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Methodology

Comparison of Equity Preferences for Life Expectancy Gains: A Discrete Choice Experiment Among the Japanese and Korean General Public

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ABSTRACT

Background: Setting priorities for limited public resources has become a topic of heated discussion the world over. Assigning different weights for the health gains of different population groups allows for equity considerations in cost-effectiveness analysis. However, only a few empirical works have elicited the preferences of the general public. **Objective:** To compare the equity preferemce assigned by Japanese and Koreans. **Methods:** We conducted a Web-based survey in March 2013, including a discrete choice experiment, to elicit the equity preferences of the general public for the life expectancy gains of different population groups. We selected attributes and designed the experiment following Norman et al.'s study (Norman R, Hall J, Street D, Viney R. Efficiency and equity: a stated preference approach. Health Econ 2013;22:568–81). Accordingly, we analyzed preference for sex, smoking status, lifestyle, caring status, income, and age. **Results:** The Japanese assigned a higher preference for males ($P < 0.001$), nonsmokers ($P < 0.001$), those with lower income ($P < 0.001$), and carers ($P < 0.001$), and they assigned a lower preference for those with a life expectancy of 60 years ($P = 0.002$) and 75-year-olds ($P < 0.001$). Koreans have the same patterns of preference for lower income ($P < 0.001$), caring ($P < 0.001$), and smoking status ($P = 0.026$). However, they prefer both sexes ($P = 0.331$) and different age groups equally. In both countries, respondents tend to prefer groups with characteristics similar to their own. **Conclusions:** People from the two Asian developed countries, with universal health insurance, show different equity preferences. These may reflect the variations in cultural background and coverage of health care services.

Keywords: discrete choice experiment, equity, Japan, Korea, preference.

Introduction

Because public resources are limited, setting priorities for their use has evoked widespread discussion in many developed countries. However, the priority-setting process involves a broad range of issues, potentially causing social, ethical, and political tensions [1]. These become evident in the course of discussions on distributional issues such as how to evaluate the health gains of different individuals.

Health benefits in cost-effectiveness analysis (CEA) are often measured in terms of the number of quality-adjusted life-years (QALYs) gained. The standard approach to CEA identifies how resources should be allocated so as to maximize the number of QALYs gained, irrespective of who those QALYs accrue to and how they are distributed across society [2]. However, a fair distribution of health gains across different socioeconomic groups is another important policy objective [3]. The present Guidance for Priority Setting in Health Care initiated by the World Health Organization offers a comprehensive checklist of equity criteria that are not adequately considered by extant cost-effectiveness analyses. These criteria include broad issues related to disease and intervention targets, characteristics of social groups, and nonhealth consequences of interventions [4]. Ideally, decision makers should ensure a balance between maximizing health gains per unit of expenditure and a fair distribution of those gains.

Several researchers have proposed economic evaluations related to distributional issues, such as distributional CEA, for example, in which an explicit social welfare function based on individual aversion to inequality is considered. Assigning different weights for the health gains of different population groups is another method to consider equity in CEA [5]. Equity weights are numerical representations of equity preferences in the population through empirical analysis. Equity weights by empirical analysis are aligned with the social values and can support decision making.

The existing literature has clarified various attributes across which the value of QALY gains may vary. A general framework

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Table 1 – Attributes and levels used in discrete choice experiments.

Attribute	Level			
	0	1	2	3
A. Sex	Male	Female		
B. Income	Lower than average	Higher than average		
C. Smoking status	Smokers	Nonsmokers		
D. Healthy lifestyle	Healthy	Unhealthy		
E. Carer status	Yes	No		
F. Age	30 y	45 y	60 y	75 y
G. Life expectancy gain	1 y	3 y	6 y	10 y

based on the causes of ill health and the consequences of treatment is developed by Olsen et al. [6]. This framework suggests several possible factors that can determine the value of QALY gain: those relating to a person's relationship to others (e.g., having children and/or unemployed), those relating to their illness (e.g., smoking and/or unhealthy diet), and those relating to themselves (e.g., age and/or sex) [6]. Dolan et al. [2] also offer a broad review of equity criteria in priority setting, which covers characteristics of members of the society, not only the age of the recipient but also other characteristics. As for age, a large number of studies suggest that the younger should be prioritized because of productivity and "fair innings"-type reasons [7]. From these previous reviews on attributes in priority setting, a compact set of attributes was selected in our study, which were sex, income, smoking status, healthy lifestyle, care status, and age. Moreover, it is also important to investigate heterogeneity in responses according to respondents' characteristics. For example, it is possible that males differ in their response patters to males and females. Weighting health gains are based on population preferences and have been estimated through discrete choice experiments [8]. However, few studies have analyzed the dissimilarity of preferences across different backgrounds.

Equity preferences have wide variations in international comparison [9]. These differences stem partly from the collective mental characteristics of a people sharing the same cultural background. Unified social security policies can also affect preference formation through shared experiences. For example, Japan and Korea follow similar health care systems. They have achieved universal health insurance coverage, with private institutions being the most popular health care providers. However, the details of their health care systems, such as organization of insurers, coverage, and cost-containment mechanisms, are different. Therefore, it would be interesting to examine whether the equity preferences differ between the two countries, where similarities and differences coexist on a wide range of social factors.

The objective of this research was to summarize and compare the equity preferences of the general public in these two countries. For numerical comparison, we used the same survey design conducted in previous research. To our knowledge, no research has elicited and compared equity preferences in an Asian setting.

Methods

Design of Discrete Choice Experiments

Discrete choice experiments (DCEs) were used to investigate the health care program preferences of two target populations with different characteristics. We conducted a Web-based public survey among both Japanese and Koreans in March 2013, including a DCE, to elicit from the general public equity preferences for life expectancy (LE) gains of different groups. We selected attributes and designed the experiment following Norman et al. [8], who selected sex, age, smoking status, income, and lifestyle, (i.e., whether the individual maintained a healthy lifestyle), caring status, and gain in remaining LE. During the pretest, respondents commented that the remaining LE was difficult to anticipate and that current age was easier to specify. Hence, we used current age instead of remaining LE. Table 1 presents the attributes and levels adopted in the DCEs conducted.

Two different profiles were presented in this study because we have no common base program in this health care allocation version. Because the number of paired choice sets extracted from 512 ($2^5 \times 4^2$) profiles was too large, we had to select and present some of them, which were required to satisfy the following properties: *level balance*, *orthogonality*, and *minimal overlap* [10]. One of the most efficient among the orthogonal methods was used [11].

As a result, 640 pairwise choice sets were used in this survey and were randomly divided into 40 versions, each version containing 16 choice sets. One of the 40 versions was randomly assigned to each respondent, who was then asked to indicate which of two alternatives in each choice set was preferred. Figure 1 is a sample question.

A Web-based survey was administered during the periods March 1 to 11 (Japan) and March 11 to 13 (Korea) in 2013. The Japanese version of the questionnaire was translated into Korean. Two persons who are bilingual between Japanese and Korean checked both versions of the questionnaire and modified wordings. Respondents, who were registered monitors with Goo Research, Inc., a research firm, were asked to estimate preferences among the general public. Subjects were asked to provide consent to participate in the survey after reading the objectives and a document explaining the protection of confidentiality on the survey Web site. Participants could withdraw from the survey at any time and/or skip any questions they did not want to answer. After respondents finished the tasks of the DCE questions, they were asked to answer personal demographic questions: age, sex, household income, their lifestyle, and so forth.

The targeted sample size was set at 1600 in Japan and 600 in Korea, reflecting the proportion of total population in the two countries. The recruitment ended when the targeted sample size was collected, whereby 1628 Japanese and 618 Koreans completed the questionnaires. Sampling was stratified according to age and sex to reflect the general distribution in both countries.

Estimation of Preference Parameters

The choice faced by respondents in this survey is dichotomous in which only two alternatives are included. In this case, a binary probit or logit is a popular specification. Both models lead to equivalent parameter estimates [12]. To estimate the parameters of equity preferences, the utility model reported by Norman et al. [8] was adopted, in which option j in choice set s among 16 pairwise choice sets for respondent i was assumed as follows:

$$U_{isj} = \alpha \cdot \mathrm{GAIN}_{isj} + \beta \cdot X'_{isj} \cdot \mathrm{GAIN}_{isj} + \mu_i + \varepsilon_{isj} \quad (1)$$

Now, please suppose that there are two programs (A and B) which increase life expectancies for different groups. Each program is effective for the same number of group with different characteristics below. When you decide to which program society should use societal budget, which would you select?

The people in this group are	Program A	Program B
A. Sex	Male	Female
B. Income	Above average	Above average
C. Smoking status	Smokers	Nonsmokers
D. Healthy lifestyle (exercise and food)	Healthy	Healthy
E. Caring other family member	They do care	They do not care
F. Present age	30 years old	30 years old
G. The program would increase their life expectancy by	3 years	3 years
Which would you select ?	O	O

Fig. 1 – Sample discrete choice experiment (DCE) question.

where GAIN is the gain in total LE if the health care program is implemented and X′is a set of characteristics of hypothetical beneficiaries; μ_i and ε_{isj} are, respectively, a person-specific error term and a conventional independent, identically and normally distributed random error term. A person-specific error term can be used to take account of individual effects stemming from the multiple observations from each respondent. The second term on the right-hand side of Equation 1 is included to explore the effects of characteristics of the potential beneficiaries. An additive utility function with GAIN and the characteristics of the potential respondents of the program would be inappropriate because the utility of the program in itself should be zero if the gain from the hypothetical health program tends to zero. Thus, an important point to note is that the characteristics of hypothetical beneficiaries were investigated using two-factor interaction terms. The marginal utility of GAIN is as follows.

$$\frac{\delta U_{isj}}{\delta \mathrm{GAIN}_{isj}} = \alpha + \beta X'_{isj} \quad (2)$$

The estimated parameter α, expected to be positive, is the magnitude of gain in total LE when the health care program is implemented. The estimated parameter β is the magnitude of gain in the characteristics of potential beneficiaries, representing equity preferences (whether to prioritize or not) of groups with certain characteristics.

In Table 1, we set males as the baseline value of the sex variable and therefore assign 1 to females. When β is estimated to be positive, it indicates that respondents favor programs benefiting women over those benefiting men. For the age variable, 30 years is set as the baseline, and dummy variables are created for 45, 60, and 75 years.

All samples were investigated to estimate the preferences, and then subsamples by sex, smoking status, age, and income were used to estimate what preferences respondents have as representatives of subpopulations with the same attributes. Stata 13.0 (Stata Corp., College Station, TX, USA) was used to estimate the preferences of respondents, and 95% was used as the confidence interval.

Results

Table 2 presents the demographic characteristics of the surveyed participants: 1618 Japanese and 618 Koreans. The basic characteristics listed in Table 2 for the two groups are very similar. Korea has a higher percentage of smokers and a larger lower-income population than Japan, but all demographic characteristics except smoking and income are quite similar.

Table 3 presents the estimation results for the whole sample. The coefficient of the LE gain term is statistically positive at the 1% level for both groups, which means that the general public in both countries favor a program with greater health gains.

When respondents favor a program that benefits a subpopulation with a particular characteristic, the coefficient of the two-factor interaction term between health gains and the characteristic is positive, and is otherwise negative.

Both countries indicate a preference for nonsmokers and against those with higher incomes and no carers. Sex, health, and age preferences differ between the two countries. Japanese show a preference for males and those with a healthy lifestyle, whereas Koreans are indifferent about these characteristics. As for the age group, Japanese weigh LE gains of 60- and 75-year-olds lower

Table 2 – Demographic characteristics of respondents.

Characteristic	Japanese (n = 1628)	Korean (n = 618)
Mean age (y)	45.5	42.2
Sex: female (%)	50.9	49.0
Level of education (%)		
Junior high school	1.3	1.3
High school	35.7	35.1
2- or 4-y university education	56.9	57.6
Graduate school	6.2	6.0
Household income (%)		
<2,000,000 yen	9.7	32.5
2,000,000–3,000,000 yen	14.2	12.1
3,000,000–4,000,000 yen	13.4	15.7
4,000,000–6,000,000 yen	23.5	21.7
6,000,000–9,000,000 yen	39.1	18.0
Current smoker (%)	22.0	33.0

Note: It is assumed that 1 yen = 10 KRW.

than those of 30-year-olds. The preference for age is not significantly different among Koreans.

Table 4 presents the estimation results subsamples of both countries. The preferences of those with the same characteristics can be compared here. Separate results are reported for subgroups by sex, age, smoking status, and income level.

Both men and women, irrespective of country, have a consistent same-sex preference. Likewise, nonsmokers, too, have a consistent preference for nonsmokers in both countries. In Japan, however, smokers are indifferent to smoking status. In Korea, on the other hand, smokers show a significant preference for smokers.

Both the higher- and lower-income groups express the same preference patterns in both countries, which means that participants from both income categories consistently prefer programs for those with lower income.

For both older and younger groups, Koreans are indifferent to age. Meanwhile, Japanese show a varied pattern for age groups. In Japan, both the older and younger groups have a discriminating preference for those aged 75 years. Besides, the younger group has a discriminating preference even for those aged 60 years.

Discussion

This article compares equity preferences for LE gains of Japanese and Koreans, using a DCE. Different equity preferences were observed for participants from the two East Asian developed countries, even though they provide universal health insurance coverage. These variations may reflect the variations in cultural and institutional background.

For the whole sample, preference for nonsmokers, those with low income, and carers was robustly observed for both countries. These preferences are also observed in Norman et al. [8], who used the same DCE design. Thus, these preferences may be common even across different backgrounds.

Age and sex preferences are clearly different between the two countries. As for age, preference distinctions are seen only in Japan. One possible explanation for this result is the differences in health care benefits between the countries. The younger generation in Japan tends to think that older people receive more social security benefits than the premium or tax they paid in their younger age, considering the pay-as-you-go nature of health care financing in both countries. User charges for health care are also different between the two countries. In Japan, the co-payment rate is 30%, and between 10% and 20% for the elderly older than 70 years. In Korea, the government adopted a policy of limited benefit coverage with high co-payment for patients [13]. Moreover, lower co-payment rates are adopted for inpatients and for specific diseases, or cancer care. However, there is no age differentiation in co-payment rate. These differences in health care systems may produce the age preference variations in the two countries, which generally share the same cultural background insofar as the elderly are concerned.

The effect of equity preferences differed according to respondents' characteristics. Men and women in both countries prefer the same sex. However, only Japanese showed an overall preference for males. In both countries, housewives obtain health care benefits under their working husbands' insurance cover. Therefore, housewives may put more stress on their husbands' health to secure their own benefits. Moreover, the female/male

Table 3 – Estimation results for whole sample.

Variable	Japanese			Korean		
	Coefficient	SD	*P* value	Coefficient	SD	*P* value
Gain	0.1128	0.0074	<0.001	0.0987	0.0106	<0.001
Gain × Female	−0.015	0.0017	<0.001	−0.0048	0.0027	0.08
Gain × High income	−0.0464	0.0018	<0.001	−0.0593	0.003	<0.001
Gain × Nonsmokers	0.0538	0.002	<0.001	0.0075	0.0032	0.018
Gain × Unhealthy	−0.0061	0.0028	0.026	−0.0014	0.0044	0.754
Gain × No carers	−0.0951	0.0018	<0.001	−0.0927	0.003	<0.001
Gain × 45 y	0.0043	0.0067	0.527	0.0161	0.01	0.108
Gain × 60 y	−0.0237	0.0077	0.002	0.0017	0.0122	0.888
Gain × 75 y	−0.0589	0.0068	<0.001	0.0165	0.0106	0.12
Constant	−0.0138	0.0169	0.413	−0.0185	0.0252	0.464
n		1628			618	
Log likelihood		−15294.773			−5947.9432	
McFadden R^2		0.153			0.132	

Note: If respondents favor a program offering benefits to a subpopulation having a particular characteristic, the two-factor interaction term coefficient between health gains and the characteristic is positive, and negative otherwise.

Table 4 – Estimation results for subsamples.

Variable	Japanese			Korean		
	Coefficient	SD	P value	Coefficient	SD	P value
	Male (n = 818)			Male (n = 315)		
Gain × Female	−0.0372	0.00245	<0.001	−0.0319	0.00383	<0.001
	Female (n = 810)			Female (n = 303)		
Gain × Female	0.00801	0.00241	<0.001	0.0256	0.00404	<0.001
	Smoker (n = 326)			Smoker (n = 204)		
Gain × Nonsmoker	0.00023	0.00479	0.962	−0.01384	0.00578	0.017
	Nonsmoker (n = 1302)			Nonsmoker (n = 414)		
Gain × Nonsmoker	0.06575	0.00229	<0.001	0.01695	0.00382	<0.001
	Higher income (n = 1025)			Higher income (n = 245)		
Gain × High income	−0.0449	0.00236	<0.001	−0.0635	0.00495	<0.001
	Lower income (n = 603)			Lower income (n = 373)		
Gain × High income	−0.0486	0.00292	<0.001	−0.0572	0.00382	<0.001
	Older (n = 697)			Older (n = 210)		
Gain × 45 y	0.01427	0.01003	0.155	0.02163	0.01775	0.223
Gain × 60 y	−0.0036	0.01103	0.744	0.03081	0.02063	0.135
Gain × 75 y	−0.0292	0.00931	0.002	0.02355	0.01853	0.204
	Younger (n = 931)			Younger (n = 408)		
Gain × 45 y	−0.0033	0.00909	0.716	0.01407	0.01227	0.251
Gain × 60 y	−0.0392	0.01056	<0.001	−0.0116	0.01528	0.448
Gain × 75 y	−0.0833	0.00972	<0.001	0.01546	0.01308	0.237

Note: The higher-income group consists of participants whose household income is more than 4,000,000 yen. Older participants are those older than 45 y. Coefficients for group characteristics are reported.

ratio in the labor force is similar (0.73 in Korea and 0.78 in Japan) [14]. Thus, it is difficult to explain this difference between the two countries in terms of differences in sex disparity vis-à-vis economic participation. Because the other indicators concerning sex gap such as educational attainment and political empowerment are also similar between the two countries [15], other cultural factors may have impacts on this particular feature observed in the Japanese sample.

Both high- and low-income participants have a consistent preference for the low-income group. This result implies that, in both countries, social tensions are minor when resource allocation is considered more generous toward low-income groups. This research considers only two income groups. The higher-income category includes middle-income citizens, who tend to empathize with the lower-income group.

In contrast, although smokers in Japan are indifferent to smoking status, smokers in Korea show a significant preference for smokers. When policy is considered more favorable to nonsmokers, social conflicts may be stronger in Korea than in Japan because of the opposite preference for smoking status in Korea.

As for subgroup analysis for age, younger people in Japan show a significant discrimination against the older patient group. Older respondents assign a lower preference for 75-years-olds. The recent polls conducted by Japan's Ministry of Health, Labour and Welfare showed that a higher proportion of older people, relative to younger people, expect to receive more social security benefits than the premium or tax they have paid [16]. Older people in Japan may be conscious of intergenerational inequity of the net benefit of social security.

There are several limitations of this article. Our study is based on an online survey that yielded a nonrandom sample of respondents. Our sample is biased toward respondents with higher incomes, higher education, and of younger age compared with the national averages in Korea and Japan. Therefore, although it is not possible to generalize our results beyond the context of our sample, useful cross-country insights based on the differential preferences of individuals are yielded. To investigate public preferences more precisely, it is a future task to capture data from respondents who cover a broader range of socioeconomic and demographic characteristics.

Although a large number of studies eliciting preferences in priority settings have been conducted worldwide, no research has hitherto elicited and compared equity preferences in an Asian setting. That said, the focus of our study is limited to just two countries in this region and there remains ample scope for future research to consider a broader array of Asian jurisdictions.

Although preferences are identified from a large sample in our study, they are based on choices between hypothetical health programs rather than real-world policy questions. Thus, it is not well known whether respondents actually react in the same way to actual policy settings. A number of experimental studies have shown that images of watching eyes can cause people to behave more cooperatively, even toward unrelated individuals [17–19]. Thus, different elicitation methodologies—contrast face-to-face interviews with anonymous online surveys—can alter the results. Future research into the impacts of social cues on stated preferences vis-à-vis equity in health care settings would certainly be welcomed.

The importance of capturing both social and scientific values that inform resource allocation for health care has been recognized recently [20]. Therefore, collecting evidence that reflects the social values of resource allocations for health care is an important topic for future research.

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