

Differences in the impact on physical frailty between urban and rural areas within a municipality



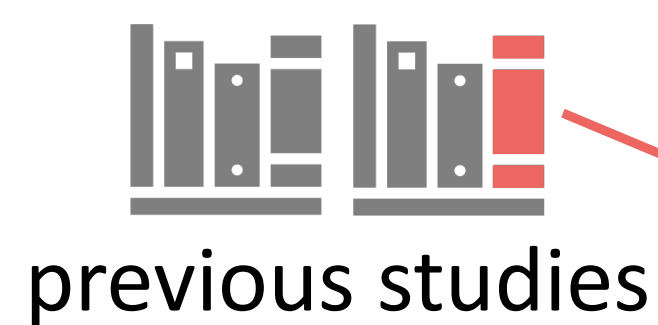
Atsushi Shirakawa,¹ Shujirou Imaeda,² Nanako Sasaki,¹ Yukihiko Okada,^{3,4} Kai Tanabe,^{5,6} Akira Ando,² Akiko Tsukao,⁷ Shinya Kuno⁶

¹Master's Program in Service Engineering, Univ. of Tsukuba, Japan, ²Nikken Sekkei Research Institute, Japan, ³Faculty of Engineering, Information and Systems, Univ. of Tsukuba, Japan, ⁴Center for Artificial Intelligence Research, Univ. of Tsukuba, Japan, ⁵Faculty of Health and Sport Sciences, Univ. of Tsukuba, Japan, ⁶R&D Center for Smart Wellness City Policies, Univ. of Tsukuba, Japan, ⁷Tsukuba Wellness Research Co. Ltd., Japan

Background

Neighborhood environmental attributes are associated with physical frailty.

Most of them have examined only the direct association between environmental factors and physical frailty.



Some studies have compared differences in environmental factors on physical frailty between urban and rural areas **at the national level.**

- Are there **indirect impacts** of environmental characteristics on physical frailty through individual factors?
- Are there differences in environmental factors on physical frailty **at a smaller level?**

Objectives

This study aims to determine whether differences in neighborhood environmental characteristics affect the association between individual factors and physical frailty in a Japanese local city.

Methods

Data

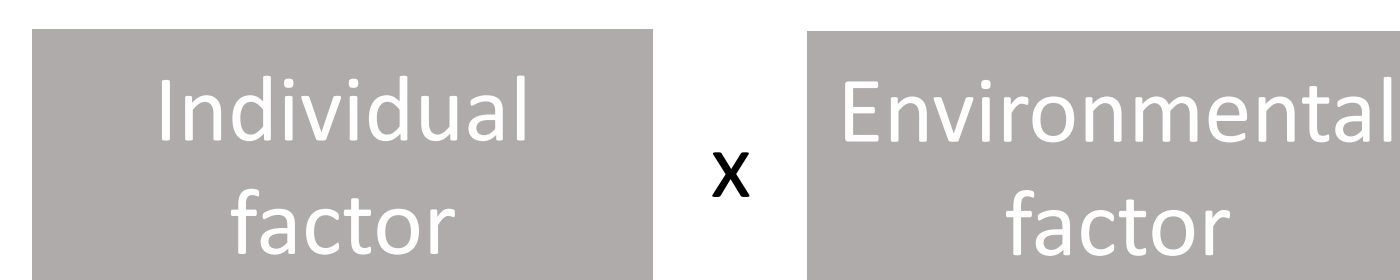
- **1,478** residents in a local city in Japan (age ≥ 45 year)
- Original questionnaires and geographic open data were used.

Physical Frailty

Assessed using a modified version of Fried's Frailty phenotype criteria;
Frailty : three or more of the five criteria
Non-frailty : two or less of them

Multilevel Logistic Regression analysis

Objective variable : physical Frailty
 Explanatory Variables :
 Focusing on cross-level interactions



Interactions were included in the models for all combinations.

Simple slope analysis

To identify patterns of their interactions, simple slope tests were analyzed when the interactions were statistically significant ($p < 0.05$).

Individual factors

- socioeconomic characteristics (age, gender, etc.)
- lifestyle (alcohol consumption, smoking)
- social activities (employment, social activity*)
 *like volunteer work or sports activities

Environmental factors

Building density, bus stop density, intersection density, park area, and social cohesion

Results

summary statistics

Participants' mean age was 70.9 years (SD=8.24), and female rate was 50.3%. The prevalence of physical frailty was 20.4%.

Multilevel Logistic Regression analysis

Multilevel analysis showed statistically significant negative associations for two main effects about social participation and five interactions below:

Variables showing significant associations ($p < 0.05$)	Odds Ratio
employment	0.78
social activity	0.78
employment x building density	0.83
employment x bus stop density	0.84
employment x intersection density	0.79
social activity x building density	0.84
social activity x intersection density	0.83

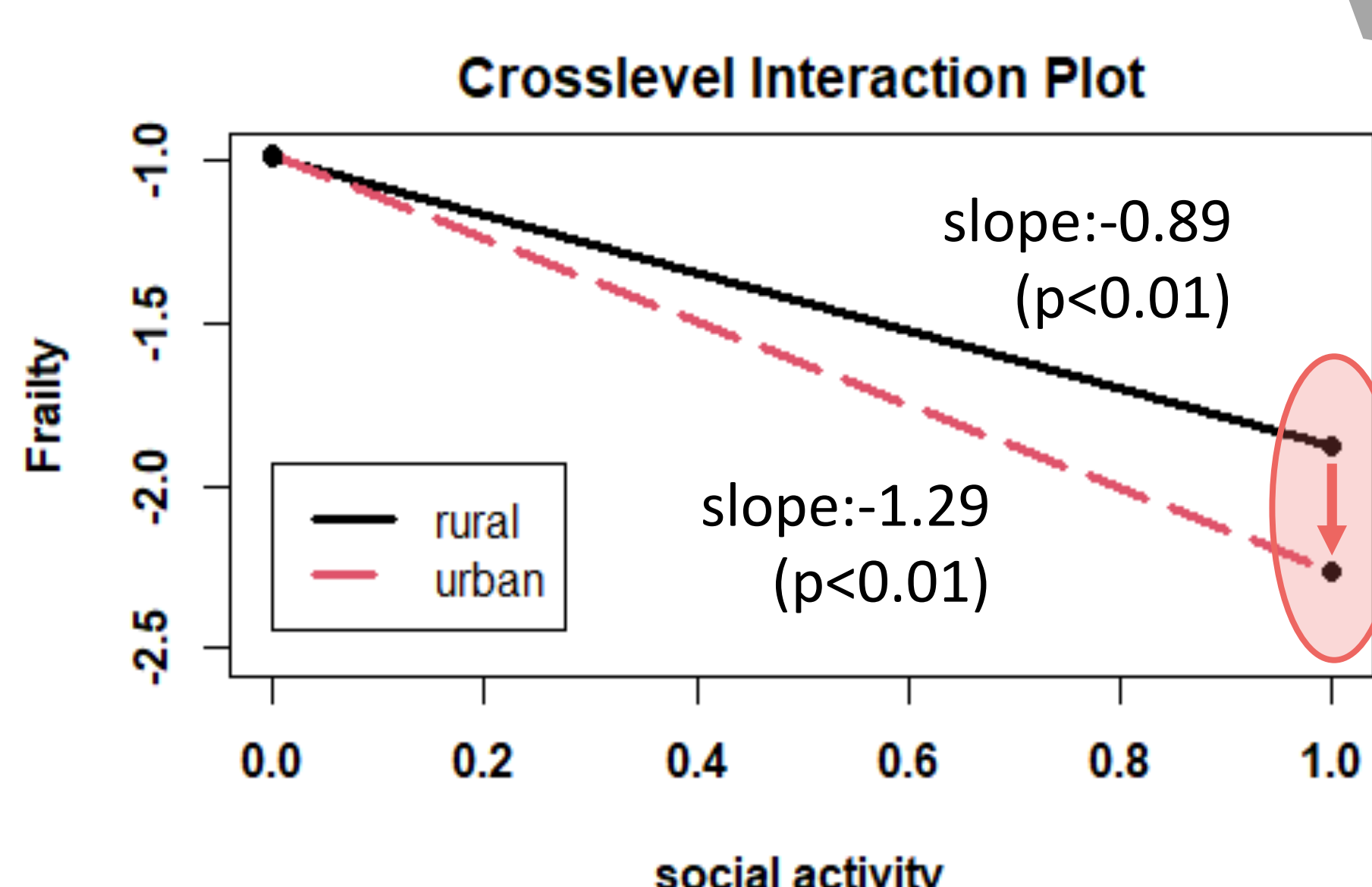
HYPOTHESIS

The degree of **concentration of urban functions** influences the association between physical frailty and social participation.

Defined in two parts

building density, bus stop density, intersection density are **high : urban** area and **low : rural** area

Simple slope analysis

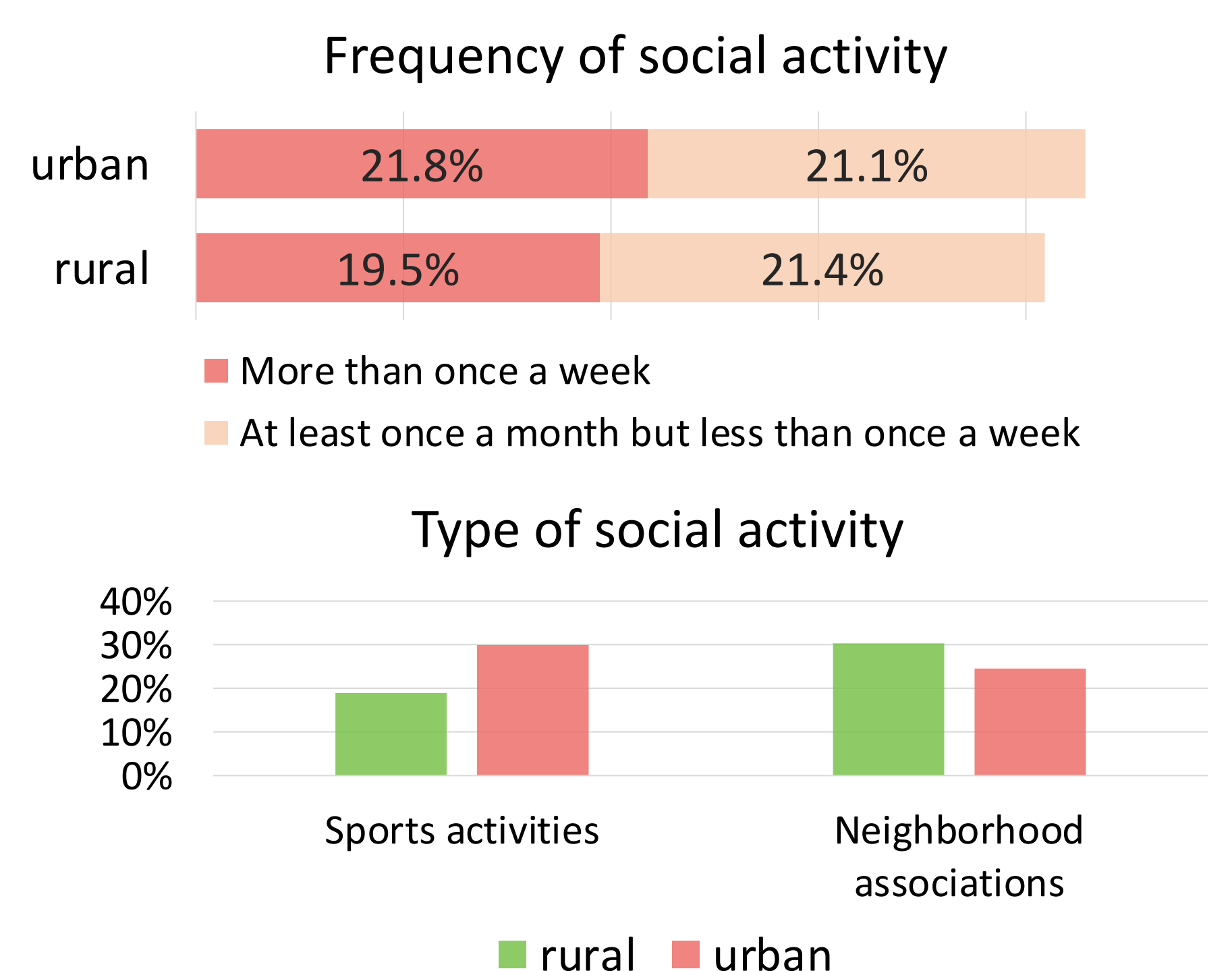


Employment and social activities reduced the risk of physical frailty, and these effects were **larger in urban areas**: with higher building density, bus stop density, and intersection density than in rural areas.

Employment also showed same trend.

Consideration

It is presumed that urban areas are more likely to be physically active because bases of social activities related to sports are nearby.



Conclusion

- This study showed the degree of **concentration of urban functions** can affect the way people **participate in society.**
- The risk of physical frailty for those who participate in society differs between urban and rural areas **within a municipality.**
- It is important to promote social participation not only in urban areas but also in rural areas.

Acknowledgements

This work was supported by Health Labor Sciences Research Grant. Research for building evidence on results of verification programs for prevention and health promotion (22FB1002).