Urban-Rural Difference in the Acceptance of Mass Health Examination in North-Eastern Japan

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— Over 40000 residents (≤ 40 years of age) in a city (Sendai; the city group), a
town (Shiroishi; the town group) and two villages (Wakuya and Tajiri; the
village group) in Miyagi prefecture in north-eastern Japan responded in a question-
naire survey on their attitude towards mass health examinations (i.e., whether they
underwent in the previous year and if so where) on 4 items of blood pressure
measurement, chest x-ray examination and screening tests for stomach and cervical
cancer. The coverage rates were about 70% on an average both for blood pressure
measurement and for chest x-ray examination, whereas the rates for cancer screen-
ing were between 30-40%. As for the opportunity of the former two examina-
tions, the workplace mass examination played a large role in the case of the city
and town groups (especially among men but not women) in addition to visit to
clinics, in contrast to the case of the village group in which people depended much
on regional mass examination service. The trend was essentially reproducible in
stomach cancer screening although the over-all coverage rate was low, whereas
women in the three groups almost exclusively utilized clinics for cervical cancer
screening with one exception that the mobile unit service appeared to be equally
accepted in the village group. ——— cervical cancer; chest disease; hyperten-
sion; mass health examination; stomach cancer

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Statistics are available to show that how many people and therefore how many percentage of the residents participate in a particular mass health examination, e.g. local health authority-organized blood pressure measurement, in a region of concern (e.g., Miyagi prefecture 1985a, b). The chance for blood pressure measurement for the individual is, however, not necessarily limited to the examination offered by the authorities; the subject may consult his/her family doctor for the check, or he/she may be examined at the routine check-up in the workplace in case he/she serves in a governmental organization or in a large company (Ministry of Health and Welfare 1974). The information, as far as it is correct, should be equally valuable for the health maintenance of him- or herself regardless of variation in chance of the measurement. The critical point then is whether or not such service is offered, the examination is made and the information is available. No survey appears to be made to investigate the attitude of the individual residents in the acceptance of various mass health examination. The present study was conducted as a part of multifaceted "Health and Environment" program in Miyagi prefecture to investigate how the residents in Miyagi prefecture access health examination for their health maintenance and if there is any urban-rural difference in the response.

MATERIALS AND METHODS

Study populations

The study method was previously described in detail (Ikeda et al. 1986; Nakatsuka et al. 1988; Sato et al. 1989). In brief, all inhabitants at the ages of ≥ 40 years in 6 primary school sectors in the center of the city of Sendai (to be called the city group), in a central part of the city of Shiroishi (the town group), and in two entire farming villages of Wakuya and Tajiri (neighboring to each other and combined to form the village group) were examined if and where they underwent health examination in the preceding year. The survey was made by means of the self-completion questionnaires, which consisted of questions on various facets of life such as current subjective symptoms, medical history, dietary habits, etc., and the part on the acceptance of mass health examination (as to be detailed in the succeeding section) is analyzed in the present study. The findings on health effects of air pollution (Ikeda et al. 1986) and on food habits (Nakatsuka et al. 1988; Sato et al. 1989) in Sendai, Wakuya and Tajiri have been reported. The survey in Sendai, Wakuya and Tajiri was conducted in February, 1984, and that in Shiroishi in February, 1988. The numbers of examinees, respondents and response rates are summarized in Table 1.

The characteristics of the three study regions (for locations, see Fig. 1) are summarized as follows (Kahoku Shimpō 1982); Sendai with a population of about 800,000 is a prefectural city and a center of administration, business, transportation, university/college level education, and other social activities. Shiroishi with ca. 41,000 residents is a regional center of administration and education (up to high school levels) with spinning and other light industries in addition to horticulture for peach and persimmon. Wakuya and Tajiri with 21,000 and 15,000 inhabitants, respectively, have been predominantly agricultural in economy with rice as staple.

Questionnaires

The self-completion questionnaires had 30 questions on various facets of life, and

Fig. 1. Location of three study regions in Miyagi prefecture, Japan. The shaded area indicates Miyagi prefecture, and three dots in the expanded map of Miyagi prefecture are for Sendai, Shiroishi, Wakuya and Tajiri, respectively.

included following 7 questions on the response of the examinees towards mass health examinations for hypertension, tuberculosis, and stomach/(uterine) cervical cancer. The questionnaires were hand-delivered and hand-collected by local volunteer organizations with due care to protect privacy of each respondent (Ikeda et al. 1986 ; Nakatsuka et al. 1988). The seven questions analyzed in this article were as follows :

Question 1 : Have you ever engaged in the following activities ? (Identify all among the followings by circle.)

A. Yes, I do (or did).

1. Agriculture.
2. Forestry.
3. Mining.

B. No, I do (did) not.

Question 2 : What type of health (social) insurance do you have as either an insured individual or as a family dependent ? (Specify by circle.)

1. National health insurance.
2. Social insurance by mutual aid associations.
3. Government-managed health insurance.
4. Society-managed health insurance.
5. Others (Specify by writing).

[Note : All Japanese nationals are covered by one of the health (social) insurance systems cited above. The employees (as insured) and their family dependents of large companies are covered by *society-managed* health insurance, whereas those in medium or small companies (and their family dependents) are by *government-managed* one. Employees of the central and local governments, public enterprise corporations and school teachers, separately, form mutual aid associations for various social insurance (i.e., *social insurance by mutual aid associations* which includes health insurance). Other people (e.g., those in small-scale independent business and farmers) regionally organize a *national* health insurance system. For details of the insurance system, see Ministry of Health and

Welfare (1974).

Additional question : Are you the insured or a family dependent ? (Specify by circle).

1. The insured.
2. The family dependent.

Question 3 : Did you undergo blood pressure measurement last year ? If yes, where ? (Identify all among the followings by circle.)

- A. Yes, I did.
 1. At the regional mass health examination organized by local health authorities.
 2. At the mass medical examination in the workplace.
 3. At the clinical facilities (e.g., hospitals, dispensaries, or out-patient clinics, excluding the health center).
 4. At the regional health center.
 5. Others (Specify by writing.)
- B. No, I did not.

Question 4 : Did you undergo chest x-ray examination (for tuberculosis) last year ? If yes, where ? (Identify all among the followings by circle.)

- A. Yes, I did.
 1. At the regional mass health examination organized by local health authorities.
 2. At the regional health center.
 3. At the mass medical examination in the workplace.
 4. At the clinical facilities (e.g., hospitals, dispensaries, or out-patient clinics, excluding the health center).
 5. Others (Specify by writing.)
- B. No, I did not.

Question 5 : Did you undergo stomach cancer screening last year ? If yes, where ? (Identify all among the followings by circles.)

- A. Yes, I did.
 1. At the regional mass health examination organized by local health authorities.
 2. At the mass medical examination in the workplace.
 3. At the clinical facilities (e.g., hospitals, dispensaries, or out-patient clinics, excluding the health center).
 4. Others (Specify by writing.)
- B. No, I did not.

(Note : No medical service of GI tract check-up was available in the regional health center.)

Question 6 : How often did you have mass screening for stomach cancer in these 5 years ? Give the number.

Question 7 (Women only) : Did you undergo screening for cervical cancer last year ? If yes, where ? (Identify all among the followings by circle.)

- A. Yes, I did.
 1. At the mass medical examination in the workplace.
 2. At the clinical facilities (e.g., hospitals, dispensaries, or out-patient clinics, excluding the health center).
 3. By a cancer screening mobile unit.
 4. Others (Specify by writing.)
- B. No, I did not.

Statistical analyses

Basic statistics were conducted with an ACOS 1000 system in the Tohoku University Computer Center utilizing a package program "CROSS". The significance of difference between the groups was examined by *t*-test, chi-square test or analysis of variance as indicated.

RESULTS

Response rates and age distribution

In total, over 40000 people responded to the questions with a grand response rate of 87.7% (Table 1). The number of the respondents was largest in the city group (i.e., in Sendai) in both sexes, slightly smaller in the village group (i.e., in Wakuya+Tajiri) and about half the size of the former two in the town group (i.e., in Shiroishi). The respondent numbers were essentially equal between the two sexes in the three regions studied. It was found that the difference in age distribution was small if present among the three study groups (Table 1) when the age structure was compared, and accordingly, no adjustment for age was made in the following analyses.

Characteristics of the study population

The comparison of work history of the respondents in primary industries made it clear that the rate of those who once engaged in agriculture was markedly

TABLE 1. *Number of respondents in the three study regions, by sex and age*

Sex and age range		Region*			
		City	Town	Village	Total
Men	Number of respondents	7703	3707	6680	18090
	40-49 years	30.1%	27.5%	27.5%	28.6%
	50-59 years	30.2%	29.1%	33.9%	31.3%
	60-69 years	20.9%	22.7%	20.3%	21.0%
	70 years and over	15.9%	17.6%	14.9%	15.9%
	Unknown	2.9%	3.1%	3.4%	3.2%
Women	Number of respondents	9693	4382	8048	22123
	40-49 years	28.9%	24.1%	25.1%	26.6%
	50-59 years	29.9%	28.6%	31.6%	30.3%
	60-69 years	22.0%	24.9%	21.5%	22.4%
	70 years and over	16.2%	19.1%	18.1%	17.5%
	Unknown	3.0%	3.3%	3.7%	3.2%
Total	Number of respondents	17396	8089	14728	40213
	(Response rate†)	(81.4%)	(91.8%)	(94.1%)	(87.7%)
	40-49 years	29.4%	25.7%	26.2%	27.5%
	50-59 years	30.0%	28.8%	32.7%	30.7%
	60-69 years	21.5%	23.9%	21.0%	21.8%
	70 years and over	16.1%	18.4%	16.6%	16.8%
	Unknown	3.0%	3.2%	3.5%	3.2%

*Unless otherwise specified, the values in the table are the percentages taking the number of respondents as 100.

† The response rate is defined as $[\text{respondents/examinees}] \times 100 (\%)$.

TABLE 2. *History of engagement in primary industries*

Sex	Industry*	City	Town	Village	Total
Men	Agriculture	7.2%	22.3%	53.1%	27.3%
	Forestry	1.3%	5.6%	9.1%	5.1%
	Mining	1.5%	2.2%	2.7%	2.1%
Women	Agriculture	5.8%	15.4%	43.1%	21.3%
	Forestry	0.6%	1.9%	2.8%	1.6%
	Mining	0.2%	0.3%	0.4%	0.3%

*There was no fishing activity in the three regions.

different among the three groups; the rate was highest in the village group, followed by the town group and lowest in the city group both in men and in women (Table 2) as expected. The rate of current farmers or ex-farmers among men was almost 8 times higher in the village group than in the city group. A similar difference was observed in forestry and to a lesser extent in mining, but the numbers of the people with experiences in the latter two industries were very limited in any of the three groups. Very few fishing activity was present in the study regions.

The study populations were further examined for types of the health (social) insurance the individuals were covered by (Table 3). It was apparent from the table that the rate of those covered by national health insurance is highest in the village group, then in the town group and the lowest in the city group; the

TABLE 3. *The types of health insurance among the respondents*

Insurance	Men				Women			
	City	Town	Village	Total	City	Town	Village	Total
Type of insurance (HI or SI*)								
National HI	40.2%	45.2%	69.4%	52.0%	44.7%	45.7%	66.6%	52.9%
SI by mutual aid associations	13.6%	14.0%	7.6%	11.5%	12.7%	11.7%	6.7%	11.2%
Government-managed HI	26.9%	22.6%	13.7%	21.1%	25.1%	24.1%	15.5%	21.4%
Society-managed HI	15.2%	10.7%	4.3%	10.3%	12.2%	9.1%	5.0%	9.0%
Others plus no marking	4.1%	7.5%	5.0%	5.1%	5.3%	9.4%	8.6%	6.5%
The insured or a family dependent								
The insured	84.2%	73.5%	64.0%	74.6%	29.9%	32.4%	19.5%	26.6%
A family dependent	7.7%	15.0%	20.7%	14.0%	61.7%	55.6%	64.4%	61.5%
No answer	8.1%	11.6%	15.4%	11.5%	8.4%	12.1%	16.1%	11.9%

For total number of the respondents, see Table 1.

*HI for health insurance; SI for social insurance.

difference is statistically significant ($p < 0.01$) both in men and in women. A mirror image was the case for society-managed health insurance. The rates are similar between the two sexes in the three groups independent of the types of insurance systems; e.g., 40.2% of the men in the city group are covered by the national health insurance, and the rate is 44.7% in the women of the same group. Men themselves were mostly the insured, whereas a majority of women was covered as a family dependent regardless of either different types of the insurance or the place of the residence (Table 3).

Coverage of health examination for hypertension and chest disease

Men and women in the three study regions were classified depending on the health examinations they had for early detection of two manageable diseases of hypertension and tuberculosis. In the case of blood pressure measurement (the upper half in Table 4), about 70% or more of the respondents underwent the examination in the previous year independent of the location of the residence. The rate was highest for the consultation at the clinical facilities in both sexes followed by the rate for workplace examination among men (but not among women) in the city group, whereas almost 50% of the people in the village group were examined at the regional mass examination organized by the local health authorities. In the town group, the rates of men who had examined at regional or workplace mass examination and of women examined at workplace mass examination were just between the values for the city and village groups. Such different attitude on acceptance of various occasions for health examination was essentially reproducible when the cases of chest x-ray examination were analyzed (the lower half in Table 4), with an exception that the rates of those who had examination in the previous year were not similar among the three groups; it was higher in the town and village groups and lower in the city group. The dependency of men and women in the village group on the regional mass examination was, however, even more evident (i.e., 64% in men and 80% in women) in the case of chest x-ray examination.

Limited acceptance of cancer screening

When similar analyses were made for men and women in case of stomach cancer examination and for women in case of cervical cancer examination, it was shown (Table 5) that the acceptance of cancer screening examination appeared to be low, i.e., 46% at best (stomach cancer test among men in the town group) and less than one third in most of other instances, making a contrast to the case of blood pressure measurement which was widely accepted (Table 4). Among those who underwent the examination in the previous year (although they were small in number), the two leading occasions for stomach cancer screening in the city group were visit to clinics and workplace examination for men, whereas clinics played even a bigger role for women. In contrast, both men and women in the

TABLE 4. Rates of residents who underwent blood pressure measurement or chest x-ray examination in the previous year, by sex, by residence and by service

Item	Men				Women			
	City	Town	Village	Total	City	Town	Village	Total
Blood pressure measurement								
Number of affirmative answer	5659	3403	4440	13502	6428	4031	5403	15862
(A ; N ; NA in%*)	(73 ; 14 ; 12)	(92 ; 6 ; 2)	(66 ; 10 ; 24)	(75 ; 11 ; 14)	(67 ; 19 ; 14)	(92 ; 6 ; 2)	(67 ; 10 ; 23)	(72 ; 13 ; 15)
Regional mass exam.†	5.1%	24.5%	43.0%	22.5%	16.0%	37.8%	55.4%	37.4%
Regional health center	1.9%	5.4%	1.8%	2.7%	2.1%	8.4%	2.5%	3.8%
Workplace mass exam.‡	41.9%	36.6%	25.6%	35.2%	11.0%	16.6%	10.2%	12.2%
Clinics	62.1%	46.8%	48.2%	53.6%	75.7%	51.5%	49.7%	60.7%
Others plus no marking	3.2%	3.7%	2.5%	3.1%	3.6%	2.4%	1.8%	2.7%
Chest x-ray examination								
Number of affirmative answer	4881	3333	4712	12926	5053	4063	5943	15059
(A ; N ; NA in %*)	(63 ; 26 ; 10)	(90 ; 8 ; 2)	(71 ; 7 ; 22)	(72 ; 13 ; 15)	(52 ; 36 ; 12)	(93 ; 5 ; 2)	(74 ; 5 ; 21)	(68 ; 19 ; 13)
Regional mass exam.†	11.6%	37.8%	64.0%	37.4%	39.0%	58.3%	79.9%	60.3%
Regional health center	1.3%	4.2%	1.8%	2.2%	2.0%	6.6%	2.0%	3.3%
Workplace mass exam.‡	52.1%	39.4%	25.2%	39.0%	17.4%	17.5%	10.7%	14.8%
Clinics	41.9%	24.7%	16.3%	28.1%	44.5%	22.0%	12.5%	25.8%
Others plus no marking	1.6%	2.4%	1.5%	1.8%	1.4%	1.4%	1.3%	1.4%

*The percentage of those with affirmative answers (i.e., who underwent the examination at any occasion), followed by who answered that they did not and those with no answer. For the total number of the respondents (i.e., the sum of those with affirmative, negative and no answer), see Table 1.

†Mass examination organized by the local health authorities.

‡Mass examination in the workplace.

TABLE 5. Rates of residents who underwent screening examination for stomach and cervical cancer, by sex, by place of residence and by service

Item	Men				Women			
	City	Town	Village	Total	City	Town	Village	Total
Examination for stomach cancer								
Number of affirmative answer*	3500	1715	2364	7579	3143	1630	2632	7405
(A ; N ; NA in % †)	(45 ; 45 ; 10)	(46 ; 47 ; 7)	(35 ; 44 ; 21)	(42 ; 45 ; 13)	(33 ; 56 ; 11)	(37 ; 55 ; 8)	(33 ; 47 ; 20)	(33 ; 53 ; 14)
Regional mass exam. ‡	12.9%	23.2%	49.6%	26.7%	32.1%	37.6%	62.7%	44.2%
Workplace mass exam. §	40.3%	29.9%	16.1%	31.2%	10.6%	13.2%	7.3%	10.0%
Clinics	50.5%	47.8%	35.0%	45.1%	57.3%	49.0%	31.1%	46.1%
Others plus no marking	1.9%	4.7%	2.7%	2.8%	2.5%	3.6%	2.8%	2.9%
Frequency in past 5 years								
Those who answered	5789	2780	4505	13074	6411	2926	5175	14512
Frequency (M + s.d.)	1.9 ± 2.1	2.0 ± 2.2	2.4 ± 1.9	2.1 ± 2.1	1.5 ± 1.8	1.8 ± 2.1	2.2 ± 1.9	1.8 ± 1.9
Examination for cervical cancer								
Number of affirmative answer*					2582	1100	2475	6157
(A ; N ; NA in % †)					(27 ; 64 ; 9)	(25 ; 67 ; 8)	(31 ; 52 ; 17)	(28 ; 60 ; 12)
Workplace mass exam. §					4.8%	5.3%	10.2%	7.1%
Clinics					91.9%	90.1%	48.4%	74.1%
Cancer screening mobile unit					0.8%	3.1%	37.2%	15.8%
Others plus no marking					2.7%	2.0%	5.3%	3.6%

*For the examination in the previous year.

†The percentage of those with affirmative answers (i.e., who underwent the examination at any occasion), followed by who answered that they did not and those with no answer. For the total number of the respondents (i.e., the sum of those with affirmative, negative and no answer), see Table 1.

‡Mass examination organized by the local health authorities.

§Mass examination in the workplace.

village group applied for the regional mass examination more extensively than the people in the city for the cancer screening. In the town group, visit to clinics was the most common for both men and women, followed by workplace examination in men and regional mass examination in women.

The coverage rate was even lower in the case of cervical cancer screening, i.e., from 25% for town women to 31% for village women. As for the occasion of examination, women in the city and the town groups almost exclusively relied upon clinical facilities, whereas women in the village used both clinics and to a slightly lesser extent, the cancer screening mobile unit.

DISCUSSION

The present questionnaire survey has clearly demonstrated that more than a half of the residents in the three study regions in Miyagi prefecture used to have blood pressure measurement and chest x-ray examination every year (Table 4), whereas the coverage rates of the screening for serious diseases like stomach and cervical cancer are lower at the level of well below 50% (Table 5). The behavior of the people in utilizing the opportunity of health examination varied depending not only on the place of residence (i.e., urban-rural difference in acceptance) and on the sex, but acceptability of the examination (e.g., blood pressure measurement is easy to accept) as well as the seriousness of the disease [e.g., more people are willing to undergo examination for more manageable diseases like hypertension and lung tuberculosis (i.e., 60–70%) than for more insidious diseases such as cancer (30–40%) (Table 4 and Table 5)]. For the examination of the former two diseases, men in the city mostly take advantage of mass examination in the workplaces and also consultation in clinical facilities, and women in the city depend more on visit to clinics, whereas men and women in rural areas use health authority-organized mass screening examination (Table 4); it is apparent that women are employed in the secondary or tertiary industries less than men even in the city group (Table 2) and therefore chance of health examination in workplace is less available to women. In this connection, it should be noted that medical doctors and hospital beds are more available in the city than in the town, and least so in the villages among the three regions examined (Table 6), even though the numbers of visit to clinics and hospitalization did not differ very much suggesting that the needs for medical care may be essentially equal among the three groups.

Of particular interest is the difference of the values in Tables 4 and 5 from the screening rates in Table 6. The comparison shows that the real coverage rates for many health examinations are in fact higher than the rates usually understood. For example, the coverage rates for general health examination under Senior Health Act is 14–23% (depending on the year) in Sendai (man and women combined; Table 6), but 73% of men and 67% of women had blood pressure measurement, and 63% of men and 52% of women had chest x-ray examination (Table 4). Similarly, the official figure for stomach cancer screening rate in

TABLE 6. *Screening rates in cancer examination, and availability of clinical beds*

Item	City (Sendai)	Town (Shiroishi)	Village (Wakuya)	<i>ibid.</i> (Tajiri)	Miyagi prefecture	Reference
Screening rate						
General health examination*	22.8(13.5)	42.3(52.5)	55.5(58.3)	43.7(26.8)	38.2(33.7)	Min. Health & Welfare 1987
Examination for stomach cancer*	12.8(11.8)	11.2(10.2)	18.9(17.9)	25.0(24.1)	18.4(17.1)	Min. Health & Welfare 1987
Examination for cervical cancer*	29.6(28.6)	9.6(9.6)	22.9(20.8)	21.0(21.4)	26.8(25.4)	Min. Health & Welfare 1987
No. of visit at out-patient clinic†	5171	3924	4290	4520		Nagai, unpublished.
No. of hospitalization†	999	890	1181	1194		Nagai, unpublished.
No. of medical doctors‡	302.6	92.3	70.2	60.3		Miyagi prefecture 1985
No. of beds available						
In hospitals§	11.4	9.7	0.0	0.0		Miyagi prefecture 1985
In dispensaries§	3.6	3.1	5.4	3.6		Miyagi prefecture 1985

*Screening examination defined by Senior Health Act (Ministry of Health and Welfare 1983). The values are screening rates (i.e., the proportion of the examinees among the target population in %) for 1986 (th values for 1985 in parentheses).

†Calculated by Dr. Y. Nagai for Miyagi prefecture (1985b). The values are per 10 + 5 population, with correction for age taking 1985 Miyagi population as a standard (unpublished data).

‡Per 10 + 5 population.

§Per 10 + 3 population.

TABLE 7. *Screening rates in general and cancer examination, and urbanization indices for Miyagi prefecture in comparison with the values for urbanized and rural prefectures*

Item	Miyagi prefecture	Urban prefectures			Rural prefectures		
		Tokyo	Kanagawa	Osaka	Iwate	Shimane	Kochi
Screening rate							
General health examination *	38.2(33.7)	22.5(21.2)	19.5(16.9)	15.0(13.7)	52.7(50.7)	34.1(30.5)	29.4(28.7)
Examination for stomach cancer*	18.4(17.1)	4.7(4.2)	5.9(5.7)	5.9(5.3)	17.9(16.1)	12.5(11.0)	18.4(17.8)
Examination for cervical cancer*	26.8(25.4)	7.3(6.9)	12.1(11.1)	13.5(12.3)	21.5(19.5)	17.6(17.2)	17.5(17.5)
Production by primary industries (%)†	12.3	0.6	1.6	1.1	23.3	17.5	17.3
Proportion of densely populated areas (%)‡	2.5	46.0	34.8	44.1	0.5	0.6	0.7

*Cited from Ministry of Health and Welfare (1987).

†The proportion of people engaged in primary industries after Prime Minister's Office (1987b).

‡The area with dense (<4000 people/km²) after Prime Minister's Office (1987a).

Sendai (man and women combined) is 12-13% (Table 6) whereas 45% of men and 33% of women were examined for stomach cancer there (Table 5). The major reason for the difference is that the rates in Tables 4 and 5 take not only the regional mass health examination but other examinations such as workplace mass examinations and personal visits to clinics. Currently, possible association between the acceptance of various health examinations and type of health insurance (which probably varies among the three study regions) is under study, and will be reported separately.

Better acceptance of mass examination in rural areas than in urban areas is in agreement with previous publication. For example, it was reported that the screening rates in general examination as well as the rates in the screening for stomach and cervical cancer were all higher in the two villages of Wakuya and Tajiri and lower in the city of Sendai both in 1983 and 1984 (Ministry of Health and Welfare 1987). On prefectural basis, it is also true that the rates were generally lower in urban prefectures like Tokyo (with low proportion for primary industries and high density of population) and higher in rural areas like Iwate prefecture (where the primary industries are predominant and the population density is low) (Table 7). In this regard, the study populations in the city of Sendai and in the villages of Wakuya and Tajiri are apparently most and least urbanized among the three study regions (Table 2), and the prefecture of Miyagi should be considered between the two extreme groups of prefectures (Table 7) in a whole country with an employment rate in primary industries (value for agriculture in parenthesis) of 9.3% (8.3%) in 1985. The corresponding values for whole Japan are 14.6% and 12.2%, respectively (Prime Minister's Office 1987a). It is criticized that the definition of the screening rate is not always followed in practice, inevitably making the quality of the screening rates thus calculated (and cited in Table 6 and 7) rather poor for interregional comparison (Amagami 1987). The difference observed is however apparently large enough to overcome such difficulties.

Particular attention should be paid to the relatively poor acceptance by the study populations of screening examination for two insidious serious diseases of stomach and cervical cancer. The service of the two screening programs, especially that of cervical cancer screening, have been questioned recently (Bailar and Smith 1986; Murphy et al. 1987; Schnieden 1988) because, e.g., the rates of mortality from cervical cancer have not fallen in Britain (Schnieden 1988) and cost-benefit balance should also be taken into account (Morrissey 1982; Schnieden 1988). The majority of the opinions is, however, in the favor of the validity of the screening and continuation of the service both for stomach (Okui and Tejima 1980; Shanmugaratnam 1985; Shiratori et al. 1985; Arisue et al. 1986; Hisamichi et al. 1988) and cervical cancer detection (Arisue et al. 1986; Battista and Grover 1988; van der Graaf et al. 1988). The experiences by Anderson et al. (1988) and MacCormac et al. (1988) that women of younger ages, e.g., 20-30 years

or 25-34 years have higher risk of in-situ cervical cancer suggest the extension of cervical cytology service towards the women of lower ages.

Given that screening for chest disease, hypertension (Canadian Task Force for the Periodic Health Examination 1979) and cancer of stomach and cervix is all valid and beneficial, it is apparently worth to discuss the factors disturbing wider acceptance of the service. Based on a national survey in the United States on cervical and breast cancer, Hayward et al. (1988) found that the cervical smear test is less frequently received by the women of older ages (e.g., over 65 years), and that those who has no insurance or of low socio-economic status are less likely to have tests. Similarly, Akamatsu et al. (1986a) observed in a questionnaire survey on stomach cancer screening that the screening rate was high among company employees who have workplace examination in agreement with the observation in the present study (Table 5), whereas the rate was low among housewives who primarily depend on regional examination for health check. High attendance rates were observed when cervical screening tests were introduced to workplaces, suggesting potential contribution of workplace-based screening for cancer of cervix also (Morris 1988; Reid 1988). Further analysis in the reason of not to receive an examination (Akamatsu et al. 1988b) revealed that "inconvenience" or difficulty in the access due, e.g. to shortage of time, far location of the examination site, etc. was the leading reason why they were not examined. While this observation may suggest the need for the improvement of the service system so that the people will have easier access, it appears apparently too premature to draw any solid conclusion because "inconvenience" would well be a general excuse for varieties of hidden reasons.

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References

- 1) Akamatsu, N., Ide, M., Ueda, Y., Kondo, Y., Nakamura, S., Mori, T., Ogimoto, I. & Yoshimura, T. (1986a) A population survey on mass screening program for gastric cancer. Part 1. Population characteristics related to examination rates for screening program. *J. Univ. Occup. Environm. Health*, **8**, 177-183. (Japanese)
- 2) Akamatsu, N., Ide, M., Ueda, Y., Kondo, Y., Nakamura, S., Mori, T., Ogimoto, I. & Yoshimura, T. (1986b) A population survey on mass screening program for gastric cancer. Part 2. Why don't they receive mass screening examination? *J. Univ. Occup. Environm. Health*, **8**, 415-422. (Japanese)
- 3) Amagami, Y. (1987) Fundamental study on effective administration of examination for secondary cancer prevention. Report to Ministry of Health and Welfare, the Government of Japan.
- 4) Anderson, G.H., Boyes, D.A., Benedet, J.L., Le Riche, J.C., Matisic, J.P., Suen, K.C., Worth, A.J., Millner, A. & Bennnett, O.M. (1988) Organization and results of cervical cytology screening programme in British Columbia, 1955-85. *Br. Med. J.*,

- 296, 975-978.
- 5) Arisue, T., Tamura, K., Yosida, Y., Tebayasi, A., Yamaguchi, Y., Ikeda, S. & Ohtuka, S. (1986) Comparison of the changes in the mortality from stomach cancer between the model areas of mass screening for stomach cancer and the control areas. *J. Gastroenterol. Mass Surv. (Nippon Shokaki Shudan Kenshin Shi)*, **73**, 26-32. (Japanese)
 - 6) Bailar, J.C., III & Smith, E.M. (1986) Progress against cancer? *N. Engl. J. Med.*, **314**, 1226-1232.
 - 7) Battista, R.N. & Grover, S.A. (1988) Early detection of cancer; an overview. *Annu. Rev. Public Health*, **9**, 21-45.
 - 8) Canadian Task Force on the Periodic Health Examination (1979) The periodic health examination. *Can. Med. Assoc. J.*, **121**, 1193-1254.
 - 9) Hayward, R.A., Shapiro, M.F., Freeman, H.E. & Corey, C.R. (1988) Who gets screened for cervical and breast cancer? Results of a new national survey. *Arch. Intern. Med.*, **148**, 1177-1181.
 - 10) Hisamichi, S., Sugawara, N. & Fukao, A. (1988) Effectiveness of gastric mass screening in Japan. *Cancer Detect. Prev.*, **11**, 322-329.
 - 11) Ikeda, M., Watanabe, T., Watanabe, T., Hisamichi, S., Shimizu, H., Fijisaku, S., Ichinowatari, Y., Ida, Y., Suda, M., Kato, K. & Ikeda, M. (1986) Upper respiratory symptoms presumably due to studded tire-generated dust. *Environ. Int.*, **12**, 505-511.
 - 12) Kahoku Shimpō (1982) *Miyagiken Hyakkajiten (Encyclopedia on Miyagi Prefecture)*, 582-584, 658 and 1106, Kahoku Shimpō Publishers, Sendai. (Japanese)
 - 13) MacCormac, L., Lew, W., King, G. & Allen, P.W. (1988) Gynaecological cytology screening in South Australia. *Med. J. Aust.*, **149**, 530-536.
 - 14) Ministry of Health and Welfare, the Government of Japan (1974) *Health Services in Japan*, 52-57, Japan Public Health Association, Tokyo.
 - 15) Ministry of Health and Welfare, the Government of Japan (Department of Senior Health) (1983) *Rojin Hoken Ho (Senior Health Act)*.
 - 16) Ministry of Health and Welfare, the Government of Japan (Department of Senior Health) (1987) *Kenko Mappu Suchihyo (Health Map)*, Kenko-Tairyokuzukuri Zaidan, Tokyo.
 - 17) Miyagi prefecture (Department of Health and Environment) (1985a) *Miyagi Eisei Tokei Nenpo (Miyagi Health Statistics)* Miyagi prefecture, Sendai.
 - 18) Miyagi prefecture (Department of Health and Environment) (1985b) *Miyagi Kanjya Chosa (Miyagi Statistics of Patients)*, Miyagi prefecture, Sendai.
 - 19) Morris, G.J.A. (1988) Cervical screening: The potential contribution of workplace examinations. *Health Bull.*, **46**, 156-159.
 - 20) Morrissey, J.F. (1982) Mass screening for gastric cancer. *Gastrointest. Endosc.*, **28**, 112-113.
 - 21) Murphy, M.F.G., Campbell, M.J. & Goldblatt, P.O. (1987) Twenty years' screening for cancer of the uterine cervix in Great Britain, 1964-84; further evidence for its ineffectiveness. *J. Epidemiol. Community Health*, **42**, 49-53.
 - 22) Nakatsuka, H., Kasahara, M., Watanabe, T., Hisamichi, S., Shimizu, H., Fujisaku, S., Ichinowatari, Y., Ida, Y., Suda, M., Kato, K. & Ikeda, M. (1988) Urban-rural difference in food habits: A questionnaire survey in north-eastern Japan. *Ecol. Food Nutr.*, **21**, 77-87.
 - 23) Okui, K. & Tejima, H. (1980) Evaluation of gastric mass survey. *Acta Chir. Scand.*, **146**, 185-187.
 - 24) Prime Minister's Office, the Government of Japan (Bureau of Statistics) (1987a) *1985 Kokusei Chosa (1985 Census)*, Ministry of Finance Printing Bureau, Tokyo.
 - 25) Prime Minister's Office, the Government of Japan (Bureau of Statistics) (1987b) *1987 Shugyo Kozo Kihon Chosa Hokoku Sokuho (1987 Employment Status Survey Short Report)*, Ministry of Finance Printing Bureau, Tokyo.

- 26) Reid, G. (1988) Is there a need for a place-of-work cervical smear service? *Health Bull.*, **46**, 153-155.
 - 27) Sato, Y., Nakatsuka, H., Watanabe, T., Hisamichi, S., Shimizu, H., Fujisaku, S., Ichinowatari, Y., Ida, Y., Suda, S., Kato, K. & Ikeda, M. (1989) Possible contribution of green tea drinking habits to the prevention of stroke. *Tohoku J. Exp. Med.*, **157**, 337-343.
 - 28) Shanmugaratnam, K. (1985) Prevention and early detection of cancer. *Cancer Detect. Prev.*, **8**, 431-445.
 - 29) Schnieden, H. (1988) District based cervical cancer screening; are there alternative approach? *Public Health*, **102**, 405-406.
 - 30) Shiratori, Y., Nakagawa, S., Kikuchi, A., Ishii, M., Ueno, M., Miyashita, T., Sakurai, T., Negami, J., Suzuki, T. & Sato, I. (1985) Significance of gastric screening survey. *Gastroenterology*, **80**, 831-834.
 - 31) van der Graaf, Y., Zielhuis, G.A. & Vooijs, P. (1988) Cervical cancer mortality in the Netherlands. *Int. J. Epidemiol.*, **17**, 270-276.
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