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*Original Paper*

# Willingness to Pay for Mortality Risk Reduction from Water Accidents: Application to Recreational Beaches, Miyagi Prefecture, Japan

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**Abstract**

*The purpose of this paper is to measure benefits of the risk reductions on water accidents. 763 people who recreated at beaches were selected by an internet research. The reduction rates were 10%, 50%, and 90%. The median WTPs and the mean WTPs for reduction rates with and without protest bits were calculated. As results, the median WTPs at 10% reduction rates were calculated from 6 yen to 221 yen, the mean WTPs were from 615 yen to 820 yen. At 50% reduction rates, WTPs were from 743 yen to 1287 yen, and from 1256 yen to 1695 yen. At 90% reduction rates, WTPs were from 1607 yen to 2924 yen, and were from 2411 yen to 3433 yen.*

**Keywords**

*contingent valuation, mortality risk, option price, recreational activity*

## 1. Introduction

Water recreations, such as the swimming and the fishing, are very popular activities in the world. Since there are many beaches in most area of Japan, the water recreations at beaches are familiar to the nations. Thus, the risks of recreational activities at beaches (such as the mortality risk by the drowning) should be recognized by more people. It is a problem that people does not recognize the risks so much when they recreate at beaches.

National Policy Agency (2009) reported the mortality risk of water accidents (Note 1). Figure 1 shows the total numbers of water accidents and the dead from 1999 to 2008. The total number of water accidents was decreasing from 1999 to 2003, and then about 750 accidents have occurred from 2004 to 2008. The total number of the dead was also decreasing from 1999 to 2003, and then about

400 people have been dead from 2004 to 2008. Totally, the data indicates the number of water accidents have decreased. However, the mortality has not decreased. Figure 2 shows the mortality, number of the dead in a year per an accident. The mortalities caused from water accidents have been constant at about 55% levels. From other data base, the mortality caused from accidents at mountains has been about 20% from 1999 to 2008. That is, it is considered that the mortality caused form water accidents are high rate.

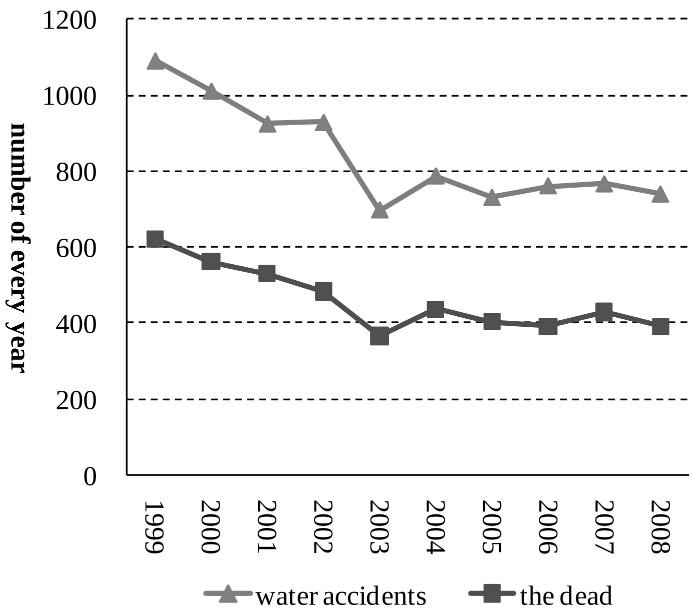



**Figure 1. Number of Water Accidents and Death**

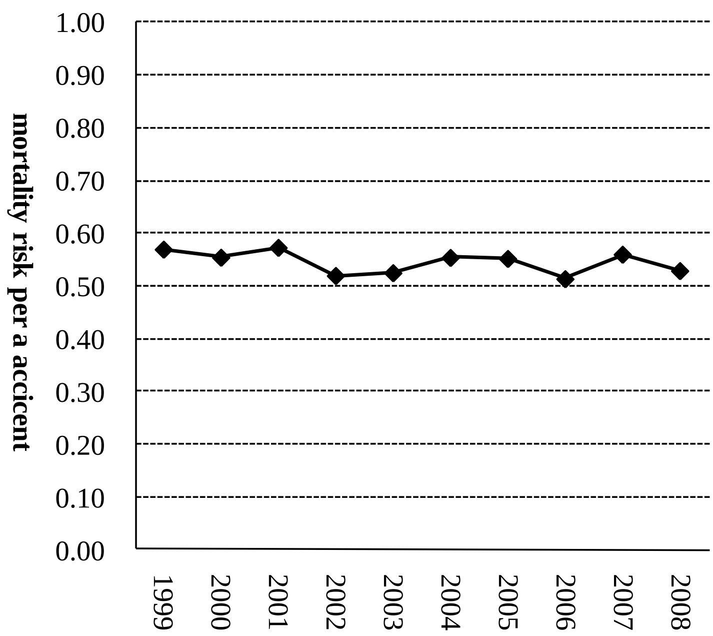



**Figure 2. Time Series of Mortality Risks of Water Accidents**

Generally, it would be recognized among people that the mortality risks of recreational activities are low. However, if a person is in a water accident, the person would dead due to the high rate of mortality. Thus, the number of disaster protection countermeasures, such as lifeguards, emergency service, and coastal levee, are performed in recreation sites. Costs (investments) for the countermeasures are usually provided by the local government, however, the effects of the countermeasures are vague. Sine project evaluations are required in recent years, and then it is necessary to examine the benefit analysis on the countermeasures at recreation sites. Thus, the purpose of this paper is to perform the estimation of willingness to pay (hereafter WTP) for the mortality risk reduction.

Since the mortality risk is one of non market goods, this study employs the contingent valuation method (hereafter CVM) for the benefit estimation (Note 2). In this study, the concept of option price (hereafter, OP), which is presented by Weisbrod (1964), was employed as a welfare measure in the benefit analysis. Jones-Lee (1976) and Graham (1981) examined the theoretical analysis on the OP. Viscusi (1993) reviewed empirical studies on the OP. Recently, Hayashiyama (2001) ，Persson et al. (2001), Johansson (2002), Krupnik et al. (2002) and Hultkrantz et al. (2006) are earlier studies on the estimation of the OP by the CVM. Whitehead (1993) estimates the OP of Wildlife in Coastal and Marine. Although there are many studies on benefit analyses of the OP, little studies have not focused on the benefits of mortality risk reductions on recreational activities at beaches (Note 3).

The definition of OP is as follows. Let $\pi$ be the probability of death caused from a recreational activity, respectively, $1-\pi$ be the probability of alive. Next, $\pi' = (1-r)\pi$ be the risk reduced by DPCs. Here, $r$ is the risk reduction rate defined as $r \in [0,1)$. Finally, let $U_D$ be an individual's utility when he is dead, and $U_A$ be an individual's utility when he is arrive. Freeman III (1999) formulated the OP for a risk reduction as Eq. (1).

$$\pi U_D(y) + (1-\pi)U_A(y) = \pi' U'_D(y-OP) + (1-\pi')U'_A(y-OP) \tag{1}$$

## 2. Survey Design

### *2.1 Survey*

The research was conducted through an Internet research company, Net Mile, Inc., from January to February in 2010. The object of this research is peoples who used at least one of 25 beaches (Note 4) in Miyagi Prefecture, Japan in past a year. From the data of Miyagi Prefectural Government, total number of visitors for the beaches was about 380,000 persons. From the data of National Policy Agency (2009), eight persons were dead by water accidents in 2008. Note that the reasons of eight persons' death were not only recreational activities.

An e-mail was sent to about 10,000 respondents, and 3,401 respondents answered screening questions, 1) whether they had lived in Miyagi prefecture now, 2) whether they had visited at least one of 25 beaches in the past year. 914 respondents answered "yes", and then they were invited to complete online questionnaires. As a result, 763 respondents answered the questionnaires.

### *2.2 Designing Mortality Risk*

In this study, it was difficult to know the actual mortality risk caused from recreational activities at beach because of the lack of official data. Thus, the mortality risk was designed as 8 persons, which are the number of deaths in 2008 described above, per 2,340,049 persons, which is the population of Miyagi prefecture. Here, the mortality risk should be adjusted to be consisted with the total number of users because the possibility involved in the risk give for only people who used beaches. Thus, the denominator was adjusted as 380,000, which is the total number of visitors at 25 beaches in 2009 published by Miyagi Prefectural Government (2010). As a result, the mortality risk from water accidents designed as 1.3 persons per 380,000 persons.

Since the reasons of eight persons' death were not only recreational activities, thus the mortality risk, 1.3 per 380,000, was not the exact rate of mortality. However, Miyagi Coast Guard Office (2010) reported that the two persons dead by the swimming in 2009 (This report was published during the research period). The mortality risk presented by the research were lower value than the actual one, 2 persons per 380,000 persons. Thus, at least, there was no possibility that respondents overestimated their WTPs due to the high level of mortality risk (There were possibility of the inverse cases).

### *2.3 Visual Aids of Mortality Risks*

It is sometimes difficult for respondents to understand the magnitudes of mortality risks (reductions). In the case, earlier studies noticed the scope insensitivity problem, which respondents answer same values of WTP under different mortality risks, have occurred. The studies (c.f. Smith & Desvousges, 1987; Corso et al., 2001) suggested that it is desirable to show the magnitudes of mortality risks for respondents by figures in the questionnaire in order to avoid the problem.

Higher Mortality risk

| Causes | Mortality risk |
|---|---|
| Cancer | 800.7 persons (per 380,000) |
| Traffic accident s | 15.6 persons (per 380,000) |
| Fire (Building) | 3.7 persons (per 380,000) |
| Water Accident | 1.3 persons (per 380,000) |

**Figure 3. Comparison of Magnitudes of Mortality Risks in Individuals' Life**

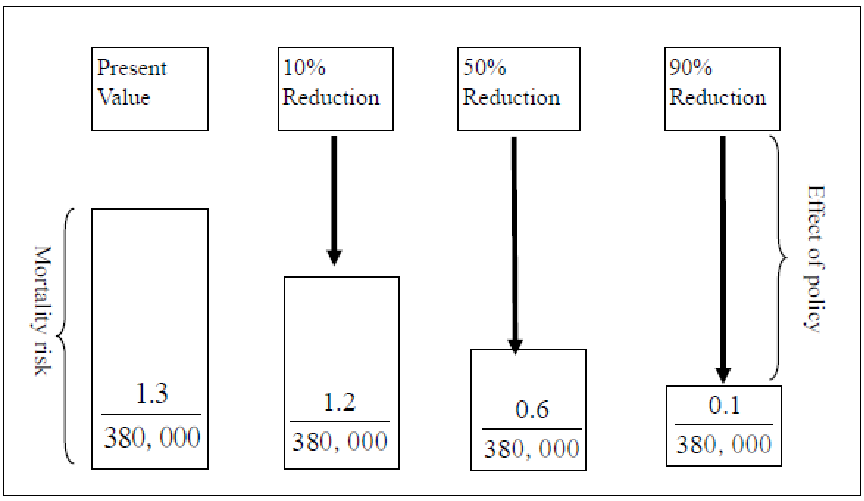



**Figure 4. Risk Reduction Rates Described in Contingent Scenario**

This study used two figures following the manner. Figure 3 shows the relative magnitudes of mortality risks of cancer, traffic accidents, fire, and water accidents. The mortality risks (without the one of water accidents) were calculated from the statistics of Miyagi prefectural governmental office. Figure 4 shows the magnitudes of the effects of risk reductions, such as the present mortality risk, and reduced mortality risks by 10%, 50%, and 90% (Note 5). The levels of mortality risks were showed by bars.

*2.4 Contingent Scenario*

Contingent scenario was shown after the explanation of Figure 4. The contents were as follows.

"Please imagine that you will use the beaches as same as the past a year during next 10 years. Now, the protection countermeasures for water accidents are performed at beaches, but the mortality risk from water accident at beaches is 1.3 persons per 380,000 persons in a year. Although it is unable to eliminate the mortality risk completely, the mortality risk is, however, reduced by performing the additional protection countermeasures such as the increase of additional life savers, safety nets, and the increase of emergency medical service, etc.

Since it needs an additional found to implement the additional protection countermeasures, then let assume the situation that the tax used for the protection countermeasures is collected. The tax is collected from residents lived in Miyagi prefecture in order to maintenance or improve the protection countermeasures. The usages of collected tax are as follows:

1) The tax is used only for the protection countermeasures at beaches

The period of the project is 10 years from now. The tax is used for the increase of additional manpower for the protection such as life savers, monitored facilities, breakwaters, and the increase of emergency medical service.

2) The number of collecting the tax is once. The effect of the protection countermeasures continue during next 10 years.

3) All of founds are only used for the protection countermeasures. The detail of the accounting is published".

The duration of the effect of the project was set as 10 years not to change individuals' present situations (i.e., frequency of visitation) in respondents' images. This point is confirmed by including data on respondents' perspectives for visitations. The number of payments was once, and the format was the tax. The true objects of collecting the tax were users at beaches from the view point of the benefit principle. However, all beaches are opened for citizens (Open access), thus, an admission fee for the usage of beaches was considered as unrealistic method. Therefore, the tax for citizen lived in Miyagi prefecture was assumed.

*2.5 Answer Format*

**Table 1. Answer Format A on Willingness to Pay**

| Reduction rates / WTP yen (once) | The effect of countermeasure is 90% | The effect of countermeasure is 50% | The effect of countermeasure is 10% |
|---|---|---|---|
| 10,000 yen | ✔ | | |
| 7,000 yen | | | |
| ⋮ | | | |
| 300 yen | | ✔ | |
| 100 yen | | | |
| 0 yen | | | ✔ |

**Table 2. Answer Format B on Willingness to Pay**

| Reduction rates / WTP | The effect of countermeasure is 10% | The effect of countermeasure is 50% | The effect of countermeasure is 90% |
|---|---|---|---|
| 100 yen | ✓ | | |
| 300 yen | | | |
| ⋮ | | | |
| 7,000 yen | | ✓ | |
| 10,000 yen | | | ✓ |
| 0 yen | | | |

Although the single and the double bounded formats are usual research methods on the CVM, however, it is difficult to construct programs of the formats due to the systems of the research company. Thus, this research used the payment card format (Note 6). Moreover, since three reduction rates were assumed in this study (Figure 4), then the two answer formats were made as matrix formats in Table 1 (Format A) and Table 2 (Format B). The reduction rates are showed in the first row and the WTPs (0, 100, 300, 500, 1,000, 3,000, 5,000, 7,000, and 10,000) are showed in the first column. All respondents answered both questionnaires by checking (✔) the elements of matrixes; the first is Format A, then Format B. The two formats were used for checking the differences of WTPs caused from the answer formats.

In questionnaire, four categories of 0 yen were shown in Table 1 and Table 2; A) 0 yen: There is no meaning of the effect of the project, B) 0 yen: There is no money, C) 0 yen: No possibility to meet the accident, D) 0 yen: Dislike the tax. If a respondent select A or B, the WTP were classified as 0 yen. If C or D, the WTP were classified as protest bids because the respondent objected to the payments vehicle or the mortality risk in the question. In this study, the two estimations were performed. The one is the estimation using data with protest bids and the other is without protest bids. Checking the differences among WTPs in each formats (internal scope test) using data with the protest bits performed in AppendixA.

*2.6 Explanatory Variables*

There are three categories of explanatory variables in this study, individuals' characteristics, the experiences of injure in beaches, and issues on usage of beaches. The questionnaires are shown in Appendix B.

The first is individuals' characteristics. Data of individual $i$ 's gender ($GND$) and age ($AGE$), which were collected by the company as respondents' information (The data have updated every year), were used. The $GND$ was a dummy variable, 1 for male, 0 for female. The $AGE$ was the individual $i$ 's years. Individual $i$ 's annual household income ($M$) and educational level researched by the questionnaire of this study were used. The educational level has four categories; vocational school ($EDVS$), junior college ($EDJC$), university ($EDU$), and graduate school ($EDGS$). Each variable were employed as dummy variables. Next, irregular employment ($JBIE$) and a homemaker ($JBHM$) were used as the individual $i$'s employment status. The $JBIE$ and $JBHM$ were employed as dummy variables.

The second category is the experiences of injures in beaches. A hypothetical assumption on the influence of the variable for WTP was that the WTP becomes high if the individual $i$ had experienced to injure at a beach in a recreational activity. Here, there are some magnitudes of injures. Thus, the magnitudes of injury were categorized in the questionnaire as follows (The explanations were refereed by Japanese dictionary).

The minor injury: an injured person is not admitted to hospital.

The severe injury: an injured person must be admitted to hospital more than one month.

The serious medical condition: an injured person is in mortal danger.

Moreover, the experiences were categorised as individual $i$'s experiences (self injured experiences) and individual $i$'s *friend or family*'s experience (other persons' injured experiences). Finally, variables were categorized as the individual $i$'s minor injury ($IMI$), the individual $i$'s severe injury ($ISI$), the individual $i$'s serious medical condition ($ISM$), the individual $i$'s *friend or family*'s minor injury ($OMI$), the individual $i$'s *friend or family* 's severe injury ($OSI$), and the individual $i$'s *friend or family*'s serious medical condition ($OSM$).

The third category is the individual $i$'s usage of beaches for recreational activity. The first is the individual $i$'s perspective for future usage ($FUSE$). Respondents were asked how many years you use beaches for recreational activities. The second is the individual $i$'s main purpose of recreations at beaches; swimming ($SW$), surfing ($SF$), fishing ($FS$), fireworks or driving ($FD$). The fireworks or driving has two categories. The first (fireworks or driving [1]) is the individual $i$ had an opportunity to touch seawater ($FD1$) when he visited a beach, the second is the individual $i$ did not have the opportunity (fireworks or driving [2]; $FD2$). Basic statistics of variables are shown in Table 3.

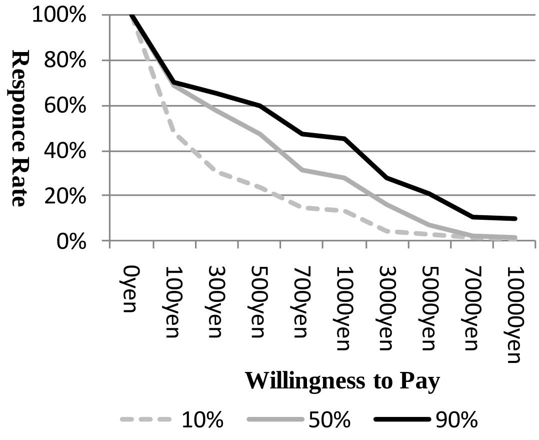
**Table 3. Basic Statistics**

| | | Descriptions (units) | Symbol | Mean | Standard error |
|---|---|---|---|---|---|
| WTP | Format A | 90% reduction (yen) | $WTPA90$ | 2029.489 | 3072.772 |
| | | 50% reduction (yen) | $WTPA50$ | 994.758 | 1788.480 |
| | | 10% reduction (yen) | $WTPA10$ | 421.887 | 1272.135 |
| | Format B | 90% reduction (yen) | $WTPB90$ | 1758.847 | 2781.370 |
| | | 50% reduction (yen) | $WTPB50$ | 891.088 | 1635.282 |
| | | 10% reduction (yen) | $WTPB10$ | 445.478 | 1390.336 |

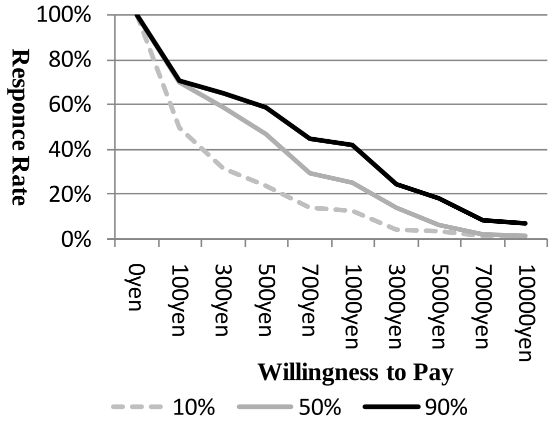
| | | | | | |
|---|---|---|---|---|---|
| Individual Characteristics | | Income (10 thousand yen) | *M* | 572.149 | 312.986 |
| | | Gender (male: 1, female: 0) | *GND* | 0.594 | 0.492 |
| | | Age (years) | *AGE* | 40.134 | 9.333 |
| | | Vocational school (1, other:0) | *EDVS* | 0.142 | 0.349 |
| | | Junior college (1, other:0) | *EDJC* | 0.073 | 0.261 |
| | | University (1, other:0) | *EDU* | 0.385 | 0.487 |
| | | Graduate school (1, other:0) | *EDGS* | 0.055 | 0.228 |
| | | Irregular employment (1, other:0) | *JBIE* | 0.165 | 0.372 |
| | | Homemaker (1, other:0) | *JBHM* | 0.159 | 0.366 |
| Injure Experience | Self | Minor injury(1, other:0) | *IMI* | 0.138 | 0.345 |
| | | Severe injury(1, other:0) | *ISI* | 0.005 | 0.072 |
| | | Serious medical condition(1, other:0) | *ISM* | 0.005 | 0.072 |
| | Friend or Family | Minor injury(1, other:0) | *OMI* | 0.010 | 0.300 |
| | | Severe injury(1, other:0) | *OSI* | 0.011 | 0.102 |
| | | Serious medical condition (1, other:0) | *OSM* | 0.021 | 0.143 |
| Usage | | Perspective for future use (years) | *FUSE* | 7.603 | 5.716 |
| | | Purpose of swimming (1, other:0) | *SW* | 0.561 | 0.497 |
| | | Purpose of surfing (1, other:0) | *SF* | 0.032 | 0.175 |
| | | Purpose of fishing (1, other:0) | *FS* | 0.198 | 0.399 |
| | | Purpose of swimming (1, other:0) (There were opportunities to touch seawater) | *FD*1 | 0.257 | 0.437 |
| | | Purpose of swimming (1, other:0) (There were no opportunities to touch seawater) | *FD*2 | 0.256 | 0.437 |

**3. Model**

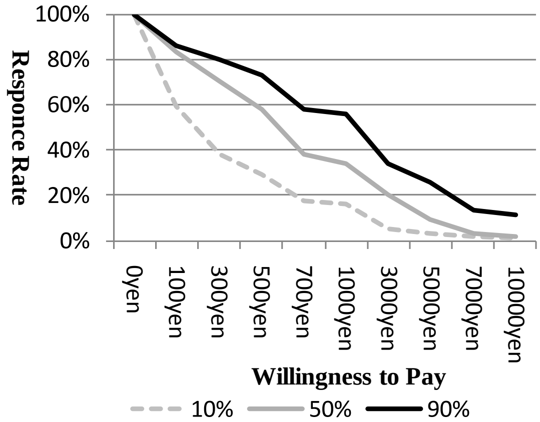
This paper used the logit model for estimations. Ôno (2000) presented the reconstruction of data for using the method as follows. Let $n$ be total number of respondents, and $m$ be total number of presented WTP in the questionnaire, and each WTP are expressed as $WTP_1,...,WTP_k,...,WTP_m$ and $WTP_1 < WTP_2 < ... < WTP_k < ... < WTP_m$ respectively. If the individual $i$ chooses $WTP_k$ , it is interrupted that the individual willingness to pay for WTPs from $WTP_1$ to $WTP_{k-1}$ (because these WTP are lower than $WTP_k$ ). On the other hand, it is interrupted that the individual do not willingness to pay for WTPs from $WTP_{k+1}$ to $WTP_m$ . Since $m$ numbers of response data are obtained from a respondent' answer, then, totally, $N = n$ x $m$ numbers of response data are constructed. Similarly, data of an explanatory variable, $x$ , were reconstructed as a vector ($X$) which has $N$ numbers of elements such as $X = (x, x, ..., x)$ . Figure 5 shows the response rates for WTPs, Table 4 and Table 5 shows the basic statistics after the reconstruction.



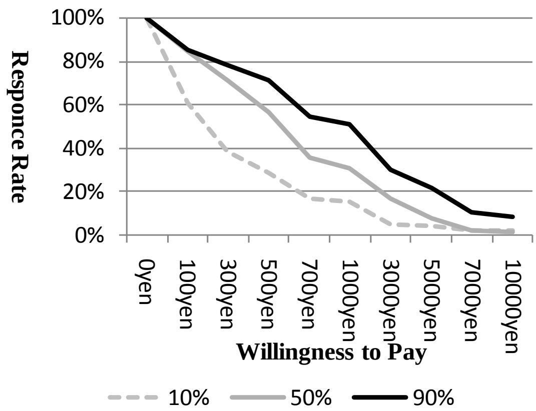

a) Format A with Protest bits




b) Format B with Protest bits




c) Format A without Protest bits




d) Format B without Protest bits

**Figure 5. Response Rates of WTPs with and without Protest Bit**

**Table 4. Reconstructed Data with Protest Bits**

| Variables | mean | sd | mean | Sd | mean | sd | mean | sd |
|---|---|---|---|---|---|---|---|---|
| *M* | 572.149 | 312.801 | *JBIE* | 0.165 | 0.371 | *OSM* | 0.021 | 0.143 |
| *GND* | 0.594 | 0.491 | *JBHM* | 0.159 | 0.365 | *FUSE* | 7.603 | 5.713 |
| *AGE* | 40.134 | 9.327 | *IMI* | 0.138 | 0.345 | *SW* | 0.561 | 0.496 |
| *EDVS* | 0.142 | 0.349 | *ISI* | 0.005 | 0.072 | *SF* | 0.031 | 0.175 |
| *EDJC* | 0.073 | 0.261 | *ISM* | 0.005 | 0.072 | *FS* | 0.198 | 0.398 |
| *EDU* | 0.385 | 0.487 | *OMI* | 0.100 | 0.299 | *FD*1 | 0.257 | 0.437 |
| *EDGS* | 0.055 | 0.228 | *OSI* | 0.010 | 0.102 | *FD*2 | 0.256 | 0.436 |
| *N* | 7,630 | | 7,630 | | 7,630 | | 7,630 | |

**Table 5. Reconstructed Data without Protest Bits**

| Format | A | A | A | B | B | B |
|---|---|---|---|---|---|---|
| Rate | 90% | 50% | 10% | 90% | 50% | 10% |
| *M* | 576.045 | 576.923 | 578.606 | 578.195 | 575.994 | 575.994 |
| | (312.141) | (314.086) | (316.503) | (315.494) | (313.494) | (313.494) |
| *GND* | 0.601 | 0.598 | 0.595 | 0.599 | 0.596 | 0.596 |
| | (0.490) | (0.490) | (0.491) | (0.490) | (0.491) | (0.491) |
| *AGE* | 40.000 | 40.010 | 40.010 | 40.126 | 40.095 | 40.095 |
| | (9.370) | (9.426) | (9.448) | (9.369) | (9.428) | (9.428) |
| *EDVS* | 0.127 | 0.130 | 0.130 | 0.134 | 0.130 | 0.130 |
| | (0.333) | (0.336) | (0.336) | (0.341) | (0.337) | (0.337) |
| *EDJC* | 0.074 | 0.075 | 0.073 | 0.077 | 0.076 | 0.076 |
| | (0.262) | (0.264) | (0.260) | (0.266) | (0.266) | (0.266) |
| *EDU* | 0.397 | 0.397 | 0.402 | 0.399 | 0.396 | 0.396 |
| | (0.489) | (0.489) | (0.490) | (0.490) | (0.489) | (0.489) |
| *EDGS* | 0.056 | 0.054 | 0.055 | 0.054 | 0.052 | 0.052 |
| | (0.230) | (0.227) | (0.228) | (0.227) | (0.223) | (0.223) |
| *JBIE* | 0.170 | 0.173 | 0.172 | 0.173 | 0.176 | 0.176 |
| | (0.376) | (0.378) | (0.377) | (0.378) | (0.381) | (0.381) |
| *JBHM* | 0.150 | 0.151 | 0.152 | 0.147 | 0.148 | 0.148 |
| | (0.357) | (0.358) | (0.359) | (0.354) | (0.355) | (0.355) |
| *IMI* | 0.150 | 0.149 | 0.149 | 0.142 | 0.146 | 0.146 |
| | (0.357) | (0.356) | (0.356) | (0.349) | (0.353) | (0.353) |
| *ISI* | 0.003 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 |
| | (0.057) | (0.069) | (0.070) | (0.069) | (0.069) | (0.069) |
| *ISM* | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |
| | (0.080) | (0.080) | (0.080) | (0.080) | (0.079) | (0.079) |
| *OMI* | 0.101 | 0.104 | 0.102 | 0.101 | 0.105 | 0.105 |
| | (0.302) | (0.306) | (0.303) | (0.301) | (0.306) | (0.306) |
| *OSI* | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 |
| | (0.098) | (0.098) | (0.098) | (0.097) | (0.097) | (0.097) |
| *OSM* | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 |
| | (0.138) | (0.137) | (0.138) | (0.137) | (0.137) | (0.137) |
| *FUSE* | 7.698 | 7.688 | 7.697 | 7.653 | 7.588 | 7.588 |
| | (5.713) | (5.718) | (5.691) | (5.720) | (5.717) | (5.717) |
| *SW* | 0.582 | 0.582 | 0.574 | 0.572 | 0.574 | 0.574 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.493) | (0.493) | (0.495) | (0.495) | (0.495) | (0.495) |
| *SF* | 0.032 | 0.034 | 0.034 | 0.035 | 0.035 | 0.035 |
| | (0.176) | (0.180) | (0.181) | (0.184) | (0.184) | (0.184) |
| *FS* | 0.195 | 0.194 | 0.191 | 0.192 | 0.196 | 0.196 |
| | (0.396) | (0.395) | (0.393) | (0.394) | (0.397) | (0.397) |
| *FD*1 | 0.275 | 0.277 | 0.272 | 0.272 | 0.281 | 0.281 |
| | (0.447) | (0.448) | (0.445) | (0.445) | (0.450) | (0.450) |
| *FD*2 | 0.246 | 0.248 | 0.251 | 0.252 | 0.248 | 0.248 |
| | (0.431) | (0.432) | (0.434) | (0.434) | (0.432) | (0.432) |
| *N* | 6,220 | 6,240 | 6,170 | 6,260 | 6,290 | 6,290 |

The estimation model was followed by Hanemann and Kanninen (2001). Let $\mathbf{X}$ be a matrix of explanatory variables, $\Delta V = \mathbf{X\beta}' + \gamma WTP + \varepsilon$ be a difference between utilities with and without implementing a project. Here, $\boldsymbol{\beta}$ and $\gamma$ are parameters, and $\varepsilon$ is a randomly distributed preference. Let $\Pr(yes)$ be a probability which the individual $i$ willing to pay for a WTP. The probability was assumed the logistic distribution. $1-\Pr(yes)$ be a probability which the individual $i$ do not willing to pay. Let assume that each $\varepsilon$ follows the distribution ( $1/1+\exp(-\Delta V)$ ), then, a mean WTP defined as integrating $\Pr(WTP)$ from 0 to Infinite (plus) with both estimated parameters and mean values of the data, a median WTP defined as WTP under $\Delta V$ =0, namely, $Median\ WTP = -\mathbf{X\beta}'/\gamma$ .

## 4. Estimation Results

Estimations were performed using R version 2.11. The results of including protest bits are shown in Table 6, and without protest bits are shown in Table 7. Confidence intervals of parameters were calculated following Venables and Ripley (2002), and the results are shown in Appendix C. Columns of Table 6 and Table 7 are categorized by 1) format A and B, 2) reduction rates (10%, 50%, and 90%). The notation of PwA, PwB, PwoA, and PwoB are categories segmented by Formats and with/without protest bits. The variables, maximum likelihood (max. LL), McFadden's pseudo r-squared, and number of samples are shown in rows. The samples (N) in Table 5 were difference due to the differences of protest bits.

**Table 6. Estimation Results with Protest Bits**

| Case | | PwA | | | PwB | |
|---|---|---|---|---|---|---|
| Format | | A | | | B | |
| Rates | 90% | 50% | 10% | 10% | 50% | 90% |
| *Cont.* | 0.21880 | 0.08406 | -0.22530 [a] | -0.48560 [a] | -0.08030 | -0.07686 |
| *WTP* | -0.00042 [a] | -0.00076 [a] | -0.00117 [c] | -0.00104 [a] | -0.00084 [a] | -0.00048 [a] |

| | | | | | | |
|---|---|---|---|---|---|---|
| *M* | 0.00054 $^{a}$ | 0.00043 $^{a}$ | 0.00020 $^{a}$ | 0.00017 $^{b}$ | 0.00049 $^{a}$ | 0.00066 $^{a}$ |
| *GND* | -0.00997 | -0.20040 $^{b}$ | -0.27800 | -0.14580 $^{b}$ | -0.10750 | 0.07787 |
| *AGE* | -0.00621 $^{c}$ | -0.00252 | 0.00140 | 0.00566 | 0.00014 | -0.00377 |
| *EDVS* | -0.11240 | -0.00657 | 0.08555 | 0.05552 | -0.10060 | -0.18350 $^{b}$ |
| *EDJC* | 0.42070 $^{a}$ | 0.22590 $^{c}$ | -0.05145 | 0.04873 | 0.15840 | 0.32050 $^{a}$ |
| *EDU* | 0.12310 $^{c}$ | 0.12780 $^{c}$ | 0.19720 $^{a}$ | 0.12900 $^{c}$ | 0.04603 | 0.03877 |
| *EDGS* | 0.22210 $^{c}$ | 0.14560 | 0.30740 $^{b}$ | 0.14480 | 0.02770 | 0.17380 |
| *JBIE* | 0.22840 $^{a}$ | 0.08519 | 0.07305 | 0.14320 | 0.22540 $^{b}$ | 0.29270 $^{a}$ |
| *JBHM* | -0.25180 $^{a}$ | -0.25390 $^{a}$ | -0.05818 | -0.07486 | -0.11330 | -0.06518 |
| *IMI* | 0.37420 $^{a}$ | 0.28330 $^{a}$ | 0.20270 $^{b}$ | 0.02152 | 0.04992 | 0.29060 $^{a}$ |
| *ISI* | -1.47400 $^{a}$ | -1.40800 $^{b}$ | 1.30100 $^{b}$ | 1.85300 $^{a}$ | 0.22220 | -0.52710 |
| *ISM* | 1.98700 $^{a}$ | 5.02100 $^{a}$ | 2.73000 $^{a}$ | 1.63300 $^{a}$ | 1.80700 $^{a}$ | 0.90760 $^{c}$ |
| *OMI* | 0.03003 | 0.02077 | -0.02624 | -0.13110 | 0.04007 | -0.05226 |
| *OSI* | 0.64000 $^{c}$ | 0.47800 | 0.30570 | -0.93530 $^{b}$ | -0.22360 | -0.04862 |
| *OSM* | -0.34610 | -0.14160 | -0.51970 $^{b}$ | 0.12650 | -0.27280 | -0.34200 |
| *FUSE* | 0.02021 $^{a}$ | 0.02234 $^{a}$ | 0.00477 | 0.00524 | 0.02245 $^{a}$ | 0.02398 $^{a}$ |
| *SW* | 0.24710 $^{a}$ | 0.24890 $^{a}$ | 0.14950 $^{b}$ | 0.19840 $^{a}$ | 0.26640 $^{a}$ | 0.23660 $^{a}$ |
| *SF* | 0.26640 | 0.35000 $^{c}$ | 0.11750 | 0.07819 | 0.31770 $^{c}$ | 0.33560 $^{b}$ |
| *FS* | 0.01750 | 0.06676 | 0.07621 | 0.09719 | 0.09294 | 0.09392 |
| *FD*1 | 0.28270 $^{a}$ | 0.24400 $^{a}$ | -0.01938 | 0.01303 | 0.34030 $^{a}$ | 0.39080 $^{a}$ |
| *FD*2 | -0.00116 | -0.01644 | -0.00136 | -0.02257 | -0.01239 | 0.12520 $^{c}$ |
| *Max.LL* | -4,153.7231 | -3,538.5154 | -3,070.4619 | -3,143.4511 | -3,457.9408 | -4,015.2871 |
| $R^2$ | 0.2105 | 0.2906 | 0.2687 | 0.2556 | 0.3025 | 0.2326 |
| *N* | 7,630 | 7,630 | 7,630 | 7,630 | 7,630 | 7,630 |

Note A. Super script, a, in tables means p-value of a estimated parameter is less than 1%, the b means less than 5%, and the c means 10%, respectively.

**Table 7. Estimation Results without Protest Bits**

| Case | PwoA | | | PwoB | | |
|---|---|---|---|---|---|---|
| Format | A | | | B | | |
| Rates | 90% | 50% | 10% | 10% | 50% | 90% |
| *Cont.* | 0.63890 $^{a}$ | 0.43790 $^{b}$ | -0.03258 | -0.30300 | 0.19720 | 0.25201 |
| *WTP* | -0.00046 $^{a}$ | -0.00077 $^{a}$ | -0.00107 $^{a}$ | -0.00096 $^{a}$ | -0.00085 $^{a}$ | -0.00051 $^{a}$ |
| *M* | 0.00068 $^{a}$ | 0.00046 $^{a}$ | 0.00013 | 0.00014 | 0.00053 $^{a}$ | 0.00076 $^{a}$ |
| *GND* | -0.10950 | -0.28350 $^{a}$ | -0.32500 $^{a}$ | -0.18450 $^{b}$ | -0.16190 $^{c}$ | 0.07843 |
| *AGE* | -0.00467 | -0.00048 | 0.00345 | 0.00683 $^{c}$ | 0.00138 | -0.00395 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *EDVS* | 0.10640 | 0.14510 | 0.20060 [c] | 0.09481 | 0.00523 | -0.06797 |
| *EDJC* | 0.53210 [a] | 0.21170 | -0.07736 | -0.02877 | 0.10950 | 0.33233 [a] |
| *EDU* | 0.14040 [c] | 0.11880 | 0.17910 [b] | 0.09250 | 0.01756 | 0.03149 |
| *EDGS* | 0.30570 [b] | 0.28760 [c] | 0.40960 [b] | 0.16570 | 0.18770 | 0.47133 [a] |
| *JBIE* | 0.17520 [c] | -0.00623 | 0.01184 | 0.10960 | 0.13150 | 0.22089 [b] |
| *JBHM* | -0.31590 [a] | -0.28160 [b] | -0.06113 | -0.01925 | -0.05434 | 0.04180 |
| *IMI* | 0.24520 [a] | 0.20280 [b] | 0.12150 | -0.01904 | -0.03325 | 0.18629 [b] |
| *ISI* | 15.50000 | -1.04300 | 2.86200 [a] | 3.31600 [a] | 1.44000 [c] | 0.13920 |
| *ISM* | -0.46670 | 4.30600 [a] | 1.65100 [b] | 0.64650 | 0.74060 | -0.00216 |
| *OMI* | 0.02272 | -0.01486 | -0.03309 | -0.14290 | -0.01301 | -0.11436 |
| *OSI* | 0.08186 | 0.60040 | 0.57540 | -0.96990 [b] | -0.34060 | -0.19555 |
| *OSM* | -0.23100 | 0.17230 | -0.33430 | 0.54010 [b] | 0.10440 | -0.01627 |
| *FUSE* | 0.02627 [a] | 0.02734 [a] | 0.00505 | 0.00731 | 0.03321 [a] | 0.03643 [a] |
| *SW* | 0.13760 [b] | 0.14620 [b] | 0.11880 | 0.17850 [b] | 0.21820 [a] | 0.14903 [b] |
| *SF* | 0.30110 | 0.26480 | -0.03612 | -0.11540 | 0.08869 | 0.10947 |
| *FS* | 0.12220 | 0.15600 [c] | 0.13170 | 0.16840 [b] | 0.19140 [b] | 0.23933 [a] |
| *FD*1 | 0.13450 | 0.09578 | -0.11050 | -0.06434 | 0.17410 [b] | 0.21122 [a] |
| *FD*2 | 0.08182 [c] | 0.01967 | 0.00588 | -0.03289 | 0.03565 | 0.25260 [a] |
| *Max.LL* | -3,187.007 | -2,848.067 | -2,601.330 | -2,693.030 | -2,803.712 | -3,147.876 |
| $R^2$ | 0.258 | 0.329 | 0.280 | 0.266 | 0.341 | 0.278 |
| *N* | 6,220 | 6,240 | 6,170 | 6,260 | 6,290 | 6,290 |

Note A. Super script, a, in tables means p-value of a estimated parameter is less than 1%, the b means less than 5%, and the c means 10%, respectively.

**Table 8. Calculation of Median and Mean WTPs for Reduction Rates and Answer Formats**

| | | | | |
|---|---|---|---|---|
| With Protest | | | | |
| PwA | Format | A | A | A |
| | Rates | 10% | 50% | 90% |
| | Median | 47.02<br>[-1053.49, 1363.93] | 807.60<br>[-863.10, 2708.35] | 1850.94<br>[-982.82, 5022.29] |
| | Mean | 615.254<br>[180.33, 1560.12] | 1377.86<br>[498.71, 2899.49] | 2749.57<br>[1121.96, 5343.13] |
| PwB | Format | B | B | B |
| | Rates | 10% | 50% | 90% |
| | Median | 6.30<br>[-1224.83, 1471.68] | 743.28<br>[-784.29, 2486.94] | 1607.40<br>[-940.49, 4457.38] |
| | Mean | 671.57<br>[197.87, 1705.79] | 1256.11<br>[450.04, 2656.95] | 2411.95<br>[965.08, 4739.35] |
| Without Protest | | | | |
| PwoA | Format | A | A | A |
| | Rates | 10% | 50% | 90% |
| | Median | 221.36<br>[-1099.70, 1812.06] | 1287.12<br>[-597.63, 3433.41] | 2924.63<br>[-203.28, 6691.67] |
| | Mean | 766.22<br>[207.57, 1975.12] | 1695.90<br>[580.93, 3544.40] | 3433.40<br>[1335.07, 6815.92] |
| PwoB | Format | B | B | B |
| | Rates | 10% | 50% | 90% |
| | Median | 187.64<br>[-1267.89, 1928.52] | 1157.42<br>[-560.53, 3119.85] | 2403.76<br>[-356.86, 5493.77] |
| | Mean | 820.59<br>[223.50, 2122.21] | 1533.07<br>[520.98, 3221.75] | 2907.12<br>[1115.41, 5634.81] |

The signs and p-values of estimated parameters are as follows. First, the *WTP*s and the individual statistics are described. The signs of WTPs are positive in all categories (PwA, PwB, PwoA, and PwoB), and the p-values are less than 1%. The signs of incomes (*M*) are positive in all categories. The p-values of 10% in PwoA and PwoB are more than 10%, other values are less than 10%. The signs and p-values of *GND*s are different in reduction rates and categories. However, there is a tendency that most of p-values are low levels in the case of 10% and 50% reduction rates. Finally, the signs and p-values of *AGE*s are different in reduction rates and categories, and most of the p-values are more than 10%. Next, signs and p-values of injured experiences are discussed. Totally, the numbers of p-values, which are considered statistically significant, on self injured experiences (*IMI*, *ISI*, and *ISM*) are over the ones of other person's injured experiences (*OMI*, *OSI*, and *OSM*). Thus, it is considered that the self injured experiences influence *WTP*s more than the other persons' injured experiences. Some of the signs were estimated negative values such as 50% and 90% in PwA. Thus, there is possibility that the self injured experiences are not influenced to *WTP*s. However, most of the signs in the *ISI* and the *ISM* in 10% reduction rates are positive, and p-values are considered as statistically significant. Therefore, it is considered that the injured experiences are influenced to *WTP*s in the cases of low levels of reduction rates.

Next, signs and p-values of use status are discussed. First, the signs of *FUSE*s are positive in all categories, and the p-values are less than 10% without the cases of 10% reduction rates in all categories. Thus, it is considered that the *FUSE* influences WTP in the high levels of reduction rates. In the contingent scenario, the duration of the effect of the project was set as 10 years, and assumed the numbers of visits are same with their present situations. However, it is considered that individuals did not image such future situations when they answered.

The signs of purposes to visit beaches (*SW*, *SF*, etc.) were estimated both positive and negative values. However, the signs are positive when the p-values are less than 10%.

Finally, calculations of WTPs are shown in Table 8. The values in brackets are the WTPs calculated by lower and upper bounds of parameters in Appendix C. As results, median WTPs at 10% reduction rates ranges from 6.30 yen/once to 221.36 yen/once, mean WTPs ranges from 615.25 yen/once to 820.59 yen/once. Median WTPs at 50% reduction rates ranges from 743.28 yen/once to 1287.12 yen/once, mean WTPs ranges from 1256.11 yen/once to 1695.90 yen/once. Median WTPs at 90% reduction rates ranges from 1607.40 yen/once to 2924.63 yen/once, mean WTPs ranges from 2411.95 yen/once to 3433.40 yen/once.

## 5. Conclusions

Water recreations, such as swimming and fishing, are very popular activities in the world. Since there are many beaches in most area of Japan, water recreations at beaches are familiar to the nations. However, if a person is in a water accident, the person would dead due to the high rate of mortality risk of water accident. Although there are many studies on benefit analyses of the OP, little studies have not focused on the benefits of mortality risk reductions on recreational activities. The purpose of this paper is to perform the estimation of willingness to pay (hereafter WTP) for the mortality risk reduction researched by the contingent valuation method.

The research was conducted through an Internet research company. 763 respondents answered the questionnaires. Although the single and the double bounded formats are usual research methods on the contingent valuation method, however, it is difficult to create programs of the formats due to the systems of the research company. Thus, this research used the payment card format. Moreover, since three reduction rates (10%, 50%, and 90%) were assumed in this study, then the two answer formats (Format A and Format B) were presented. the presented WTPs were 0 yen, 100 yen, 300 yen, 500 yen, 1,000 yen, 3,000 yen, 5,000 yen, 7,000 yen, and 10,000 yen, and were shown with each reduction rate. The number of payment is at once, and the payment vehicle was tax.

Our findings are as follows. The median WTPs and the mean WTPs for each reduction rate with and without protest bits were calculated. As results, the median WTP at 10% reduction rates ranges from 6.30 yen/once to 221.36 yen/once, the mean WTP ranges from 615.25 yen/once to 820.59 yen/once. The median WTP at 50% reduction rates ranges from 743.28 yen/once to 1287.12 yen/once, the mean WTP ranges from 1256.11 yen/once to 1695.90 yen/once. The median WTP at 90% reduction rates ranges from 1607.40 yen/once to 2924.63 yen/once, and the mean WTP ranges from 2411.95 yen/once to 3433.40 yen/once.

As for the explanatory variables, estimation results indicated that 1) the self injured experiences influence WTPs more than the other persons' injured experiences, 2) the injured experiences are influenced to WTPs in the cases of low levels of reduction rates, 3) individuals' perspective for future use of beaches influences their WTPs in the high levels of reduction rates.

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**Notes**

Note 1. Accidents at sea. Thus, the reason of death was not only recreational activities at beaches.

Note 2. The hedonic wage method is one of methods to estimate the OP. See Viscusi & Aldy (2003).

Note 3. For example, Dharmaratne and Brathwaite (1998), Loomis et al. (2000), Bin et al (2005), and Whitehead (2008) are earlier studies on benefit analyses on recreational activities at beaches. Beaumaisa and Appéré (2010) analyzed the health risk reduction caused form shellfish harvesting. But their study did not focus on the risk cause from recreational activity itself (this study focused on the harvesting).

Note 4. Miyagi prefecture is located in North-East area in Japan and faces the Pasific Ocean. The latitude and longitude of Sendai city, which is the central city of Miyagi prefecture, are near the ones of Athens (in Greece) and San Francisco (in U.S.A.). The urban area is 7,285km2 and its length of coastline is about 828km. Orders of mortality, which is caused from water accidents, of Miyagi prefecture in 46 prefectures of Japan were 8th in 2007 and 16th in 2008. In addition, the number of beaches researched by Miyagi prefectural governmental office is 26. However, the one of them is excluded from this research because it had been closed during the summer in 2009.

Note 5. It is need the enough distance among reduction rates because respondents cannot judge the effect of the reduction if the distance is small. Thus, this study set the distances of the reduction rates as 40%.

Note 6. Evans et al. (2003), and Broberg & Brännlund (2008) are similar studies, which used the matrix format.

## Appendix

AppendixA. Scope Tests

Internal scope tests were performed by testing the differences of mean values of WTPs (with protest bits). The Tukey's multiple comparison were employed. H0: no differences in mean values, H1: other. The results of the statistic are shown in Table 9, p-values are in the parenthesis. Let $\alpha$ be a rejection region, and sets $\alpha = 0.01$. The p-value of 10% of Format A and 10% of Format B is larger than $\alpha$. Thus, there is no differences between the means of two WTPs. Similarly, there are statistically no differences between 50% and 90 % of Format A and Format B, respectively. On the other hand, the mean values of other WTPs are different because of $\alpha$ > p-values. It is concluded that the WTPs presented by respondents in same reduction rates are same values, and the WTPs in different reduction rates are different.

**Table 9. Results on Scope Tests for Reduction Rates and Answer Formats**

| | | Format A | | Format B | | |
|---|---|---|---|---|---|---|
| | | 50% | 10% | 90% | 50% | 10% |
| Format A | 90% | 9.5983<br>(0.0000) | 14.9124<br>(0.0000) | 2.5105<br>(0.1211) | 10.5599<br>(0.0000) | 14.6934<br>(0.0000) |
| | 50% | - | 5.3140<br>(0.0000) | 7.0878<br>(0.0000) | 0.9617<br>(0.9299) | 5.0957<br>(0.0000) |
| | 10% | - | - | 12.4018<br>(0.0000) | 4.3524<br>(0.0002) | 0.2188<br>(0.9999) |
| Format B | 90% | - | - | - | 12.1829<br>(0.0000) | 4.1335<br>(0.0000) |
| | 50% | - | - | - | - | 8.0494<br>(0.0005) |

Appendix B Questionnaires

Figures used in the estimation are in the parentheses.

Q. Did you or your friends or families have injured in beaches in past a year?

A. No experiences, B. I had experience to have the minor injury, C. I had experience to have the severe injury, D. I had experience to have serious medical condition, E. My friends or families had experience to have the minor injury, F. My friends or families had experience to have the severe injury, G. My friends or families had experience to have the serious medical condition, H. Other ( )

Q. How long do you use beaches in future? Please answer your perspective.

A. There is no possibility to use in future (0), B. From 1 year to 3 years (2), C. From 4 years to 6 years (5), D. From 7 years to 10 years (7), E. From 11 years to 20 years (5) (15), F. More than 21 years (21)

Q. Please answer your educational levels.

A. Junior high school, B. High school, C. vocational school, D. junior college, E. specialized vocational high school, F. Under graduate school, G Graduate school, H. Other

Q What is your job?

A. Regular employee, B. Contract employee , C. Temporary employee, D. Part-time jobber

E. Self-owned business, F. Freelance professional, G. Homemaker, H. Student, I. Other

Q. What is your main purpose to visit beaches in past a year?

A. Swimming, B. Surfing, C. Fishing, D. Fireworks or Driving 【1】, E. Fireworks or Driving 【2】, F. Other

Q. What is your annual household income (before tax)?

A. Less than 1 million yen (500), B. 1 million yen – less than 2 million yen (1,500), C. 2 million yen – less than 4 million yen (3,000), D. 4 million yen – less than 6 million yen (5,000), E. 6 million yen – less than 8 million yen (7,000), F. 8 million yen – less than 10 million yen (9,000), G. 10 million yen – less than 12 million yen (11,000), H. 12 million yen – less than 14 million yen (13,000), I. 14 million yen–less than 16 million yen (15,000), J. Over 16 million yen (16,000)

Appendix C Confidence Intervals

Confidence intervals with protest bits

| Format | A | | | | | | B | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rates | 90% | | 50% | | 10% | | 10% | | 50% | | 90% | |
| | *lower* | *upper* | *lower* | *upper* | *lower* | *upper* | *lower* | *upper* | *lower* | *upper* | *lower* | *upper* |
| *Cont.* | -0.09212 | 0.52995 | -0.25145 | 0.41969 | -0.58598 | 0.13500 | -0.84358 | -0.12853 | -0.41965 | 0.25889 | -0.39319 | 0.23939 |
| *WTP* | -0.00044 | -0.00040 | -0.00081 | -0.00071 | -0.00128 | -0.00107 | -0.00113 | -0.00095 | -0.00089 | -0.00078 | -0.00050 | -0.00045 |
| *M* | 0.00036 | 0.00072 | 0.00024 | 0.00063 | -0.00001 | 0.00040 | -0.00003 | 0.00038 | 0.00029 | 0.00069 | 0.00048 | 0.00085 |
| *GND* | -0.15427 | 0.13421 | -0.35640 | -0.04467 | -0.44404 | -0.11209 | -0.31018 | 0.01865 | -0.26502 | 0.04978 | -0.06890 | 0.22467 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *AGE* | -0.01247 | 0.00003 | -0.00926 | 0.00422 | -0.00584 | 0.00863 | -0.00149 | 0.01280 | -0.00667 | 0.00696 | -0.01013 | 0.00259 |
| *EDVS* | -0.27863 | 0.05364 | -0.18609 | 0.17287 | -0.10799 | 0.27806 | -0.13611 | 0.24607 | -0.28215 | 0.08073 | -0.35265 | -0.01443 |
| *EDJC* | 0.20219 | 0.64068 | -0.00828 | 0.46081 | -0.30653 | 0.20034 | -0.20134 | 0.29614 | -0.07862 | 0.39634 | 0.09846 | 0.54378 |
| *EDU* | -0.00355 | 0.24971 | -0.00882 | 0.26440 | 0.05067 | 0.34398 | -0.01608 | 0.27418 | -0.09208 | 0.18414 | -0.09018 | 0.16772 |
| *EDGS* | -0.03294 | 0.47922 | -0.12801 | 0.42046 | 0.01714 | 0.59524 | -0.14579 | 0.43193 | -0.24884 | 0.30509 | -0.08592 | 0.43553 |
| *JBIE* | 0.06205 | 0.39524 | -0.09361 | 0.26426 | -0.11714 | 0.26250 | -0.04481 | 0.33069 | 0.04455 | 0.40679 | 0.12343 | 0.46263 |
| *JBHM* | -0.43052 | -0.07334 | -0.44729 | -0.06099 | -0.26466 | 0.14756 | -0.28058 | 0.13006 | -0.30837 | 0.08149 | -0.24668 | 0.11622 |
| *IMI* | 0.21396 | 0.53536 | 0.11188 | 0.45544 | 0.02138 | 0.38299 | -0.16014 | 0.20165 | -0.12303 | 0.22314 | 0.12777 | 0.45439 |
| *ISI* | -2.49741 | -0.46142 | -2.57873 | -0.27247 | 0.11413 | 2.57238 | 0.66310 | 3.13789 | -0.91437 | 1.40305 | -1.55889 | 0.52155 |
| *ISM* | 0.94018 | 3.13042 | 3.55225 | 6.60631 | 1.46816 | 4.14723 | 0.55309 | 2.81489 | 0.66709 | 3.04210 | -0.04912 | 1.92283 |
| *OMI* | -0.15165 | 0.21235 | -0.17478 | 0.21673 | -0.23586 | 0.18109 | -0.34125 | 0.07619 | -0.15729 | 0.23794 | -0.23675 | 0.13265 |
| *OSI* | -0.00105 | 1.30151 | -0.20856 | 1.18535 | -0.42312 | 1.02139 | -1.84368 | -0.14015 | -0.92815 | 0.47112 | -0.69709 | 0.59937 |
| *OSM* | -0.76454 | 0.07299 | -0.59597 | 0.31446 | -1.04422 | -0.02271 | -0.35348 | 0.59763 | -0.73251 | 0.18541 | -0.76761 | 0.08373 |
| *FUSE* | 0.01052 | 0.02993 | 0.01192 | 0.03280 | -0.00638 | 0.01590 | -0.00582 | 0.01627 | 0.01190 | 0.03302 | 0.01411 | 0.03387 |
| *SW* | 0.13194 | 0.36239 | 0.12484 | 0.37326 | 0.01676 | 0.28245 | 0.06709 | 0.32989 | 0.14096 | 0.39205 | 0.11917 | 0.35415 |
| *SF* | -0.05690 | 0.59370 | -0.00102 | 0.70634 | -0.25351 | 0.48244 | -0.28766 | 0.43742 | -0.03541 | 0.67594 | 0.00594 | 0.66947 |
| *FS* | -0.11646 | 0.15169 | -0.07780 | 0.21151 | -0.07833 | 0.22991 | -0.05526 | 0.24886 | -0.05319 | 0.23935 | -0.04276 | 0.23094 |
| *FD*1 | 0.15898 | 0.40674 | 0.11111 | 0.37721 | -0.16162 | 0.12218 | -0.12763 | 0.15307 | 0.20578 | 0.47526 | 0.26449 | 0.51760 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *FD*2 | -0.12856 | 0.12640 | -0.15386 | 0.12107 | -0.14868 | 0.14537 | -0.16849 | 0.12275 | -0.15124 | 0.12660 | -0.00483 | 0.25547 |

Confidence intervals without protest bits

| Format | A | | | | | | B | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rates | 90% | | 50% | | 10% | | 10% | | 50% | | 90% | |
| | *lower* | *upper* | *lower* | *upper* | *lower* | *upper* | *lower* | *upper* | *lower* | *upper* | *lower* | *upper* |
| *Cont.* | 0.28171 | 0.99717 | 0.06398 | 0.81270 | -0.42060 | 0.35534 | -0.68971 | 0.08309 | -0.17855 | 0.57335 | -0.10577 | 0.61023 |
| *WTP* | -0.00048 | -0.00043 | -0.00082 | -0.00072 | -0.00117 | -0.00097 | -0.00105 | -0.00088 | -0.00090 | -0.00079 | -0.00054 | -0.00048 |
| *M* | 0.00046 | 0.00089 | 0.00024 | 0.00068 | -0.00009 | 0.00035 | -0.00008 | 0.00036 | 0.00031 | 0.00075 | 0.00055 | 0.00098 |
| *GND* | -0.27844 | 0.05891 | -0.46094 | -0.10679 | -0.50565 | -0.14477 | -0.36296 | -0.00607 | -0.33979 | 0.01547 | -0.09044 | 0.24713 |
| *AGE* | -0.01190 | 0.00256 | -0.00800 | 0.00704 | -0.00432 | 0.01123 | -0.00088 | 0.01454 | -0.00619 | 0.00896 | -0.01116 | 0.00327 |
| *EDVS* | -0.09318 | 0.30697 | -0.06324 | 0.35437 | -0.01594 | 0.41659 | -0.11715 | 0.30605 | -0.20447 | 0.21573 | -0.26650 | 0.13128 |
| *EDJC* | 0.27600 | 0.79190 | -0.04952 | 0.47529 | -0.35469 | 0.19726 | -0.29508 | 0.23528 | -0.15176 | 0.37298 | 0.08121 | 0.58630 |
| *EDU* | -0.00521 | 0.28615 | -0.03455 | 0.27225 | 0.02013 | 0.33840 | -0.06495 | 0.25016 | -0.13723 | 0.17229 | -0.11588 | 0.17881 |
| *EDGS* | 0.00681 | 0.60960 | -0.02862 | 0.60862 | 0.09071 | 0.72769 | -0.15281 | 0.48168 | -0.13633 | 0.51654 | 0.15241 | 0.79661 |
| *JBIE* | -0.01795 | 0.36930 | -0.20681 | 0.19489 | -0.19410 | 0.21708 | -0.09320 | 0.31192 | -0.06945 | 0.33332 | 0.02900 | 0.41375 |
| *JBHM* | -0.52667 | -0.10524 | -0.50365 | -0.05972 | -0.28909 | 0.16628 | -0.24593 | 0.20686 | -0.27819 | 0.16969 | -0.17023 | 0.25426 |
| *IMI* | 0.06481 | 0.42714 | 0.01430 | 0.39270 | -0.07194 | 0.31420 | -0.21389 | 0.17453 | -0.22239 | 0.15682 | 0.00344 | 0.37067 |
| *ISI* | 7.09001 | 59.69777 | -2.46459 | 0.43997 | 1.20101 | 4.68999 | 1.72888 | 5.04211 | -0.09435 | 3.08034 | -1.16025 | 1.51210 |
| *ISM* | -1.55886 | 0.68660 | 2.72879 | 5.99653 | 0.44620 | 2.99511 | -0.47428 | 1.82673 | -0.46637 | 2.06185 | -1.05914 | 1.11427 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *OMI* | -0.19 | 0.238 | -0.23 | 0.205 | -0.26 | 0.194 | -0.37 | 0.082 | -0.23 | 0.206 | -0.32 | 0.094 |
| | 128 | 74 | 358 | 43 | 225 | 34 | 057 | 17 | 048 | 01 | 157 | 24 |
| *OSI* | -0.69 | 0.895 | -0.22 | 1.489 | -0.23 | 1.400 | -1.92 | -0.12 | -1.12 | 0.463 | -0.93 | 0.572 |
| | 264 | 83 | 904 | 09 | 121 | 18 | 092 | 205 | 693 | 94 | 908 | 17 |
| *OSM* | -0.73 | 0.283 | -0.37 | 0.738 | -0.90 | 0.218 | 0.001 | 1.082 | -0.43 | 0.659 | -0.52 | 0.510 |
| | 319 | 08 | 580 | 84 | 923 | 24 | 12 | 92 | 551 | 05 | 920 | 32 |
| *FUSE* | 0.014 | 0.037 | 0.015 | 0.039 | -0.00 | 0.017 | -0.00 | 0.019 | 0.021 | 0.045 | 0.024 | 0.047 |
| | 98 | 61 | 55 | 19 | 711 | 21 | 467 | 28 | 27 | 22 | 97 | 96 |
| *SW* | 0.003 | 0.271 | 0.005 | 0.287 | -0.02 | 0.263 | 0.035 | 0.321 | 0.076 | 0.360 | 0.013 | 0.284 |
| | 25 | 95 | 56 | 05 | 546 | 30 | 72 | 59 | 29 | 30 | 27 | 92 |
| *SF* | -0.07 | 0.688 | -0.12 | 0.665 | -0.42 | 0.351 | -0.49 | 0.259 | -0.28 | 0.472 | -0.24 | 0.474 |
| | 641 | 55 | 601 | 81 | 979 | 83 | 759 | 45 | 777 | 73 | 843 | 11 |
| *FS* | -0.03 | 0.279 | -0.00 | 0.321 | -0.03 | 0.301 | 0.001 | 0.334 | 0.026 | 0.357 | 0.081 | 0.398 |
| | 448 | 99 | 897 | 93 | 821 | 09 | 54 | 76 | 08 | 92 | 08 | 74 |
| *FD*1 | -0.00 | 0.276 | -0.05 | 0.243 | -0.26 | 0.041 | -0.21 | 0.086 | 0.026 | 0.322 | 0.069 | 0.353 |
| | 710 | 66 | 161 | 70 | 333 | 74 | 525 | 04 | 09 | 76 | 34 | 81 |
| *FD*2 | -0.06 | 0.230 | -0.13 | 0.174 | -0.15 | 0.164 | -0.19 | 0.123 | -0.11 | 0.191 | 0.103 | 0.402 |
| | 596 | 28 | 442 | 27 | 330 | 59 | 006 | 78 | 947 | 35 | 23 | 86 |