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Impact of loneliness on disability-free life expectancy among older adults: A comparative study of France and Japan

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Abstract

Background

Although loneliness is increasingly recognized as a major health risk in later life, its impact as captured through health expectancy indicators remains largely unexplored. This study examines the impact of loneliness on disability-free life expectancy (DFLE) among older adults in France and Japan, two countries with divergent policy approaches to loneliness and distinct demographic dynamics with Japan experiencing population aging quicker than France.

Methods

Data came from two longitudinal surveys of older adults conducted in France (Paquid, n = 3,700, aged 65+; 1988–2017) and Japan (JAHEAD, n = 3,496, aged 60+; 1987–2017). We applied a multi-state life table approach using the Interpolated Markov Chain method (IMaCh software) to estimate disability-free life expectancy (DFLE) according to loneliness (never, occasional, often) treated as time-varying variable. Analyses were stratified by gender for each country.

Results

The prevalence of loneliness (occasional) and (often) at baseline were respectively 16.2% and 13.8% in France and 12.9% and 3.3% in Japan. In both countries, men and women who were often lonely tended to be the most disadvantaged in terms of life expectancy (LE) and DFLE. While in France, the effect of loneliness is strong only for older adults who report feeling often lonely, a gradual pattern was observed in Japan: LE, DFLE, and the proportion of disability-free life declined as levels of loneliness increased. However, irrespective of loneliness status, Japanese older adults could expect to live a greater proportion of their remaining lifetime free of disability than their French counterparts.

Conclusion

This study reveals some major differences between France and Japan in the potential impact of loneliness on health, suggesting that older adults in Japan remain particularly susceptible to the adverse health consequences of loneliness. Cultural, political, and organizational factors may explain such differences. Our findings highlight loneliness as a key determinant of health in later life and inform future strategies for promoting healthy aging across diverse sociocultural and policy contexts.

Contributions to the literature

1. To provide the first comparative estimates of disability-free life expectancy by loneliness levels among older adults in France and Japan, two countries characterized by divergent policy approaches toward loneliness.

2. To demonstrate that the relationship between loneliness and health expectancy is not uniform but shaped by sociocultural and policy contexts, going beyond single-country studies to capture the complexity of loneliness as a health determinant in later life.

3. To inform public health strategies and long-term care policies by providing actionable evidence on loneliness as a key determinant of healthy aging in different sociocultural and policy environments.

Background

Social health is increasingly recognized as a core dimension of overall health, alongside physical and mental health, with loneliness and social connection serving as key indicators (1). Loneliness, in particular, has emerged in the last ten years as a major public health and policy concern worldwide. It can be defined as an unpleasant emotional state that arises when a gap is perceived between an individual's actual social relationships and those they desire (2). Unlike social isolation, which is an objective condition measurable by the number, type, or frequency of social contacts, loneliness reflects a subjective and personal experience. Loneliness is not inherently linked to advanced age, but rather to the negative life changes in later life, such as declining health, the loss of meaningful relationships, and the weakening of social ties (3). Over the last decade, loneliness and social isolation have increasingly been recognized as public health priorities, leading numerous countries to adopt national-level policies and public health interventions aimed at mitigating their health and social consequences, such as the United Kingdom (UK), Japan, New Zealand, and Sweden. The UK was the first country to establish a specific minister dedicated to loneliness in 2018 in order to combat the social and health issues caused by social isolation (4), followed by Japan in 2021.

France and Japan provide important comparative contexts in which to examine health consequences of loneliness in later life, as both countries are experiencing rapid pace of population aging while adopting distinct policy responses to loneliness among older individuals. In France, the devastating 2003 heatwave, which caused thousands of deaths predominantly among older adults, exposed severe social isolation and systemic failures in later-life care (5). This shock played a key role in reshaping public policy on aging and social connectedness, ultimately contributing to the launch of the MONALISA ("*Mobilisation nationale contre l'isolement des âgés*") initiative (6). Nevertheless, despite early awareness and mobilization, France has not yet implemented a structured and sustained national policy specifically dedicated to loneliness. In Japan, concerns over *kodoku shi* (lonely death), heightened after the 1995 Hanshin-Awaji Earthquake (7), intensified with recent increases in the percentage of older adults living alone, changing from 10.7% in 1980 to 31.7% in 2023 (8). In response to the alarming rise in lonely deaths, Japan appointed a Minister of Loneliness and Social Isolation in 2021, reflecting a centralized and institutionalized policy efforts to address loneliness. In 2024, the European Commission and the European Parliament published a report on loneliness in Europe, providing an overview of its prevalence, determinants and consequences across member states, with the aim of supporting evidence-base policy responses (9). At the global level, the WHO established a commission on social connection in 2023, framing loneliness and social isolation as an "urgent threat" to public health.

Several studies have demonstrated the detrimental effects of loneliness on health in later life, including cerebrovascular and cardiovascular health (10), cognitive function (11), mental health (12), and mortality (13). In addition, a few studies have specifically examined the impact of loneliness on disability and functional decline (14, 15), but this relationship remains substantially understudied. This represents a significant gap in the literature, as much of the existing research has focused on specific disease outcomes rather than adopting a more comprehensive approach to health. Yet independence in daily activities is widely recognized as a core indicator of healthy aging and a key determinant of well-being in older populations.

With the recent acceleration of aging worldwide, it has become increasingly important to assess not only the length of life but also the quality of life lived. At the population level, disability-free life expectancy (DFLE) offers a particularly informative measure of overall health. DFLE combines both mortality and morbidity (i.e., disability) into a single composite indicator, estimating the average number of years individuals can expect to live without disability (16). This comprehensive measurement captures the multidimensional nature of health and well-being. A small but growing body of research has examined the role of loneliness in health expectancy measures. Studies from Singapore (17) and China (18), for example, have documented that loneliness is associated with shorter LE and DFLE at older ages. Understanding whether and to what extent loneliness compresses the disability-free period of life in other cultural and institutional contexts has important implications for healthy aging policies worldwide.

Aims

The present study aims to explore how loneliness shapes not only survival but also quality of life, as captured by DFLE through a comparative analysis of France and Japan. Both countries are characterized by high LE and rank among the world's most aged societies. More importantly, they represent contrasting sociocultural and policy contexts. Notably, Japanese mortality began declining only after 1945, accelerating population aging and prompting policy responses from which France may draw useful lessons. Japan exhibits collectivist values and traditionally strong intergenerational ties, whereas France shows more individualistic patterns with greater reliance on formal care systems. Both countries have recognized loneliness as a pressing concern but adopted markedly different policy responses. We hypothesize that, first, loneliness is negatively associated with DFLE in both France and Japan, such that lonely older adults have shorter DFLE compared to their non-lonely counterparts. Our second hypothesis that the magnitude of the association between loneliness and DFLE differs between France and Japan, reflecting variations in social norms, support systems, and policy responses to loneliness.

Methods

Data

This study used two nationally representative population-based cohorts of older individuals in France and Japan: the Personnes Agées QUID (Paquid) cohort for France (19) and the Japanese Aging and Health Dynamics Study (JAHEAD) for Japan (20). Paquid was one of the first French population-based studies investigating the epidemiology of cerebral and functional aging. Starting in 1988, the baseline sample included 3,777 adults aged 65 or older at baseline and followed at home every two-three year by a neuropsychologist. The Paquid study has previously been used in cross-national comparative research with other large longitudinal studies, supporting its external validity (21, 22). For the present analysis, 77 participants were excluded due to missing data on loneliness or health measures at baseline, yielding the final sample size of 3,700. We used 13 waves of the Paquid data from 1988 to 2017, with a follow-up period up to 30 years.

The JAHEAD, previously known as the National Survey of Japanese Elderly (NSJE), started in 1987 and provides a nationally representative sample of non-institutionalized individuals aged 60 years or older at baseline, followed every three years (23). The survey was designed to conduct a comprehensive investigation into the health, lifestyle, and life-course changes of middle-aged and older adults in Japan and was developed to be comparable to the Health and Retirement Survey (HRS) in the United States. To ensure comparability with the French data, we selected participants included at baseline (n = 2,200) in 1987, and added participants recruited in wave 5 (n = 1,657 aged 70 and older in 1999) to align the age structure and follow-up period with the Paquid cohort (aged 71 + in 1999), leading to 3,857 individuals in the JAHEAD sample. After excluding 361 participants from the analysis due to missing data on key variables or attrition, the final sample size was 3,496. A total of up to 9 waves of Japanese data, collected between 1987 and 2017, were analyzed (see Supplementary Fig. 1).

In both surveys, vital status was regularly updated, with precise dates of death being available.

Measurement of Loneliness

Loneliness was assessed using a single item from the Center for Epidemiologic Studies Depression Scale (CES-D) (24) in both surveys, previously used and validated in the Paquid (25) and JAHEAD (26) cohorts. Participants were asked: "How often have you felt lonely during the past week?". In France, across all follow-up waves, four response options were available: *never* (0 days), *occasionally* (1–2 days), *fairly often* (3–5 days), and *frequently or all the time* (> 5 days). In Japan, for waves 1 to 4, three response options were provided: *hardly ever*, *some of the time*, and *most of the time*. From wave 5 and onward (waves 5 to 9), four categories were used: *none* (0 days), *rarely* (1–2 days), *sometimes* (3–4 days), and *frequently* ($\geq$ 5 days). For consistency across waves, Japanese responses from waves 1 to 4 were matched with those from later waves as follows: *hardly ever* was considered equivalent to *none*, *some of the time* to *rarely*, and *most of the time*

to a combination of *sometimes* and *frequently*. Participants in both France and Japan were then categorized into the following three groups: those who never felt lonely (0 days), those who felt lonely occasionally (1–2 days), and those who often felt lonely ($\geq$ 3 days per week).

Measurement of Disability

Disability was defined by basic and instrumental activities of daily living (ADLs and IADLs, respectively). Both ADLs and IADLs are recognized as key indicators of functional status in older adults (27, 28). Both surveys assessed ADLs (difficulty in bathing, dressing, eating, getting in/out of a bed, and toileting) and IADLs (difficulty in shopping, using public transportation, using the telephone, and doing light housework) at each follow-up. Participants were considered as having disability, if they reported a limitation in at least one of the four IADLs or one of the five ADLs, as in the coding scheme proposed by Lawton and Katz (29, 30). Individuals were considered disability-free, if they reported no difficulties in either ADLs or IADLs.

Statistical Analysis

The Interpolated Markov Chain (IMaCh, version 0.99s11) approach was applied to estimate LE, DFLE, and DLE by the three levels of loneliness (i.e., never, occasionally, often). Loneliness was measured at each wave and treated as a time-varying variable. Note that, for time-varying covariates, IMaCh uses the fixed value from the result line to compute expectancies, which influence is discussed in (31, 32) and more detailed later.

IMaCh relies on a continuous-time Markov process assumption, whereby transition probabilities depend only on the current state and age, and not on prior health trajectories. The method accommodates irregular observation intervals by partitioning the time between consecutive interviews into shorter, fixed subintervals and estimating transition probabilities through multinomial logistic regression models. This interpolation procedure allows individuals with unequal follow-up durations or missing intermediate waves to appropriately contribute to the likelihood estimation.

The model considered three states: no disability, disability, and death, with death treated as an absorbing state. Six transition probabilities were estimated: 1) No disability ◊ No disability; 2) No disability ◊ Disability; 3) No disability ◊ Death; 4) Disability ◊ Disability; 5) Disability ◊ No disability; 6) Disability ◊ Death. These transition probabilities were then used in a multistate life table to estimate LE in each disability state (without disability DFLE and with disability DLE) by age and gender for France and Japan separately.

Given the well-established gender-specific differences in disability and mortality (33, 34), analyses were stratified by gender. In fact, loneliness is a subjective measure, and substantial differences often exist between men and women: men tend to be more reluctant than women to talk about health problems, vulnerability, or emotions, reflecting social norms around masculinity and emotional expression (26, 35, 36). Although the Japanese survey included respondents aged 60 and older, we began the estimation of health expectancy at age 65 to ensure comparability with the French data.

Prior research has shown that health expectancy differs by socioeconomic and demographic characteristics, such as educational attainment (37) and marital status (38). To assess the robustness of our findings, we conducted sensitivity analyses by simulating four profiles at age 65 combining educational level and marital status as follows: 1) low education (i.e., primary education or less) and single (i.e., widowed/divorced/never married); 2) low education and partnered (married/couple or cohabiting); 3) higher education and single; 4) higher education and partnered. For each profile, we examined the difference in DFLE at age 65 associated with occasional and often loneliness, relative to the never lonely reference group in each country.

Results

Sample Characteristics

Table 1 presents baseline characteristics for the French and Japanese samples. French participants were more likely to be older, female, less educated, widowed/single, disabled at baseline, and had higher mortality rates over the follow-up period compared with their Japanese counterparts. Loneliness (occasional or frequent) has been reported by 30.0% of the French participants at baseline (16.2% occasionally and 13.8% often lonely) versus 16.1% by the Japanese ones (12.8% occasional and 3.3% often lonely) (Table 1). Supplementary Figure S2 illustrates the prevalence of three levels of loneliness in the two countries for the period between 1987 and 2017. Overall, the prevalence of loneliness ("occasionally" and "often" combined) tended to be higher in France than in Japan during the study period, particularly among the French women.

Table 1
Sample characteristics at baseline for France (1988–2017) and Japan (1987–2017).

Loneliness status	**France**			**Japan**		
	N = 3,700			**N = 3,496**		
	Never	**Occasionally**	**Often**	**Never**	**Occasionally**	**Often**
	N = 2,592 (70.0%)	N = 599 (16.2%)	N = 509 (13.8%)	N = 2,930 (83.8%)	N = 450 (12.9%)	N = 116 (3.3%)
Mean age (Sd)	74.50 (6.7)	76.1 (7.0)	76.4 (7.1)	72.0 (6.8)	72.8 (6.8)	74.8 (6.2)
Female, n (%)	1,301 (50.2)	429 (71.6)	419 (82.3)	1,597 (54.5)	286 (63.6)	85 (73.3)
Low education, n (%)	2,004 (77.3)	469 (78.3)	439 (86.2)	1,733 (59.1)	285 (63.3)	72 (62.1)
Widowed/divorced/single, n (%)	809 (31.2)	386 (64.4)	391 (76.8)	1,047 (35.7)	237 (52.7)	73 (62.9)
Disability (ADL/IADL), n (%)	648 (24.9)	209 (34.9)	211 (41.5)	337 (11.5)	105 (23.3)	45 (38.8)
Total death (1988–2017), n (%)	2,519 (97.2)	577 (96.3)	495 (97.2)	2,271 (77.5)	368 (81.8)	90 (77.6)
Note. Low education refers to less than primary education.						

Estimates of LE, DFLE and DLE

LE and DFLE were estimated between age 65 and 99 by the three levels of loneliness stratified by gender for each country. As presented in Figures S3 (LE) and S4 (DFLE), regardless of gender and country, feelings of loneliness were associated with lower LE and DFLE compared with the never-loneliness group particularly among individuals who often report feeling lonely. However, these differences tended to decrease with age in both countries. Estimated LE and DFLE at ages 65 and 75 are presented in Table 2 (men) and Table 3 (women).

Among French men, occasional loneliness had no impact on LE and DFLE, whereas frequent loneliness was associated with substantial reductions in both LE and DFLE at age 65 (-2.22 years and − 1.91 years, respectively, compared with men who were never lonely) (Table 2). At age 75, no significant differences were observed, except among men reporting frequent loneliness, who had the shortest DFLE (-0.99 years). The pattern among Japanese men differed substantially from that observed in France. In Japan, men experiencing loneliness had shorter LE and DFLE, and a slightly longer DLE, although this latter difference was not statistically significant. Moreover, the more frequent the feeling of loneliness, the

greater its impact on LE and DFLE. For example, at age 65 and compared with the reference group (never lonely), men reporting occasional loneliness had 0.88 fewer years of LE (vs. 1.97 when loneliness was often) and 1.27 fewer years of DFLE (vs.2.04 years among men who reported feeling often lonely).

Table 2
Estimates of life expectancy (LE), disability-free life expectancy (DFLE), life expectancy with disability (DLE), and percentages of life free of disability at ages 65 and 75 by levels of loneliness for France and Japan, men.

	France					Japan				
	Never	**Occasionally**	Δ^1	**Often**	Δ^2	**Never**	**Occasionally**	Δ^1	**Often**	Δ^2
at age 65										
LE	17.27	16.62	-0.65	15.05	-2.22*	17.67	16.79	-0.88	15.7	-1.97*
	[16.64–17.90]	[14.99–18.25]		[13.26–16.83]		[17.17–18.17]	[15.76–17.81]		[14.03–17.36]	
DFLE	12.24	11.78	-0.46	10.33	-1.91*	14.62	13.35	-1.27*	12.58	-2.04*
	[11.72–12.76]	[10.73–12.82]		[9.23–11.43]		[14.14–15.10]	[12.47–14.23]		[11.26–13.90]	
DLE	5.03	4.84	0.19	4.72	-0.31	3.05	3.44	0.39	3.12	0.07
	[4.63–5.50]	[3.99–5.70]		[3.77–5.66]		[2.76–3.33]	[2.88-4.00]		[2.26–3.97]	
at age 75										
LE	10.65	10.99	0.34	9.95	-0.70	10.45	9.66	-0.79	9.08	-1.37*
	[10.32–10.98]	[10.17–11.80]		[9.12–10.77]		[10.13–10.77]	[9.03–10.28]		[8.12–10.05]	
DFLE	5.45	5.47	0.02	4.46	-0.99*	7.52	6.46	-1.06*	6.06	-1.46*
	[5.11–5.79]	[4.88–6.05]		[3.90–5.03]		[7.19–7.86]	[5.84–7.07]		[5.19–6.94]	
DLE	5.20	5.52	0.32	5.48	0.28	2.93	3.20	0.27	3.02	0.09
	[4.89–5.52]	[4.85–6.18]		[4.80–6.17]		[2.68–3.18]	[2.74–3.65]		[2.33–3.71]	

Note: 95% confidence intervals are in parentheses.

Δ^1 Difference in years between occasional and never lonely (reference)

Δ^2 Difference in years between often and never lonely (reference)

* Indicate significant difference

* Indicate nearly significant difference

Among French women, no significant differences were found across loneliness levels in terms of DFLE, although those reporting frequent loneliness tended to show the lowest DFLE (e.g., -1.15 years at age 65 compared with the reference

group) (Table 3). Women who felt occasionally lonely had the longest LE, DFLE, and DLE at both ages 65 and 75. However, none of these differences among French women reached statistical significance, except for the difference in LE between those who were never and occasionally lonely (+ 1.32 years at age 75).

In contrast, substantial health inequalities by levels of loneliness were observed among Japanese women. Individuals who felt lonely (i.e., occasional or often) showed substantially lower LE, DFLE, and higher DLE compared to those who never felt lonely, at both ages 65 and 75. Among Japanese women aged 65, there was a significant difference around 2 years in DFLE between women who were never lonely and those who reported feeling lonely (15.65 years vs. 13.96 years when occasional and 13.72 years when frequent). At age 75, the same pattern was observed.

Table 3
Estimates of life expectancy (LE), disability-free life expectancy (DFLE), life expectancy with disability (DLE), and percentages of life free of disability at ages 65 and 75 by levels of loneliness for France and Japan, women.

	France					Japan				
	Never	**Occasionally**	Δ^1	**Often**	Δ^2	**Never**	**Occasionally**	Δ^1	**Often**	Δ^2
at age 65										
LE	22.08	23.08	0.92	21.52	-0.62	22.15	20.98	-1.17*	20.50	-1.65*
	[21.59–22.57]	[22.16-24.00]		[20.52–22.51]		[21.69–22.61]	[20.20-21.76]		[19.29–21.72]	
DFLE	14.05	14.34	0.33	12.87	-1.15*	15.65	13.96	-1.69*	13.72	-1.93*
	[13.57–14.53]	[13.59–15.08]		[12.10-13.64]		[15.21–16.08]	[13.12–14.79]		[12.48–14.96]	
DLE	8.03	8.74	0.59	8.64	0.54	6.50	7.03	0.53	6.79	0.29
	[7.62–8.43]	[7.98–9.51]		[7.83–9.45]		[6.12–6.88]	[6.27–7.78]		5.57-8.00]	
at age 75										
LE	13.72	14.98	1.32*	13.82	0.12	13.86	12.78	-1.08*	12.66	-1.20*
	[13.39–14.05]	[14.32–15.64]		[13.17–14.47]		[13.51–14.21]	[12.17–13.40]		[11.80-13.52]	
DFLE	6.06	6.38	0.40	5.34	-0.70*	7.77	6.40	-1.37*	6.34	-1.43*
	[5.72–6.39]	[5.81–6.94]		[4.78–5.89]		[7.44–8.10]	[5.75–7.05]		[5.35–7.33]	
DLE	7.67	8.60	0.92	8.48	0.82	6.09	6.38	0.29	6.32	0.23
	[7.35–7.99]	[7.94–9.27]		[7.82–9.14]		[5.76–6.41]	[5.76-7.00]		[5.35–7.28]	

Note: 95% confidence intervals are in parentheses.

Δ^1 Difference in years between occasional and never lonely (reference)

Δ^2 Difference in years between often and never lonely (reference)

* Indicate significant difference

* Indicate nearly significant difference

In terms of proportions of life without disability (Fig. 1), older Japanese individuals could expect to live a greater proportion of their remaining life free of disability than their French counterparts, regardless of loneliness status (approximately 80% versus. 70% in men, and 70% versus. 60% in women at age 65). Among Japanese individuals, no significant differences in the proportion of disability-free life were observed according to loneliness levels, except for women occasionally experiencing loneliness at ages 65 and 75, where the association reached near statistical significance. In contrast, among

French older adults, no significant differences were observed at any level of loneliness, although those reporting frequent loneliness tended to show the lowest percentages of disability-free life.

Sensitivity Analyses

Figure 2 presents the differences in DFLE between the three loneliness groups with the never lonely reference group at age 65 across four sociodemographic profiles (based on education and marital status). In France, for both men and women, the impact of loneliness on DFLE was highly dependent on background socioeconomic characteristics. Among individuals with low education, irrespective of marital status, loneliness had minimal impact on DFLE. However, among highly educated, frequent loneliness in partnered individuals was associated with substantial lower in DFLE (-3.27 years in men and − 3.55 years in women), while occasional loneliness was associated with higher DFLE, although these differences were not statistically significant. In contrast, Japan showed very different findings: Regardless of educational level or marital status, both occasional and frequent loneliness were associated with reduced DFLE, with patterns that were consistent across all profiles and comparable to those observed in the initial analyses.

Discussion

Using two nationally representative surveys of older adults in France and Japan, this study provides the first estimates of gender-specific DFLE according to loneliness status from a comparative perspective. Three key findings stand out from this study. First, men and women who often feel lonely experience the greatest disadvantages in terms of both quantity and quality of life lived as evidenced by lower LE, lower DFLE, and longer DLE. Second, differences in DFLE by loneliness are more pronounced in Japan than in France. Among Japanese men and women, estimates of LE and DFLE (in absolute and relative terms) showed a graded pattern, with those who were often lonely being the most disadvantaged consistently. Third, irrespective of the level of loneliness, Japanese older adults were expected to enjoy higher percentage of life without disability compared to their French counterparts. Even among those who felt often lonely, Japanese older adults generally had more favorable outcomes than those in France.

Our findings confirm that loneliness is a key risk factor for older people's health, adversely affecting quantity and quality of life (17, 18). Our results underscore the importance of considering both the presence and frequency of loneliness, as its health consequences vary by the degree of loneliness experienced: Individuals who often felt lonely during the past week faced the most pronounced disadvantages. The literature suggests that frequent loneliness likely reflects deeper or more chronic social disconnection, which is more detrimental to health and functioning (9, 39). Notably, the findings of this study point to cross-national differences in the health impacts of loneliness. The proportion of individuals reporting loneliness (occasionally or often) was nearly twice as high in France (30.0%) as in Japan (16.1%). Despite this higher prevalence, our findings suggest that loneliness is associated with more severe "health" consequences among older Japanese adults than among their French counterparts, as captured through disability, a comprehensive measure reflecting the multidimensional nature of health. In Japan, health disadvantages appeared even among those who were only occasionally lonely, suggesting a threshold effect: any expression of loneliness, regardless of frequency, was associated with worse outcomes compared to those who were never lonely. In contrast, the pattern among the French population was less consistent, with significant differences observed only among individuals reporting frequent feelings of loneliness.

Several factors may contribute to these cross-national differences. First, cultural and social norms surrounding loneliness differ between the two societies. This is particularly relevant, because subjective assessments of loneliness, which reflects each participant's own interpretation of the concept, can vary across cultural contexts, making cross-national comparisons challenging (9). In Japan, a more collectivist society where social connectedness and group belonging are highly valued, admitting loneliness may be considered socially undesirable (35, 40, 41). Furthermore, research suggests that Japanese respondents often report lower negative emotional self-awareness, due to cultural norms of modesty and emotional restraint (42). Consequently, individuals who acknowledge feeling lonely, even occasionally, may already experience measurable adverse effects on their physical and mental health. Our results support these hypotheses, showing lower self-

reported loneliness in Japan compared with France, but a more severe impact on LE and DFLE. This suggests that, in the Japanese context, individuals are less likely to report loneliness, but when they do, even at an occasional level, it may reflect a more serious underlying condition, with consequently stronger effects on health. Contrariwise, in France, as a more individualistic society, older adults may experience loneliness less as a failure to meet high social expectations and more as a result of a mismatch between the social relationships they desire and the contacts they actually have (35). In such contexts, acknowledging feeling of loneliness may be more socially acceptable and may encompass a broader and more heterogeneous range of experiences. This greater heterogeneity may introduce measurement noise, potentially attenuating observed associations with LE and DFLE, particularly among those who felt occasionally lonely.

In addition to cultural norms, structural and societal transformations play a key role. The traditional living arrangements in Japan used to be multi-generational co-residence, based on the Confucianism concept of filial piety that requires devotion, respect, and care from adult children to their older parents (27). In more recent years, however, the system has largely collapsed due to demographic and socio-cultural shifts in the country, namely declined marriage and birth rates, women's growing participation in the labor force, and ideas of individual autonomy (Sugimoto, 2020). An increasing number of older adults now live either with a spouse or alone, reducing their access to intergenerational support and placing them at heightened risk of loneliness (43). In this context, where intergenerational care remains a deeply embedded cultural expectation, experiencing loneliness may carry an additional burden of social failure, potentially amplifying its psychological and health consequences beyond what is observed in societies where such norms are less prevalent. Conversely, our results imply that, in France, the negative health consequences of loneliness may manifest only once individuals reach relatively high levels of loneliness. Individual rights and personal autonomy are emphasized, in contrast to the collective focus on group belonging observed in Japan, which may shape both the experience and reporting of loneliness. The values of equality and individual rights are deeply embedded in French society as in the four pillars of the Republican spirit (freedom, equality, fraternity, and secularism). More broadly, the absence of significant difference in LE and DFLE between those who felt occasionally and never lonely among French men and women could initially be interpreted as a sign of greater resilience to social adversity. However, when comparing across the two countries, French individuals, regardless of their level of loneliness, showed lower DFLE and spent a greater number of years with disability than their Japanese counterparts.

This suggests that other contextual or structural factors in France may play a more prominent role in shaping functional decline among older adults. Our sensitivity analyses further support this interpretation: among individuals with low education and single status, a sociodemographic profile associated with greater vulnerability, DFLE remained consistently lower in France than in Japan across all loneliness levels. This pattern suggests that, in France, cumulative disadvantages related to socioeconomic position and marital status may already substantially compromise health expectancy, potentially limiting the additional detrimental impact of loneliness. In other words, when individuals are already experiencing multiple sources of adversity, loneliness may not further exacerbate functional health outcomes. In contrast, among more advantaged profiles (highly educated and partnered individuals), where baseline DFLE is higher, frequent loneliness appears to have a more pronounced negative impact, suggesting that loneliness may be particularly detrimental when it occurs in otherwise favorable life circumstances. By contrast, in Japan, no differences were observed by such sociodemographic characteristics.

Although France and Japan differ in terms of their socio-cultural contexts, loneliness emerged as a significant risk of both the length of life and quality of life lived among older individuals. Our results suggest that, regardless of loneliness level, Japanese older adults tend to have better health outcomes than their French counterparts. This finding indicates that Japanese older adults may live in more favorable social circumstances that help buffer the adverse health effects of loneliness. While loneliness is an emerging public health crisis, governments vary in their level of commitment to addressing the problem. With the continued rise in the share of the older population, the Japanese government has implemented various programs and measures designed to foster social integration among older adults, the initiative known as "successful aging." The Silver Human Resource Centers (SHRCs), for instance, provide post-retirement paid employment

opportunities for older individuals, and participation in SHRCs is associated with higher levels of well-being among men, highlighting health benefits of post-retirement work (44). The government also provides assistance in the form of subsidies for group activities, and discounted transportation fees to enhance mobility among older persons (45). Also, the second Monday of September is observed as Respect for the Aged Day, during which communities organize events like communal meals, health examinations, and physical activities for older adults. These efforts and initiatives created opportunities for social integration, which may have contributed to the lower prevalence of loneliness observed among older Japanese adults. These findings point to social integration as a key factor that shapes health and well-being of older adults in Japan. However, our findings suggest that when loneliness does occur, its detrimental health consequences are higher among older Japanese adults compared to their French counterparts.

Contrariwise, France lacks comparable nationwide initiatives specifically targeting social participation and loneliness among older adults. While local programs and senior associations exist, they are often fragmented and less systematically coordinated compared to Japan. Measures facilitating mobility and access to activities (e.g., subsidized transportation or organized community events) are particularly limited, and formal encouragement for post-retirement employment or participation in structured group activities remains minor (46–48). Consequently, older adults, especially those living alone or in rural and socioeconomically disadvantaged areas, may have fewer opportunities for regular social engagement and meaningful activities. This lack of structured opportunities can contribute not only to greater social isolation, but also to accelerated functional decline. Taken together, the findings highlight the need for more coordinated and accelerated policy efforts in France to protect older adults from the risk of experiencing loneliness to foster healthy aging.

Strengths and limitations

The key strengths of this study include the use of two nationally representative longitudinal data, a long follow-up period spanning more than 30 years, and the application of a multistate approach that accounts for health transitions over time. Although the findings advance our understanding of the relationship between health and loneliness, the analyses have several limitations. The first issue is about the data. The two samples excluded institutionalized older adults at baseline. However, as participants who were subsequently institutionalized during follow-up, were retained in the analyses, cross-sectional prevalence at baseline are underestimated but transitions incidences between states are not. And mixed indexes such as DFLE, DLE and LE are weighted with period (or forward) prevalence not cross-sectional prevalence, and depend only on transitions between states (31), we are only missing the moves from institutions to standard households, but they are very few. Also, some discrepancies between the Paquid and JAHEAD data should be noted. While the Paquid survey recruited men and women older than 65 years of age at baseline, JAHEAD included individuals aged 60 and above (participants younger than 65 years represent only 19% of the total sample, N = 674). It is important to acknowledge that these two cohorts are not strictly comparable in this regard: participants in the JAHEAD study who were aged 60 to 64 at baseline are likely, given their younger age, to exhibit lower mortality and potentially different disability trajectories compared to those already aged 65 at enrollment. This difference of mean age at baseline explains why French participants appear, on average, older than their Japanese counterparts in the descriptive statistics. Nevertheless, all estimates were calculated starting from age 65, and results are interpreted by age, ensuring comparability between the two populations. To assess the potential impact of including younger JAHEAD participants, sensitivity analyses were conducting excluding JAHEAD participants younger than 65 years. Results were consistent with those obtained with the full JAHEAD sample (i.e., main analysis), supporting the robustness of our findings. We therefore chose to retain all individuals included in JAHEAD from age 60 in order to preserve statistical power. The timing of interviews also varies between the two surveys. In the French survey, data were collected approximately every two-three year, whereas the Japanese survey had longer intervals, especially between 2012 and 2017 waves. Although the IMaCh program can account for differences in time intervals between interviews, one should note the difference in survey design but not in the validity of the results. The two datasets used in our analysis, however, have been widely used to study the health of older individuals in France and Japan, confirming both the quality of the data and the validity of this comparative analysis.

The second limitation concerns the measurement of loneliness. This study focused only on a single-item question from the CESD-scale to assess levels of loneliness. Although this direct measurement has been employed in large-scale surveys, evidence suggests that it is subject to underreporting due to the social stigma associated with admitting loneliness (49). However, a large European survey assessed the validity and reliability of single-item measures by comparing them to multidimensional scales, such as the De Jong Gierveld loneliness scale (50) and the UCLA loneliness scale (51). The results revealed moderate to strong correlations, although they may reflect somewhat different dimensions of loneliness (9). In addition, both studies used the same assessment tool, ensuring comparability between France and Japan.

Third, there are issues about our disability measures. Disability in this study was assessed through difficulties in ADLs/IADLs. Prior research has noted that these indicators can be influenced by individuals' physical and social environments (52). However, to ensure comparability across the French and Japanese data, analyses were restricted to the four IADL items available in both surveys, out of the eight originally included in the Paquid study. Nevertheless, a previous study using the Paquid data demonstrated that the earliest losses occur in IADL (shopping, transportation, finances) at the partial limitation level, followed by overlapping IADL and ADL losses, with bathing and dressing being the earliest ADL declines (53). This supports the notion that restricting our analysis to these four items is unlikely to materially affect the results.

Finally, in IMaCh, time-varying covariates are incorporated into the estimation of transition intensities, with values updated at each wave and assumed constant between observation times (31, 32). Let us remember that transition intensities in a multinomial logistic model are estimated from cases observed at a specific date in a specific health state *i* and observed in health state *j* at next wave. By adding a covariate, such as education, the maximum likelihood process is able to detect the change in the various probabilities to move between state *i* and *j*, and finally the total changes in DFLE, DLE and LE over the entire life. With time-varying covariates, such as loneliness, an individual's feeling of loneliness may change during follow up, and the effect on the maximum likelihood estimate will not be as strong as if the individual's loneliness level had remained stable. Furthermore, when computing DFLE, DLE and LE according to loneliness level, the observed differences are calculated as if the loneliness level were constant throughout the entire life; however, since these differences are attenuated by changes in loneliness over time, the results are likely closer to the reality of the observed longitudinal trajectories.

Conclusion

This study offers the first longitudinal evidence of the association between loneliness and health expectancy among older adults in France and Japan, two rapidly aging countries that markedly differ in their policy approaches to loneliness. Our results reveal distinct cross-national patterns in how loneliness relates to health, suggesting that older adults in Japan remain particularly susceptible to lower health expectancy linked to loneliness: feeling of loneliness, whether occasional or frequent, is associated with significantly lower DFLE relative to non-lonely individuals, unlike in France, where this association is only observed for chronic loneliness. By documenting these differences, the present study advances our understanding of how loneliness relates to health trajectories among older adults living in divergent sociocultural and policy contexts. The findings underscore the importance of developing comprehensive policy initiatives aimed at addressing loneliness among aging populations in a worldwide context where healthy aging is a priority.

Abbreviations

***ADL**: Activities of Daily Living*

***DFLE**: Disability-free life expectancy*

***DLE**: Life expectancy with disability*

***IADL**: Instrumental Activities of Daily Living*

***IMaCh**: Interpolated Markov Chain*

***JAHEAD**: Japanese Aging and Health Dynamics*

***LE**: Life expectancy*

***PAQUID**: Personnes Âgées QUID*

Declarations

Ethical approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki. Each cohort obtained approval from an ethics committee (of the University Hospital of (Bordeaux) for Paquid and of the Tokyo Metropolitan Geriatric Hospital and Institute of Gerontology for JAHEAD). All participants were informed about the purpose of the study, assured of confidentiality, and provided their written and informed consent prior to participation.

Competing Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Author Contribution

YS planned the study, performed all statistical analyses, and wrote the paper. YM supervised the data analysis and contributed to drafting and revising the paper. JMR, NB, TO, and KP helped to plan the study and supervised the work.

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Not applicable.

Data Availability

The Paquid cohort data are available upon reasonable request to the study coordinators at the Bordeaux Population Health Research Center (please contact Dr Catherine Helmer, catherine.helmer@u-bordeaux.fr). Data access is subject to approval

of the request and signature of a data-use agreement.The JAHEAD data are available upon request from the Social Science Japan Data Archive, the University of Tokyo.

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Figures

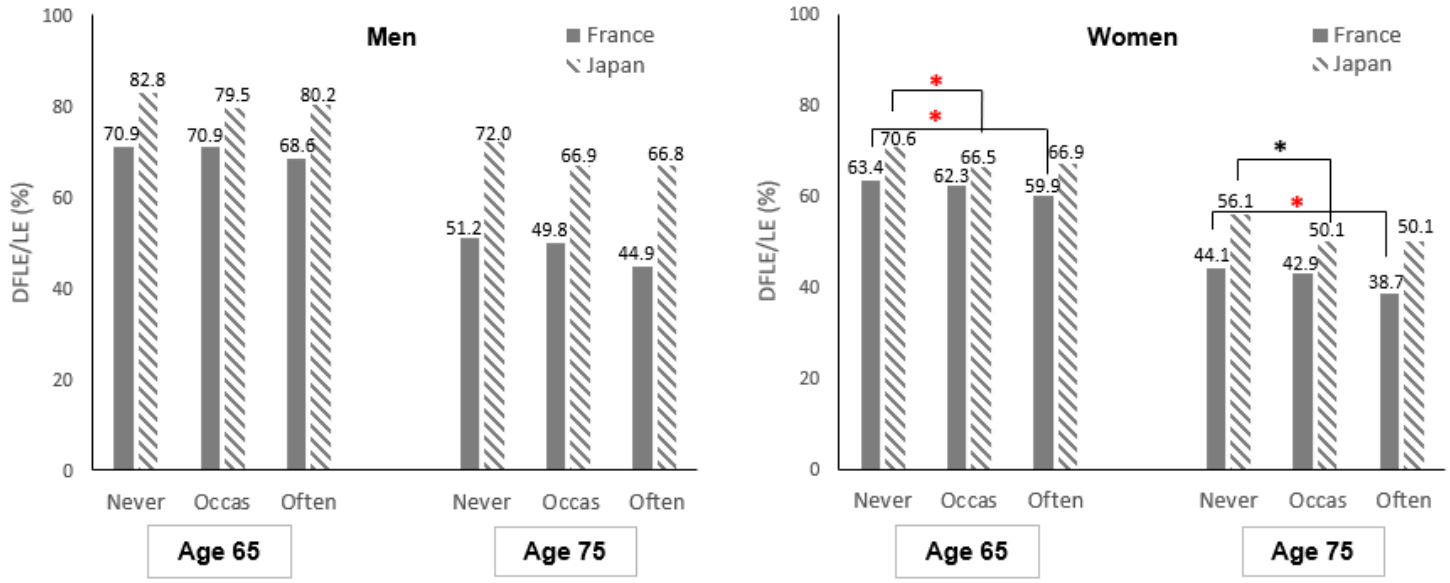


Figure 1

Percentages of disability-free life (DFLE/LE) at ages 65 and 75 by levels of loneliness for France and Japan, separately by gender.

Note: * Indicate significant difference

* Indicate nearly significant difference

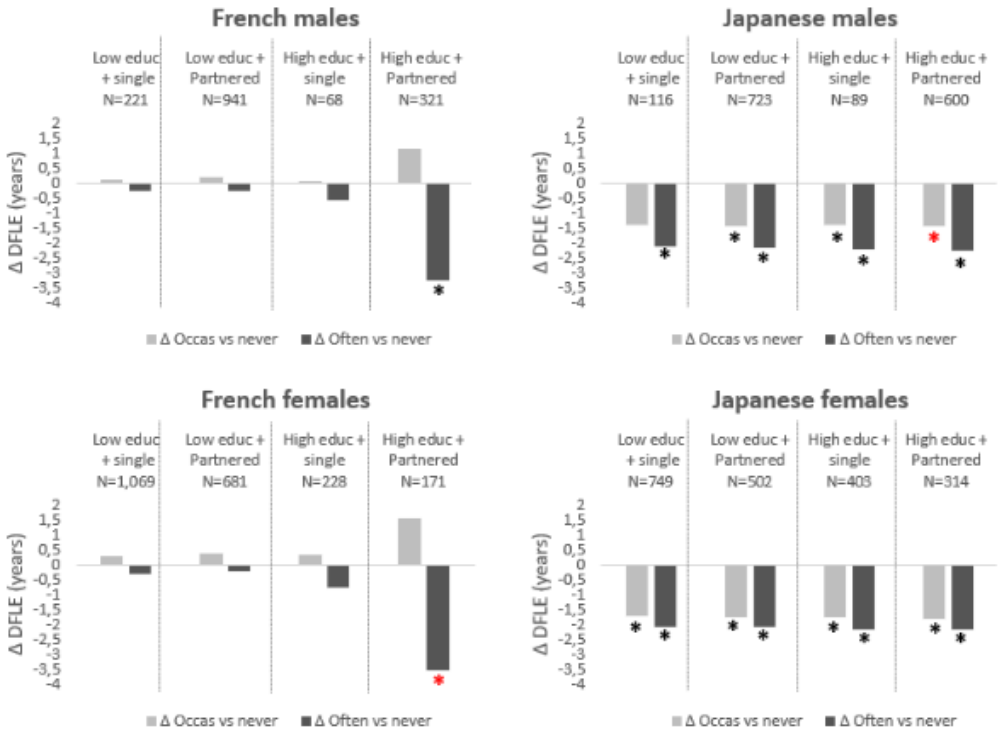


Figure 2

Difference in disability-free life expectancy (DFLE) (years) compared to those never experiencing loneliness for France and Japan, by gender at age 65, stratified by combined profiles of educational level and marital status.

Note: * Indicate significant difference

* Indicate nearly significant difference

Low education = primary education or less; High education = above primary education

Single = divorced/widowed/never married; Partnered = married/cohabiting.

Supplementary Files

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