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Income Disparities in the Use of Health Screening Services Among University Students in Korea

A Cross-Sectional Study of 2479 Participants in a University

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Abstract: Public health insurance coverage for preventive care in young adults is incomplete in Korea. Few studies have focused on young adults' socioeconomic disparities in preventive care utilization. We aimed to explore household income disparities in the use of different types of health screening services among university students in Korea.

This cross-sectional study used a web-based self-administered survey of students at a university in Korea from January to February 2013. To examine the associations between household income levels and health screening service use within the past 2 years, odds ratios (ORs) and 95% confidence intervals (CIs) were estimated using logistic regression with adjustment for various covariables.

Of 2479 participants, 45.5% reported using health screening services within 2 years (university-provided screening 32.9%, private sector screening 16.7%, and both 4.1%). Household income levels were not significantly associated with overall rates of health screening service use with a multivariable-adjusted OR (95% CI) in the lowest versus highest income group of 1.12 (0.87–1.45, $P_{trend} = 0.35$). However, we found significantly different associations in specific types of utilized screening services by household income levels. The multivariable-adjusted OR (95% CI) of university-provided health screening service use in the lowest versus highest income level was 1.74 (1.30–2.34; $P_{trend} < 0.001$), whereas the multivariable-adjusted OR (95% CI) of private sector service use in the lowest versus highest income level was 0.45 (0.31–0.66; $P_{trend} < 0.001$).

This study demonstrated significant disparities in the types of utilized health screening services by income groups among university students in Korea, although overall rates of health screening service use were similar across income levels. Low-income students were more likely to use university-provided health screening services, and less likely to use private sector screening services. To ensure appropriate preventive care delivery for young adults and to address disparities in disadvantaged groups, the expansion of medical insurance coverage for preventive health care, establishment of a usual source of care, focusing on vulnerable groups, and the development of evidence-based standardized health screening guidelines for young adults are needed.

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Abbreviations: ACA = Patient Protection and Affordable Care Act, BMI = body mass index, CI = confidence interval, OR = odds ratio, SES = socioeconomic status, SNU = Seoul National University.

INTRODUCTION

Young adulthood, spanning the age of 18 years to the mid-20s, is a critical developmental period.[1] What happens during these years has profound and long-lasting implications for individuals' future health, quality of life, employment, healthcare costs, and national security.[1,2] Contrary to popular perception, young adults are surprisingly unhealthy.[2,3] Recent studies in the United States revealed that young adults have higher mortality and morbidity rates and greater engagement in health-damaging behaviors than adolescents.[3–6] Of the Korean young adults aged 19 to 29 years in 2014, 22.5% smoked, 11.9% were heavy drinkers, 23.9% were obese, 27.7% were physically inactive, 28.9% experienced severe emotional stress, and only 34.2% received health checkups within the past 2 years.[7] The unhealthy behaviors tend to continue into middle and late adulthood, predisposing individuals to the early onset of hypertension, diabetes, and various chronic diseases.[4,6]

Because most of the health problems are preventable, young adulthood is an optimal time for screening, counseling, and interventions.[4,5,8] However, too little attention has been paid to the preventive care of young adults.[9] In addition, young adults are a vulnerable population in the area of preventive care. They are usually under financial hardship due to low income, high youth unemployment, and high levels of debt.[9,10] Furthermore, the distressful conditions may have greater negative impacts on young adults with lower socioeconomic status (SES). Socioeconomic barriers are known to contribute to disparities in healthcare access and utilization.[11] From 1999 to 2006, health disparities in the United States were significantly greater among mostly uninsured young adults than among individuals older than 65 years with Medicare coverage[12]; young adults received significantly fewer screening and preventive services than other age groups[5,8]; they were least likely to have a usual source of care[4,5]; and financial cost was the main barrier among young adults with low SES.[11,13,14]

In Korea, preventive healthcare delivery for young adults remains disorganized. The National Health Insurance system provides partial coverage for health screening services. Only young adults who are householders or employees are eligible for

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national health screening services. Under the School Health Act, a periodic health checkup is mandatory for elementary to high school students, but not for university students. Thus, preventive healthcare coverage for young adults who are university students or unemployed is omitted in the national care system. Given that this age group comprises about 10% of the Korean population[15] and over 70% of high school graduates are enrolled in universities,[16] this is a critical omission. Apart from the public sector, the private sector plays a large part in providing health screening services in Korea, which usually require high out-of-pocket payment. Consequently, access to health screening services seems to be limited for young adults who are struggling under high economic pressures. In this circumstance, some universities in Korea provide unique and nontraditional healthcare settings, such as university-based health centers. They provide primary healthcare or preventive screening services for their students, but their roles and coverage vary widely across universities.[17]

We supposed that income disparities in the use of health screening services might be pronounced among university students in Korea where preventive care is not covered by the public health system. Although many studies have examined socioeconomic disparities in preventive care utilization in other age populations,[4] few have focused on young adults. A better understanding of patterns of preventive service use by income groups among young adults may help to develop promising interventions and policies to reduce disparities. We aimed to explore disparities in health screening service use by household income levels among university students in Korea, and how household income is related to the patterns of use of different types of health screening services.

METHODS

Study Population

The Seoul National University (SNU) Student Health Survey, a web-based cross-sectional survey, was conducted from January 24 to February 24, 2013, at a university in Seoul, South Korea. The survey used in this study was based on the Global School-based Student Health Survey,[18] the U.S. National College Health Assessment,[19] the 2012 SNU health statistics,[20] and several currently used national surveys in Korea. Content and face validity of the questionnaire were established through consultation with healthcare professionals and 35 student volunteers. We consecutively enrolled students who voluntarily responded to our e-mail request. A total of 2501 students participated in the survey, which was 9% of all the students of the university. For our purposes, we excluded students aged less than 18 or more than 40 years ($n = 20$) and those with missing data on household income and health screening service use ($n = 2$). Subsequently, 2479 participants remained for the current analysis. This study was approved by the SNU Research Ethics Committee in 2013 (SNUIRB 1301/001-007). All participants provided written informed consent.

Health Screening Service Use and Indicators of Income Levels

Participants completed a web-based self-administered questionnaire anonymously. To obtain information on health screening service use, we asked participants whether they had received health screening within the past 2 years (yes/no). To assess utilization of specific health screening services, we asked participants whether they received either university-provided health screening services (yes/no) or private sector screening services at their own expense (yes/no) during the past 2 years. The university, where this study was conducted, provides free annual health screening services for all students. Private sector health screening services included medical checkups served by off-campus hospitals or clinics with out-of-pocket payments from individuals.

Household income levels were assessed by asking students their monthly household income by selecting 1 of 8 possible responses ranging from ''less than 1 million Korean Won'' to ''over 15 million Korean Won'' (1 million Korean Won $\approx$ 850 USD $\approx$ 760 EUR $\approx$ 590 GBP). To have sufficient numbers in each category, the 8 responses were combined into 4 categories: less than 3 million, 3 to 4.9 million, 5 to 6.9 million, 7 million and over (unit: Korean Won). In addition, we assessed subjectively perceived economic conditions using the question ''How is your current economic situation for tuition and living expenses?'' allowing 4 possible responses: (1) very difficult, (2) difficult, (3) good, or (4) very good.

Covariables

Various sociodemographic characteristics were included as covariables: age, sex, academic status (undergraduate, master's course, doctoral course), residence (living with parents, living alone, dormitory, others), hometown (Seoul, urban, rural, foreign country), parents' education levels (high school or less, college or above), smoking (nonsmoker, ex-smoker, current smoker), alcohol use (nondrinker, moderate, heavy), physical activity, weight status, self-rated physical and mental health, and presence of chronic disease (hypertension, diabetes, hyperlipidemia, chronic hepatitis). Heavy drinking was defined as consuming 14 drinks/week or over for men and 7 drinks/week or over for women, and moderate drinking was defined as less than these amounts. Using the International Physical Activity Questionnaire, overall physical activity (metabolic equivalent-minutes/week) was calculated and categorized as high, moderate, or low.[21] Based on self-reported weight (kg) and height (m), body mass index (BMI) was calculated as weight divided by the square of height (kg/m^2). Standard BMI cut-off points for the Korean population were used to categorize weight status: BMI less than 18.5 kg/m^2 was defined as underweight, 18.5 to 22.9 kg/m^2 as normal, 23 to 24.9 kg/m^2 as overweight, and 25 kg/m^2 or above as obese.[22] Self-rated physical (or mental) health was obtained by asking participants ''In the past year, how do you describe your physical (or mental) health in general?: (1) excellent, (2) good, (3) fair, (4) poor, or (5) very poor,'' which was collapsed into 3 groups (good, fair, poor).

Health Screening Programs

To compare the programs between university-provided and private sector health screening services, we took 5 convenience samples of universities and private sector hospitals in different regions of Korea. Through telephone inquiries and an Internet search, we obtained detailed information on health screening programs for young adults at each site.

Statistical Analysis

To describe and compare the characteristics of study participants, frequencies, means, and standard deviations were calculated by household income levels, and Chi-square tests for categorical variables and analysis of variance for continuous variables were conducted.

The dependent variable was household income level. The main independent variable was health screening service use (university-provided or private sector) within the past 2 years. To examine the association between household income levels and utilization of health screening services, odds ratios (ORs) and 95% confidence intervals (CIs) were estimated using logistic regression. To estimate independent associations of possible confounding factors, ORs were adjusted for age, sex, academic status, residence, hometown, and parents' education levels in Model 1; and were further adjusted for individuals' health status and behaviors, including history of chronic disease, self-rated overall health status (physical and mental health), weight status, smoking status, alcohol use, and physical activity level in Model 2. Tests for trend were conducted by treating income levels as continuous terms. We examined whether the association between income levels and health screening service use varied by sex. Tests for interaction were performed by the Wald test using cross-product terms of the 2 variables. We performed sensitivity analyses using participants' subjectively perceived economic levels. All P values were 2-sided, and $P < 0.05$ was considered statistically significant. Statistical tests were performed using SAS software, version 9.4 (SAS Institute, Cary, NC).

RESULTS

Table 1 presents the characteristics of 2479 participants by household income levels. The mean age was 24.3 years, and 57.2% were male. Of the students, 58.9% were undergraduates, and 48.7% were living with parents. Participants with the lowest income level (compared to those with the highest level) were more likely to be obese (15.0% vs 10.7%), physically inactive (53.1% vs 42.6%), and less likely to drink heavily (17.9% vs 24.0%).

Health Screening Service Use by Household Income Levels

Of the participants, 45.5% responded that they had received any type of health screening services within the past 2 years (Table 2). Almost twice as many students reported use of university-provided health screening services than private sector services (32.9% vs 16.7%), and 4.1% used both university and private sector services.

We calculated multivariable-adjusted ORs (and 95% CIs) of health screening service use by household income levels. The results were almost similar in Model 1 and Model 2, and thus multivariable ORs from Model 2 are presented in the results. Household income levels were not significantly associated with overall rates of health screening service use, and the trends were not significant. Compared to the highest income group, the multivariable-adjusted OR (95% CI) of overall health screening service utilization in the lowest income group was 1.12 (0.87–1.45, $P_{trend} = 0.35$).

However, when we further explored specific types of health screening services, we found significantly different associations between household income levels and the types of utilized screening services. Students with low income levels were more likely to use university-provided health screening services. Multivariable-adjusted ORs (95% CIs) of university-provided health screening service use (overall or only) in the lowest versus highest income group were 1.75 (1.32–2.31) and 1.74 (1.30–2.34) respectively ($P_{trend} < 0.001$; Table 2, Figure 1). In contrast, students with low income levels were less likely to use private sector health screening services. Multivariable-adjusted ORs (and 95% CIs) of private sector health screening service use (overall or only) in the lowest versus highest income group were 0.57 (0.40–0.79) and 0.45 (0.31–0.66) respectively ($P_{trend} \leq 0.004$).

Among the covariables, female students were more likely to use health screening services in general and university-provided services in particular than men [multivariable-adjusted OR (95% CI), 1.30 (1.08–1.56) and 1.30 (1.07–1.58) respectively]. Participants from rural areas tended to use overall and university-provided screening services [multivariable OR (95% CI), 1.84 (1.42–2.48) and 2.21 (1.70–2.89) respectively]. Obese participants and current smokers were less likely to use university-provided screening services [multivariable OR (95% CI), 0.66 (0.49–0.90) and 0.61 (0.42–0.88) respectively]. Parents' education levels were not significantly associated with any types of health screening service use ($P \geq 0.09$).

When we further stratified the associations by sex, the relationship between income levels and the types of utilized health screening services was similar in both sexes ($P_{interaction} \geq 0.42$; see Supplemental Table 1, http://links.lww.com/MD/A968, which illustrates the comparison of the associations between household income levels and health screening service use by sex). We performed sensitivity analyses using participants' subjectively perceived economic levels, and found almost similar results to the main analyses using household income levels. Compared to participants who perceived their economic conditions to be very good, those perceiving them to be very difficult were more likely to use university-provided health screening services (OR = 1.42; 95% CI, 1.07–1.88; $P_{trend} = 0.003$), and less likely to use private sector services (OR = 0.53; 95% CI, 0.36–0.76; $P_{trend} < 0.001$).

Comparison of Health Screening Programs

We compared health screening programs for young adults between university-provided and private sector services in our sample universities and hospitals (see Supplemental Table 2, http://links.lww.com/MD/A968, which illustrates the comparison of university-provided and private sector health screening programs). The university-provided services varied widely in eligible students (for all students, dormitory residents only, or freshmen) and covering test items. Few universities provided medical counseling or comprehensive care for high-risk groups after health screening. The private sector screening programs for young adults were similar to the programs for older adults (e.g., gastroendoscopy, abdominal sonography, tumor markers), and included more test items than university-provided services. However, they were limited in screening or counseling for young adults' risky behaviors and mental health. There was usually no out-of-pocket payment for university-provided services, but private sector services required a relatively high amount of out-of-pocket payment.

DISCUSSION

University students utilized university-provided health screening services more frequently than private sector screening services in Korea. Although overall rates of health screening service utilization were not significantly different across household income levels, we obtained interesting findings when we explored specific types of health screening services. Students with low household income levels were more likely to use university-provided health screening services, and less likely to use private sector screening services.

TABLE 1. General Characteristics of Study Participants by Household Income Levels

		Income, Million Korean Won/Month				
	All	**<3**	**3–4.9**	**5–6.9**	**≥7**	***P****
N (%)	2479 (100)	815 (32.9)	752 (30.3)	417 (16.8)	495 (20.0)	
Age, y (mean, SD)	24.3 (4.1)	24.8 (4.1)	24.6 (4.3)	23.9 (4.2)	23.2 (3.6)	<0.001
Sex (n, %)						0.001
Male	1417 (57.2)	497 (61.0)	445 (59.2)	211 (50.6)	264 (53.3)	
Female	1062 (42.8)	318 (39.0)	307 (40.8)	206 (49.4)	231 (46.7)	
Academic status (n, %)						<0.001
Undergraduate	1459 (58.9)	433 (53.1)	429 (57.1)	255 (61.2)	342 (69.1)	
Master's course	518 (20.9)	177 (21.7)	151 (20.1)	87 (20.9)	103 (20.8)	
Doctoral course	502 (20.3)	205 (25.2)	172 (22.9)	75 (18.0)	50 (10.1)	
Residence (n, %)						<0.001
Living with parents	1206 (48.7)	340 (41.7)	355 (47.2)	215 (51.6)	296 (59.8)	
Living alone	796 (32.1)	276 (33.9)	240 (31.9)	135 (32.4)	145 (29.3)	
Dormitory	423 (17.1)	181 (22.2)	135 (18.0)	58 (13.9)	49 (9.9)	
Others[†]	54 (2.2)	18 (2.2)	22 (2.9)	9 (2.2)	5 (1.0)	
Hometown (n, %)						<0.001
Seoul	967 (39.0)	252 (30.9)	272 (36.2)	179 (42.9)	264 (53.3)	
Other urban	1318 (53.2)	467 (57.3)	432 (57.5)	212 (50.8)	207 (41.8)	
Rural	137 (5.5)	73 (9.0)	38 (5.1)	18 (4.3)	8 (1.6)	
Foreign country	57 (2.3)	23 (2.8)	10 (1.3)	8 (1.9)	16 (3.2)	
Father's highest education (n, %)						<0.001
High school or less	680 (27.4)	402 (49.3)	186 (24.7)	59 (14.2)	33 (6.7)	
College or above	1799 (72.6)	413 (50.7)	566 (75.3)	358 (85.9)	462 (93.3)	
Mather's highest education (n, %)						<0.001
High school or less	1065 (43.0)	532 (65.3)	342 (45.5)	123 (29.5)	68 (13.7)	
College or above	1414 (57.0)	283 (34.7)	410 (54.5)	294 (70.5)	427 (86.3)	
Any chronic disease[‡] (n, %)	274 (11.1)	107 (13.1)	80 (10.6)	42 (10.1)	45 (9.1)	0.11
Self-rated physical health (n, %)						0.002
Good	1308 (52.8)	388 (47.6)	395 (52.5)	244 (58.5)	281 (56.8)	
Fair	818 (33.0)	304 (37.3)	254 (33.8)	122 (29.3)	138 (27.9)	
Poor	353 (14.2)	123 (15.1)	103 (13.7)	51 (12.2)	76 (15.4)	
Self-rated mental health (n, %)						0.13
Good	1065 (43.0)	322 (39.5)	329 (43.8)	194 (46.5)	220 (44.4)	
Fair	791 (31.9)	265 (32.5)	244 (32.5)	133 (31.9)	149 (30.1)	
Poor	623 (25.1)	228 (28.0)	179 (23.8)	90 (21.6)	126 (25.5)	
Body mass index, kg/m^2 (n, %)						0.006
Normal, 18.5–22.9	1504 (60.7)	491 (60.3)	435 (57.9)	262 (62.8)	316 (63.8)	
Underweight, <18.5	274 (11.1)	68 (8.3)	94 (12.5)	58 (13.9)	54 (10.9)	
Overweight, 23–24.9	392 (15.8)	134 (16.4)	128 (17.0)	58 (13.9)	72 (14.6)	
Obesity, ≥25	309 (12.5)	122 (15.0)	95 (12.6)	39 (9.4)	53 (10.7)	
Smoking status (n, %)						0.34
Never	2072 (83.6)	673 (82.6)	633 (84.2)	350 (83.9)	416 (84.0)	
Past smoker	199 (8.0)	61 (7.5)	56 (7.5)	40 (9.6)	42 (8.5)	
Current smoker	208 (8.4)	81 (9.9)	63 (8.4)	27 (6.5)	37 (7.5)	
Alcohol use[§] (n, %)						0.01
None	212 (8.6)	87 (10.7)	66 (8.8)	25 (6.0)	34 (6.9)	
Moderate	1769 (71.4)	582 (71.4)	533 (70.9)	312 (74.8)	342 (69.1)	
Heavy	498 (20.1)	146 (17.9)	153 (20.4)	80 (19.2)	119 (24.0)	
Physical activity level[‖] (n, %)						0.008
High	259 (10.5)	80 (9.8)	85 (11.3)	35 (8.4)	59 (11.9)	
Moderate	1000 (40.3)	302 (37.1)	310 (41.2)	163 (39.1)	225 (45.5)	
Low	1220 (49.2)	433 (53.1)	357 (47.5)	219 (52.5)	211 (42.6)	

One million Korean Won ≈ 850 USD ≈ 760 EUR ≈ 590 GBP.
SD = standard deviation.
[*] *P*-value from ANOVA for continuous variables or Chi-square test for categorical variables.
[†] Living in a lodging house, living with relatives, married, etc.
[‡] Includes hypertension, diabetes, hyperlipidemia, and hepatitis.
[§] Moderate: ≤14 drinks/wk (men), ≤7 drinks/wk (women); heavy: >14 drinks/wk (men), >7 drinks/wk (women).
[‖] High: (a) vigorous activity ≥ 3 d/wk and total activity ≥ 1500 metabolic equivalent (MET)-min/wk or (b) any activities ≥ 7 days with total activity ≥ 3000 MET-min/wk; moderate: (a) vigorous activity ≥ 3 days and ≥ 20 min/d or (b) moderate activity and/or walking ≥ 5 days and ≥30 min/d or (c) any combination of activities ≥ 5 days and ≥600 MET-min/wk.

TABLE 2. Multivariable Odds Ratios (ORs) and 95% Confidence Intervals (CIs) of Health Screening Service Use Within 2 Years by Household Income Levels

		Income, Million Korean Won/Month				
Type of Health Screening	**All (n = 2479)**	**<3 (n = 815)**	**3–4.9 (n = 752)**	**5–6.9 (n = 417)**	**≥7 (n = 495)**	**P_{trend}**
Either university-provided or private sector						
N (%)	1128 (45.5)	373 (45.8)	361 (48.0)	190 (45.6)	204 (41.2)	
Model 1†	—	1.11 (0.87–1.43)	1.24 (0.98–1.58)	1.13 (0.87–1.48)	1 (ref)	0.38
Model 2‡	—	1.12 (0.87–1.45)	1.24 (0.97–1.59)	1.13 (0.86–1.48)	1 (ref)	0.35
Both						
N (%)	102 (4.1)	33 (4.1)	39 (5.2)	14 (3.4)	16 (3.2)	
Model 1†	—	1.19 (0.61–2.30)	1.60 (0.86–2.98)	1.01 (0.48–2.11)	1 (ref)	0.44
Model 2‡	—	1.28 (0.66–2.51)	1.70 (0.91–3.17)	1.04 (0.49–2.18)	1 (ref)	0.31
University, overall						
N (%)	816 (32.9)	299 (36.7)	261 (34.7)	136 (32.6)	120 (24.2)	
Model 1†	—	1.72 (1.30–2.27)	1.62 (1.24–2.12)	1.45 (1.08–1.95)	1 (ref)	<0.001
Model 2‡	—	1.75 (1.32–2.31)	1.62 (1.23–2.12)	1.44 (1.07–1.94)	1 (ref)	<0.001
University, only						
N (%)	714 (28.8)	266 (32.6)	222 (29.5)	122 (29.3)	104 (21.0)	
Model 1†	—	1.75 (1.31–2.33)	1.53 (1.16–2.03)	1.49 (1.09–2.03)	1 (ref)	0.001
Model 2‡	—	1.74 (1.30–2.34)	1.51 (1.14–2.01)	1.47 (1.08–2.01)	1 (ref)	<0.001
Private, overall						
N (%)	414 (16.7)	107 (13.1)	139 (18.5)	68 (16.3)	100 (20.2)	
Model 1†	—	0.56 (0.40–0.79)	0.85 (0.62–1.15)	0.74 (0.52–1.05)	1 (ref)	0.003
Model 2‡	—	0.57 (0.40–0.79)	0.86 (0.63–1.17)	0.74 (0.52–1.06)	1 (ref)	0.004
Private, only						
N (%)	312 (12.6)	74 (9.1)	100 (13.3)	54 (13.0)	84 (17.0)	
Model 1†	—	0.46 (0.32–0.67)	0.70 (0.50–0.98)	0.70 (0.48–1.03)	1 (ref)	<0.001
Model 2‡	—	0.45 (0.31–0.66)	0.70 (0.50–0.99)	0.70 (0.48–1.03)	1 (ref)	<0.001

†Adjusted for age (continuous), sex, academic status (undergraduate, master's course, doctoral course), residence (living with parents, living alone, dormitory, others), hometown (Seoul, other urban, rural, foreign country), and parents' education levels (high school or less, college or above).

‡Based on Model 1, Model 2 was further adjusted for history of chronic disease (yes, no), self-rated overall physical health (good, fair, poor), self-rated overall mental health (good, fair, poor), body mass index (underweight, normal, overweight, obesity), smoking status (never, past, current smoker), alcohol use (never, moderate, heavy), and physical activity level (high, moderate, low).

Many previous studies reported that socioeconomically disadvantaged people not only have worse health outcomes, but also make less use of health services, including health screening.[14,23,24] Evidence supports that simply improving quality of health care will not eliminate or reduce disparities between different segments of society, and covering the uninsured is key to reducing the disparities.[12,25] Healthcare coverage provides financial security against the costs of unexpected illness, facilitates access to care and preventive services, and protects from large out-of-pocket expenses. In contrast, out-of-pocket payments have a disproportionate effect on socioeconomically disadvantaged groups.[23] In Europe, SES inequalities in the use of dental care services were higher in countries where no public coverage was provided than in countries with some degree of public coverage.[23] A study of Korean older adults reported SES inequalities in the use of different types of screening services. People with lower income levels tended to undergo publicly covered screening options (e.g., stool occult blood test), instead of the options requiring high out-of-pocket payment (e.g., colonoscopy).[26]

In addition, improved access to care and health outcomes were typically via public insurance coverage expansions rather than private insurance.[13,27,28] Therefore, to reduce disparities in healthcare access and utilization, universal insurance coverage is essential, which should be comprehensive and inclusive. The high-deductible, high-copayment policies leave many disadvantaged groups unable to afford care.[25] For example, a Thai study indicated that inequalities persisted even after the introduction of universal coverage mainly due to the limited scope of benefit packages in covering expenditure and also due to the presence of private sector.[29] In the United States, the Patient Protection and Affordable Care Act (ACA) since 2010 enables young adults to remain as dependents on their parents' health insurance until age 26 and expands insurance coverage including mandatory coverage for preventive services with no copayment.[4,5,30] Many studies reported that the ACA provision significantly improved young adults' access to and utilization of healthcare services and provided protection against overall out-of-pocket medical expenditures.[9,27,30–32]

However, formal policies on young adults' preventive health care are not established in Korea. To enhance access to and engagement in preventive care for young adults, this critical issue should be addressed in legislative efforts for system-wide policy changes in youth health management. For these purposes, we propose the following elements. First, we recommend the expansion of the Korea National Health Insurance and National Health Screening Programs in its eligibility and coverage for young adults' preventive care. Although the national system has reduced income disparities in several aspects of health services in Korea,[24,28] public coverage for

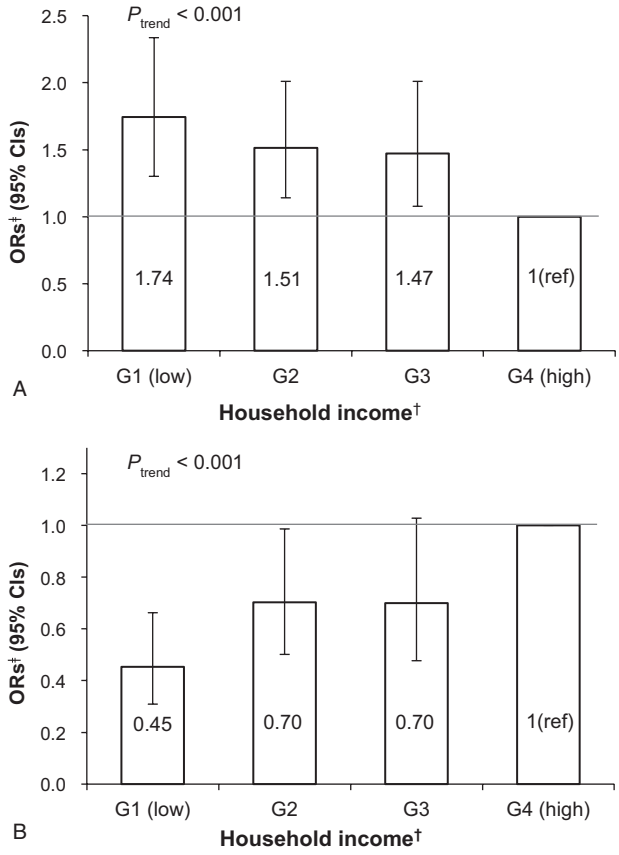

FIGURE 1. Multivariable odds ratios (ORs)‡ and confidence intervals (CIs) of the use of (A) university-provided health screening services and (B) private sector health screening services within 2 years by household income levels. Participants who used both university-provided and private sector health screening services were excluded from analyses. †Monthly household income (unit: million Korean Won, 1 million Korean Won ≈ 850 USD ≈ 760 EUR ≈ 590 GBP): G1 < 3, G2 3−4.9, G3 5−6.9, G4 ≥7. ‡Adjusted for age (continuous), sex, academic status (undergraduate, master's course, doctoral course), residence (living with parents, living alone, dormitory, others), hometown (Seoul, other urban, rural, foreign country), parents' education levels (high school or less, college or above), history of chronic disease (yes, no), self-rated overall physical health (good, fair, poor), self-rated overall mental health (good, fair, poor), body mass index (underweight, normal, overweight, obesity), smoking status (never, past, current smoker), alcohol use (never, moderate, heavy), and physical activity level (high, moderate, low).

preventive care is yet incomplete and the private sector plays a large part in health screening services. Furthermore, preventive care coverage, including health screening, for young adults who are students or unemployed is omitted in the national care system. In our results, university students utilized university-provided health screening services (imposing no out-of-pocket payment) more frequently than private sector services (requiring high out-of-pocket expenditure); this pattern was significant among low-income students. Public coverage expansion for young adults will encourage their preventive service use and reduce income disparities in screening.

Second, establishing and strengthening a university-based health center as a usual source of care for university students, who comprise the majority of young adults in Korea, might be an effective strategy. As seen after the ACA provision, young adults with a usual source of care were more likely to receive preventive health services than those without it.[4,30] The presence of a usual source of care facilitated the receipt of a broad range of preventive care, health education, and counseling.[4,33–36] Because universities can provide a unique setting where students can easily receive health education and services, and a positive environment for physical and mental health,[37] university-based health centers can play a critical role in establishing regular preventive care settings for university students. Unfortunately, more than 30% of universities or colleges in Korea did not have a university-based health center.[17] In addition, the health screening rates among university students are relatively low in our results and in the national survey.[7] Among young adults, the most commonly reported reason for not undergoing health screening was that they did not feel its necessity.[38] Therefore, we need to improve young adults' awareness of health and health screening through multifaceted approaches, including university health education and services.

Third, as inequality has a significant negative effect on young people's health,[10] we need to focus on vulnerable groups. Achieving a balance between providing universal services to all young people (e.g., university health services) as well as focusing additional resources on marginalized groups should be one of the main principles in shaping young adult health.[10] In this study, students with low income levels were more likely to be obese and physically inactive, but less likely to drink heavily. This finding implies that different health problems may exist across income levels; therefore, income group-specific approaches may be required to effectively reduce health disparities.

Lastly, to ensure appropriate preventive services for young adults, evidence-based and organized screening programs are essential. Although many professional organizations have established guidelines in many areas of health care, there are no guidelines specifically focused on young adults or consolidated into comprehensive preventive services.[4,5,8] In our analyses of sample health screening programs in Korea, the university-provided services varied widely in eligible students and covering items. Few universities provided medical counseling or comprehensive care for high-risk groups after screening. Private sector programs for young adults included a large number of tests that were not assessed for efficacy in young adults, imposing a high burden of out-of-pocket expenditure, and were limited in screening or counseling for risky behaviors and mental health. Because young adults' morbidity or burden of disease is different from that of older adults, it is important to have evidence-based recommendations assessed for efficacy in young adults.[5] Recently, the U.S. Institute of Medicine and National Research Council called for the development of a consolidated set of evidence-based recommendations on clinical preventive services specifically for young adults, including physical, mental, oral, and behavioral health screenings, counseling services, and preventive medication.[1] We propose that a standardized health screening guideline for Korean young adults is also needed because their cultural and social environments and morbidities are different from those in other nations.

This study has several strengths. As far as we are aware, this is one of the first to provide insight into the patterns of health screening service use in Korean young adults. Our study population consisted of university students with similar

education level, which may reduce the possibility of confounding by education levels and thus enable us to examine the independent effects of income levels. We performed several ancillary analyses to obtain more robust results and to minimize the possibility that the study design biased the findings.

Our study has the following limitations. First, the cross-sectional nature of this study limits causal and temporal inference. But the use of health screening services during the previous two years might not have affected household income levels. Second, this study used self-reported household income and health screening use. We were unable to verify health screening service utilization with medical records. Covariable information was based on participants' memories. Thus, we cannot exclude the possibility of inaccurate recall or misclassification, which can affect the internal validity of the results. Third, residual confounding and bias could exist, although we adjusted for many important potential confounders. Lastly, because coverage for health screening services varies widely across universities in Korea, our findings based on a single university may not be generalizable.

In conclusion, although overall rates of health screening service use were not different across income levels, we found significant disparities in the types of utilized screening services by income groups among university students in Korea. Low-income students were more likely to use university-provided health screening services, and less likely to use private sector services requiring high out-of-pocket payment. To ensure appropriate preventive care delivery for young adults and to address disparities in disadvantaged groups, we suggest that the Korean government expand medical insurance coverage for young adult preventive health care. In addition, establishing a usual source of care for young adults, such as university health services, focusing on vulnerable groups, and the development of evidence-based standardized health screening guidelines are needed.

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