Tohoku J. Exp. Med., 2021, **255**, 9-17

Knowledge, Experience, and Perceptions of Generic Drugs among Middle-Aged Adults and their Willingness-to-Pay: A Nationwide Online Survey in Japan

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Promoting generic drugs can reduce the financial burden on patients and improve healthcare finances. The insurers have been conducting promotional efforts, such as direct-mail campaigns, but little is known about the public's perception of generic drugs and effective message strategies for promotion. In 2018, we conducted a web-based survey of middle-aged Japanese men and women that investigated: (i) their perceptions of generic drugs, (ii) the association between perceptions and willingness-to-pay for brand-name drugs relative to generic drugs, and (iii) potentially effective forms of information provision to alter individuals' perceptions. Of the 1,005 respondents, over half perceived generic drugs as having the same level of efficacy and safety as brand-name drugs. While willingness-to-pay was dispersed among respondents, two factors were associated with small willingness-to-pay: (a) perceiving generic drugs as having the same level of efficacy and safety as brand-name drugs and (b) perceiving that promoting the use of generic drugs is important for controlling medical expenditures. Moreover, presenting potential savings over five years by choosing generic drugs was a potentially effective tool for altering perceptions, relative to showing monthly savings. Our findings suggest that certain parts of the population still have high willingness-to-pay for brand-name drugs, and strategic communication to alter perception could be effective in promoting the use of generic drugs among those who are price-inelastic.

Keywords: generic drugs; Japan; strategic communication; survey; willingness-to-pay
Tohoku J. Exp. Med., 2021 September, **255** (1), 9-17.

Introduction

Policies that can reduce health expenditures without harming health are attractive among developed countries. One candidate for such a policy is encouraging the use of generic drugs, as brand-name drugs and most generic drugs are assumed to have the same level of efficacy (Kesselheim et al. 2008), and the price of generic drugs is generally lower than that of brand-name drugs. One clinical advantage of generic drug prescriptions is that they improve adherence and may improve clinical outcomes because the prices are lower as compared to brand-name drugs (Gagne et al. 2014).

Despite the price difference between generic and brand-name drugs, the latter tend to maintain a substantial share (Frank and Salkever 1992). To promote the use of generic drugs, countries and insurers have introduced reimbursement schemes that require patients to pay larger copayments for brand-name drugs than generic drugs (Carone et al. 2012; Panteli et al. 2016). Although policies that aim to control out-of-pocket costs of patients seem to be effective to some extent (Brekke et al. 2011), the shares of generic drugs remain limited in many countries: While the United States and Germany have a share of approximately 90%, countries such as Italy, Japan, and Spain have somewhat limited shares of 60-80% (Ministry of Health,

Received June 17, 2021; revised and accepted July 27, 2021. Published online September 8, 2021; doi: 10.1620/tjem.255.9.
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Labour and Welfare 2018).

While various factors such as price difference between brand name and generic drugs (Dalen et al. 2011; Decollogny et al. 2011; Pechlivanoglou et al. 2011; Iizuka 2012; Takizawa et al. 2015), age (Decollogny et al. 2011; Pechlivanoglou et al. 2011), complexity of treatment (Decollogny et al. 2011), experience (Pechlivanoglou et al. 2011), and previous prescriptions (Iizuka 2012) are associated with the use of generic drugs, previous studies have noted that patients' and providers' perceptions about generic drugs are potential barriers to stimulate the use of generic drugs (Shrank et al. 2009b; Kesselheim et al. 2016). Other studies showed that perceptions of generic drugs differ according to patients' demographic characteristics such as age, ethnicity, income, and education level (Gaither et al. 2001; Federman et al. 2007; Iosifescu et al. 2008; Omojasola et al. 2012).

Considering the importance of the perception of generic drugs, one popular approach—direct-mail campaigns—could accelerate the use of generic drugs by altering individuals' perceptions through information provision. Indeed, information provision has been successful in other areas such as improving take-up of social benefits (Bhargava and Manoli 2015) and improving influenza vaccination rates (Milkman et al. 2011). Such an approach should be attractive when controlling out-of-pocket costs, which have only limited effects. For example, the Japanese government announced that they are encouraging municipal-level governments and insurers to provide information on generic drugs by sending letters to brand-name drug users (Ministry of Health, Labour and Welfare, 2016, 2017a).

To efficiently perform direct-mail campaigns, we need to know how people perceive generic drugs as well as their willingness-to-pay (WTP) for brand-name drugs relative to generic drugs. Moreover, there is no evidence on the effective content and design of the letters that would facilitate the switch from brand name to generic drugs.

The objectives of this survey-based study were to (i) investigate the level of knowledge, experience, and perceptions of generic drugs in the general population; (ii) evaluate their WTP for brand-name drugs relative to generic drugs and their associations with their characteristics, including perceptions of generic drugs; and (iii) assess how WTP varies according to the content and design of messaging strategies.

Materials and Methods

Study design and survey sample

We conducted a cross-sectional study based on an online questionnaire survey using a web-based platform provided by Macromill Inc. (Tokyo, Japan)—a market research company with a nationwide social research panel of more than one million registrants living in Japan. Of these registrants, we chose our sample to include men and women aged between 40 and 59 years to focus on individuals at a relatively high risk of being diagnosed or have already been diagnosed with some lifestyle diseases, such as hypertension, diabetes, and dyslipidemia. Macromill Inc. sent invitation e-mails to randomly selected registrants of this age group; once the registrants accepted the invitation, they proceeded to the online survey. The invitation e-mails were sent automatically until the number of participants exceeded 1,200. All surveys were completed on February 27, 2018.

Survey contents

The survey consisted of four parts: (1) healthcare utilization; (2) knowledge, experience, and perception of generic drugs; (3) WTP for brand-name drugs relative to generic drugs; and (4) comparison of the forms of information provision (Fig. 1). A complete list of the questions is available upon request. Demographic characteristics of the respondents, such as age, sex, residential region, and household income, were collected by Macromill Inc. prior to the study. Since household income was missing for some respondents (234 out of 1,239), we excluded these respondents from analyses.

The study protocol was reviewed by Research Ethics Committee at the Graduate School of Medicine and Faculty of Medicine, The University of Tokyo (application number: 11827) and was found to comply with ethical standards.

(1) Part 1: Healthcare utilization

We obtained information on the frequency at which the respondents visited medical institutions.

(2) Part 2: Knowledge, experience, and perception of generic drugs

For questions on knowledge, we asked whether the participants knew about the existence of generic drugs and the price difference between brand-name and generic drugs. Regarding experience, we asked whether the participants had used generic drugs within a year and whether they had ever been recommended the use of generic/brand-name drugs at a medical institution or pharmacy. Regarding perception, we asked whether the participants thought that brand-name drugs and generic drugs had the same level of efficacy/safety and whether they thought that it is important to promote the use of generic drugs to control medical expenditures throughout the country.

(3) Part 3: Measuring WTP

To investigate how WTP for brand-name drugs relative to generic drugs would vary by providing information on generic drugs, we randomly assigned the respondents to seven distinct groups: a no-additional-information group (25%), a document-type-format group (12.5%), and five letter-type-format groups (12.5% each). First, a quarter of the respondents were randomly selected to answer questions on their WTP for brand-name drugs relative to generic drugs without any additional information provision (no-

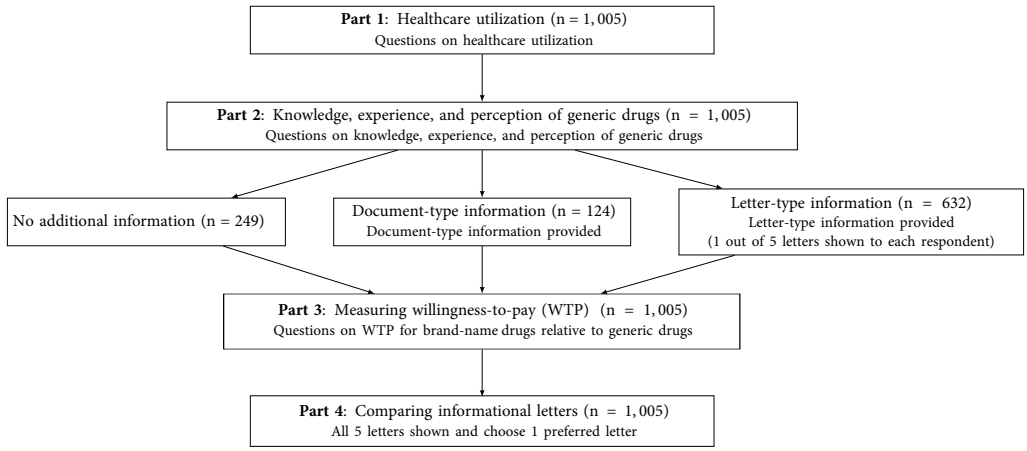

Fig. 1. Flowchart of the survey procedure.
WTP, willingness-to-pay.

additional-information group). The selected respondents were told that they were taking the brand-name version of an imaginary antihypertensive drug that costs 3,000 Japanese yen (JPY), which is approximately 30 US dollars per month. Then, each respondent chose all the price options that they would take the generic version among 500, 900, 1,200, 1,500, 1,800, 2,100, and 2,500 JPY or stated that they would never take the generic drug under the presented prices.

Next, 12.5% of the respondents were asked the same question as above, but they were provided with detailed information on generic drugs before answering the questions. Information was provided in a document-type format (document-type-format group).

The remaining respondents were assigned to groups that provided information on generic drugs in a letter-type format. We designed five types of letters that aimed to provide information on generic drugs and alter perceptions of generic drugs, based on informational letters provided in Japan. Each type of letter corresponded to a distinct group. We followed the literature on information provision to design letters (Tversky and Kahneman 1991; Bertrand et al. 2010; Bhargava and Manoli 2015). Several aspects have been noted as important for information provision: sufficient information, simplicity of the information, salience of the information, stimulating loss aversion, and social pressure. Letters were designed to address such aspects.

All the letters included: (a) information on how much one can save by switching from a brand-name drug to a generic drug per month, and (b) the word "important." The first letter included additional detailed information regarding generic drugs: (i) substitution to generic drugs leads to reduced health expenditures among Japan and reduction in out-of-pocket payment for respondents, (ii) how one can switch to a generic drug, and (iii) how safe and effective the generic drugs are. It also included a sentence saying that "it is good news for you" (abundant-information-letter group). The second letter did not include additional information (simple-letter group). The third letter additionally showed how much generic drugs are cheaper per year and every five years (long-term-profit-letter group). The fourth letter additionally showed how much they would lose if they chose the brand-name drug instead of the generic drug (loss-aversion-letter group). The fifth letter additionally showed the monetary impact of the whole Japanese population choosing generic drugs and the importance of reducing health expenditure for the future generation (social-pressure-letter group).

The respondents assigned to a letter-type-format group were asked the same question as the no-additional-information group, but they were asked to choose between brand-name and generic drugs for each sequentially displayed price. The order of prices shown to the respondents was randomized.

(4) Part 4: Comparing informational letters

Each respondent had five types of letters, as described in Part 3. The letters were shown simultaneously on the screen in the same order as described in Part 3. They were asked to choose the letter with the highest probability of switching to generic drugs if they had received the letter.

Statistical analysis

(1) Association between demographics and perception of generic drugs

We conducted a logistic regression analysis to determine the association between demographics and the perception of generic drugs for each question, asking the respondents about their perceptions of generic drugs. The dependent variable was answering "yes" to each question regarding respondents' perceptions. We included age, sex, residential region, household income, and whether they regularly visited hospitals or clinics as individual characteristics. These variables were treated as independent variables in the regression analysis. Age was categorized in five-year ranges. Residential regions were categorized into eight regions, which were determined based on the prefectures in which the participants reside. Household income

was included as a dummy variable, indicating whether annual income was more than 6 million JPY. For this part of the analysis, we excluded respondents who answered "Do not know" to the corresponding question on the survey.

(2) Calculation of WTP

We calculated respondents' WTP for the brand-name drug relative to the generic drug as follows:

3,000 − (maximum price of the generic drug which the respondent chose the generic drug among the prices presented) JPY.

If participants stated that they would never take the generic drug under the presented prices, WTP was calculated as 3,000 JPY. This calculation provided an upper bound for respondents' WTP. For example, consider a respondent who chose the generic drug if the price was 1,200 JPY and chose the brand-name drug if the generic drug was 1,500 JPY. This respondent should have a WTP for the brand-name drug within the range of 1,500 (3,000 minus 1,500) and 1,800 (3,000 minus 1,200) JPY. Although this calculation only provides an approximation to the true WTP, we expected the bias from treating this value as WTP to be minimal if WTP follows a natural distribution. Hereafter, we refer to this calculated value as WTP.

(3) Analyses concerning the association between WTP and individual characteristics

We conducted ordinary least squares (OLS) regression analyses to determine the association between demographics and WTP. We regressed WTP for the same individual characteristics as described above.

In addition, to analyze the relationship between WTP and respondents' knowledge, experience, and perception of generic drugs, we conducted OLS regression analyses of WTP on dummy variables for answers to questions on knowledge, experience, and perceptions of generic drugs controlling for the same individual characteristics as above.

(4) Analyses of WTP and information provision

We compared WTP between the group without information provision and the document-type information-provided group. In addition, we compared WTP across five letter-type information-provided groups, which are described in Part 3. Measuring WTP. We regressed WTP on dummy variables corresponding to each group and the same individual characteristics as in the first section of *Statistical analysis*. Statistical significance was set at $P < 0.05$. All analyses were performed using Stata version 15 (StataCorp LP, College Station, TX, USA).

Results

Respondents' characteristics

A total of 1,239 respondents completed the survey. The exclusion of individuals without income information resulted in 1,005 respondents. Table 1 summarizes participants' individual characteristics. Overall, 44.3% of the

Table 1. Descriptive statistics of the survey sample.

Characteristic	All respondents (N = 1,005)	No additional information (n = 249)	Document-type information (n = 124)	Letter-type information provision				
				Abundant information (n = 130)	Simple (n = 127)	Long-term profit (n = 124)	Loss-aversion (n = 123)	Social pressure (n = 128)
Mean age (standard deviation), years	48.8 (5.7)	48.7 (5.9)	49.0 (5.3)	48.5 (5.6)	49.1 (5.8)	49.0 (5.8)	49.3 (5.9)	48.2 (5.3)
Women, n (%)	445 (44.3)	110 (44.2)	61 (49.2)	61 (46.9)	46 (36.2)	56 (45.2)	56 (45.5)	55 (43.0)
Annual household income > 6 million JPY, n (%)	487 (48.5)	116 (46.6)	56 (45.2)	66 (50.8)	63 (49.6)	71 (57.3)	57 (46.3)	58 (45.3)
Regular visit to medical institution, n (%)	559 (55.6)	138 (55.4)	60 (48.4)	80 (61.5)	68 (53.5)	79 (63.7)	63 (51.2)	71 (55.5)
Region, n (%)								
Hokkaido	56 (5.6)	15 (6.0)	8 (6.5)	9 (6.9)	6 (4.7)	5 (4.0)	4 (3.3)	9 (7.0)
Tohoku	61 (6.1)	14 (5.6)	9 (7.3)	11 (8.5)	9 (7.1)	5 (4.0)	9 (7.3)	4 (3.1)
Kanto	386 (38.4)	97 (39.0)	52 (41.9)	47 (36.2)	51 (40.2)	49 (39.5)	42 (34.1)	48 (37.5)
Chubu	160 (15.9)	40 (16.1)	21 (16.9)	16 (12.3)	22 (17.3)	22 (17.7)	21 (17.1)	18 (14.1)
Kinki	187 (18.6)	45 (18.1)	21 (16.9)	29 (22.3)	16 (12.6)	26 (21.0)	24 (19.5)	26 (20.3)
Chugoku	47 (4.7)	12 (4.8)	5 (4.0)	6 (4.6)	7 (5.5)	5 (4.0)	5 (4.1)	7 (5.5)
Shikoku	27 (2.7)	6 (2.4)	0 (0.0)	5 (3.8)	2 (1.6)	3 (2.4)	6 (4.9)	5 (3.9)
Kyushu	81 (8.1)	20 (8.0)	8 (6.5)	7 (5.4)	14 (11.0)	9 (7.3)	12 (9.8)	11 (8.6)

100 JPY is approximately 1.00 USD.
JPY, Japanese yen.

respondents were women, and the median annual household income was within the range of 4-6 million yen. More than half (55.6%) of the participants visited medical institutions regularly, and 28.3% visited more than once a month. Among the respondents, 249 (24.8%) were included in the no-additional-information group. The number of respondents assigned to each group in addition to the no-additional-information group was within the range of 123-130.

Knowledge, experience, and perception

Table 2 summarizes the knowledge, experience, and perceptions of generic drugs. Most (81.3%) respondents knew about generic drugs before the survey; approximately one-fourth (27.1%) knew the price difference between brand name and generic drugs; and approximately half (48.4%) took generic drugs within a year. The proportion of respondents who were recommended the use of generic drugs at medical institutions was 43.8%, while 14.1% were recommended the use of brand-name drugs. More than half (55.2%) considered the brand-name and generic drugs to have the same level of efficacy, while more than half (58.2%) considered the drugs to have the same level of safety. Approximately three-fourths (72.1%) agreed that it was important to promote the use of generic drugs to control medical expenditures in the country.

Women and respondents who regularly visited medical institutions were more likely to know the existence of generic drugs than their counterparts [odds ratios (ORs) = 1.63 and 1.72 (95% confidence intervals (CIs) 1.15-2.32 and 1.22-2.42), respectively]. Respondents who visited medical institutions regularly were more likely to know how the price differs between brand-name and generic drugs than those who did not [OR = 2.03 (95% CI = 1.49-2.77)].

Respondents who regularly visited medical institutions were more likely to have prescribed generic drugs within a year than those who did not [OR = 4.74 (95% CI = 3.57-6.30)]. Respondents with higher income levels were more likely to have recommended the use of generic drugs at a medical institution than those with a lower income level [OR = 1.47 (95% CI = 1.12-1.93)]. Women were more likely to have recommended the use of generic drugs at pharmacies than men [OR = 1.67 (95% CI = 1.27-2.19)].

Older respondents (aged 55-59 years) were more likely to think that generic drugs and brand-name drugs have the same efficacy and safety level than younger respondents (aged 40-44 years) [ORs = 2.17 and 1.70 (95% CI = 1.39-3.39 and 1.08-2.68), respectively]. In addition, older respondents (aged 55-59 years) were more likely to think that it is important to promote the use of generic drugs to control medical expenditures throughout the country than younger respondents (aged 40-44 years) [OR = 1.83 (95% CI = 1.06-3.17)].

WTP

The mean WTP among 249 respondents was 1,439 JPY. The largest proportion of the respondents (26.5%) chose the lowest value of WTP (500 JPY), followed by 1,500 JPY (17.7%) and 900 JPY (16.5%). On the other hand, 15.7% respondents had 3,000 JPY as their WTP, which indicates that they were not willing to take the generic drug under the prices we have presented in the survey.

The results from the OLS regression analysis of WTP on individual characteristics based on the group of respondents who were asked questions on WTP for brand-name drugs are shown in Table 3. Women [278.1 JPY (95% CI = 61.0-495.2 JPY)] had less WTP than men. Regions such as Hokkaido [628.5 JPY (95% CI = 159.5 -1097.5 JPY)] and Chugoku [525.4 JPY (95% CI = 15.6-1035.3 JPY)] had larger WTPs than the Kanto region. We found no significant differences in WTP between age groups, income groups, or the frequency of hospital visits.

Table 4 shows the results of the OLS regression analysis of WTP on respondents' knowledge, experience, and perceptions. We found no significant difference between respondents' knowledge levels of generic drugs. Regarding experience, we found a smaller WTP for the respondents

Table 2. Respondents' knowledge, experience, and perception of generic drugs.

Question	Yes (%)	No (%)	Do not know (%)
Did you know about generic drugs before this survey ?	817 (81.3)	168 (16.7)	20 (2.0)
Do you know how the price differs between brand-name drugs and generic drugs ?	272 (27.1)	559 (55.6)	174 (17.3)
Have you used generic drugs within a year ?	486 (48.4)	460 (45.8)	59 (5.9)
Have you ever been recommended the use of generic drugs at a medical institution ?	440 (43.8)	502 (50.0)	63 (6.3)
Have you ever been recommended the use of brand-name drugs rather than generic drugs at a medical institution ?	142 (14.1)	755 (75.1)	108 (10.8)
Have you ever been recommended the use of generic drugs at a pharmacy ?	499 (46.5)	451 (44.9)	55 (5.5)
Do you think brand-name drugs and generic drugs have the same efficacy ?	555 (55.2)	273 (27.1)	177 (17.6)
Do you think brand-name drugs and generic drugs have the same level of safety ?	585 (58.2)	244 (24.3)	176 (17.5)
Do you think it is important to promote the use of generic drugs to control medical expenditures throughout the country ?	725 (72.1)	145 (14.4)	135 (13.4)

Table 3. Ordinary least squares (OLS) estimates of regressing willingness-to-pay (WTP) on demographics.

		Coefficient	P	95% CI
Women		−278.1	0.01	[−495.2, −61.0]
Age (years)				
	40-44	Ref		
	45-49	222.5	0.13	[−65.3, 510.3]
	50-54	−254.0	0.09	[−548.4, 40.4]
	55-59	22.5	0.89	[−285.7, 330.7]
Region				
	Hokkaido	628.5	0.01	[159.5, 1,097.5]
	Tohoku	121.9	0.62	[−357.0, 600.7]
	Kanto	Ref		
	Chubu	57.9	0.72	[−256.0, 371.7]
	Kinki	278.2	0.07	[−27.6, 583.9]
	Chugoku	525.4	0.04	[15.6, 1,035.3]
	Shikoku	158.9	0.66	[−540.0, 857.9]
	Kyushu	129.1	0.54	[−281.8, 540.0]
Annual household income > 6 million JPY		−120.9	0.28	[−341.0, 99.2]
Regular visit to medical institution		−210.8	0.05	[−425.2, 3.7]
Constant		2,498.2	< 0.001	[1,944.8, 3,051.5]

The regression analysis was performed on respondents who were assigned to the no-additional-information group (n = 249).
CI, confidence interval; JPY, Japanese yen.

Table 4. Ordinary least squares (OLS) estimates of regressing willingness-to-pay (WTP) on knowledge, experience, and perception about generic drugs adjusting for demographics.

	Coefficient	P	95% CI
Did you know about generic drugs before this survey ?	−156.8	0.30	[−452.3, 138.6]
Do you know how the price differs between brand-name drugs and generic drugs ?	17.5	0.90	[−260.2, 295.3]
Have you used generic drugs within a year ?	−474.4	< 0.001	[−713.5, −235.4]
Have you ever been recommended the use of generic drugs at a medical institution ?	−379.7	0.001	[−603.4, −156.1]
Have you ever been recommended the use of brand-name drugs rather than generic drugs at a medical institution ?	139.8	0.40	[−184.7, 464.3]
Have you ever been recommended the use of generic drugs at a pharmacy ?	−434.8	< 0.001	[−655.1, −214.4]
Do you think brand-name drugs and generic drugs have the same efficacy ?	−719.4	< 0.001	[−958.3, −480.5]
Do you think brand-name drugs and generic drugs have the same level of safety ?	−846.5	< 0.001	[−1,086.9, −606.0]
Do you think it is important to promote the use of generic drugs to control medical expenditures throughout the country ?	−843.0	< 0.001	[−1,125.6, −560.5]

The presented coefficient corresponds to the coefficient of a dummy variable corresponding to answering “Yes” to the question where the reference is answering “No.”
CI, confidence interval.

who had used generic drugs within a year [474.4 JPY (95% CI = 235.4-713.5 JPY)], those who were recommended the use of generic drugs at a medical institution [379.7 JPY (95% CI = 156.1-603.4 JPY)], and those who were recommended the use of generic drugs at a pharmacy [434.8 JPY (95% CI = 214.4-655.1 JPY)] than those who had not. WTP did not significantly differ according to whether one was ever recommended the use of brand-name drugs at a medical institution. Regarding perceptions of generic drugs, respondents who thought brand-name and generic

Table 5. Preferred generic drug informational letters.

Letter	No. of respondents (%)
Abundant-information letter	267 (26.6)
Simple letter	131 (13.0)
Long-term-profit letter	368 (36.6)
Loss-aversion letter	34 (3.4)
Social-pressure letter	205 (20.4)
Total	1,005 (100.0)

We report the results from the question, "From the five letters shown below, which letter will most likely make you switch to the generic version if you receive the letter?"

drugs have the same levels of efficacy and safety [719.4 JPY (95% CI = 480.5-958.3 JPY) and 846.5 JPY (95% CI = 606.0-1086.9 JPY), respectively] had less WTP than those who did not. Respondents who thought that it is important to promote the use of generic drugs to control medical expenditures throughout the country had less WTP [843.0 JPY (95% CI = 560.5-1125.6 JPY)] than those who did not.

We found no significant difference in WTP between the no-additional-information group and the document-type-format group. Moreover, we found no significant WTP differences across letter-type information provided groups.

Informational letters

Table 5 shows the responses to the item, "which letter will most likely make you switch to the generic version if you receive the letter?" Among the five letters, the "long-term-profit letter" had the largest proportion (37%). The next largest was the "abundant-information letter" (27%). The "loss-aversion letter" had the smallest proportion (3%).

Discussion

We conducted a nationwide web-based survey to investigate the knowledge, experience, and perceptions of generic drugs in Japan. Despite a web-based convenience sampling, the geographic and income distributions of the respondents were similar to that of the entire population aged 40-59 years (Ministry of Health, Labour and Welfare 2017b). Thus, we expect that our findings fairly represent the Japanese population.

Over 80% of the respondents knew about the existence of generic drugs before the survey, which was higher than the percentage obtained from a previous survey-based study conducted in Japan from 2007 to 2008 (Kobayashi et al. 2011). However, only 27% knew the price difference between brand name and generic drugs, which is a relatively low rate that could hinder the use of generic drugs. In addition, approximately half of the respondents had experienced taking generic drugs within a year. Over 40% of the respondents were recommended the use of generic drugs at a medical institution, while one-seventh of the respondents were recommended the use of brand-name drugs. Although there could be clinical reasons to prescribe brand-name drugs, providing information on generic drugs, such as efficacy or safety, to healthcare providers could also be effective in promoting the use of generic drugs. Furthermore, over half of the respondents perceived generic drugs as having the same level of efficacy and safety as brand-name drugs. More than 70% of the respondents thought that it was important to promote the use of generic drugs to control medical expenditures.

Older patients were more likely to think that generic drugs have the same efficacy and safety level as brand-name drugs than younger patients. Older patients were also more likely to think that generic drugs are socially more important, answering "yes" to the question "Do you think it is important to promote the use of generic drugs to control medical expenditures throughout the country?", than younger patients. However, the findings that older patients have positive views of generic drugs are not perfectly aligned with those of previous studies (Shrank et al. 2009b; Kesselheim et al. 2016). The misalignment may be owing to factors such as differences in the population and when the survey was conducted. Further research is required to reveal the relationship between age and perceptions.

To our knowledge, this was the first study to explicitly show how knowledge, experience, and perception of generic drugs relate to WTP for brand-name drugs. Although we found no significant association between knowledge of generic drugs and WTP, the experience of generic drugs and recommendation of generic drugs at a medical institution or pharmacy was associated with less WTP for brand-name drugs. This negative association between generic drug experience and WTP could be interpreted in two ways: (i) the experience of generic drugs lowered individuals' WTP, or (ii) individuals with low WTP chose generic drugs and thus had generic drug experience. Our study does not allow us to distinguish between these two bidirectional effects.

We found that WTP could vary by some socio-demographic characteristics. Women had less WTP for brand-name drugs than men, and WTP varied among regions. We should also note that not a small fraction of the population (16% in the present study) may stick to brand-name drugs regardless of the out-of-pocket payment. Policymakers may need to tailor their generic drug promotion strategy

based on an understanding of the target population's characteristics.

We could not detect differences in WTP between groups with and without information provision in a document-type format. Although we cannot rule out insufficient sample size or inaccurate WTP measurement, this result suggests the inefficacy of information provision through a document-type format. Furthermore, we could not detect differences in WTP between groups with various letter-type information provision. Again, this insignificance could be due to insufficient sample size or imprecise WTP measurement. Another potential reason for insignificance is that various letter-type formats may not have differential impacts on WTP among the general population but only among specific groups.

Our study has several important policy implications. A strong association between the perception of generic drugs and the WTP for brand-name drugs suggests that some interventions, such as providing information on the efficacy and safety of generic drugs and spreading the idea of contributing to society by taking generic drugs, could promote the use of generic drugs (Kohl and Shrank 2007; Shrank et al. 2009a). Although the results regarding the informational letters need to be interpreted with caution as they are only uncovering respondents' stated preferences, our results suggest that showing the price difference between brand-name drugs and generic drugs concerning the savings over five years could be more effective than showing the monthly price difference. Moreover, other letter types, such as the abundant-information letter and the social-pressure letter, were supported by a substantial proportion of the respondents. These interventions could be effective even for a population with a considerably high WTP for brand-name drugs. In addition, our survey will help determine the effective target population for such potential interventions. For instance, we observed that older respondents were more likely to think that it is important to promote the use of generic drugs to control medical expenditures throughout the country than younger respondents. Given this observation, it may be better to target a younger population when we try to spread the idea of contributing to society by taking generic drugs rather than targeting an older population. Investigating the optimal types of intervention and empirically evaluating these effects would be a fruitful area for further research.

We should acknowledge some limitations. First, our WTP measure was based on the stated preferences. If respondents responded differently to the hypothetical questionnaire and in the real world, our WTP estimates could be biased. However, if the size and direction of the bias are not correlated with patients' characteristics and answers to the questionnaire, our estimates of how individuals' knowledge, experience, and perception of generic drugs are associated with WTP may be valid. Second, WTP was measured only for randomly selected respondents, resulting in a relatively small sample size. We might have failed to capture some aspects of how WTP is associated with the knowledge, experience, and perception of generic drugs. However, strong associations were captured by our analysis. Third, our study included only middle-aged individuals. Older adults, such as those over 65 years of age, are potentially important targets for interventions that aim to broaden the use of generic drugs because of their high pharmaceutical expenditures (Mueller et al. 1997; Ministry of Health, Labour and Welfare 2021). If the association between knowledge, experience, and perception of generic drugs and WTP is different from that of middle-aged individuals, the power of interventions that aim to modify knowledge/experience/perception could be ineffective (or more effective). Since elderly individuals have a higher probability of choosing brand-name drugs than younger patients (Dalen et al. 2011), the interventions should have a substantial impact unless such an association does not exist or has opposite directions, which are cases that are unrealistic. Fourth, we have excluded the respondents whose income information were missing from the main sample and this could result in some bias due to sample selection. Income information was collected by Macromill Inc. prior to the study, and availability of the information was not a requirement for the respondents to participate in the study. However, we do not observe any significant difference in WTP between the main sample and those who were excluded. Thus, we expect the results to be unchanged even if we had income information for the excluded sample. Finally, our survey design did not allow us to compare WTP between the group without information provision and groups with letter-type information provision since the way how the prices shown were different between groups. However, the effectiveness of letter-type information provision has been demonstrated in the field (Bhargava and Manoli 2015), which supports the importance of such interventions.

We conducted a web-based survey to reveal the levels of knowledge, experience, and perception of generic drugs and WTP for brand-name drugs among middle-aged individuals. Our results showed that the perceptions of generic drugs were strongly associated with WTP. This association highlights the obstacles in promoting the use of generic drugs by controlling prices and the potential strength of information provision. Moreover, perceptions differed by individual characteristics, suggesting that such information provision could be more effective when targeting a certain population. Further research is needed to reveal an efficient way to provide information.

Acknowledgments

This research was, in part, supported by the research fund from JSPS KAKENHI [No. 15K08829] (JT and HS) and the Health, Labour and Welfare Policy Research Grants Research on Health Security Control [No. 19LA2003] (JT).

Conflict of Interest

The authors declare no conflict of interest.

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