Analyses of Factors Influencing Participation in the Cervical Cancer Screening Programme in the Community in Japan

Yuichiro Hirano and Toshiyuki Ojima

The association between the participation rates of cervical cancer screening programme and implementation methods, concerning data management, participant convenience, promoting participation, and payment, were analyzed. The data regarding the implementation methods were obtained in a nation-wide questionnaire survey. The relationship between the participation rates and implementation methods were assessed using the χ^2 -square test and multiple logistic regression analyses. In small municipalities, with a population < 10,000, items concerning data management, enlisting the assistance of community organizations, fee exemption, and early morning screening were positively associated with the participation. In middle-sized municipalities, with a population 10,000–49,999, early morning screening, community organizations, items concerning data management, and sending out letters were positively associated with participation. Saturday/Sunday screening, community organizations, letters, and postcards were positively associated with the participation of the older group (≥ 50 years) in large municipalities with a population > 50,000. These results indicate that enlisting the assistance of community organizations and establishing a well-organized data management system are likely to improve participation regardless of municipality size. Other implementation methods must be selected taking into account factors such as municipality population size, as well as the age distribution and characteristics of the target population.

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In Japan, every municipal government must provide screening for cervical and stomach cancer, basic health examinations, and health education programmes for aged and middle-aged residents in accordance with the Law for the Health and Medical Service of the Elderly, which came into being in 1983. These health programmes have been strengthened over the past decade, and now include screening for breast, lung, and colon cancer. The aim of these health programmes is to decrease morbidity and mortality rates from cancer and cardiovascular disease, which are the two leading causes of death in Japan. Although higher participation rates are needed to effectively carry out these screening programmes, most municipalities have not achieved the target level¹⁾.

Mass screening for cervical cancer was initiated nationwide in 1983, and involves the "Papanicolaou" smear test for

women 30 or more years of age. The level of participation in the cervical cancer programme increased from 12.9% in 1984 to 16.1% in 1993. Recently, however, the participation rate has not increased significantly and is still far below the target rate for the current eight-year plan, 30%, a goal set by the Ministry of Health and Welfare^{1,2)}. The participation rate could potentially be further increased by actively encouraging participation, setting up a more efficient data management system, and/or taking into account participant convenience.

In this study, the associations between the implementation methods for the cervical cancer screening programme and participation rates were analyzed, with the aim of identifying practical means of improving participation.

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Department of Public Health, Jichi Medical School.

Address for correspondence : Yuichiro Hirano, Department of Public Health, Jichi Medical School, 3311-1, Yakushiji, Minami-kawachi-machi, Tochigi-ken, 329-04 Japan.

SUBJECTS AND METHODS

In February of 1991, we mailed questionnaires to all 3,268 municipal governments in Japan. The items regarding implementation methods of cervical cancer screening in the questionnaire were listed in Table 1.

According to the aforementioned legislation, the population eligible for screening programme excludes individuals who have the opportunity to undergo periodic health examinations at a work-place. However, the estimation method of eligible population varies among municipalities due to lack of relevant statistics. Therefore, in this study, the female population 30 or more years of age in each municipality was used as the denominator of the participation rate. The population data were based on the 1990 national census report ³⁾. The numerator was the number of participants in the cervical cancer screening programme from April 1990 to March 1991, data obtained from an annual report published by the Ministry of Health and Welfare ⁴⁾.

The participation rate varies with population size and age-group. To control for population confounding effects, populations were categorized into one of three groups according to size. These three groups are small municipalities with a population less than 10,000, middle-sized with a population between 10,000 and 49,999, and large with a population of 50,000 or more. This classification system is widely used in Japan.

To control for age-confounding effects, populations were divided into two age-groups; a younger group between 30 and 49 years of age, and an older group 50 or more years of age. The total numbers of participants in the younger and older groups were nearly the same.

From the four categories dealing with the methods used to implement the cervical cancer screening programme, a total of 13 items were analyzed. (Table 1) For each population size and each age group, odds ratios were calculated using the χ^2 -square test in order to compare the rate of each item in the high participation municipalities with that in the low participation municipalities and to assess the association between each item and the participation rate. The high and low participation municipalities were classified as to whether or not their participation rates equalled or exceeded the average of their population and age groups. In assessing all municipalities, odds ratios were calculated using the Cochran-Mantel-Haenzel method in order to adjust for the population confounding factor.

In addition to the above mentioned univariate analyses, multiple logistic regression models were used to assess the relationship between each item regarding implementation methods and the participation rate. A total of eight items were analyzed. (Table 1) These eight items showed a clear association with the participation rate in the univariate analyses and/or representative items among each category.

All statistical analyses were conducted using SAS.

RESULTS

1. Responses to questionnaires

We sent questionnaires to all 3,268 Japanese municipal governments, and 2,795 (response rate 85.5%) were returned completed. Of these 2,795 municipalities, 1,231 were small (response rate 80.6%), 1,136 middle-sized (88.6%), and 428 large (93.2%). While all response rates exceeded 80%, the larger the population, the higher the response rate.

Table 1. Four major categories and 13 items of the cervical cancer screening programmes questionnaire used in a nationwide survey.

1. Data management

- (1) Individual filing system* (Individual filing system for maintaining and managing of individual screening data)
- (2) Computer filing system (Using computers to maintain screening records)
- (3) Records of non-participants* (Maintaining records of those who have not participated in screening for 3 years or more)
- (4) Records of detailed examinations (Maintaining records as to whether or not participants requiring detailed examinations have received them)

2. Participant convenience

- (1) Early morning screening* (Conducting a portion of screening programmes early in the morning, before 9 a.m.)
- (2) Saturday/Sunday screening* (Conducting a portion of screening programmes on Saturday and/or Sunday)
- (3) Concurrent screening* (Conducting two or more kinds of screening including cervical cancer screening at the same time)

3. Encouraging participation

- (1) Postcards (Mailing postcards to invite eligible women to participate)
- (2) Letters* (Mailing letters to invite eligible women to participate)
- (3) Telephone calls (Making telephone calls to provide necessary information about screening and encourage participation)
- (4) Community organizations* (Enlisting the assistance of community organizations for encouraging participation)
- (5) Home visits* (Employing home visits from public health nurses for promoting participation)

4. Payment

Fee exemption

Note: Eight items marked * were analyzed by multiple logistic regression analyses.

As for "payment", municipalities providing partial exemption or no information were excluded from the test.

2. Participation rates

The overall average rate was 14.3%. The rates for small, middle-sized and large municipalities were 17.7%, 12.8% and 8.8%, respectively. That is, the smaller the population, the higher the participation rate. (Fig 1) The rate for the younger group was 16.1%, that for older group 13.1%. For all population-size groups, the rates were higher for younger than those for older participants.

The numbers and rates of municipalities in relation to municipality population size, age group, and participation rate are shown in Table 2. The overall proportion of low participation municipalities was 57.1%. For all population and age groups, the numbers of low participation municipalities exceeded those of high participation municipalities.

3. Rates of cervical cancer screening implementation methods

The numbers and rates of municipalities adopting each implementation item in the cervical cancer screening programme in relation to municipality population size are shown in Table 3.

Regarding the data management, 80.9% of all municipalities had maintained "records as to whether or not participants requiring detailed examinations had received them (records of detailed examinations)". The proportions of municipalities which had an "individual filing system", those with a "computer filing system", and those maintaining "records of non-participants" were 40.1%, 26.3%, and 12.8%, respectively. For both items "individual filing system" and maintaining "records of non-participants", the proportion decreased according to

Figure 1. Participation rates of cervical cancer screening by age groups and municipality population sizes.

Table 2. Number and rates of municipalities in terms of age groups, municipality population sizes, and participation rates.

Age	Participation rate	All municipalities (2,795)		Small (1,231)		Middle-sized (1,136)		Large (428)	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)
All age	High	1,199	(42.9)	536	(43.5)	479	(42.2)	184	(43.0)
	Low	1,596	(57.1)	695	(56.5)	657	(57.8)	244	(57.0)
Younger (30-49)	High	1,221	(43.7)	533	(43.3)	497	(43.8)	191	(44.6)
	Low	1,574	(56.3)	698	(56.7)	639	(56.3)	237	(55.4)
Older (50-)	High	1,156	(41.4)	534	(43.4)	457	(40.2)	165	(38.6)
	Low	1,639	(58.6)	697	(56.6)	679	(59.8)	263	(61.4)

Note : The "high" and "low" participation municipalities were classified as to whether or not their participation rates are equalled or exceeded the average of thier population and age groups.

Table 3. Numbers and rates for each item regarding cervical cancer screening implementation methods.

Categories and items regarding implementation methods		All municipalities (2,795)		Small (1,231)		Middle-sized (1,136)		Large (428)	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)
Date management	Individual filing system	1,122	(40.1)	568	(46.1)	426	(37.5)	128	(29.9)
	Computer filing system	734	(26.3)	325	(26.4)	300	(26.4)	109	(25.5)
	Records of non-participants	358	(12.8)	243	(19.7)	94	(8.3)	21	(4.9)
	Records of detailed examinations	2,260	(80.9)	1,020	(82.9)	919	(80.9)	321	(75.0)
Participant convenience	Early morning screening	175	(6.3)	87	(7.1)	73	(6.4)	15	(3.5)
	Saturday/Sunday screening	505	(18.1)	161	(13.1)	244	(21.5)	100	(23.4)
	Concurrent screening	1,515	(54.2)	672	(54.6)	628	(55.3)	215	(50.2)
Encouraging participation	Postcards	757	(27.1)	308	(25.0)	295	(26.0)	154	(36.0)
	Letters	988	(35.3)	412	(33.5)	430	(37.9)	146	(34.1)
	Telephone calls	281	(10.1)	116	(9.4)	125	(11.0)	40	(9.3)
	Community organizations	1,747	(62.5)	839	(68.2)	707	(62.2)	201	(47.0)
	Home visits	485	(17.4)	253	(20.6)	171	(15.1)	61	(14.3)
Payment	Fee exemption	449	(16.1)	209	(17.0)	158	(13.9)	82	(19.2)

increasing population size.

Regarding participant convenience, 54.2% of all municipalities conducted "concurrent screening" and 18.1% conducted "Saturday/Sunday screening", while only 6.3% conducted "early morning screening". The proportion of municipalities conducting "early morning screening" decreased with increasing population size, while the proportion of municipalities conducting "Saturday/Sunday screening" rose with population size.

As to encouraging participation, 62.5% of all municipalities enlisting the assistance of "community organizations", 35.3% sent out "letters", 27.1% mailed "postcards", 17.4% employed "home visits" from public health nurses, and 10.1% made "telephone calls". The proportions of municipalities enlisting the assistance of "community organizations" for small and middle-sized were markedly higher than that for large municipalities. The proportion using "postcards" for large municipalities was higher than those for small and middle-sized municipalities. The proportion offering "home visits" for small municipalities was higher than those for middle-sized and large municipalities.

Regarding the payment for screening, 984 municipalities collected a fee for screening, while 449 offered exemption. The remaining 1,362 had a partial exemption (e.g. exemption for low-income participants) or did not provide information regarding payment. There were no distinct differences in the proportion of municipalities with an exemption policy among the three population size groups.

4. Univariate analyses

Figure 2 shows odds ratios and their 95% confidence inter-

vals which represent associations between each item regarding implementation methods for the cervical cancer screening programme and the participation rate for all municipalities and all age group.

All four items concerning data management showed strong positive associations with participation rates. "Maintaining records of non-participants" had the strongest association (odds ratio:2.19) among all 13 items analyzed in this study. Among the items aimed at participant convenience, "early morning screening" showed a strong positive association (1.94) with the participation rate. As to encouraging participation, "community organizations" showed the strongest association (1.85) among the five items in this category, followed by "letters" (1.35) and "home visits" (1.32). Regarding the payment for screening, "fee exemption" showed a clear positive association with participation (1.32).

Table 4 shows the odds ratios for each population-size and age group.

In assessing three population groups separately, all four items concerning data management had strong positive associations with participation rates in small and middle-sized municipalities. In large municipalities, maintaining "records of detailed examinations" and "computer filing system" showed strong positive associations. "Early morning screening" showed strong positive associations with the participation rate in small and middle-sized municipalities. In small municipalities, however, "Saturday/ Sunday screening" showed a clear negative association with the participation rate. "Postcards" showed a clear positive association in large municipalities, while this item had a clear negative association in middle-sized municipalities. "Letters" showed a positive association in mid-

Figure 2. Associations between cervical cancer screening implementation methods and participation rates (Odds ratios and their 95% confidence intervals).

dle-sized municipalities. In municipalities of all three sizes, “community organizations” had a strong positive association with participation. “Home visits” showed a positive association in large municipalities. “Fee exemption” showed a positive association in small municipalities, while the relationship was not clear in middle-sized and large municipalities.

In assessing two age groups separately, all four items regarding data management, “early morning screening”, “letters”, and “community organizations” had strong positive associations with participation rates for both age groups. “Saturday/Sunday screening” showed a negative association for the younger, and “postcards” had a negative association for the older group. “Fee exemption” had a positive association for the younger group.

For both age groups in small municipalities, “Saturday/Sunday screening” was negatively associated with the participation rate, while this item had a strong positive association in older women in large municipalities. For both age groups in middle-sized and older women in small municipalities, “postcards” showed a negative association, while this item had a clear positive association in older women in large municipalities. Except for the items regarding data management, no items were clearly associated with the participation of younger women in large municipalities.

5. Multiple logistic regression analyses

The results of multiple logistic regression analyses are shown in Table 5. “Early morning screening” showed the

strongest association with the participation rate (odds ratio:1.96). Maintaining “records of non-participants” (1.87), “community organizations” (1.68), “letters” (1.35), and “individual filing system” (1.28) all showed clear positive associations with the participation rate, while “Saturday/Sunday screening” showed a negative association.

The associations demonstrated by the multiple logistic regression model varied according to the size of the population and age group. In small municipalities, maintaining “records of non-participants” had the strongest association, followed by “early morning screening”, “community organizations”, and “individual filing system”. In middle-sized municipalities, “early morning screening” showed the strongest positive association, followed by “community organizations” and “letters”. In large municipalities, only “home visits” had a clear positive association with participation.

For both age groups in all municipalities, “records of non-participants”, “early morning screening”, “letters”, and “community organizations” showed clear positive associations with the participation rates. “Individual filing system” showed a positive association for the older group. However, “Saturday/Sunday screening” showed a negative association for the younger group.

DISCUSSION

Mass screening for cervical cancer employing the “Papanicolaou” smear test, which has been carried out nation-

Table 4. Associations between cervical cancer screening implementation methods and participation rates in terms of age groups and municipality population sizes.

Age	Categories and items regarding implementation methods		All municipalities Odds ratio (95%CI)	Small Odds ratio (95%CI)	Middle-sized Odds ratio (95%CI)	Large Odds ratio (95%CI)
All age	Data management	Individual filing system	1.52** (1.30-1.78)	1.66** (1.32-2.10)	1.42** (1.11-1.81)	1.43 (0.94-2.17)
		Computer filing system	1.67** (1.41-1.97)	1.44** (1.11-1.86)	1.84** (1.41-2.41)	1.97** (1.26-3.06)
		Records of non-participants	2.19** (1.74-2.74)	2.56** (1.91-3.42)	1.61* (1.05-2.46)	1.88 (0.78-4.57)
		Records of detailed examinations	1.89** (1.49-2.39)	1.70** (1.18-2.46)	1.72** (1.19-2.50)	2.96** (1.65-5.32)
	Participant convenience	Early morning screening	1.94** (1.43-2.63)	1.57* (1.02-2.44)	2.64** (1.61-4.33)	1.54 (0.55-4.33)
		Saturday/Sunday screening	0.88 (0.72-1.07)	0.64** (0.45-0.90)	0.90 (0.67-1.20)	1.45 (0.92-2.27)
		Concurrent screening	1.01 (0.87-1.17)	1.01 (0.80-1.26)	1.00 (0.79-1.27)	1.02 (0.70-1.50)
	Encouraging participation	Postcards	0.87 (0.73-1.03)	0.84 (0.64-1.09)	0.69** (0.52-0.91)	1.56* (1.05-2.33)
		Letters	1.35** (1.15-1.57)	1.20 (0.95-1.53)	1.48** (1.16-1.89)	1.42 (0.95-2.12)
		Telephone calls	0.99 (0.77-1.27)	0.77 (0.52-1.15)	1.13 (0.78-1.64)	1.37 (0.71-2.62)
		Community organizations	1.85** (1.57-2.16)	1.80** (1.40-2.31)	2.03** (1.58-2.61)	1.56* (1.06-2.29)
	Payment	Home visits	1.32** (1.09-1.61)	1.19 (0.90-1.58)	1.32 (0.95-1.83)	1.97** (1.14-3.41)
		Fee exemption	1.32* (1.05-1.64)	1.76** (1.27-2.45)	1.05 (0.73-1.52)	0.96 (0.55-1.68)
Younger (30-49)	Data management	Individual filing system	1.27** (1.09-1.48)	1.33* (1.05-1.67)	1.25 (0.98-1.60)	1.14 (0.75-1.74)
		Computer filing system	1.63** (1.38-1.93)	1.45** (1.13-1.88)	1.87** (1.43-2.44)	1.60* (1.03-2.48)
		Records of non-participants	1.86** (1.48-2.33)	1.90** (1.43-2.53)	1.62* (1.06-2.48)	2.68* (1.06-6.78)
		Records of detailed examinations	1.92** (1.52-2.43)	2.01** (1.37-2.93)	1.59* (1.11-2.29)	2.65** (1.51-4.68)
	Participant convenience	Early morning screening	1.98** (1.46-2.70)	1.76* (1.13-2.73)	2.46** (1.50-4.03)	1.44 (0.51-4.03)
		Saturday/Sunday screening	0.76** (0.62-0.93)	0.62** (0.44-0.88)	0.76 (0.57-1.02)	1.08 (0.69-1.69)
		Concurrent screening	0.92 (0.79-1.07)	0.90 (0.72-1.13)	0.96 (0.76-1.22)	0.86 (0.59-1.26)
	Encouraging participation	Postcards	0.87 (0.74-1.04)	0.96 (0.74-1.25)	0.62** (0.47-0.82)	1.46 (0.98-2.17)
		Letters	1.33** (1.14-1.56)	1.19 (0.94-1.51)	1.57** (1.24-2.00)	1.18 (0.79-1.75)
		Telephone calls	0.87 (0.68-1.11)	0.69 (0.46-1.03)	0.87 (0.60-1.27)	1.58 (0.82-3.05)
		Community organizations	1.64** (1.40-1.92)	1.51** (1.18-1.93)	1.88** (1.47-2.41)	1.42 (0.97-2.09)
	Payment	Home visits	1.08 (0.88-1.31)	0.93 (0.70-1.23)	1.12 (0.81-1.56)	1.68 (0.98-2.91)
		Fee exemption	1.31* (1.05-1.64)	1.66** (1.20-2.31)	1.12 (0.78-1.62)	0.94 (0.53-1.66)
Older (50-)	Data management	Individual filing system	1.56** (1.33-1.82)	1.66** (1.32-2.10)	1.48** (1.15-1.89)	1.48 (0.97-2.26)
		Computer filing system	1.83** (1.55-2.17)	1.49** (1.16-1.93)	2.02** (1.55-2.64)	2.61** (1.67-4.08)
		Records of non-participants	2.11** (1.68-2.65)	2.32** (1.74-3.10)	2.12** (1.38-3.25)	0.82 (0.32-2.08)
		Records of detailed examinations	1.69** (1.34-2.14)	1.48* (1.03-2.12)	1.63** (1.12-2.37)	2.59** (1.42-4.70)
	Participant convenience	Early morning screening	1.81** (1.34-2.45)	1.37 (0.88-2.11)	2.39** (1.47-3.88)	2.47 (0.86-7.09)
		Saturday/Sunday screening	0.91 (0.75-1.10)	0.56** (0.40-0.80)	0.89 (0.67-1.19)	2.17** (1.38-3.42)
		Concurrent screening	1.09 (0.94-1.27)	1.02 (0.81-1.28)	1.10 (0.87-1.39)	1.32 (0.90-1.96)
	Encouraging participation	Postcards	0.76** (0.64-0.90)	0.74* (0.57-0.97)	0.57** (0.43-0.75)	1.51* (1.01-2.25)
		Letters	1.36** (1.16-1.59)	1.13 (0.89-1.43)	1.52** (1.19-1.94)	1.74** (1.15-2.61)
		Telephone calls	0.92 (0.72-1.18)	0.72 (0.48-1.07)	1.07 (0.73-1.56)	1.20 (0.62-2.32)
		Community organizations	1.93** (1.64-2.26)	1.81** (1.41-2.33)	2.12** (1.64-2.73)	1.78** (1.20-2.64)
	Payment	Home visits	1.33** (1.09-1.62)	1.25 (0.95-1.66)	1.45* (1.05-2.01)	1.32 (0.76-2.28)
		Fee exemption	1.12 (0.89-1.40)	1.58** (1.14-2.20)	0.87 (0.59-1.26)	0.69 (0.38-1.25)

Note : * $p < 0.05$, ** $p < 0.01$

wide since 1983 in Japan, is simple, convenient, and safe. To date, evidence accumulated both in Japan and western countries suggests the effectiveness of this form of screening in reducing the incidence and mortality of invasive cervical cancer ^{5,6,7,8}.

In this study, the denominator of the participation rate was defined as the female population 30 or more years of age in each municipality in order to compare participation rates on the same basis, although according to the legislation, the target population of cervical cancer screening is female residents 30 or more years of age excluding company employees who can

have periodic health examinations at their work place. Of course, the possibility of underestimating the participation rates in large municipalities and younger groups, in which the proportions of employed females tend to be high, must be taken into consideration ³. However, almost all municipalities practically accept employed residents for cervical cancer screening because it is not a compulsory item in the periodic health examinations at work place. Therefore, such underestimation does not have significant effects on the results of this study.

"Individual filing system" is very important for effectively

Table 5. Associations between cervical cancer screening implementation methods and participation rates in terms of age groups and municipality population sizes analyzed with a multiple logistic regression model.

Age	Categories and items regarding implementation methods	All municipalities Odds ratio (95%CI)	Small Odds ratio (95%CI)	Middle-sized Odds ratio (95%CI)	Large Odds ratio (95%CI)
All age	Data management				
	Individual filing system	1.28* (1.08-1.51)	1.35* (1.05-1.74)	1.25 (0.96-1.63)	1.37 (0.88-2.11)
	Record of non-participants	1.87** (1.47-2.36)	2.40** (1.77-3.28)	1.37 (0.88-2.14)	1.53 (0.61-3.83)
	Participant convenience				
	Early morning screening	1.96** (1.41-2.73)	1.89** (1.17-3.04)	2.56** (1.52-4.30)	1.22 (0.41-3.58)
	Saturday/Sunday screening	0.80* (0.65-0.99)	0.56** (0.38-0.81)	0.80 (0.58-1.10)	1.34 (0.82-2.19)
	Concurrent screening	0.99 (0.85-1.17)	1.00 (0.78-1.28)	1.08 (0.83-1.39)	0.84 (0.56-1.28)
	Encouraging participation				
	Letters	1.35** (1.14-1.60)	1.22 (0.94-1.59)	1.52** (1.17-1.97)	1.30 (0.85-1.98)
	Community organizations	1.68** (1.41-1.99)	1.69** (1.29-2.22)	1.89** (1.44-2.48)	1.44 (0.95-2.18)
	Home visits	1.13 (0.91-1.40)	1.02 (0.75-1.38)	1.10 (0.77-1.58)	1.80* (1.02-3.19)
Younger (30-49)	Data management				
	Individual filing system	1.11 (0.94-1.30)	1.15 (0.90-1.48)	1.14 (0.88-1.48)	1.07 (0.70-1.65)
	Record of non-participants	1.60** (1.26-2.02)	1.85** (1.37-2.51)	1.37 (0.88-2.15)	2.27 (0.88-5.85)
	Participant convenience				
	Early morning screening	2.07** (1.49-2.88)	2.13** (1.33-3.42)	2.48** (1.47-4.18)	1.28 (0.44-3.75)
	Saturday/Sunday screening	0.72** (0.58-0.89)	0.60** (0.41-0.87)	0.66** (0.48-0.90)	1.05 (0.64-1.71)
	Concurrent screening	0.92 (0.78-1.08)	0.86 (0.68-1.10)	1.08 (0.84-1.39)	0.77 (0.51-1.17)
	Encouraging participation				
	Letters	1.37** (1.16-1.62)	1.24 (0.96-1.61)	1.65** (1.28-2.14)	1.08 (0.71-1.64)
	Community organizations	1.53** (1.29-1.81)	1.49** (1.14-1.94)	1.76** (1.35-2.31)	1.38 (0.91-2.08)
	Home visits	0.95 (0.77-1.18)	0.82 (0.61-1.12)	1.00 (0.70-1.43)	1.54 (0.87-2.72)
Older (50-)	Data management				
	Individual filing system	1.35** (1.14-1.59)	1.38* (1.07-1.77)	1.30* (1.00-1.70)	1.47 (0.94-2.30)
	Record of non-participants	1.85** (1.46-2.35)	2.23** (1.64-3.03)	1.80** (1.15-2.82)	0.63 (0.24-1.68)
	Participant convenience				
	Early morning screening	1.86** (1.34-2.59)	1.61* (1.00-2.60)	2.40** (1.43-4.03)	1.67 (0.56-4.99)
	Saturday/Sunday screening	0.82 (0.66-1.01)	0.49** (0.33-0.72)	0.80 (0.58-1.10)	1.90** (1.16-3.11)
	Concurrent screening	1.08 (0.92-1.28)	1.02 (0.80-1.31)	1.14 (0.88-1.47)	1.09 (0.71-1.68)
	Encouraging participation				
	Letters	1.36** (1.15-1.61)	1.14 (0.87-1.48)	1.53** (1.17-1.98)	1.68* (1.09-2.59)
	Community organizations	1.79** (1.50-2.13)	1.78** (1.35-2.34)	1.86** (1.41-2.45)	1.63* (1.06-2.51)
	Home visits	1.08 (0.87-1.34)	1.05 (0.77-1.42)	1.16 (0.81-1.66)	1.12 (0.63-2.02)

Note : * $p < 0.05$, ** $p < 0.01$

managing information obtained from screening programmes and for precisely appraising the outcome of the screening. However, less than half of all municipalities were found to have set up an "individual filing system". Recently, the adverse effect on the efficiency of cervical cancer screening due to the frequent participation of a specified subgroup of the target population (i.e. limited persons participate frequently, while many eligible women are screened rarely or not at all) has been pointed out ^{9,10}. In order to prevent this kind of situation, "maintaining records of non-participants" is indispensable. In efficiently and effectively utilizing a large number of individual records which contain various kind of screening data, computers have the potential to play a very important role. However, the proportions of municipalities which maintained records of non-participants and those with a computer filing system were only 13% and 26%, respectively.

As to the proportions of the municipalities with "individual filing system" and "maintaining records of non-participants", the proportions decreased with increasing population size. Smaller municipalities tended to conduct well-established and detailed data management regarding their screening programmes. This is partly because it is easy to set up data management system for smaller municipalities with small number of target individuals, and partly because the number of personnel engaged in the health programme, such as public health nurses, per unit population increases with diminishing municipality population size¹¹.

According to the result of the univariate analyses for all municipalities and all age group, maintaining "records of non-participants" showed the highest odds ratio (2.19) among all 13 items assessed in this study. This suggests how important it is to identify non-participants and to intensively encourage their

participation in order to increase the participation rate. For each population and age group, maintaining "records as to whether or not participants requiring detailed examinations had received them (records of detailed examinations)" and "computer filing system" had clear positive relationship with the participation rate.

Improving data management for the screening programme, through setting up an individual filing system, maintaining records of high risk individuals, such as non-participants and participants requiring detailed examinations, and establishing a computer filing system, all of which are now considered to be indispensable for screening programmes, has the potential to further increase the participation rates.

While the proportion of municipalities conducting early morning screening was only 6 % of all municipalities, this item showed the strongest relationship with the participation rate among eight items assessed using the multiple logistic regression model. However, in large municipalities, "early morning screening" was not clearly associated with participation. This is partly because the middle-aged and aged women in small and middle-sized municipalities, which are located mainly in rural farming areas, can more easily attend health programmes held early in the morning than those offered in the daytime. On the other hand, those with a so-called "night-oriented life style" are numerous in urban areas, such that an early morning screening programme would not improve participation rates in large municipalities.

"Saturday/Sunday screening" was positively associated with the participation rate only for the older group in large municipalities. This reflects the cultural perception that older women in urban areas are less home-bound on Saturdays or Sundays, comparing with those in rural areas and younger women.

While there have been reports indicating clear positive associations with "concurrent screening" and the participation rate in stomach cancer screening and basic health examinations^{12,13}, such a relationship was not clear in the case of cervical cancer screening. One reason for residents not participating in cervical cancer screening is discomfort for taking the pelvic examination and/or embarrassment surrounding^{14,15}. Another reason is that women with a positive family history are reported to participate more frequently in cervical cancer screening than those with a negative family history¹⁶. Therefore, "concurrent screening" could not particularly be effective in terms of increasing participation.

The main reason for people ignoring cancer screening programmes is due to lack of awareness of cancer prevention^{15,17}. Thus, it is essential to educate residents regarding the importance of prevention and early detection of cancer, rather than scheduling or locating the screening programmes conveniently, to increase the participation rate.

In order to encourage participation, more than 60% of all municipalities enlisted the assistance of "community organiza-

tions", such as community health promotion organizations, women's associations, and local hygiene associations. This proportion was lower in large than those in small and middle-sized municipalities. This is because the turn-over of residents is rather high and the coverage and activities of "community organizations" are somewhat limited in large, as compared to those in small and middle-sized municipalities.

There were clear associations between collaboration with "community organizations" and participation rates for all three population groups. "Community organizations" were shown to contribute to improved participation in stomach cancer screening and basic health examinations^{12,13}. In the U.S.A., Windsor and his colleagues demonstrated a dramatic increase in cervical cancer screening participation after introducing a community health organization education effort¹⁸. These indicate that "community organizations" could play the most important role as to encouraging participation and disseminating necessary information including the potential benefits of community health programmes. Therefore, various forms of support for "community organizations", such as manpower development, as well as technical and financial support, should be continued and strengthened regardless of municipality size.

"Postcards", which were found not to have a positive relation with participation in small and middle-sized municipalities, showed a positive association with the participation rate for the older group in large municipalities. Women in small and middle-sized municipalities do not seem to consider postcards as important measure to convey message.

None of the five items as to encouraging participation were positively associated with the participation rate for younger women in large municipalities. In order to increase the participation rate for the younger group in large municipalities, responsible municipal governments must carefully evaluate and select the methods employed to promote participation, including the feasibility of new methods, such as campaigns based on the mass media (i.e. TV, radio, newspapers and magazines).

As to payment for screening, "fee exemption" was positively associated with the participation rate in small municipalities. This is attributable partly to the average income being lower in small than in middle-sized and large municipalities and the proportion of low-income participants being higher in small than in middle-sized and large municipalities. While fee exemption poses the possible risks of diminishing awareness of the importance of people taking responsibility for their own health, fee exemption for the low income population has potential to contribute to increased participation rate.

Implementation methods for cervical cancer screening programmes vary among municipalities depending on population size, age distribution, pattern of industries, relevant health and medical institutions and manpower, such as the number of public health nurses, and the financial situation of each municipi-

pality.

The results of the present study indicated that establishing a well-organized data management system and enlisting the assistance of "community organizations" had a positive association with the participation rates regardless of municipality size. Association between other implementation methods and participation varied depending on the municipality population size and age of the target women. In small municipalities, "early morning screening" and "fee exemption" were positively associated with participation. In middle-sized municipalities, "early morning screening" and sending out "letters" were found to have a positive association with participation. In large municipalities, "postcards" and "home visits" from public health nurses were positively associated with the participation rate. Therefore, implementation methods of cervical cancer screening should be carefully planned and chosen taking into account the characteristics of the target population of each municipality, as suggested by the results of this study, to achieve further improvement in participation.

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