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Promoting Social Participation in the Primary Care Field: An Ecological Study on the Potential Reduction of Multimorbidity Prevalence

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Abstract

Background: No municipal-level study has elucidated the social determinants associated with multimorbidity prevalence (MP). **Objective:** This article aimed to determine the differences in MP among municipalities and investigate factors associated with such differences through an ecological study of data obtained from a nationwide survey. This article focused on social participation and household income, which are associated with single chronic diseases, such as hypertension. **Methods:** Study design was a cross sectional study, which used the data from the Japan Gerontological Evaluation Study, a population-based gerontological study among functionally independent older adults aged ≥65 years in Japan. Overall, 152 212 participants from 2016 to 2017 across 91 municipalities were included in the final analysis. Multiple regression analysis was performed with MP as objective variable; social participation or household income were explanatory variables, and education, population density, and health check-ups were adjustment variables. **Results:** Intermunicipal differences in MP were 28.4% to 43.1% and 23.2% to 38.8% among men and women, respectively. Significant negative correlation was observed between MP and proportion of social participation (non-standardized coefficient [*B*] = −.18 for men and women). A significant positive correlation was noted between MP and equivalent household income of ≤2 million yen in women (*B* = .21). **Conclusion:** Considerable differences in MP existed among municipalities. Areas with high proportion of social participation showed significantly lower MP. Considering the difficulty in managing multimorbidity within the primary care field and limited evidence on effective interventions, community-level interventions encouraging social participation among older individuals might reduce MP. Primary care physicians should consider a community health approach for multimorbidity.

Keywords

multimorbidity, social determinants of health, community health, primary care, chronic disease

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Introduction

"Multimorbidity," defined as the presence of multiple chronic diseases or conditions, has become one of the most important issues in recent primary care practice and research.[1,2]

The number of multimorbid patients increases with ageing.[3] Moreover, the negative effects of multimorbidity on health outcomes [eg, mortality,[4] quality of life (QOL),[5] and physical function[6]], treatment burden (eg, increased consultations[7] and polypharmacy[8]) and health care resources (eg, excessive emergency consultations, unscheduled hospitalizations, and increased medical costs[9,10]) have been reported. Thus, primary care physicians need to pay particular attention to the management of patients with multimorbidity. However, a Cochrane Review in 2016, which evaluated 18 intervention studies on multimorbid patients, reported that interventions promoted little to no difference in clinical outcomes.[11] Although multimorbidity is an important issue in the primary care field, only a very few effective interventions have been established thus far, perhaps due to the influence of social and area-level factors that cannot be overcome by individual efforts alone.

Evidence has highlighted the importance and indispensability of community health orientation, one of primary care approaches for local communities and populations.[12] This comprehensive approach includes not only individual patients but also local communities and groups. Primary care physicians are also required to provide patient care from this perspective.

A systematic review regarding the association between multimorbidity and socio-economic status revealed that, among high-income countries, low household income levels, or deprived residential areas were associated with an increased risk of multimorbidity.[13] However, only a few area-level studies have analyzed factors associated with multimorbidity prevalence (MP).[14,15]

In the purview of public health, the World Health Organization (WHO) proposed the concept of Age Friendly Communities in 2007,[16] which recommends that cities, towns, and villages encourage their people to have more social participations. Oshio et al's[17] study on single chronic diseases or conditions found that social participation prevented the onset of non-communicable diseases (eg, hypertension, diabetes mellitus, and cerebral infarction). Social participation and social support could have preventive the effects against chronic diseases and disorders, including hypertension,[18-20] diabetes,[21] depressive state,[22] and cognitive impairment.[23] Moreover, other studies have reported that areas with high social participation had a decreased risk for chronic diseases, including hypertension, dementia, and depression.[20,22,23] Evidence also suggests that community interventions on social activities for older people increased social participation.[24] Conversely, people in low socio-economic circumstances have low social participation, highlighting the need to also consider the social determinants of health. Unfortunately, reports on intermunicipal differences in MP and factors associated with such differences are limited, with only 1 study[14] reported to our knowledge.

If community-level social participation indeed reduces the risk of multimorbidity, low MP rates may be expected in areas with a high social participation. However, no municipal-level study has yet clarified these associations. Uncovering intermunicipal differences in MP and the relevant social factors could help develop new social strategies for multimorbid populations in whom effective interventions have been lacking. In order to accumulate evidence in the area of community health, this study was the first attempt in Asian region to conduct a study on the general population.

Therefore, this study was conducted to clarify the presence of intermunicipal differences in multimorbidity and its relationship with 2 social factors (income and social participation). Income is one of the social determinants of many health disparities, whereas social participation is one of the modifiable social capitals for individuals and communities. This article hypothesized that the areas with a high proportion of social participation or few economic disadvantages would be associated with a low prevalence of multimorbidity, which were related to negative effects on health outcomes and had limited evidence on effective interventions.

The aim of this study was to determine the differences in MP among municipalities and investigate factors associated with such differences through an ecological study of data obtained from a nationwide survey.

Methods

Study Design and Population

This ecological study used cross-sectional data from the Japan Gerontological Evaluation Study (JAGES), a population-based gerontological study that focuses on the social determinants of health and the social environment among functionally independent older adults aged ≥65 years in Japan. A questionnaire survey was administered by randomly mailing the study participants. The study project details have been described in elsewhere.[25] The current study used the 2016 wave data from the JAGES database, and conducted the study on older people who could independently perform activities of daily living (ADLs). The study area included 40 cities, towns, and villages, ranging from Hokkaido, Japan's northernmost region, to Kyushu, the southernmost region, and included both urban and rural areas. For area-level analysis, the municipal level (eg, city, ward, town, and village) was used as the analysis unit. Among the participants who responded to the questionnaire, those already certified as requiring long-term care by the

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national insurance system and those with missing information on sex, age, ADLs, and chronic diseases were excluded.

Objective Variables

MP calculated from the proportion of people with 2 or more chronic diseases according to municipality was used as the objective variable. Similar to other studies,[7-9,14] this article defined multimorbidity as the coexistence of 2 or more chronic conditions in the same individual, based on WHO's definition.[26] The questionnaire requested the participants to "please circle all numbers that apply to diseases which you are currently treated or have sequelae," from which the total number of chronic diseases was calculated. Of the top 20 list of chronic diseases in the systematic review,[27] the following 14 chronic diseases were selected that matched the chronic diseases collected in the JAGES study: (#1) hypertension, (#2) stroke (cerebral hemorrhage, cerebral infarction, and so on), (#3) heart disease, (#4) diabetes mellitus, (#5) hyperlipidemia (dyslipidemia), (#6) respiratory disease (pneumonia, bronchitis, and so on), (#7) gastrointestinal diseases (liver/gallbladder disease), (#8) kidney diseases (prostate disease), (#9) musculoskeletal disease (osteoporosis, arthrosis, and so on), (#10) cancer (malignant neoplasms), (#11) blood disease (immune disease), (#12) depression, (#13) dementia (Alzheimer's disease, etc.), and (#14) hearing loss.

Explanatory Variables

The first explanatory variable was the proportion of people who participated in social activities by municipality. This article defined social participation of older people in community groups or clubs based on the definition used in a previous study on the JAGES.[28] Particularly, social participation was defined as the "participation in 1 or more community groups or clubs at least several times a year," whereas "not participating" was defined as the absence of any participation. The questionnaire also asked the study participants whether they had participated in any of the following 9 types of community groups or clubs: (#1) sports groups or clubs, (#2) volunteer groups, (#3) hobby groups, (#4) senior citizen clubs, (#5) neighborhood associations, (#6) learning or cultural groups, (#7) long-term care prevention or health-promoting activity groups, (#8) activities to teach skills or pass on experiences to others, and (#9) paid work.

The second explanatory variable was the proportion of people with a household income equivalent to $\leq$2 million yen according to municipality. Those who satisfied this criterion were defined as having a low economic status.

Adjustment Variables

Based on the findings of previous area-level studies on social participation[20,22,23,27] and multimorbidity,[14,15] 3 adjustment variables such as; educational history, health check-up situation, and urbanization level were selected. Educational history was categorized as less than 9 years and more than 9 years.[28] The proportions of people who underwent a health check-up within 1 year were used. The logarithmically converted values of the dwelling area population density were used. Each adjustment variable was simultaneously inserted into each model.

Income and education have generally been strongly correlated. As such, taking income and education together as adjustment variables could increase the risk of multicollinearity. Thus, only educational history was included as an adjustment variable in the current study.

Age Standardization

This study applied the age standardization method used by the Ministry of Health, Labor and Welfare (MHLW).[29,30] The smoothed population data from 2015 were used as the reference population.[30] This enabled us to accurately compare the areas without focusing on the different age compositions within the municipalities.

Statistical Analysis

All analyses were stratified by sex. Participants were also divided into 5-year age groups (65-69, 70-74, 75-79, 80-84, and $>$85 years). Municipal-level data on equivalent household income, educational history, health check-up, MP, social participation, and dwelling area population density were presented using descriptive statistics. Intermunicipal differences in MP were presented as municipal difference graphs according to sex. Multiple linear regression analyses were performed with MP as the objective variable and proportion of social participation (1 or more community groups) and equivalent household income as separate explanatory variables. These analyses were adjusted for the 3 adjustment variables discussed earlier. All statistical analyses were performed at a significance level of 5% using statistical software (Stata BE version 18.0).

Ethical Considerations

All participants were informed that participation was voluntary and that completing and returning the questionnaire via mail implied their consent to participate in the study.

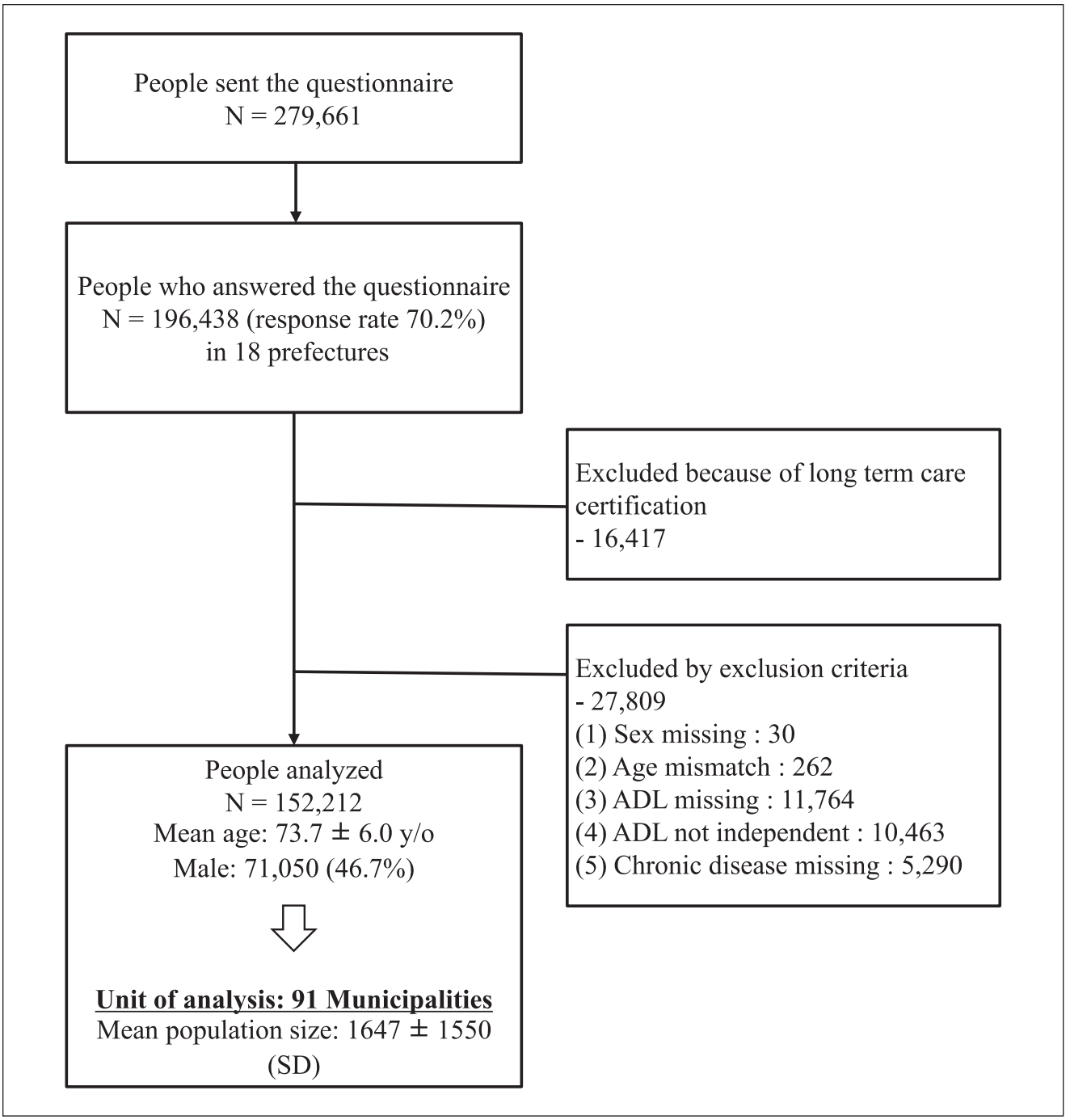

Figure 1. Flowchart for the inclusion of participants included in the JAGES 2016.

Results

Study Participants

The flowchart for the inclusion of the study population is depicted in Figure 1.

The questionnaire was sent to a total of 279 661 people, among whom 196 438 from 18 prefectures from as far north as Hokkaido and as far south as Kumamoto in Japan responded (response rate, 70.2%). Among the 196 438 participants who responded to the questionnaire, 16 417 were excluded due to long-term care or support certification and 27 809 were excluded for satisfying the exclusion criteria (missing sex data, age mismatch, missing ADL data, incapable of independently performing ADLs, and missing chronic disease data). The remaining 152 212 people (71 050 men and 81 162 women) were divided into 91 groups based on their

Table 1. Sex-specific Basic Municipal-level Characteristics of the 91 Municipalities in the JAGES 2016.

The mean of proportions of each municipalities (%)[c]	Men		Women	
N = 91 municipalities	Mean	SD	Mean	SD
Multimorbidity prevalence (2 or more chronic diseases; %)	37.1	2.8	30.8	3.0
Social participation (1 or more community groups or clubs; %)[a]	73.4	4.8	72.2	4.0
Equivalent household income less than 2 million yen (%)	38.2	6.4	38.0	5.5
Educational history less than 9 years (%)	27.7	11.1	32.4	12.9
Health checkup within 1 year (%)	57.9	5.3	57.7	6.4
Dwelling area population density (person/m^2)[b]	7.9	1.5	7.9	1.5

[a]Social participation: at least several times a year.
[b]Dwelling area population density: natural logarithmic conversion.
[c]Age adjustment: divided into 5-years age groups (65-69, 70-74, 75-79, 80-84, and >85 years old).

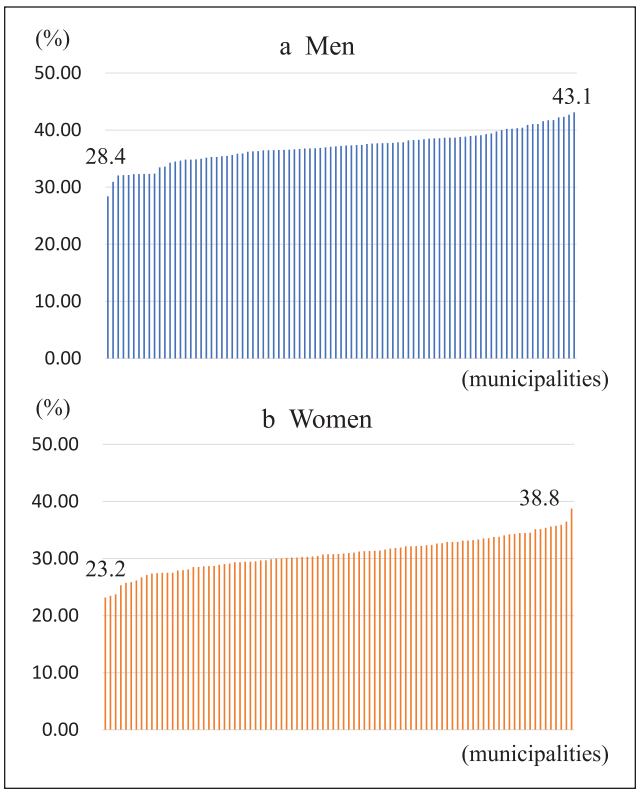

Figure 2. Sex-specific differences in multimorbidity prevalence across the 91 municipalities in the JAGES 2016.

municipalities, including urban and rural areas (cities, wards, towns, and villages).

Descriptive Statistics

Table 1 summarizes the basic municipal-level characteristics of the 91 municipalities.

The mean MP by municipality was higher among men at 37.1% (SD = 2.8%) than among women at 30.8% (SD = 3.0%). Women [32.4% (SD = 12.9%)] were more likely have a mean educational history of <9 years than men [27.7% (SD = 11.1%)]. Other variables were similar for men and women.

Municipal Difference Graph (Figure 2)

Sex-specific differences in MP according to municipalities were 28.4% to 43.1% (1.5 times) for men and 23.2% to 38.8% (1.7 times) for women.

Regression Analysis

Figure 3 shows the results of the multiple linear regression analysis.

Significantly negative correlations were found between MP and the proportion of social participation (1 or more community groups) in both sexes (non-standardized coefficient $B = -.18$ [95% CI: −0.33 to −0.03] for men and $B = -.18$ [95% CI: −0.33 to −0.02] for women; $P < .05$). Regarding socio-economic status, a significant positive correlation was found between MP and the proportion of equivalent household income among women (non-standardized coefficient $B = .21$ [95% CI: 0.11 to 0.31]; $P < .05$).

Discussion

This has been the first ecological study on the MP and municipal-level proportion of social participation after adjusting for socio-economic status, including educational history in ADL-independent older people in Japan. Notably, 3 new findings had been observed. First, the intermunicipal differences in MP were 1.5 and 1.7 times for men and women, respectively. Second, regarding the social determinants associated with intermunicipal differences, significant negative correlations were found between MP and the proportion of social participation in both men and women. Third, a significant positive correlation was found between MP and an equivalent household income of ≤2 million yen among women.

To the best of our knowledge, this has been the first study in Asia to determine the differences in MP and investigated factors associated with such differences. Wilk et al[14] reported significant and substantial geographic differences

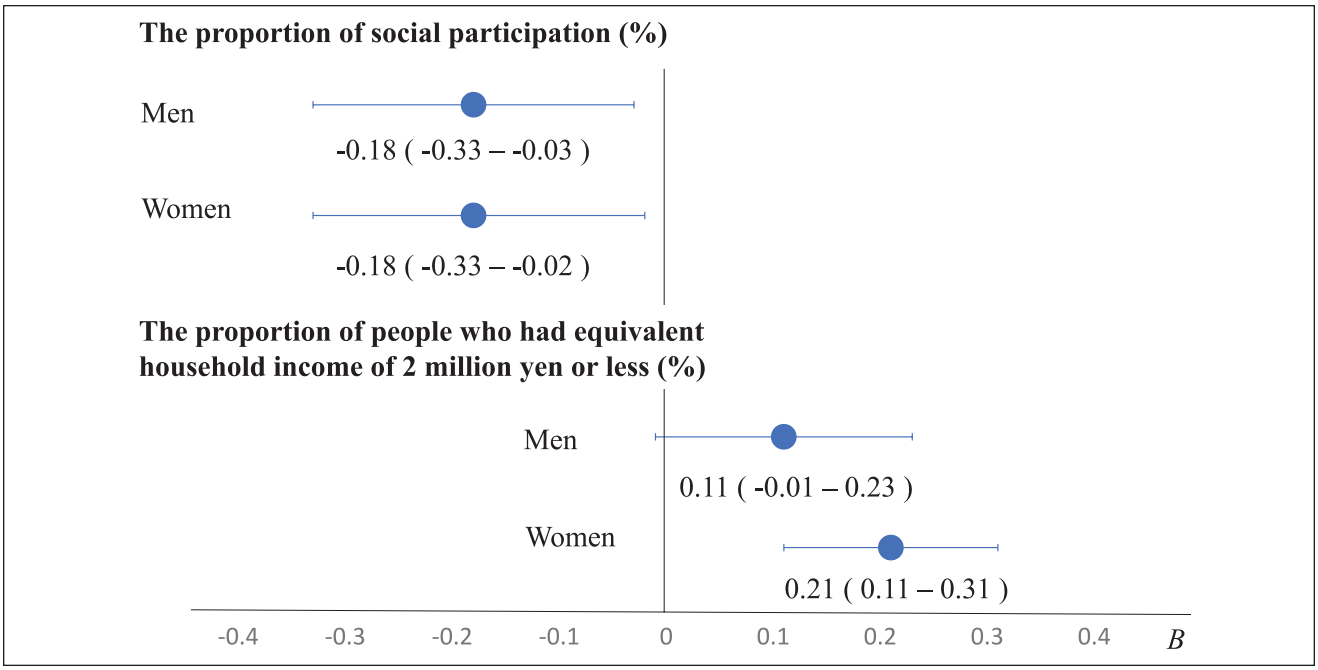

Figure 3. Sex-specific results of the multiple linear regression analysis between multimorbidity prevalence and social participation or equivalent household income.

in MP across Canada's large urban centers based on the neighborhood difference graph (adjusted odds ratio for multimorbidity in 35 areas ranged from 0.76 to 1.60), a finding echoed by the results presented in the current study. However, the aforementioned study limited their population to only people living in urban areas such as Toronto City. Therefore, this study's findings offer greater validity considering our inclusion of participants residing in not only urban areas but also rural areas.

Our results showed significant negative correlations between MP and the proportion of social participation in both men and women. A study involving an urban Canadian population suggested that age, sex, race, educational history, and income were individual factors associated neighborhood differences in multimorbidity.[14] In the current study, which examined associations by aggregating municipal-level household income, MP was also higher among people living in areas with a low household income.

One previous study has suggested the following 2 possible mechanisms by which social participation might act as a preventive factor against chronic disease: (1) a healthy lifestyle and (2) coping with psychological stress.[17] Regarding (1) promoting a healthy lifestyle, individuals' participation in community groups, such as sports and volunteering, may promote good health behaviors (eg, exercise and diet) and discourage bad health behaviors (eg, smoking) through interactions with group members. Participation in community groups could promote more engagement in physical activity by increasing the frequency of outings and walking time, which could prevent hypertension.[18]

Regarding (2) coping with psychological stress, social participation increases a sense of camaraderie, self-esteem, and perceptions of social support, which may increase one's ability to cope with stressors. Additionally, with regard to individuals and the community as a whole, residents who do not participate in sports clubs, despite residing in areas where many people do participate, may be influenced to start exercising and walking by the behavior of those around them. Indeed, these community-wide effects are observed among individuals with hypertension, depression, and cognitive decline.[20,22,23] Conversely, the mechanisms underlying the relationship between multimorbidity and social participation have yet to be fully understood. Further research is expected in the future.

Limited evidence has been available regarding the effective interventions for multimorbid people. The current study focused on social participation, which is a modifiable factor and one of the social determinants of health. Notably, a significant negative correlation was found between the proportion of social participation and MP. To the best of our knowledge, only a few studies have examined the area-level differences in the prevalence of multimorbidity and their related factors. Particularly, no study has yet examined the association between MP and modifiable factors. Considering the cross-sectional ecological nature of this study, care should be taken when interpreting our results.

Nonetheless, social participation has the potential to be one of the important interventions for multimorbid people.

Recently, much attention has been placed on "social prescribing" as a new community method in the field of primary care.[31] Social prescribing is a method for linking patients with sources of support within their community. In this approach, physicians or medical staff refer their patients to local activities and services, such as voluntary work, hobby clubs, sports clubs and so on.[32] Our results showed that municipalities with a higher proportion of social participation had a lower MP. Indeed, accumulating face-to-face interaction at the individual level through social prescription may increase social participation in the community. Available evidence from Japan indicated that encouraging older people at the community level increased social participation by 1 million people across 5 years.[33,34]

Multimorbidity is a challenging issue in the field of primary care given the few available evidence regarding effective interventions. Moreover, social participation's effectiveness as a means of social prescribing in addressing multimorbidity remains unclear. Further longitudinal or intervention studies on social participation should clarify the causal relationship of this important theme in the future.

Community health orientation in primary care is an approach targeting not only individual patients but also community groups and communities.[12,35] Primary care physicians are also required to provide patient care from this perspective. For instance, they must understand the socio-economic situation and social participation activities in their assigned area and encourage local groups to participate in community groups.

MP was significantly positively correlated with equivalent household income. Hence, policies eliminating economic disparities are recommended. To correct health disparities, consideration may be needed for economically disadvantaged people.

Strengths/Limitations

The current study has 2 strengths. First, our sample size was quite large. Moreover, the municipal data covered both urban and rural areas with various population sizes and densities. Second, the response rate of questionnaire survey was relatively high at 70.2%. Both of these strengths appeared to reduce the potential risk for selection bias.

Nonetheless, some study limitations need to be noted. First, the study's cross-sectional design precluded the determination of causal relationships. Future longitudinal and interventional studies are needed to verify causal relationships. Moreover, the possibility of reverse causality should be considered. Second, considering that the questionnaire was self-reported, the true existence of chronic diseases remains unknown. Additionally, given that the presence or absence of chronic diseases was self-reported, underestimation due to undiagnosed conditions or overestimation due to misunderstanding might have occurred. Third, concerns regarding the possible existence of ecological fallacy with ecological studies cannot be overlooked. In light of these limitations, the results presented herein must be interpreted with caution. Nonetheless, it is also important to note that ecological studies are able to reject individual fallacy.

Conclusion

Notably, the findings of our ecological study clearly showed that MP differed among municipalities and was significantly negatively correlated with the proportion of social participation.

Although multimorbidity is an important issue in the field of primary care, evidence on effective interventions in individuals and communities is limited, with no study having yet determined whether social participation, as a means of social prescribing, might effectively prevent multimorbidity. Our findings encourage primary care physicians and other healthcare professionals to focus on the social determinants of health to decrease the prevalence of multimorbidity. Further research should be conducted on the effectiveness of primary care physicians' community health approach in preventing multimorbidity in healthy people.

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Declaration of Conflicting Interests

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Ethical Approval

This study was approved by the Research Ethics Committee of the National Center for Geriatrics and Gerontology (approval no. 992) and Chiba University (approval no. 2493).

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Data Availability Statement

The data underlying this study are from JAGES and contain sensitive information. Data for research purposes are available upon request. Requests for JAGES data can be sent to dataadmin.ml@jages.net.

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