# Employment status of physically disabled persons in relation to geodemographic characteristics of their living districts in a Japanese city

Running title: Employment status of physically disabled

Emiko HOSHINO[1], Naohito TANABE[2], Yoshinari KIMURA[1], Satoshi SASAKI[1], Isamu KONISHI[1], Akiyoshi SEKIYA[1], Satoshi YAMAZAKI[1], Etsuko NAKAMURA[1], Nao SEKI[3], Hiroshi SUZUKI[1].

1 Division of Public Health, Niigata University Graduate School of Medical and Dental Sciences
2 Division of Health Promotion, Niigata University Graduate School of Medical and Dental Sciences
3 School of Health Science, Faculty of Medicine, Niigata University.

Correspondence: Naohito Tanabe, Division of Health Promotion, Niigata University Graduate School of Medical and Dental Sciences, 1-757 Asahimachi-dori, Chuo Ward, Niigata 951-8510, Japan.
Phone +81-25-227-2129, Fax +81-25-227-0765,
e-mail tanabe@med.niigata-u.ac.jp

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## Abstract

Gaining employment is one of the rehabilitation goals for disabled persons. Although the Japanese government has established a legal employment quota requiring employers to hire disabled persons, the employment of disabled persons has not yet been satisfactorily facilitated. Since employment opportunities vary by district, the employment status of disabled persons could be affected by their location. We classified 22 administrative service districts of Niigata City into 3 district-groups—urban, residential, and rural—by their geodemographic features. Then, the employment status of 2,034 physically disabled subjects (1,181 men and 853 women) aged 20–64 years was analyzed in relation to the geodemographic characteristics of their living districts. According to a questionnaire survey, the probability of being a regular employee was low for disabled women living in a residential area compared to those living in an urban area (multivariable odds ratio, 0.41; 95% confidence interval, 0.21–0.79; $P$= 0.008). Low employment capacity was a characteristic of the residential area, which seemed to account for this low probability. However, the low employment capacity of the rural area did not affect the employment status

of the physically disabled subjects who lived in those districts. The demographic features of the rural area suggested that the residents had a stronger attachment to the local community than with other areas, which might help disabled persons to be employed. In planning and providing employment support to disabled persons, the government may need to consider their residential distributions.

Key words: Physically disabled persons; Employment, Residence , Geodemographics, Geographical information system

Abbreviations: none to be listed

# Introduction

There are 1.24 million physically disabled persons aged 18–64 years old at home in Japan.[1)] For disabled persons of working age, having a job is indispensable not only for attaining economic independence but also for avoiding psychological, emotional, and social isolation.[2)] Therefore, gaining a job is one of the rehabilitation goals for disabled persons. However, the employment rate of disabled persons in the working-age population (15–64 years) is only 43.0%,[3)] which is much lower than that the 70.8%[4)] employment rate of the general population of Japan for the same age group. Further, 59% of unemployed disabled persons desire to work.[3)]

In many countries, regulations requesting employers to hire disabled persons have helped facilitate their employment.[5, 6)] In Japan, the law requires that a reservation of 1.8% of the total number of employees in a private company with more than 56 regular workers must be for disabled persons.[6)] However, the nationwide average percentage of disabled employees in such companies was 1.63% in 2009[7)], which does not satisfy this legal employment quota. Therefore, it is necessary to determine the barriers to employment of disabled persons.

In a Japanese study, 65% of surveyed employers answered that the lack of a suitable job was the main reason they hesitated to employ disabled persons.[8] Approaches to removing barriers to employment of disabled persons could include educating employers to help remove their prejudice and demonstrating to them changes to the workplace that would improve accessibility for disabled persons; in addition, disabled persons may need assistance in raising their occupational skill levels.[9, 10] However, difficulties in commuting between home and worksite can also be a barrier for disabled persons wanting to get a job.[11] Disabled persons who live in districts with fewer employment opportunities would be less employed than those who live in districts with more opportunities.[12]However, few studies have considered such a geographical mismatch in assessing barriers to employment of disabled persons. The purpose of this study was to clarify how conditions in living districts of physically disabled persons affect their employment status.

## Methods

The study area was Niigata City, the prefectural capital of Niigata prefecture, Japan. Niigata City is an ordinance-designated city with 785,134 people

according to the 2005 census and an area of 726.1 km$^2$. Because the present Niigata City has been formed by the merger of 4 cities, 5 towns, and 5 villages from January 2001 to October 2005, it consists of districts with various characteristics such as commercial, industrial, residential, and agricultural areas.

Niigata City is composed of 8 wards, and each ward has several districts for providing community-based civil services (administrative service districts); in total, there are 22 administrative service districts in Niigata City. We analyzed the working status of disabled persons in relation to characteristics of their districts by (1) classifying 22 districts into several groups according to similarities of demographic features of the residents and characterizing each district-group according to geographic features (geodemographic analysis) and (2) comparing the working status of disabled residents among the different district-groups.

*Geodemographic analysis*

For the grouping of the 22 districts, we analyzed 13 indexes from the 2005 National Population Census and the 2006 Business Establishment and

Enterprise Census for Niigata Prefecture. From the National Population Census, the following 11 indexes were calculated for each district: the proportions of (1) three-generation households and (2) homeowner households among the total private households; (3) the ratio of employed workers to those aged 25–64 years old; and the proportions of (4) female workers, (5) employees, (6) self-employed workers, (7) family workers, (8) agricultural workers, (9) secondary industry workers, (10) tertiary industry workers, and (11) part-time workers (workers with less than 35 working hours per week) among the entire employed worker population. In Niigata City, we have a lot of higher educational institutions, including 8 colleges. Students of these institutions are primary residents with no working purposes, and many of them are temporary residents in each district. We had to exclude the effects of uneven regional distribution of these students to assess the demographic characteristics of each district related to employment status. Therefore, we used the population of 25–64 years old as a surrogate index for working-age population.

From the 2006 Business Establishment and Enterprise Census for Niigata Prefecture, we added up the employees working at worksites that

located in each district (working employees) and calculated 2 indexes for employment capacity: i.e., (12) the ratio to population aged 25–64 years old, and (13) the ratio to employed worker population. Population data for these calculations were obtained from the 2005 National Population Census statistics. Accordingly, the higher the values of these indexes, the higher the possibility that the residents can work within their living districts. Conversely, lower values indicate a greater necessity for residents to commute to worksites outside of their living district.

After grouping the 22 districts using the 13 indexes of the demographic data, we compared the geographic distribution of the district-groups to geographic distributions of population density and land-usage conditions. For the geographic distribution of population density, population per 500-m mesh area (population per 0.25 $km^2$) was calculated based on the 2005 National Population Census. For the land-usage condition, land usage subdivision mesh data from the 2006 National Land Information Report was used: the digital data were publicly released by the Ministry of Land, Infrastructure, Transport and Tourism (http://nlftp.mlit.go.jp/ksj/jpgis/datalist/KsjTmplt-L03-b.html). These

geographical analyses were performed based on digital maps drawn with ArcGIS ver 9.2 (;ESRI Inc., Redlands, CA, USA). Finally, a geodemographic name was given to each district-group that characterized demographic and geographic features.

### *Questionnaire survey of welfare service for disabled persons*

Niigata City government conducted a questionnaire survey of welfare service for disabled persons in November 2005. The purpose of the survey was to assess the current conditions and needs of disabled persons living in Niigata City to improve administrative services. An anonymous, self-administered questionnaire was mailed to 3,800 subjects randomly selected from 8,543 physically disabled children and adults aged less than 65 years; replies were received from 2,135 subjects (56.2%). Of those respondents, 101 subjects with age <20 yeas were excluded. Then, 1,181 men and 853 women (2,034 total) aged 20–64 years (disabled subjects) were included, and their basic characteristics and employment status were analyzed.

The basic characteristics assessed were living district, sex, age, certified grade of disability, type of disability, living place, household

members, disability pension–receiving status, welfare benefit–receiving status, and independence status in regard to activity of daily living, domestic work, and financial control. The employment-status analysis looked at type of employed workers and amount of earnings. The type of employed workers was classified into 3 categories: regular employees, part-time employees, and nonemployee workers. All working subjects who did not declared themselves to be employees were categorized as nonemployee workers, which consisted of 144 self-employed workers and 147 subjects with unidentified working style. These findings were then compared between district-groups where disabled subjects lived.

### *Statistical analysis*

For the geodemographic analysis, Ward's method of hierarchical cluster analysis was performed using the squared Euclidian distance calculated from standardized data of 13 demographic indexes for the 22 districts. Indexes for demographic features of each district were averaged within each district-group, and the mean values were compared between district-groups using one-way analysis of variance. To compare basic characteristics of study

subjects between district-groups, one-way analysis of variance was applied for numerical values, and a chi-square test was applied for proportional values. Sex-specific age-adjusted and multivariable logistic regression analyses were applied to evaluate the association of geodemographic characteristics and employment status of disabled subjects. Age-adjusted models adjusted for age in 5-year intervals, and multivariable models further adjusted for certified grade of disability, type of disability, living place (at home or not), household (single-person or not), disability pension–receiving status (yes/no), welfare benefit–receiving status (yes/no), and independence (independent or not) of activity of daily living, domestic work, and financial control. All statistical analyses were performed with software (SPSS 17.0J for Windows; SPSS Inc, Chicago, IL), and $P < 0.05$ was considered statistically significant.

## Results

In the cluster analysis, 22 administrative service districts indicated a hierarchic structure from 2 to 8 clusters (Fig. 1). When those 22 districts were grouped to 4 clusters, disabled subjects for the study would comprise 27

males and 23 females in the smallest district-group, which would be too small to be applied to the subsequent analyses. Therefore, we grouped the districts to 3 clusters.

In regard to geographic characteristics, the prefectural office, the city hall, and Niigata station are located in districts classified in the cluster 1 district-group (Fig. 2a); the district-group occupies a broad population-dense area (Fig. 2b) and a built-up area (Fig. 2c). Most districts in the cluster 2 district-group are located near the densely populated built-up area of the cluster 1 group and are easily accessible by railways and national trunk roads. Districts in the cluster 3 district-group occupy a broad farming area, and the population density was low.

In regard to demographic characteristics, the proportions of employees and tertiary industry workers were the highest in the cluster 1 district-group. Those districts were considered to be population inflow districts in the daytime; workers from surrounding areas came into these districts for their jobs because of the large employment capacity (Table 1). For the cluster 2 district-group, the proportions of employees and tertiary industry workers were also high, but employment capacity was low, which

showed that those districts would be population outflow districts in the daytime. In districts in the cluster 3 district-group, the ratio of employed-worker population to that aged 25–64 years was the highest among the 3 district-groups, whereas indexes for employment capacity were the lowest. The proportion of self-employed workers and agricultural workers was the highest for the cluster 3 district-group. The proportions of three-generation households and homeowner households were especially high in the cluster 3 district-group. From the previously described geodemographic characteristics, we characterized the cluster 1 district-group as “urban area,” the cluster 2 district-group as “residential area,” and the cluster 3 district-group as “rural area.”

In regard to basic characteristics of disabled subjects, disabled men in the rural area most frequently lived with their parents ($P = 0.014$), and most rarely received a welfare benefit (Table 2). For disabled women, mean age was the highest in the residential area, whereas it was the lowest in the urban area ($P = 0.019$). Disabled women in the urban area most often lived alone ($P < 0.001$) and were unmarried ($P = 0.014$), whereas those in the rural area most frequently lived with their parents ($P = 0.008$).

For disabled men, there were no significant differences in employment status in relation to geodemographic characteristics of their living district, whereas for disabled women, the prevalence of regular employees was lower in the residential area (5.8%) than in the urban (12.0%) and rural (11.8%) areas ($P$= 0.006) (Table 3). Disabled women living in the residential area were less likely to be regular employees than those living the urban area even after adjusting for basic characteristics of the study subjects (multivariable odds ratio 0.41; 95% confidence interval, 0.21–0.79; $P$ = 0.008) (Table 4).

## Discussion

Results of our study suggested that disabled women living in the residential area have a low probability of being hired as regular employees. According to the geodemographic characteristics, the employment capacity in the residential area was low compared with that in the urban area. Thus, the limited availability of employment opportunities near their living places could have contributed to this finding. A nationwide survey reported that job-seeking disabled persons living in ordinance-designated cities and

surrounding areas could get a job with less difficulty than those living in other areas.[12] Our study showed that such regional differences could also be present in part within an ordinance-designated city, especially for disabled women.

The low probability of becoming regular employees could prevent economic independence of disabled women living in a residential area; if they desire to have stable employment, some support measures would be necessary. Because commuting could be a barrier to employment, rehabilitation helping them learn to use public transportation could be useful. However, this kind of rehabilitation has not been found to be an effective support measure for disabled persons in the United States[9]. Working at home using information technologies [13, 14] might be a solution for disabled persons who have difficulty commuting [15]. On the other hand, the low prevalence of regular employees in the residential area may suggest that disabled women do not frequently need economic independence in this area. It is possible that disabled women want to live in districts with many employment opportunities if they need economic independence. Disabled women living alone were most prevalent in the urban area in this study,

which could support this hypothesis. If this possibility is true, then disabled women living in urban areas would be better subjects for employment supports those in residential areas. Future studies should focus on household income as well as the earnings of disabled persons themselves.

In contrast to the findings for disabled women, low employment capacity in the residential area did not affect the working status of disabled men. As men are likely to provide the majority of the income for households in Japan,[16, 17] disabled men would more strongly desire to get a job than disabled women. Therefore, commuting between home and work would not impose as strong a barrier for them.

Living in the rural area did not relate to poor employment status of disabled subjects even though the employment capacity was low. In the rural area, the proportions of three-generation households and homeowner households were high, a finding which suggests that those residents have a strong attachment to local community. In such areas, dense social networks may exist from which the residents could receive social supports. Some other studies have reported that social networks are strong in rural communities [18]. Such social networks might have helped disabled subjects in the rural

area to gain employment.

A methodological feature of this study was to adopt a geodemographic analysis, which is a multivariable statistical technique to classify small districts into several district-groups based on demographic features of each district. This method has been developed in the fields of marketing and criminology[19, 20], and its application has been growing in the field of health and welfare studies[21-25]. For the present study, a cluster analysis was conducted based on 13 officially available demographic statistics to classify 22 districts into 3 district-groups. Although it might be difficult to scientifically prove its validity, the geodemographic characteristics we have demonstrated were quite similar to our informal understanding of the situation. Furthermore, the association of these characteristics with the employment status of the disabled subjects seemed reasonable. As such, this analytical technique could be a potential tool in ecological studies that analyze geographical distribution of health and welfare issues.

Since we used only data that had already been obtained for other purposes, we could not analyze some important information about the

disabled subjects: e.g., locations of their worksites, their household incomes, factors facilitating their employment, and intent of underemployed disabled subjects to seek out better employment. In future studies, these factors should be considered to clarify actual causes of the regional variations of employment status of disabled subjects.

In summary, disabled women living in residential areas might have some difficulty finding regular employment, possibly owing to the low employment capacity of the area. On the other hand, low employment capacity of the rural area did not affect the employment status of disabled subjects living in this area. Although our geodemographic analysis provided some possible explanations for these regional differences in employment status, actual causes should be clarified in future studies.

## Acknowledgements

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Figure legends

Fig. 1 Dendrogram produced by a hierarchical cluster analysis for 22 administrative service districts in Niigata City

Cluster analysis by Ward's method using squared Euclidian distance calculated from standardized data. Demographic indexes used for this analysis are listed in Table 2.

Fig. 2 Geographic characteristics of cluster-analysis oriented 3 district-groups for 22 administrative service districts

a) Geographical distribution of the three district-groups

b) Population density per 500-m mesh area based on the 2005 National Population Census

c) Land usage condition from the 2006 National Land Information Report: the digital data are distributed by the Ministry of Land, Infrastructure, Transport and Tourism, available from http://nlftp.mlit.go.jp/ksj/jpgis/datalist/KsjTmplt-L03-b.html

Table 1. Comparison of demographic characteristics between district-groups determined by cluster analysis.

| | District-group | | | |
|---|---|---|---|---|
| Cluster number | Cluster 1 | Cluster 2 | Cluster 3 | |
| Assigned name[a] | Urban area | Residential area | Rural area | *P* |
| Number of administrative service districts | 3 | 8 | 11 | |
| Total population | 229,845 | 401,574 | 182,448 | |
| Total number of private households | 98,870 | 144,902 | 52,791 | |
| Applied demographic indexes for cluster analysis | | | | |
| Proportion to total private households (%) | | | | |
| Three-generation households | 7.1 ± 1.6 | 13.4 ± 4.1 | 31.1 ± 8.3 | <0.001 |
| Homeowner households | 52.8 ± 2.8 | 68.2 ± 10.9 | 90.2 ± 6.4 | <0.001 |
| Situation of employed workers | | | | |
| Population of employed people/population of people aged 25–64 years | 0.89 ± 0.02 | 0.90 ± 0.05 | 1.00 ± 0.04 | <0.001 |
| Proportion to the entire employed population (%) | | | | |
| Working females | 44.1 ± 1.6 | 43.4 ± 0.5 | 44.2 ± 1.1 | 0.220 |

| | | | | |
|---|---|---|---|---|
| Employees | 87.2 ± 2.6 | 87.0 ± 2.2 | 78.1 ± 3.3 | <0.001 |
| Self-employed individuals | 9.3 ± 2.1 | 8.9 ± 1.0 | 13.4 ± 1.6 | <0.001 |
| Family workers[b] | 3.5 ± 0.5 | 4.1 ± 1.3 | 8.6 ± 1.7 | <0.001 |
| Agricultural workers | 1.3 ± 1.3 | 3.6 ± 2.2 | 11.8 ± 3.6 | <0.001 |
| Secondary industry workers | 17.2 ± 5.1 | 24.0 ± 6.0 | 32.2 ± 3.2 | <0.001 |
| Tertiary industry workers | 79.8 ± 5.6 | 70.6 ± 6.4 | 55.4 ± 4.6 | <0.001 |
| Part-time workers[c] | 22.8 ± 1.8 | 23.8 ± 3.0 | 20.2 ± 1.7 | 0.009 |
| Indexes for employment capacity | | | | |
| Working employees[d] /population of 25–64 years old | 1.46 ± 0.29 | 0.66 ± 0.14 | 0.70 ± 0.13 | <0.001 |
| Working employees[d] /population of total employed workers | 1.64 ± 0.30 | 0.74 ± 0.15 | 0.70 ± 0.12 | <0.001 |

All data except the number of working emploees are based on the 2005 National Population Census

[a] Name assigned according to geodemographic characteristics

[b] in-family workers working for self-employed workers

[c] People working for <35 h/wk

[d] Employees working at worksites that located in each administrative service district, of which number was based on 2006 Business Establishment and Enterprise Census for Niigata Prefecture

Table 2. Basic characteristics of disabled subjects classified according to geodemographic characteristics of their district

| | Men | | | | Women | | | |
|---|---|---|---|---|---|---|---|---|
| | Urban area (n=306) | Residential area (n=579) | Rural area (n=296) | *P* | Urban area (n=233) | Residential area (n=451) | Rural area (n=169) | *P* |
| Age (years) | 53.6 ± 9.8 | 53.3 ± 10.1 | 53.0 ± 9.8 | 0.745 | 52.1 ± 11.2 | 54.3 ± 9.1 | 53.1 ± 9.7 | 0.019 |
| Officially certified disability grades in physical disability certificate[a] | | | | 0.706 | | | | 0.939 |
| Grade 1 | 104 (34.0) | 224 (38.7) | 111 (37.5) | | 82 (35.2) | 137 (30.4) | 57 (33.7) | |
| Grade 2 | 54 (17.6) | 101 (17.4) | 49 (16.6) | | 47 (20.2) | 86 (19.1) | 35 (20.7) | |
| Grade 3 | 51 (16.7) | 68 (11.7) | 46 (15.5) | | 44 (18.9) | 88 (19.5) | 32 (18.9) | |
| Grade 4 | 59 (19.3) | 103 (17.8) | 46 (15.5) | | 38 (16.3) | 89 (19.7) | 24 (14.2) | |
| Grade 5 | 17 (5.6) | 36 (6.2) | 19 (6.4) | | 12 (5.2) | 28 (6.2) | 13 (7.7) | |
| Grade 6 | 20 (6.5) | 40 (6.9) | 21 (7.1) | | 9 (3.9) | 19 (4.2) | 7 (4.1) | |
| Missing | 1 (0.3) | 7 (1.2) | 4 (1.4) | | 1 (0.4) | 4 (0.9) | 1 (0.6) | |
| Type of disabilities | | | | 0.799 | | | | 0.443 |
| Visual impairment | 24 (7.8) | 39 (6.7) | 19 (6.4) | | 23 (9.9) | 41 (9.1) | 11 (6.5) | |
| Hearing impairment | 22 (7.2) | 36 (6.2) | 18 (6.1) | | 22 (9.4) | 28 (6.2) | 10 (5.9) | |
| Voice and speech disturbances | 9 (2.9) | 18 (3.1) | 8 (2.7) | | 5 (2.1) | 11 (2.4) | 0 (0.0) | |
| Orthopedically impaired | 171 (55.9) | 301 (52.0) | 167 (56.4) | | 135 (57.9) | 275 (61.0) | 111 (65.7) | |
| Internal impediment | 67 (21.9) | 166 (28.7) | 74 (25.0) | | 43 (18.5) | 86 (19.1) | 35 (20.7) | |
| Missing | 13 (4.2) | 19 (3.3) | 10 (3.4) | | 5 (2.1) | 10 (2.2) | 2 (1.2) | |
| Living at home | 286 (93.5) | 544 (94.0) | 273 (92.2) | 0.622 | 220 (94.4) | 428 (94.9) | 162 (95.9) | 0.807 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Household members | | | | | | | | | | | | | |
| Living alone | 45 | (14.7) | 64 | (11.1) | 36 | (12.2) | 0.289 | 33 | (14.2) | 28 | (6.2) | 5 | (3.0) | <0.001 |
| Living with parents | 79 | (25.8) | 181 | (31.3) | 109 | (36.8) | 0.014 | 49 | (21.0) | 96 | (21.3) | 55 | (32.5) | 0.008 |
| Living with spouse | 180 | (58.8) | 322 | (55.6) | 169 | (57.1) | 0.653 | 125 | (53.6) | 292 | (64.7) | 108 | (63.9) | 0.014 |
| Disability pension recipient | 144 | (47.1) | 256 | (44.2) | 151 | (51.0) | 0.160 | 109 | (46.8) | 199 | (44.1) | 85 | (50.3) | 0.377 |
| Welfare benefit recipient | 23 | (7.5) | 44 | (7.6) | 8 | (2.7) | 0.012 | 9 | (3.9) | 19 | (4.2) | 4 | (2.4) | 0.557 |
| Independency | | | | | | | | | | | | | |
| Activities of daily living | 233 | (76.1) | 429 | (74.1) | 231 | (78.0) | 0.424 | 173 | (74.2) | 354 | (78.5) | 126 | (74.6) | 0.366 |
| Housekeeping | 171 | (55.9) | 321 | (55.4) | 178 | (60.1) | 0.391 | 144 | (61.8) | 271 | (60.1) | 100 | (59.2) | 0.854 |
| Finance management | 218 | (71.2) | 429 | (74.1) | 219 | (74.0) | 0.631 | 190 | (81.5) | 361 | (80.0) | 127 | (75.1) | 0.267 |

P-values, by one-way analysis of variance or chi-square test

[a] Smaller the grade, the more severe the disability

Table 3. Employment status of disabled subjects classified according to geodemographic characteristics of their district

| | Men | | | | | | | | Women | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban area (n=306) | | Residential area (n=579) | | Rural area (n=296) | | *P* | | Urban area (n=233) | | Residential area (n=451) | | Rural area (n=169) | | *P* | |
| Type of employed workers__*n* (%) | | | | | | | | | | | | | | | | |
| Total employed workers | 157 | (51.3) | 291 | (50.3) | 160 | (54.1) | 0.567 | | 76 | (32.6) | 114 | (25.3) | 56 | (33.1) | 0.052 | |
| Employees | 102 | (33.3) | 196 | (33.9) | 107 | (36.1) | 0.731 | | 46 | (19.7) | 77 | (17.1) | 35 | (20.7) | 0.498 | |
| Regular | 82 | (26.8) | 143 | (24.7) | 79 | (26.7) | 0.723 | | 28 | (12.0) | 26 | (5.8) | 20 | (11.8) | 0.006 | |
| Part-time/temporary | 20 | (6.5) | 53 | (9.2) | 28 | (9.5) | 0.338 | | 18 | (7.7) | 51 | (11.3) | 15 | (8.9) | 0.294 | |
| Non-employeee workers* | 55 | (18.0) | 95 | (16.4) | 53 | (17.9) | 0.784 | | 30 | (12.9) | 37 | (8.2) | 21 | (12.4) | 0.098 | |
| Monthly earning in thousand *yen*__*n* (% of total employed workers) | | | | | | | 0.851 | | | | | | | | 0.656 | |
| <10 | 5 | (3.2) | 3 | (1.0) | 2 | (1.3) | | | 1 | (1.3) | 5 | (4.4) | 1 | (1.8) | | |
| 10–<50 | 4 | (2.5) | 13 | (4.5) | 5 | (3.1) | | | 3 | (3.9) | 13 | (11.4) | 8 | (14.3) | | |
| 50–100 | 12 | (7.6) | 22 | (7.6) | 16 | (10.0) | | | 20 | (26.3) | 34 | (29.8) | 12 | (21.4) | | |
| 100–150 | 20 | (12.7) | 37 | (12.7) | 23 | (14.4) | | | 14 | (18.4) | 19 | (16.7) | 12 | (21.4) | | |
| 150–200 | 25 | (15.9) | 38 | (13.1) | 24 | (15.0) | | | 8 | (10.5) | 7 | (6.1) | 4 | (7.1) | | |
| 200+ | 64 | (40.8) | 131 | (45.0) | 68 | (42.5) | | | 13 | (17.1) | 15 | (13.2) | 9 | (16.1) | | |
| Missing | 27 | (17.2) | 47 | (16.2) | 22 | (13.8) | | | 17 | (22.4) | 21 | (18.4) | 10 | (17.9) | | |

P values, by chi-square test

[a] Among the men, 99 were self-employed, 4 were family workers, and 100 were wokers with unidentified working style; among the women, the corresponding numbers were 29, 12, and 47.

Table 4. Association between the working status of disabled subjects and the geodemographic characteristics of their districts

| | Men | | | | | | | Women | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban area | Residential area | | | Rural area | | | Urban area | Residential area | | | Rural area | | |
| | OR | OR | (95% CI) | *P* | OR | (95% CI) | *P* | OR | OR | (95% CI) | *P* | OR | (95% CI) | *P* |
| Being an employed worker | | | | | | | | | | | | | | |
| Age adjusted | 1.00 | 0.98 | (0.73 , 1.30) | 0.876 | 1.11 | (0.79 , 1.54) | 0.551 | 1.00 | 0.74 | (0.51 , 1.07) | 0.107 | 1.05 | (0.67 , 1.63) | 0.832 |
| Multivariable | 1.00 | 0.93 | (0.65 , 1.32) | 0.686 | 1.00 | (0.67 , 1.49) | 0.993 | 1.00 | 0.75 | (0.50 , 1.13) | 0.171 | 1.24 | (0.75 , 2.03) | 0.400 |
| Being an employee | | | | | | | | | | | | | | |
| Age adjusted | 1.00 | 1.04 | (0.76 , 1.41) | 0.808 | 1.11 | (0.78 , 1.58) | 0.562 | 1.00 | 0.95 | (0.61 , 1.48) | 0.831 | 1.14 | (0.67 , 1.93) | 0.630 |
| Multivariable | 1.00 | 1.07 | (0.75 , 1.53) | 0.719 | 1.07 | (0.71 , 1.59) | 0.757 | 1.00 | 0.95 | (0.57 , 1.58) | 0.852 | 1.42 | (0.77 , 2.60) | 0.261 |
| Being a regular employee | | | | | | | | | | | | | | |
| Age adjusted | 1.00 | 0.91 | (0.65 , 1.27) | 0.573 | 0.97 | (0.66 , 1.42) | 0.878 | 1.00 | 0.46 | (0.26 , 0.83) | 0.010 | 1.02 | (0.54 , 1.92) | 0.963 |
| Multivariable | 1.00 | 0.87 | (0.60 , 1.26) | 0.454 | 0.87 | (0.57 , 1.33) | 0.512 | 1.00 | 0.41 | (0.21 , 0.79) | 0.008 | 1.19 | (0.57 , 2.47) | 0.641 |

OR, odds ratio; CI, confidence interval

Multivariable model adjusted for age, certified grade of disability, type of disability, living place, household, disability pension-receiving status, welfare benefit–receiving status, and independence of ADL, domestic work, and financial control.

Figure 1

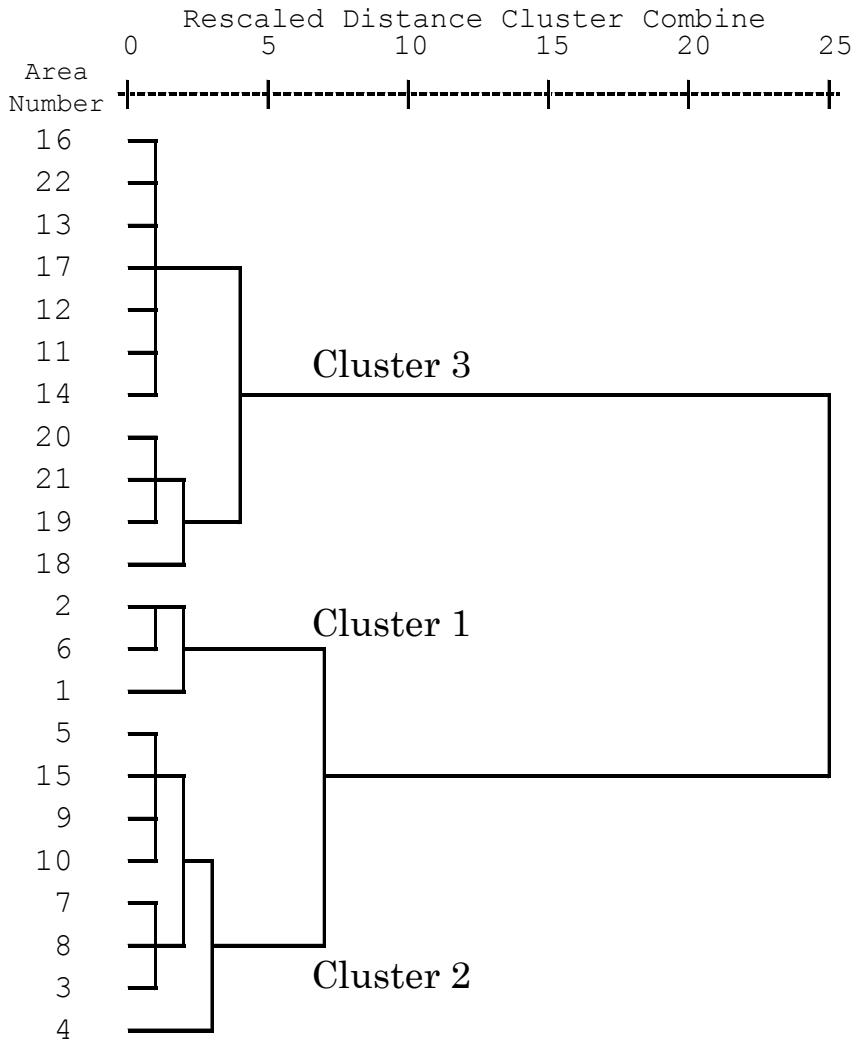
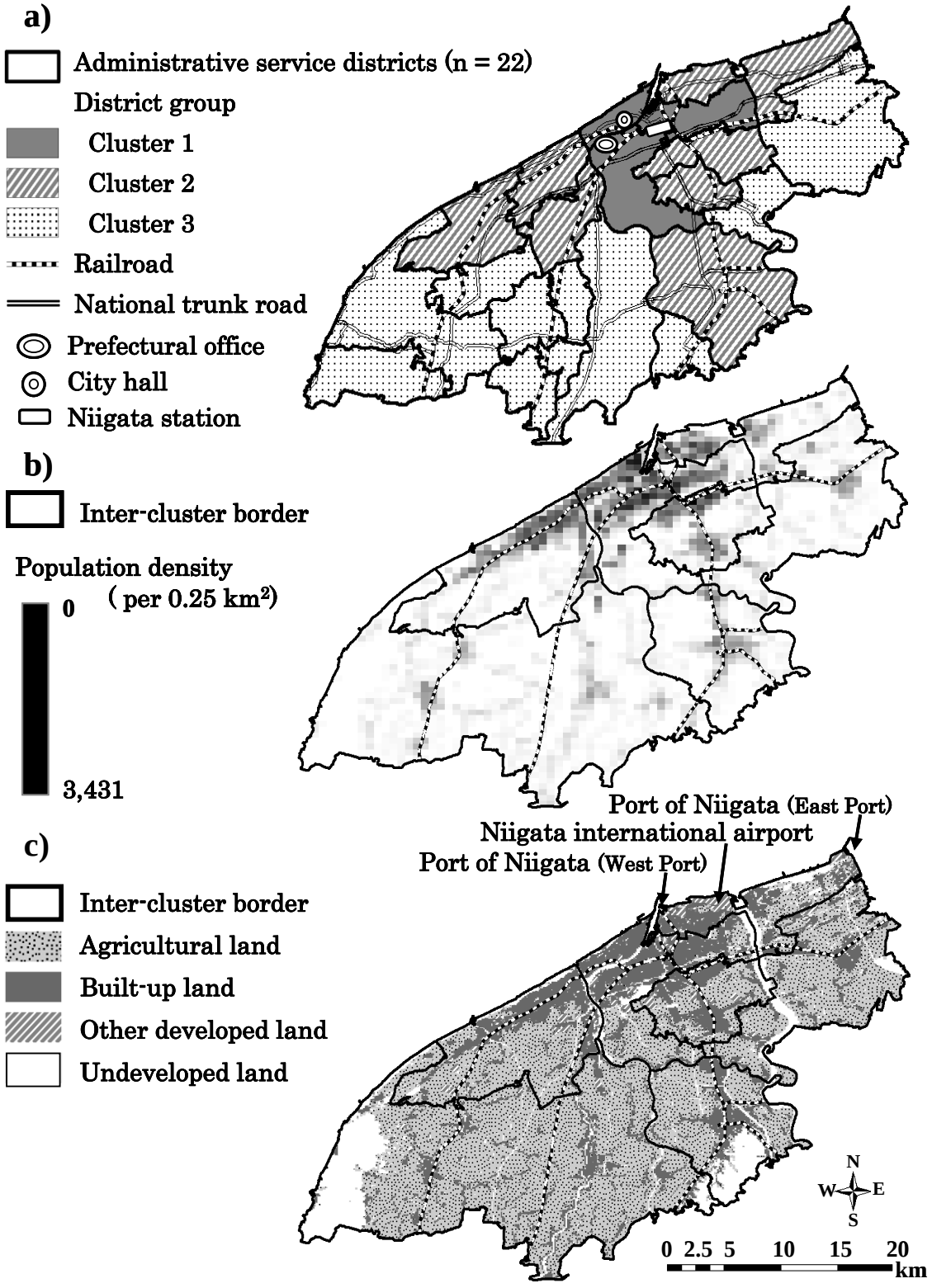

Rescaled Distance Cluster Combine
0
5
10
15
20
25
Area
Number
16
22
13
17
12
11
14
20
21
19
18
2
6
1
5
15
9
10
7
8
3
4
Cluster 3
Cluster 1
Cluster 2

Figure 2


a)
Administrative service districts (n = 22)
District group
Cluster 1
Cluster 2
Cluster 3
Railroad
National trunk road
Prefectural office
City hall
Niigata station
b)
Inter-cluster border
Population density
( per 0.25 km2)
0
3,431
c)
Inter-cluster border
Agricultural land
Built-up land
Other developed land
Undeveloped land
Port of Niigata (East Port)
Niigata international airport
Port of Niigata (West Port)
N
W
E
S
0 2.5 5 10 15 20
km