

RESEARCH COMMUNICATION

The Current Status of Gastric Cancer Screening in Korea: Report on the National Cancer Screening Programme, 2009

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Abstract

Objective: The objective of this study was to evaluate the results of the National Cancer Screening Programme (NCSP) for gastric cancer in 2009 and provide the rates of participation in organized gastric cancer screening in Korea. **Methods:** The data were obtained from the National Cancer Screening Information System, and the participation rates in gastric cancer screening were calculated. Recall rates, defined as the proportion of abnormal cases among participants, were estimated with 95% confidence intervals (CIs). **Results:** The target population of the 2009 NCSP included 6,842,209 Korean men and women aged 40 and older. Of those adults, 2,328,715 were screened with upper endoscopy or upper gastrointestinal (UGI) series (34.0%). For the first time, the number of adults (56.3%) screened with upper endoscopy exceeded the number screened with UGI series. Participation rates varied by gender and health insurance type. Overall, the recall rates of upper endoscopy and UGI series were 0.3% (95% CI, 0.34 to 0.36) and 1.6% (95% CI, 1.62 to 1.67), respectively. **Conclusions:** According to our research, efforts to facilitate participation and to reduce disparities in gastric cancer screening among Korean men and women are needed.

Key words: Korea - mass screening - stomach neoplasms

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Introduction

Gastric cancer mortality has been consistently decreasing in Korea. However, gastric cancer is still a clinically important disease due to its high incidence and mortality (Jung et al., 2011). In 2008, an estimated 28,078 new cases were diagnosed, accounting for 15.7% of new cancer cases. The incidence of disease was 43.8 per 100,000 in 2008, which was down from a high incidence of 46.1 in 2005. Survival rates have also improved.

To reduce gastric cancer mortality, a population-based screening programme for gastric cancer was initiated in 1999. Currently, the recommendation is that men and women 40 years or older undergo upper endoscopy or upper gastrointestinal (UGI) series every other year (Pack, 2002; Yoo, 2008). Participants can select a screening modality by themselves. When a UGI series is chosen as a screening method, additional upper endoscopy can also be conducted if gastric cancer is suspected. If necessary, a biopsy is able to be conducted during upper endoscopy. Currently, two population-based gastric cancer screening programmes exist in Korea: the National Cancer Screening Programme (NCSP) and the NHI Cancer Screening Programme (NHICSP). The target population of the NCSP includes

Medical Aid Programme (MAP) recipients and the lower 50th percentile of National Health Insurance (NHI) beneficiaries based on income. The NHICSP targets the upper 50th percentile of NHI beneficiaries and is provided by the NHI Corporation (Kim et al., 2011). The aim of this study was to use the 2009 NCSP gastric cancer data to calculate the participation rates and screening results by screening modality and sociodemographic characteristics.

Materials and Methods

The participants of the 2009 NCSP included NHI beneficiaries within the lower 50th percentile of income and MAP recipients who were born in 1969 or earlier. The insurance premium was US \$74 (1 US\$=1,000 won) or less per month for the self-employed and US \$60 or less for employees (based on November, 2008).

Participation in the NCSP was confirmed with insurance claims, and the results of gastric cancer screening were submitted to the NHI Corporation before December 31, 2010. Screening was performed between January 1, 2009 and December 31, 2009. Some subjects underwent the same screening procedure multiple times; for these individuals, only the first screening was

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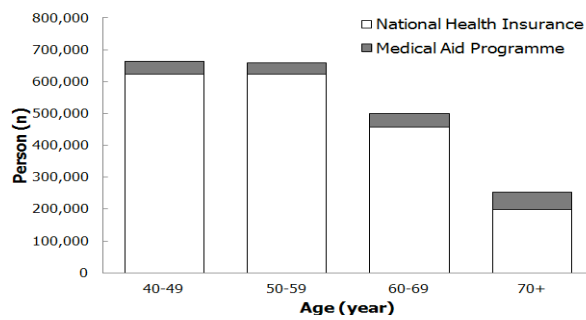


Figure 1. Number of Participants by Health Insurance Type and Age from the National Cancer Screening Programme for Gastric Cancer, 2009.

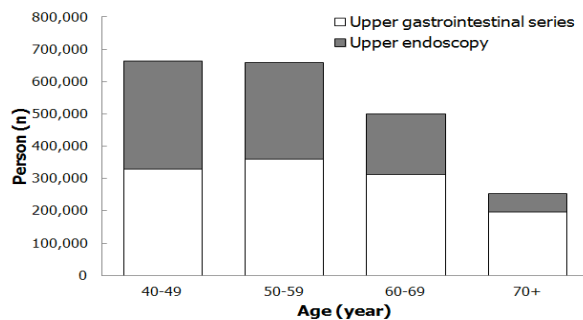


Figure 2. Number of Participants by Screening Modality and Age from the National Cancer Screening Programme for Gastric Cancer, 2009.

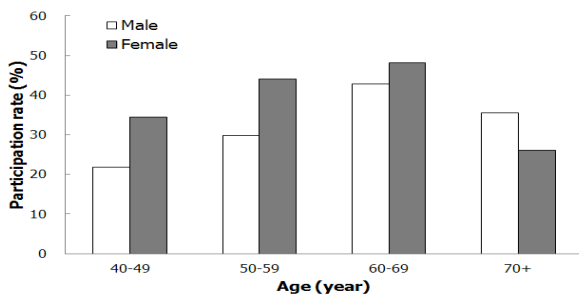


Figure 3. Participation Rates by Gender and age from the National Cancer Screening Programme for gastric cancer, 2009. The overall participation rate in the 2009 NCSP was 34.0%; the rate was 29.8% among men and 37.9% among women.

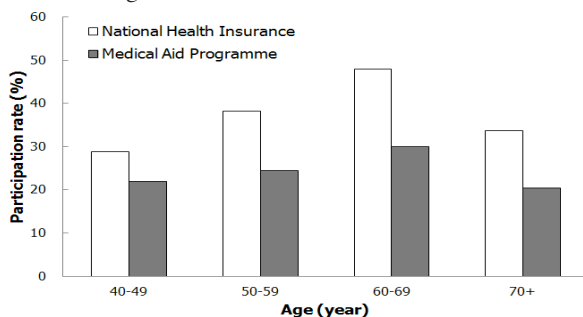


Figure 4. Participation Rates by Health Insurance Type and Age from the National Cancer Screening Programme for Gastric Cancer, 2009. The overall participation rate in the 2009 NCSP was 34.0%; the rate was 35.7% among the National Health Insurance (NHI) beneficiaries and 23.3% among the Medical Aid Programme (MAP) recipients.

counted (n=6,365). Although the NCSP-participants should undergo additional upper endoscopy at the same screening unit, in which UGI series was conducted, some subjects underwent UGI series followed by additional upper endoscopy at other screening units because gastric cancer was suspected (n=10,203). These patients were only counted once. However they were included in the number of additional upper endoscopy. The participation rate was calculated by dividing the total number of gastric cancer screening participants by the target population of the NCSP for gastric cancer and converting the result into a percentage (Perry et al., 2006).

The results of the screening programme were classified into five categories: normal, benign, suspicion of gastric cancer, gastric cancer, and other. Gastric cancer was defined as cancer confirmed by biopsy during upper endoscopy. Other was used to describe the cases of oesophageal or duodenal diseases that were diagnosed during screening. In the study, the participants falling within the categories suspicion of gastric cancer and gastric cancer were considered recall cases. The subjects who underwent UGI series followed by upper endoscopy were defined as recall cases regardless of the final diagnosis. Recall rates for gastric cancer screening were defined as the proportion of recall cases among all adults that underwent screening. The 95% confidence intervals were calculated for all outcome variables.

Results

In the target population of 6,842,209 adults, there were 3,251,981 men and 3,590,228 women. Based on health insurance data, 926,598 adults in the target population (13.5%) were covered by MAP, and 5,915,611 (86.5%) were covered by NHI. There were 335,568 adults over the age of 70 covered by MAP, accounting for 36.2% of all MAP recipients. This percentage was much higher than the 11.8% of NHI beneficiaries who were in the same age group.

Of the total target population, 2,328,715 (34.0%) adults underwent gastric cancer screening. Of the participants, 968,699 (41.6%) were men, and 1,360,016 (58.4%) were women. There were 303,989 (31.4%) male and 452,134 (33.2%) female participants in their 50s, which was the largest group of screening participants. Among NHI beneficiaries, participation decreased with increasing age. Conversely, participation increased with increasing age among MAP recipients. Thus, there were 68,439 participants in their 70s, accounting for 31.6% of the total MAP recipients who underwent screening (Figure 1).

Among all of the adults undergoing screening, 1,009,221 (43.3%) selected UGI series for primary screening and 1,319,494 (56.7%) participants selected upper endoscopy. Of participants in their 40s, 245,660 (34.3%) underwent UGI series, and 470,669 (65.7%) underwent upper endoscopy. Thus, as age increased, the percentage of adults undergoing upper endoscopy

Table 1. UGI Series and Additional Upper Endoscopy Outcomes by Gender, Health Insurance Type, Age and Area of Residence from the National Cancer Screening Programme for Gastric Cancer, 2009

	Target population	No. of screened	UGI series				Additional upper endoscopy					
			No. of screened	Recall cases* (n)	Recall rate (%)	(95% C.I.)	No. of upper endoscopy (%)	Normal	Benign	Results (%) Suspicious of gastric cancer	Gastric cancer	Others†
Total	6,842,209	2,328,715	1,009,221	16,597	1.6	(1.62-1.67)	13,958 (84.1)	160 (1.1)	8,599 (61.6)	693 (5.0)	82 (0.6)	4,424 (31.7)
Gender												
Male	3,251,981	968,699	421,072	9,875	2.3	(2.30-2.39)	8,144 (82.5)	64 (0.8)	4,925 (60.5)	477 (5.9)	58 (0.7)	2,620 (32.2)
Female	3,590,228	1,360,016	588,149	6,722	1.1	(1.12-1.17)	5,814 (86.5)	96 (1.7)	3,674 (63.2)	216 (3.7)	24 (0.4)	1,804 (31.0)
Health insurance type												
NHI	5,915,611	2,112,381	886,381	14,923	1.7	(1.66-1.71)	12,764 (85.5)	149 (1.2)	7,886 (61.8)	624 (4.9)	70 (0.5)	4,035 (31.6)
MAP	926,598	216,334	122,840	1,674	1.4	(1.3-1.43)	1,194 (71.3)	11 (0.9)	713 (59.7)	69 (5.8)	12 (1.0)	389 (32.6)
Age group												
40-49	2,544,156	716,329	245,660	3,439	1.4	(1.35-1.45)	3,143 (91.4)	42 (1.3)	1,997 (63.5)	85 (2.7)	8 (0.3)	1,011 (32.2)
50-59	2,049,147	756,123	293,919	5,126	1.7	(1.70-1.79)	4,537 (88.5)	65 (1.4)	2,869 (63.2)	188 (4.1)	10 (0.2)	1,405 (31.0)
60-69	1,217,579	553,768	266,953	5,053	1.9	(1.84-1.94)	4,269 (84.5)	37 (0.9)	2,591 (60.7)	247 (5.8)	29 (0.7)	1,365 (32.0)
70+	1,031,327	302,495	202,689	2,979	1.5	(1.42-1.52)	2,009 (67.4)	16 (0.8)	1,142 (56.8)	173 (8.6)	35 (1.7)	643 (32.0)
Residence area												
Seoul	1,234,211	389,980	143,044	2,987	2.1	(2.01-2.16)	2,775 (92.9)	23 (0.8)	1,900 (68.5)	118 (4.3)	14 (0.5)	720 (25.9)
Busan	552,457	196,196	89,721	3,415	3.8	(3.68-3.93)	3,331 (97.5)	19 (0.6)	2,290 (68.7)	71 (2.1)	8 (0.2)	943 (28.3)
Daegu	361,317	119,844	38,527	865	2.2	(2.10-2.39)	825 (95.4)	2 (0.2)	635 (77.0)	36 (4.4)	1 (0.1)	151 (18.3)
Daejeon	177,044	68,828	30,431	596	2.0	(1.80-2.11)	525 (88.1)	10 (1.9)	348 (66.3)	11 (2.1)	1 (0.2)	155 (29.5)
Incheon	378,228	111,751	45,889	405	0.9	(0.80-0.97)	293 (72.3)	9 (3.1)	121 (41.3)	35 (11.9)	1 (0.3)	127 (43.3)
Gwangju	178,866	62,005	23,141	301	1.3	(1.15-1.45)	225 (74.8)	1 (0.4)	119 (52.9)	61 (27.1)	1 (0.4)	43 (19.1)
Ulsan	114,552	33,761	13,419	128	1.0	(0.79-1.12)	114 (89.1)	.	71 (62.3)	3 (2.6)	1 (0.9)	39 (34.2)
Gyeonggi	1,385,596	438,054	144,771	2,194	1.5	(1.45-1.58)	1,861 (84.8)	46 (2.5)	805 (43.3)	104 (5.6)	15 (0.8)	891 (47.9)
Gangwon	248,428	93,267	55,376	1,099	2.0	(1.87-2.10)	677 (61.6)	14 (2.1)	239 (35.3)	79 (11.7)	6 (0.9)	339 (50.1)
Chungcheongbuk	238,106	94,004	56,262	771	1.4	(1.27-1.47)	554 (71.9)	5 (0.9)	274 (49.5)	25 (4.5)	3 (0.5)	247 (44.6)
Chungcheongnam	317,607	110,766	61,200	698	1.1	(1.06-1.22)	494 (70.8)	9 (1.8)	402 (81.4)	8 (1.6)	4 (0.8)	71 (14.4)
Jeollabuk	308,213	118,006	69,294	925	1.3	(1.25-1.42)	671 (72.5)	6 (0.9)	467 (69.6)	56 (8.3)	10 (1.5)	132 (19.7)
Jeollanam	349,187	138,458	66,074	449	0.7	(0.62-0.74)	270 (60.1)	5 (1.9)	144 (53.3)	31 (11.5)	10 (3.7)	80 (29.6)
Gyeongsangbuk	442,478	161,814	78,244	819	1.0	(0.98-1.12)	598 (73.0)	1 (0.2)	325 (54.3)	18 (3.0)	6 (1.0)	248 (41.5)
Gyeongsangnam	468,873	166,291	79,195	837	1.1	(0.99-1.13)	660 (78.9)	9 (1.4)	430 (65.2)	34 (5.2)	1 (0.2)	186 (28.2)
Jeju	87,046	25,690	14,633	108	0.7	(0.60-0.88)	85 (78.7)	1 (1.2)	29 (34.1)	3 (3.5)	.	52 (61.2)

CI, confidence interval; MAP, Medical Aid Programme; NHI, National Health Insurance; UGI, upper gastrointestinal; *Participants who received 'suspicious of cancer' or 'gastric cancer' or received additional upper endoscopy for further evaluation after undergoing UGI series were deemed to be recall cases; †The category 'others' was defined as cases where esophageal or duodenal diseases were diagnosed in the process of gastric cancer screening.

Table 2. Upper Endoscopy and Biopsy Outcomes by Gender, Health Insurance Type, Age and Area of Residence from the National Cancer Screening Programme for Gastric Cancer, 2009

	Upper endoscopy				Biopsy								
	Target population screened	No. of screened cases*	No. of Recall cases* (n) (%)	Recall (95% C.I.)	No. of Biopsy (%)	Normal	Gastritis	Inflammatory or proliferative lesion	Tubular adenoma/ low grade dysplasia	Tubular adenoma/ high grade dysplasia	Suspicious of gastric cancer	Gastric cancer	Others†
Total	6,842,209	2,328,715	1,319,494	4,614 0.3 (0.34-0.36)	308,845 (23.4)	1,337 (0.4)	204,207 (66.1)	40,090 (13.0)	5,183 (1.7)	985 (0.3)	553 (0.2)	3,140 (1.0)	53,350 (17.3)
Gender													
Male	3,251,981	968,699	547,627	3,184 0.6 (0.56-0.60)	150,461 (27.5)	656 (0.4)	97,586 (64.9)	18,232 (12.1)	3,319 (2.2)	703 (0.5)	400 (0.3)	2,165 (1.4)	27,400 (18.2)
Female	3,590,228	1,360,016	771,867	1,430 0.2 (0.18-0.19)	158,384 (20.5)	681 (0.4)	106,621 (67.3)	21,858 (13.8)	1,864 (1.2)	282 (0.2)	153 (0.1)	975 (0.6)	25,950 (16.4)
Health insurance type													
NHI	5,915,611	2,112,381	1,226,000	4,182 0.3 (0.33-0.35)	286,132 (23.3)	1,219 (0.4)	189,759 (66.3)	37,049 (12.9)	4,715 (1.6)	877 (0.3)	505 (0.2)	2,861 (1.0)	49,147 (17.2)
MAP	926,598	216,334	93,494	432 0.5 (0.42-0.51)	22,713 (24.3)	118 (0.5)	14,448 (63.6)	3,041 (13.4)	468 (2.1)	108 (0.5)	48 (0.2)	279 (1.2)	4,203 (18.5)
Age group													
40-49	2,544,156	716,329	470,669	698 0.1 (0.14-0.16)	93,636 (19.9)	403 (0.4)	64,785 (69.2)	11,463 (12.2)	766 (0.8)	116 (0.1)	96 (0.1)	465 (0.5)	15,542 (16.6)
50-59	2,049,147	756,123	462,204	1,266 0.3 (0.26-0.29)	110,151 (23.8)	444 (0.4)	73,501 (66.7)	14,215 (12.9)	1,610 (1.5)	269 (0.2)	150 (0.1)	848 (0.8)	19,114 (17.4)
60-69	1,217,579	553,768	286,815	1,590 0.6 (0.53-0.58)	77,117 (26.9)	358 (0.5)	49,340 (64.0)	10,348 (13.4)	1,824 (2.4)	381 (0.5)	204 (0.3)	1,093 (1.4)	13,569 (17.6)
70+	1,031,327	302,495	99,806	1,060 1.1 (1.00-1.13)	27,941 (28.0)	132 (0.5)	16,581 (59.3)	4,064 (14.5)	983 (3.5)	219 (0.8)	103 (0.4)	734 (2.6)	5,125 (18.3)
Residence area													
Seoul	1,234,211	389,980	246,936	775 0.3 (0.29-0.34)	59,709 (24.2)	214 (0.4)	42,544 (71.3)	7,347 (12.3)	864 (1.4)	162 (0.3)	80 (0.1)	526 (0.9)	7,972 (13.4)
Busan	552,457	196,196	106,475	428 0.4 (0.36-0.44)	20,974 (19.7)	214 (1.0)	13,098 (62.4)	2,629 (12.5)	408 (1.9)	93 (0.4)	63 (0.3)	294 (1.4)	4,175 (19.9)
Daegu	361,317	119,844	81,317	256 0.3 (0.28-0.35)	28,654 (35.2)	78 (0.3)	19,575 (68.3)	2,713 (9.5)	326 (1.1)	80 (0.3)	40 (0.1)	181 (0.6)	5,661 (19.8)
Daejeon	177,044	68,828	38,397	154 0.4 (0.34-0.46)	7,735 (20.1)	44 (0.6)	5,118 (66.2)	965 (12.5)	145 (1.9)	24 (0.3)	14 (0.2)	105 (1.4)	1,320 (17.1)
Incheon	378,228	111,751	65,862	196 0.3 (0.26-0.34)	15,378 (23.3)	37 (0.2)	9,878 (64.2)	2,345 (15.2)	278 (1.8)	34 (0.2)	23 (0.1)	147 (1.0)	2,636 (17.1)
Gwangju	178,866	62,005	38,864	145 0.4 (0.31-0.43)	8,348 (21.5)	41 (0.5)	5,973 (71.6)	883 (10.6)	141 (1.7)	29 (0.3)	16 (0.2)	109 (1.3)	1,156 (13.8)
Ulsan	114,552	33,761	20,342	71 0.3 (0.27-0.43)	5,010 (24.6)	28 (0.6)	2,836 (56.6)	483 (9.6)	93 (1.9)	21 (0.4)	17 (0.3)	43 (0.9)	1,489 (29.7)
Gyeonggi	1,385,596	438,054	293,283	960 0.3 (0.31-0.35)	64,186 (21.9)	306 (0.5)	41,954 (65.4)	8,905 (13.9)	987 (1.5)	187 (0.3)	127 (0.2)	614 (1.0)	11,106 (17.3)
Gangwon	248,428	93,267	37,891	154 0.4 (0.34-0.47)	7,253 (19.1)	40 (0.6)	3,008 (41.5)	2,237 (30.8)	216 (3.0)	28 (0.4)	23 (0.3)	73 (1.0)	1,628 (22.4)
Chungcheongbuk	238,106	94,004	37,742	143 0.4 (0.32-0.44)	9,363 (24.8)	30 (0.3)	5,164 (55.2)	1,243 (13.3)	188 (2.0)	22 (0.2)	17 (0.2)	100 (1.1)	2,599 (27.8)
Chungcheongnam	317,607	110,766	49,566	192 0.4 (0.33-0.44)	10,909 (22.0)	31 (0.3)	6,803 (62.4)	1,812 (16.6)	242 (2.2)	51 (0.5)	16 (0.1)	128 (1.2)	1,826 (16.7)
Jeollabuk	308,213	118,006	48,712	170 0.3 (0.30-0.40)	7,430 (15.3)	56 (0.8)	4,348 (58.5)	1,711 (23.0)	176 (2.4)	40 (0.5)	14 (0.2)	109 (1.5)	976 (13.1)
Jeollanam	349,187	138,458	72,384	297 0.4 (0.36-0.46)	12,968 (17.9)	52 (0.4)	8,542 (66.0)	1,616 (12.5)	258 (2.0)	51 (0.4)	32 (0.2)	200 (1.5)	2,197 (16.9)
Gyeongsangbuk	442,478	161,814	83,570	295 0.4 (0.31-0.39)	29,334 (35.1)	70 (0.2)	21,257 (72.5)	2,668 (9.1)	429 (1.5)	85 (0.3)	21 (0.1)	237 (0.8)	4,567 (15.6)
Gyeongsangnam	468,873	166,291	87,096	340 0.4 (0.35-0.43)	17,390 (20.0)	92 (0.5)	11,208 (64.5)	2,252 (12.9)	354 (2.0)	74 (0.4)	46 (0.3)	248 (1.4)	3,116 (17.9)
Jeju	87,046	25,690	11,057	38 0.3 (0.23-0.45)	4,204 (38.0)	4 (0.1)	2,881 (68.5)	281 (6.7)	78 (1.9)	4 (0.1)	4 (0.1)	26 (0.6)	926 (22.0)

CI, confidence interval; NHI, MAP, Medical Aid Programme; NH, National Health Insurance; *Participants who received 'suspicious of cancer' or 'gastric cancer' were deemed to be recall cases; †The category 'others' was defined as cases where esophageal or duodenal diseases were diagnosed in the process of gastric cancer screening.

decreased. Only 99,806 (33.0%) participants in their 70s underwent upper endoscopy (Figure 2).

The rate of participation in the NCSP for gastric cancer was 34.0% in 2009. Participation increased with increasing age; the highest participation rate (45.5%) was achieved by adults in their 60s. Overall, 37.9% of women and 29.8% of men were screened (Figure 3). Of the total eligible population, 35.7% of NHI beneficiaries participated, which was higher than the 23.3% of MAP recipients that participated (Figure 4).

Of the 1,009,221 participants who underwent UGI series, 685,945 (68.0%) had normal results, and 191,244 (19.0%) had benign results. There were 16,481 (1.6%) cases that were suspicious for gastric cancer, and 116 (0.0%) cases of gastric cancer. Among all participants screened with UGI series, 1.6% were classified as recall cases, a rate that increased to 1.9% among adults in their 60s and decreased to 1.5% of adults who were in their 70s and older. Of the recall cases, 13,958 (84.1%) underwent upper endoscopy after UGI series (Table 1).

A total of 1,319,494 participants underwent upper endoscopy as a first-choice screening tool. Of these, 308,845 (23.4%) were biopsied. Based on screening with upper endoscopy, 135,679 (10.3%) cases were normal, and 786,822 (59.6%) were benign. There were 1,773 (0.1%) cases that were suspicious for gastric cancer and 2,841 (0.2%) cases of gastric cancer. The total percentage of recall cases based on upper endoscopy was 0.3%, which was lower than the rate that was obtained using UGI series. As participant age increased, the recall rate increased (Table 2).

Discussion

The total participation rate in the NCSP for gastric cancer was 34.0% in 2009. The annual rate has been increasing continuously from 12.7% in 2002 when the NCSP was first implemented (Kim et al., 2011). However, the screening rate is still below the overall screening rate for gastric cancer in Korea of 65.1%, which includes opportunistic screenings as well as the organised screening programme conducted by the NHI Corporation (Lee et al., 2011a).

Although there is insufficient evidence to recommend upper endoscopy as a population-based screening tool for gastric cancer (Hamashima et al., 2008; Choi et al., 2011), NCSP participants have been undergoing upper endoscopy at a steadily increasing rate, from 24.8% in 2002 to 56.3% in 2009. In the 2009 NCSP, the number of participants screened with upper endoscopy exceeded the number screened with UGI series for the first time. This may be the result of changes in preference for upper endoscopy as a gastric cancer screening method (Choi et al., 2009) and improved accessibility to screening units equipped with upper endoscopy (Lee et al., 2011b). As the proportion of participants undergoing upper endoscopy increases, the cost-effectiveness of the NCSP for gastric cancer may improve (Lee et al., 2010).

Until 2008, the indications for upper endoscopy after UGI series were ambiguous, and the rate had increased by 33.3% (Lee et al., 2011b). However, in 2009, the reporting of the results in the NCSP for gastric cancer changed from six categories (normal, benign, needing further evaluation, suspicion of cancer, gastric cancer, and confirmed gastric cancer) to five categories (normal, benign, suspicion of gastric cancer, gastric cancer, and other). The indication for additional upper endoscopy among those screened with UGI series was restricted to participants with results that were suspicious for gastric cancer. This change should reduce unnecessary additional upper endoscopies, and in fact, the recall rate among those screened with UGI series dropped to 1.6% in 2009.

Despite increases in NCSP participation, there are still screening disparities based on gender, age, socioeconomic status, and area of residence. In particular, the participation rate of MAP recipients increased from only 12.6% in 2002 to 23.3% in 2009, which was lower than the increase among NHI beneficiaries within the same time period (12.7% in 2002; 35.7% in 2009). Considering the effect of gender and socioeconomic status on the incidence and mortality of gastric cancer in Korea (Khang et al., 2004; Kim et al., 2008), efforts should be made to increase gastric cancer screening among Korean men and MAP recipients. In addition, we noted differences in the selection of gastric cancer screening modalities.

In conclusion, 34.0% of the target population participated in the 2009 NCSP for gastric cancer. Along with improving the participation rate for gastric cancer screening, continuing efforts are needed to minimise screening disparities based on region, age, and socioeconomic status. We expect that our results will be useful in creating policies and strategies to prevent gastric cancer in Korea.

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