



Press Release No: (By the PR Office)

Published date (By the PR Office)

Kyoto University

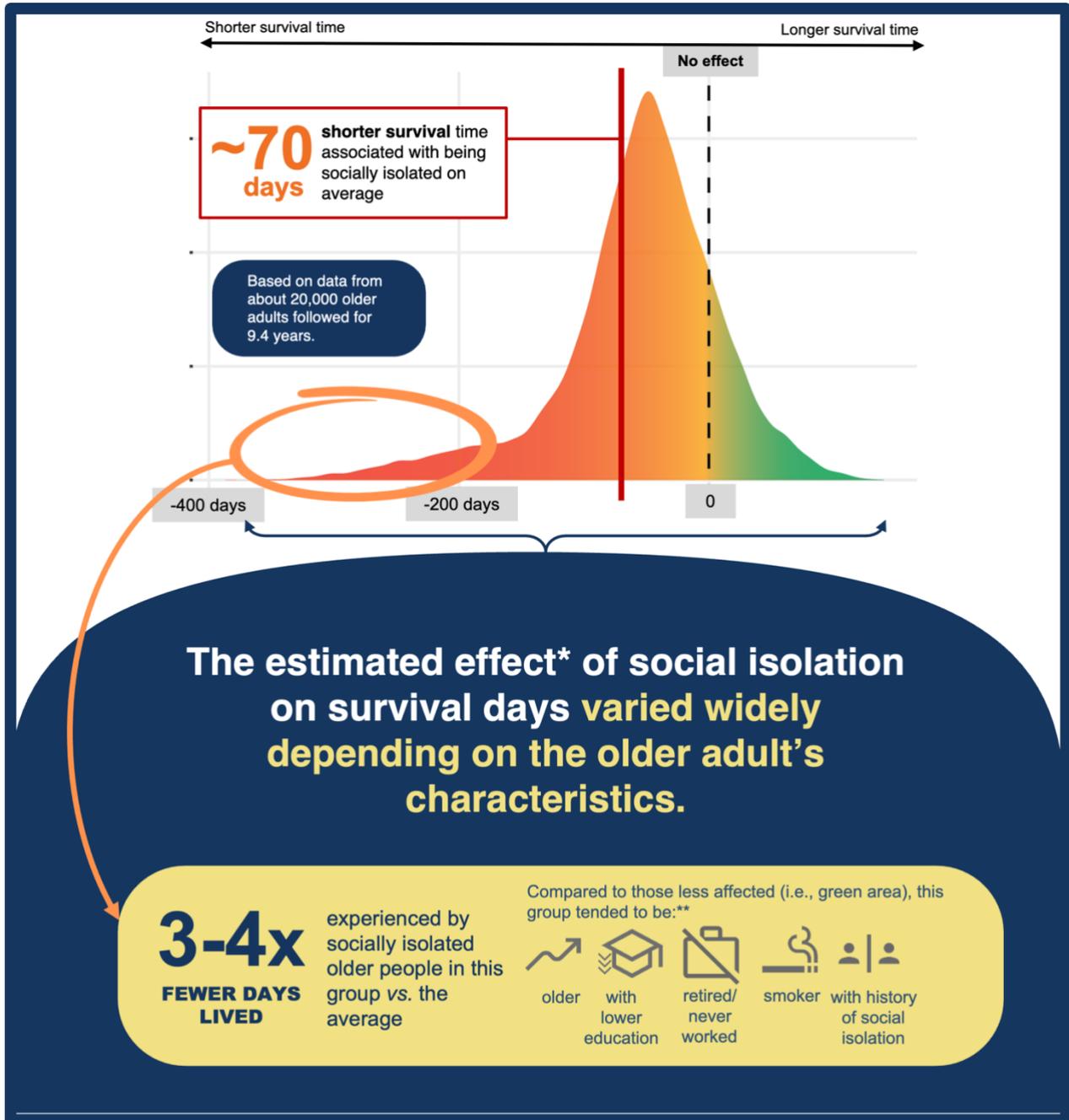


## Social isolation links with deaths:

### The links are stronger among those who were older, men, and had lower education: Machine-learning analysis reveals

A research group led by Professor Naoki Kondo and doctoral student Rom Lunar of the Graduate School of Medicine, Kyoto University, and Assistant Professor Koichiro Shiba from Boston University used a novel machine-learning algorithm that estimated how the association between social isolation and all-cause mortality varied depending on an older adult's characteristics. From this analysis, we found that the link between social isolation and death was stronger among people who were older, men, with fewer school years, retired or never had a job, smokers, people who did not participate in annual physical examinations, and were already socially isolated prior to the start of the study. We also found that the combination of low education and being in the middle- and high-income tertiles was associated with the greatest reduction in survival days due to social isolation, with this pattern being stronger among women. Lastly, our simulations showed that education- and income-based disparities in survival may decrease if social isolation is eliminated from the population. Moreover around 11,000 deaths linked to social isolation among older adults with low education could be prevented annually. With this in mind, we believe that population-level interventions reducing social isolation would not only improve health on average but also mitigate existing health disparities.

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\*The effect of social isolation was quantified as the difference between the survival time (in days) between socially isolated and non-isolated older adults with similar characteristics. Negative values imply that social isolation was associated with shorter survival time

\*\*Technically referred to as sources as heterogeneity, only selected key characteristics shown in this figure.

## Social isolation interventions could potentially mitigate education- and income-based health inequalities in survival.



Socially isolated older adults tended to have lower years of education and income



of deaths among Japanese older adults caused by social isolation occurred in people with low education

11,000

annual deaths due to social isolation among Japanese older adults with low education may be prevented\*

Interventions and policies must allow **tailor-fitting** and should consider **removing barriers to social connections among older adults from socially disadvantaged backgrounds.** (e.g., lower education/income).



\*Based on extrapolation of our estimates to the data from Saito M, Aida J, Cable N, Zaninotto P, Ikeda T, Tsuji T, et al. Cross-national comparison of social isolation and mortality among older adults: A 10-year follow-up study in Japan and England. *Geriatr Gerontol Int* 2021;21(2):209–14.



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**Introduction.** Social isolation has been linked to higher mortality among older adults; however, it remains unknown how this relationship varies depending on one's characteristics and across social groups (heterogeneous association). This information can help identify who suffers more from social isolation and informs whether interventions could have varying effects on health. To address this gap, we conducted a study using data from a cohort of Japanese older adults (JAGES). We identified groups that experience a greater impact of social isolation on death and determined how this could impact health disparities. **Subjects and methods.** JAGES consisted of ~20,000 older adults (JAGES, 2013–2022) followed-through for 9.4-years. We adjusted our analysis using 60 characteristics measured in 2010 (JAGES 2010) and used the insurance database to confirm 4,299 deaths by all causes in 2022. Then, using a novel machine-learning algorithm, we estimated the heterogeneous association between social isolation and mortality and simulated how eliminating social isolation in the population might change education- and income-based health disparities. **Results.** Social isolation was more prevalent among those with lower education and income and associated on average with 69.5-day shorter survival days (restricted mean survival time [RMST] difference; 95% CI: -111, -28.4). There was evidence of heterogeneity wherein social isolation was associated with even shorter survival days in some subgroups (e.g., an average of 205 shorter survival days among the bottom fifth of the population ranked by survival time [95% CI: -321, -87.8]). This subgroup tended to be older, men, and have lower education. The association of social isolation with mortality was particularly stronger for people with a combination of low education and middle to high income, especially among women. There was also evidence that eliminating social isolation in the population might decrease education- and income-related health disparities. Moreover, individuals with lower levels of education accounted for a larger share of deaths attributable to social isolation (58.5% of excess deaths) and around 11,000 annual deaths from those with low education could be prevented if it is addressed. **Discussion.** Social isolation may be more harmful among those from socially disadvantaged backgrounds, and a combination of some characteristics can synergistically amplify its link with mortality. Proper population-level interventions informed with this evidence might not only improve health but also mitigate existing health disparities. **Significance.** Public health interventions may consider removing barriers to social connections among individuals from socially disadvantaged backgrounds (e.g., lower education/income). Future research should also focus on clarifying the effects of a wide range of interventions that allow tailor-fitting. It is also possible to use our findings as basis for a screening method that is able to detect individuals at risk for more adverse effects of social isolation.

**Published paper:** Lunar FR, Kondo N, Honda Y, Nakagomi A, Komura T, Inoue K, et al. Sociodemographic heterogeneity in the association between social isolation and all-cause mortality among Japanese older adults: JAGES longitudinal panel study. *The Lancet Regional Health - Western Pacific*. 2025 Oct 1;63:101691.

<https://www.sciencedirect.com/science/article/pii/S2666606525002305>

**Acknowledgments.** Our study received funding support from the following: Japan Society for the Promotion of Science, Health Labour Sciences Research Grants, Research Funding for Longevity Sciences from the National Center for Geriatrics and Gerontology, Research Institute of Science and Technology from the Japan Science and Technology, Japan Health Promotion & Fitness Foundation, Department of Active Ageing, Niigata University Graduate School of Medical and Dental Sci, TMDU priority research areas grant and National Research Institute for Earth Science and Disaster Resilience. Moreover, the first author was supported by the 2023 Kyoto University School of Public Health - Super Global Course's and the Kyoto University Education Research Promotion Foundation.