant effect of work-family conflict before retirement on increased feelings of loneliness for pre-Boomers and Baby boomers. Moreover, our results substantiate the stress process model, indicating that a stressful life event would harm mental health and result in feelings of loneliness (Pearlin, 1989; Pearlin et al., 2005). As the stress process model suggests, individuals may suffer from mental health problems due to stressful life events, and their social and demographic status may shape such an effect. Our findings demonstrated that experiencing a stressful personal event was associated with a higher likelihood of being in the group of becoming and remaining lonely for women.

In addition, our analyses indicated that primary occupation before retirement was significantly associated with changes in loneliness after retirement in the pre-Boomer cohort, which shows that working in a technical and professional occupation appears to be a psychosocial advantage for this cohort group. As interpreted by the stress process model (Pearlin, 1989; Pearlin et al., 2005), primary occupation represents socioeconomic status, and advantaged groups are less likely to suffer from mental health problems, including feelings of loneliness for pre-Boomers, as consistent with prior research (Allen et al., 2020; Shin et al., 2020).

Another important empirical finding is the significant but mixed effect of family characteristics across cohorts. For example, the differences in remaining lonely between the two birth cohorts could be explained by different risk factors. Stressful life events and living alone were more likely to show significant associations with pre-Boomers than Baby Boomers, even after controlling for other covariates. In contrast, no spouse and caregiving for children were associated with increased and decreased risks of retaining feelings of loneliness for Baby Boomers. These findings may partly be because the social status of Baby Boomers represents not only their abilities but also their social expectations regarding family ties (Dykstra, 2009). Given the decline in fertility and the changing family structure in the 1980s, the Baby Boomer cohort might have become much more likely to be psychologically rewarded by having a family role. The findings of this study underscore the importance of cohort context when trying to understand the effects of family across different generations (Deaton & Paxson, 2000; Frey, 2010; Percheski, 2008). Future studies on this issue are necessary, and they should be cohort sensitive.

**Table 3**  
Bivariate analysis for factors associated with the changes in loneliness in Pre-Boomers<sup>a</sup>.

Variables in baseline	Remaining not lonely (n = 789) %	Becoming not lonely (n = 114) %	Becoming lonely (n = 191) %	Remaining lonely (n = 121) %	p value
Gender					<b>.005</b>
Male	68.0	10.1	13.4	8.5	
Female	60.6	8.4	19.0	12.0	
Age [mean (SD); range: 65–74]	69.83 (2.99)	69.46 (3.04)	69.20 (3.07)	69.30 (3.19)	.073
Education					<b>&lt;.001</b>
Elementary or below	58.9	9.3	17.6	14.2	
High school	69.2	8.3	15.0	7.5	
College and above	69.7	12.9	12.4	5.1	
Spouse/partner					<b>&lt;.001</b>
Yes	68.2	8.2	15.7	8.0	
No	52.4	14.0	16.0	17.6	
Major occupation before retirement					<b>&lt;.001</b>
Non-technical	52.5	10.5	19.7	17.3	
Technical	68.7	7.5	15.7	8.1	
Professional	69.9	12.5	11.4	6.3	
Time since retirement					<b>.050</b>
<5 years	71.2	7.3	14.6	7.0	
5–9.99 years	67.8	9.1	13.6	9.4	
10 years and more	60.7	10.3	17.2	11.8	
Life events in baseline					<b>.002</b>
0	67.7	8.5	14.5	9.3	
1 and more	54.8	12.6	20.3	12.3	
Living alone					<b>&lt;.001</b>
Yes	43.8	16.4	17.8	21.9	
No	66.3	8.9	15.6	9.2	
Having a retirement plan					<b>.013</b>
Yes	70.1	10.0	14.3	5.6	
No	63.1	9.2	16.2	11.5	
Volunteer work after retirement					<b>.003</b>
Yes	71.5	9.1	13.6	5.8	
No	62.2	9.5	16.6	11.7	
Caregiving in child care					.613
Yes	67.5	8.0	15.6	8.9	
No	64.0	9.9	15.8	10.3	
Self-rated health	3.42	3.12	3.23	2.86	<b>&lt;.001</b>
[mean (SD); range: 1–5]	(0.85)	(0.96)	(0.88)	(0.89)	
Work-family conflict before retirement	2.09	2.49	2.20	2.35	<b>&lt;.001</b>
[mean (SD); range: 1–5]	(0.85)	(0.94)	(0.94)	(0.87)	
Social contacts after retirement	7.69	5.92	7.13	5.04	<b>&lt;.001</b>
[mean (SD); range: 0–11]	(3.67)	(3.68)	(3.70)	(3.53)	

Percentages and means are weighted. Percentages may not sum to 100 owing to rounding.

Chi-square tests were used for testing the significance of categorical variables and t-tests for continuous variables by birth cohort.

<sup>a</sup> Baby Boomers: born 1951–1965, age 50–64; Pre-Boomers: born 1941–1950, age 65–74.

We also analyzed male and female retirees separately because of the gender differences suggested by a wide range of existing literature (Hansen & Slagsvold, 2016; Igbokwe et al., 2020). Results showed gender differences in which female Baby Boomers were more likely to become lonely than males. This finding suggests that socialization for two distinct genders affects the development of loneliness through the individual's inherent social qualities, specific developmental measures, family experiences, and social environment (Hansen & Slagsvold, 2016; Igbokwe et al., 2020). Another explanation for gender differences comes from the process of social stratification. Given that living alone is associated with becoming lonely in males, such a gender difference is associated with the role of women in the family context. These contexts are composed of various internal arrangements and social constraints. In summary, female baby boomers in Taiwanese society may be particularly vulnerable to loneliness due to the lack of family support after retirement; thus, more work is needed to explain this relationship.

Regarding volunteer work after retirement, unexpectedly, our results showed that it did not significantly affect loneliness in both cohorts and genders, which is inconsistent with previous research (Lee, 2021). Compared with the Taiwan Longitudinal Study on Aging (TLSA) in 2015 (Health Promotion Administration Ministry of Health and Welfare, 2018), conducted in the same year as our study, the number of volunteers was much lower in the general population (15.6–19.2% of Baby Boomers and 17.8% of pre-Boomers) because about half of the people were still employed. However, our study sample included all retired people with plenty of time and skills, motivating them to volunteer

(34.5% and 29.7% with volunteer experiences, respectively). As a result, more than 70% of those who did volunteer work after retirement remained not being lonely. However, the effects of volunteering were explained by other factors in the multinomial logit models, regardless of the birth cohort.

#### 4.1. Strengths and limitations

This is the first study using a nationwide sample of retirees to explore cohort differences in the aforementioned association by stratifying baby boomers and pre-boomers in a non-Western society with distinct cultural and family contexts. Also, this study detected work characteristics, life stressors, and all related factors simultaneously acting on the changes in feelings of loneliness. Moreover, unlike past cross-sectional studies, the present study used a follow-up dataset to explore the associations between work and life stressors before retirement and the changes in loneliness after retirement, which reveal temporal relationships.

However, this study is not without its limitations. First, the THRS dataset is based on self-reports of loneliness and stressor variables, which would inherently raise the issue of recall bias, especially among older adults. However, the THRS was conducted using face-to-face interviews with items to help verify their authenticity. Second, the final sample size for analysis accounted for only 75.5% of the original survey. Although the study sample did not suffer from a severe health-selection effect and social class disparity, the feelings of loneliness at baseline were significantly higher in the retained sample than in the dropout group, which might affect the inference of our findings.

Third, we limited the scope of the study to compare the feelings of loneliness between pre-Boomer and Baby Boomer groups to highlight the significant effects of the rapid social changes after World War II in Taiwan. As these two cohort groups consist of multiple birth years,

**Table 4**  
Multinomial logit models for the changes in the loneliness of the retirees by birth cohort<sup>a</sup>.

Variables in baseline	Baby Boomers (n = 1155)			Pre-Boomers (n = 1215)		
	Becoming not lonely (n = 133)	Becoming lonely (n = 138)	Remaining lonely (n = 86)	Becoming not lonely (n = 114)	Becoming lonely (n = 191)	Remaining lonely (n = 121)
	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)
<b>Life stressors</b>						
Work-family conflict before retirement	<b>1.60 (1.27, 2.00)***</b>	0.99 (0.79, 1.25)	<b>1.52 (1.15, 2.02)**</b>	<b>1.60 (1.26, 2.02)***</b>	1.19 (0.98, 1.44)	<b>1.45 (1.15, 1.83)**</b>
Stressful life events in baseline (ref = No) 1 and more	<b>2.66 (1.74, 4.08)***</b>	1.14 (0.71, 1.84)	1.49 (0.85, 2.63)	<b>1.88 (1.16, 3.06)*</b>	<b>1.79 (1.20, 2.66)**</b>	<b>1.67 (1.01, 2.74)*</b>
<b>Social engagement</b>						
Social contacts after retirement	<b>0.91 (0.86, 0.96)***</b>	<b>0.91 (0.86, 0.95)***</b>	<b>0.84 (0.78, 0.90)***</b>	<b>0.88 (0.83, 0.94)***</b>	0.98 (0.94, 1.03)	<b>0.86 (0.81, 0.91)***</b>
Volunteer work after retirement (ref = No)	0.83 (0.53, 1.29)	0.86 (0.57, 1.32)	0.91 (0.52, 1.60)	1.15 (0.70, 1.87)	0.78 (0.53, 1.15)	0.75 (0.44, 1.30)
<b>Work-related characteristics</b>						
Occupation before retirement (ref = Non-tech.)						
Technical	0.77 (0.44, 1.32)	0.65 (0.40, 1.07)	0.71 (0.38, 1.33)	0.61 (0.35, 1.05)	<b>0.64 (0.42, 0.96)*</b>	<b>0.46 (0.28, 0.75)**</b>
Professional	1.39 (0.68, 2.85)	0.95 (0.48, 1.89)	1.08 (0.44, 2.66)	1.09 (0.53, 2.25)	<b>0.48 (0.26, 0.89)*</b>	0.56 (0.26, 1.22)
Having a retirement plan (ref = No)	0.95 (0.63, 1.44)	0.72 (0.48, 1.10)	0.93 (0.55, 1.58)	0.91 (0.55, 1.51)	0.75 (0.50, 1.14)	0.59 (0.32, 1.09)
Time since retirement (ref: <5 years)						
5–9.99 years	0.91 (0.56, 1.49)	0.83 (0.51, 1.37)	1.36 (0.76, 2.44)	1.32 (0.69, 2.51)	1.03 (0.63, 1.69)	1.39 (0.73, 2.66)
10 years and more	1.06 (0.64, 1.74)	1.12 (0.70, 1.80)	1.45 (0.78, 2.70)	1.62 (0.93, 2.84)	1.51 (0.99, 2.28)	<b>1.92 (1.09, 3.39)*</b>
<b>Covariates</b>						
Female (ref = Male)	1.02 (0.68, 1.53)	<b>1.61 (1.09, 2.40)*</b>	1.39 (0.83, 2.33)	0.65 (0.40, 1.06)	1.36 (0.95, 1.96)	0.92 (0.57, 1.48)
Education attainment (years)	0.96 (0.66, 1.41)	1.31 (0.91, 1.89)	0.88 (0.55, 1.40)	0.98 (0.67, 1.44)	0.94 (0.69, 1.28)	0.74 (0.49, 1.11)
No spouse/partner (ref = Yes)	<b>1.92 (1.13, 3.27)*</b>	0.77 (0.41, 1.44)	<b>2.54 (1.41, 4.60)**</b>	<b>2.22 (1.27, 3.89)**</b>	0.96 (0.59, 1.56)	1.72 (0.99, 2.99)
Living alone (ref = No)	1.26 (0.50, 3.19)	<b>3.25 (1.38, 7.67)**</b>	0.88 (0.29, 2.64)	2.01 (0.86, 4.69)	1.77 (0.82, 3.82)	<b>2.97 (1.34, 6.56)**</b>
Self-rated health	0.83 (0.65, 1.06)	0.82 (0.64, 1.04)	<b>0.64 (0.47, 0.88)**</b>	0.79 (0.61, 1.01)	0.94 (0.77, 1.15)	<b>0.64 (0.50, 0.82)***</b>
Caregiving in child care (ref = No)	0.82 (0.50, 1.37)	0.83 (0.51, 1.33)	<b>0.49 (0.24, 0.98)*</b>	0.80 (0.48, 1.34)	0.97 (0.66, 1.42)	0.91 (0.55, 1.52)

Note: Y=Changes in the feeling of loneliness (ref = Remaining not lonely); \*p < .05, \*\*p < .01, \*\*\*p < .001.

<sup>a</sup> Baby Boomers: born 1951–1965, age 50–64; Pre-Boomers: born 1941–1950, age 65–74.

future research may need to consider more specific periods because the contextual changes in Taiwan varied considerably, particularly pre and post-1950. Fourth, the baseline and follow-up study design cannot disentangle or establish the causal links suggested herein. However, this theory-based study using the multivariate analytical approach does provide insight. It identifies the independent effect of work characteristics before retirement on the feelings of loneliness among Baby Boomers and pre-Boomers after retirement. Therefore, structural equation modeling (SEM) is further suggested to address such causal relationships in the multivariate framework. Lastly, although this is a follow-up study, it had only two waves of investigation. Thus, there is no suitable method to examine the changes in study variables to predict the changes in outcome variables under temporal relationships. Therefore, further studies are warranted to analyze at least three waves of surveys to explore the relationship between changes in stressful life events and changes in loneliness in the future.

## 5. Conclusions

Despite the limited evidence on retirement populations in Asia, we used longitudinal survey data to examine cohort differences, looking at the association between work characteristics before retirement, life stressors, and changes in loneliness after retirement among older adults. The findings indicate an association between cohort differences and changes in loneliness, which further underscores that an individual's birth cohort shapes feelings of loneliness according to work characteristics and life stressors.

This study also provides evidence that retired individuals who remained lonely in the two cohort groups were more likely to experience work-family conflict before retirement and life stressors after retirement. In contrast, social contacts appeared to be a protective factor for remaining lonely. These findings are essential to world populations because older people are increasingly becoming burdened with psychological problems (Cacioppo & Cacioppo, 2018). Hence, policymakers should consider cohort differences related to work characteristics and associated social stressors, which are inequitably distributed across socioeconomic strata, when developing programs and interventions to promote the psychological well-being of specifically defined cohorts.

## Ethical statements

This analysis was based on a dataset from Taiwan Health and Retirement Study. However, the interpretation and conclusions contained herein do not represent those of the Health Promotion Administration, Ministry of Health and Welfare, Taiwan.

All methods were performed in accordance with the relevant guidelines and regulations (Declaration of Helsinki). Informed consent was obtained from all participants. The study protocol used secondary data of the THRS and was approved by the Research Ethics Committee of the National Cheng-Kung University, Tainan, Taiwan (IRB Number NCKU HREC-E-106-260-2) and the National Yang Ming Chiao Tung University, Taipei, Taiwan (IRB Number: YM109021E).

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## Availability of data and materials

The data of THRS are not publicly open data. However, data of the current study are available upon reasonable request and with permission from the Health Promotion Administration, Ministry of Health and

Welfare in Taiwan.

## Author contributions

C. Chiao conducted the study and wrote the draft. P.H. Kuo analyzed the data and made tables. D.C. Li helped with the methodology and revised the draft. Finally, S.C. Hu advised the study and completed the manuscript. All authors reviewed the manuscript.

## Consent for publication

Not applicable.

## Declaration statement

No potential conflicts of interest were reported by the authors.

## Declaration of competing interest

The authors report no conflict of interest.

## Data availability

The authors do not have permission to share data.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmph.2022.101264>.

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