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Is Society Willing to Pay More for Children's Safety

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ABSTRACT

Most studies on the value of statistical life (VOSL) and values for prevention of injuries provide only the average values for the population. It is often argued that the values for children may be higher than that for adults because parents are usually more concerned about the mortality and morbidity risks of their children than for themselves. However, determining separate VOSLs for children and adults is not an easy task. Even if separate VOSLs for children and adults were available, applying them in economic evaluations of safety programmes and policies could get very complicated. Further, implicit values in decisions based on gains/losses in Quality Adjusted Life Years (QALYs) or Disability Adjusted Life Years (DALYs) may be different from the established VOSL. Using the results of a Value of Safety survey carried out in New Zealand in 1997-98, this paper investigates whether the society is willing to pay more for children's safety and discusses the theoretical explanations on the disparities between VOSL for children and adults. Formal statistical tests and regression analysis were carried out to test for any differences between VOSLs for households with and without children.

1. INTRODUCTION

Value of statistical life (VOSL) represents the total amount of money that the population collectively is willing to pay for safety improvements that are expected to prevent one premature death. This is obtained by averaging the individual marginal rates of substitution (MRS) of wealth for risk reduction. Most studies on the VOSL and values for prevention of injuries provide only the average values for the adult population. It is often argued that the values for children may be higher than that for adults because people are usually more concerned about the mortality and morbidity risks of their children than for themselves. If injured with long-term impairments, children would suffer more as they have longer expected life span and also the impairment could reduce their life span quite substantially.

This paper uses the results of a Value of Safety survey carried out in New Zealand in 1997-98 (Guria et al 2003), to investigate if this survey reveals a higher VOSL for children, i.e., society is willing to pay more for children's safety.

Theoretical arguments on disparities between VOSLs for children and adults are discussed in the next section. The third section discusses briefly the Value of Safety survey, the sample characteristics and the differences in WTP-based VOSL for households with and without young children. Formal statistical tests and a regression analysis were also carried out to compare the WTP-based VOSLs for households with and without young children. The fourth section compares the VOSL with two health status measures, the quality and disability adjusted life years (QALYs and DALYs), and discusses the implicit VOSL by age group based on the QALY approach. The last section discusses the conclusions drawn from the analysis.

2. THEORETICAL DEBATES

A regression analysis of the 1989/90 New Zealand survey data did not find age as a significant factor affecting the WTP values (Miller and Guria 1991). However, a number of international publications on VOSL for adult population found an inverted U-shaped relationship between age and MRS of wealth for risk reduction. For example, in an UK study, Jones-Lee (1985) found a quadratic relationship with age for some of the questions in the survey. Similar relationship was also observed in Shepard & Zeckhauser (1982).

Extrapolating any of the inverted U-shaped curves found in the literature would indicate VOSL for children to be lower than that for adults. However, many policy examples regarding child's health and safety suggest our society is more averse to risks experienced by young children than by adults. Referring to a study by Zeckhauser and Shepard (1976), Viscusi (1992, p. 30) states that "the young have more to lose than the old and the special societal concern with averting risks to children reflects this difference".

As noted in a number of international publications (e.g., Harbaugh 1999 and Dockins et al 2002), it is implausible to ask children to express their own WTP because children are psychologically unable to comprehend death or risk and do not have the concept of 'ability to pay' or any control over financial resources. Dockins et al (2002) discuss three other possible perspectives from which the risk values for children could be assessed. These include the societal perspective, 'adults as children' perspective and the parental perspective. These are briefly discussed below.

Societal perspective aims to obtain separate measures of social welfare from a reduction in risk to the respondent and others such as their own children. However, this approach could result in double counting if paternalistic and non-paternalistic altruism were not distinct. In the latter case, adults care not only for the well-being of their children, but also for their own utilities. To avoid double counting, only the value of paternalistic altruism should be counted.

Most individuals are altruistic. Some studies include three components of VOSL: the willingness to pay by (1) the respondent; (2) the spouse; and (3) the rest of society (e.g. Jansson, 1994 and Miller and Guria, 1991). As noted by Lindberg (2001, p. 401), "the affected individuals may have relatives outside the household, and friends who care about his exposure to risk and consequently have a willingness to pay for his risk reduction". However, the level of altruism towards their own children, family and friends and the rest of society would be somewhat different. Miller and Guria (1991) attempted to estimate the WTP for the rest of society in their survey, but the response rate was poor for that particular question. As a result, an arbitrary value was chosen for their estimates. For child safety, the altruism component can be relatively high.

Most WTP surveys only examine the valuation of risks based on people's self interests, i.e., the willingness to pay for an improvement of their (own or household's) safety. However, as noted in Jones-Lee (1992), people are also concerned with safety of other members of society. Considering paternalistic altruism in general, Jones-Lee concludes that the VOSL for a caring society should be 10%-40% higher than that for a purely self-interested individual. In Sweden, the effect of paternalistic altruism is estimated at 7% for value of statistical life and 17% for value of prevention of injuries (Lindberg 2001). In a WTP survey that examined the implicit value of reduction in risk of injury from incorrect use of insecticide products and the altruism for morbidity risk in the United States, Viscusi et al (1988) found that people's altruism was much greater for residents within their home state than in the nation at large.

The effect of paternalistic altruism can be particularly high in parents for their children. People are likely to be willing to pay more for the safety of unrelated children than that of unrelated adults. Taking this argument further, one can argue that the societal value of children's safety should be higher.

To estimate the VOSL separately for children based on societal approach would require questions on the amount people would be willing to pay separately for children and adult members of the household. It would be more difficult for the respondent to comprehend the question, assess the risks and express their willingness to pay. This may be a reason why separate values based on WTP studies are not available in the literature.

Another approach is the 'adults as children' perspective. This requires adults to think back to their own childhood and express the preferences they would exhibit over the risks they faced. As the risks in questions are no longer risks to the adults, it is almost impossible for respondents to correctly backdate their preferences.

Because of the problems associated with the societal and 'adults as children' approaches, some researchers derive theoretical models to infer the value of child safety by examining parents' decisions on safety related expenditures. Examples of such parental models include utility maximisation model and intra-household allocation model.

Blomquist et al (1996) examined the standardised marginal utility function from the use of safety belts and child restraints and estimated that the VOSL for children under 5 years of age was around 30% higher than that for adults. Their estimated VOSL for children was somewhat higher than that estimated by Carlin & Sandy (1991) based on a similar approach.

The major problems with the utility maximisation approach are threefold. Firstly, the utility function might not be able to capture all factors affecting the use of any safety equipment, for example, transport laws or regulations, the price structure of the equipment and how easily such equipment can be retrofitted to the vehicle, etc. Secondly, installation of any safety equipment to a vehicle (e.g., child restraint system) could provide benefits for more than one person in the same family but the proportion that can be attributed to one particular individual is usually unknown. Thirdly, there are substantial difference between risk exposures of children and adults but the difference in the costs of safety equipment could be small.

Household allocation models look at spending decisions at the household level subject to a budget constraint. It is considered to be the most appropriate approach for valuing children's risk values because it captures the tradeoffs made within the household (Dockins et al 2002 and Dickie & Nestor 1999).

Despite this theoretical merit, there still exist practical difficulties when assessing the value of risk for children. For example, Mount et al (2001) found that the VOSL estimates were sensitive to household type, household income and income elasticity. With an income elasticity of 1, Mount et al found the VOSL for children to be around 40% higher than for adults. However, an opposite result was found if the income elasticity was 0.3, which yielded the VOSL for children to be around two-third of that for adults.

3. THE EMPIRICAL RESULTS

In this section, we investigate whether the WTP for household safety is influenced by the presence of children in the household, based on the findings of a Value of Safety study (Guria et al 2003).

3.1 THE VALUE OF SAFETY SURVEY

A Value of Safety survey was carried out in New Zealand during 1997/98 by the Land Transport Safety Authority (LTSA). To ensure household's budget constraint was considered, the respondent was asked to express the household's WTP for risk reduction of all members of the household. Though the study did not contain enough information to provide direct estimates of the VOSL for children, information on household WTP could help us to infer any significant difference between households with and without young children. For the purpose of this analysis, we separated the sample into two groups, with and without children aged 14 years or younger.

The survey (Guria et al 2003) was comprehensive. It facilitated the estimation of not only the WTP and willingness to accept (WTA) based VOSLs, but also the values for prevention of injuries. The WTA responses indicated the amount of money that would provide enough compensation to face a higher level of risk.

The survey included two questions on WTP (*Housing Relocation* and *Safety Programme*) and one question on WTA (housing relocation). In the WTP housing relocation question, the respondent was asked to consider a situation that they would have to relocate. There were two options for relocation – one with the same level of risk as in the current location and the other with a risk lower than the current location (20% or 50% lower as randomly selected by the computer programme). Using two levels of risk reduction, 20% and 50%, helped detect the sensitivity of different levels of risk reduction on WTP responses. The second question on WTP was about a safety programme that would reduce the risk of all household members by 20%. The programme would benefit others as well. This is very similar to the safety programmes developed by the LTSA and road development agencies in New Zealand. The WTA housing relocation question is similar to that for the WTP, but the respondent was asked to choose between one location with the same level of risk as at the current location and the other with a risk 20% higher than at the current location.

Since a programme would not only reduce the risk of death but also of injuries, the survey included the total risk of fatal and serious injuries (mostly hospitalised). Minor injury was not included in the risk change questions because minor injury would not have long term impairments in most circumstances. However, it was included in the questions for estimating the relativities between injuries.

Standard Gamble and *Matching* approaches were used to determine the relativity between values of avoiding three severity levels of injuries: fatal, serious and minor. Serious injury was further divided into temporary and permanent injuries. One suffering a temporary injury would fully recover in two to four months, whereas permanent injury would result in some form of long term impairment.

A typical *Standard Gamble* question asked respondents to choose between two types of treatments following a crash: a treatment with

(1) a high probability of an injury effect (A) and a low probability of a more severe injury effect (B), or
(2) a high probability of the same severe injury effect (B) and a low probability of an injury effect better than A.

The probabilities in (2) were varied until the respondent found it difficult to choose between the two options.

In a typical *Matching* question, the respondent was asked to choose between two projects that cost the same but result in different outcomes: a project that

(1) reduces an injury effect A to a greater extent; or
(2) reduces the next higher injury effect to a greater extent.

The number of injuries saved in the second case was varied until the respondent was indifferent between the two projects.

The sample was randomly divided into two sub-groups, each sub-group receiving only one version of the questionnaire: *Standard Gamble or Matching*. Similarly the respondent was asked to consider either a 20% reduction or a 50% reduction (selected randomly by the computer software) in the risk faced by the household members. This provided four measures of WTP based MRS of wealth for risk reduction and two measures of WTA based MRS. Each respondent provided two estimates of MRS (WTP and WTA) from household relocation question and one estimate of MRS (WTP) from the safety programme question. In this paper, only the WTP estimates have been analysed.

The study results show that there was no significant difference in the estimates of VOSL from estimates of injury relativities using *Matching* and *Standard Gamble* approaches. The difference was also not statistically significant between estimates using 20% and 50% risk reductions and between estimates from housing relocation and safety programme questions.

3.2 HOUSEHOLDS WITH AND WITHOUT CHILDREN

3.2.1 Data

As the estimates from the two WTP based VOSLs (from household relocation and safety programme) were not significantly different, we first took a simple arithmetic mean for each of the two sub-groups (Standard Gamble and Matching) to obtain one MRS for each version of risk change. We then made a vertical integration of the MRS estimates from the two versions of risk changes. An advantage of combining the data this way is that when we sub-divided the VOSL estimates by income groups, the combined sample gave us a reasonable number of households within each income group and thereby minimised the extreme value effects from using a small sample.

The MRS can be very high in some cases either due to non-understanding or misunderstanding of the question or expressing inappropriately high WTP with respect to the level of risk faced by the respondent. A very few large values can substantially increase the estimate of VOSL for any income group. Considering this, we excluded the highest 15% of MRS estimates from the combined sample.

Since older adults might have different VOSLs and households with members above 60 years of age would be unlikely to have children up to 14 years of age, we considered the data only for those households without any member aged 60 or over.

The Value of Safety survey had 1051 responses. After removing some inconsistent responses, the top 15% of the remaining responses, households with members aged 60 years or more and those without information on household income, we ended up with 386 observations for the analyses in Sections 3.2 and 3.3. For the regression analyses, we used each MRS separately as the dependent variable without any age restriction imposed.

3.2.2 MRS Distribution

Distributions of the estimated MRS are given in table 1 for households with and without children. It shows that the difference between the two distributions is statistically significant (χ^2=19.89, 10 d.f.; p>0.05).

Over 57% of households with children have a MRS up to $4 million, while only 45% of other households belong to this category (Table 1). This suggests a tendency for the VOSL being higher for households without children. This, however, does not mean the value for children's safety is not higher in households with children than for adults in these households. There are two possible explanations: (1) there exists a large variation in the WTP for children and adults within the same household or (2) there exists a difference in MRS at different levels of income. Unfortunately, the available information would not allow us to test for (1) but we could test for (2).

Table 1: Percentage distribution of MRS by household type

MRS (NZ$ m)	**Households with children aged 0 to 14** Sample size: 145	**Other households** Sample size: 241
>0 and ≤ 1	32.4%	22.4%
>1 and ≤ 2	11.0%	8.3%
>2 and ≤ 3	2.8%	7.5%
>3 and ≤ 4	11.0%	6.6%
>4 and ≤ 5	3.4%	6.6%
>5 and ≤ 6	7.6%	5.8%
>6 and ≤ 7	2.1%	3.3%
>7 and ≤ 8	5.5%	2.9%
>8 and ≤ 9	3.4%	2.5%
>9 and ≤ 10	2.1%	3.3%
>10	18.6%	30.7%
Total	**100.0%**	**100.0%**

3.2.3 Income disparity

Households with young children are often young families with a relatively low disposable income. Hence, households with and without young children may have different abilities to pay for safety. To see if there are such effects, we first categorised each type of households into different income per person groups and then estimated the VOSL for each group.

As some of the household expenditures are fixed and can be shared between household members, the total expenditure of a household may not increase linearly with number of household members. Atkinson et al (1995) proposed that a better measure of household income comparison would be the household income divided by the square root of the number of household members. This approach has been used widely in international comparisons using income distribution. This allows for the non-linearity relationship between number of household members and total expenditure. For easy reference, we refer to this as adjusted household income per person.

Table 2: Percentage distribution of adjusted household income per person by household type

Adjusted Household income per person (NZ$)	**Households with children aged 0 to 14** Sample size: 145	**Other households** Sample size: 241
0 – 10,000	16.6%	11.6%
10,001 – 20,000	38.6%	18.3%
20,001 – 30,000	23.4%	20.7%
30,000 +	21.4%	49.4%
Total	**100%**	**100%**

Table 2 summarises the percentage distribution of adjusted household income per person by household type. It shows that almost 50% of households without young children have income more than NZ$30,000 per person, compared with about 21.4% for households with young children. Households with young children tend to belong to lower income groups whereas households without young children tend to belong to higher income groups. The difference in income distribution between these two types of households is also statistically significant (χ^2= 27.8, 3 d.f.; p>0.01).

Table 3 shows the WTP based VOSL for each of the adjusted household income groups described in Table 2. It shows that the VOSL generally increases with income, as expected. This suggests that people did consider their budget constraint while responding to the survey questions. The values for household income group of $20,001 - $30,000 being lower than in the preceding group is odd. We have no explanation, other than random variation.

Table 3: Estimated VOSL ($ Million) by adjusted household income per person and by household type

Adjusted Household income per person (NZ$)	**Estimated VOSL ($ million)**	
	Households with children aged 0 to 14 Sample size: 145	**Other Households** Sample size: 241
0 – 10,000	3.19	3.97
10,001 – 20,000	5.68	7.91
20,001 – 30,000	4.19	6.61
30,000 +	8.39	9.66
Total	**5.50**	**8.05**

However, at each level of income the estimated WTP based VOSL is lower for households with young children. This could mean either (1) the value people placed on children was lower or, (2) the value for children was either higher than or equal to those of adults in these households and the value placed on adults' risk reduction was relatively low. The first explanation is extremely unlikely in any society. As the unavoidable expenditure associated with young children (e.g., child care services and education for young child) could be higher than for adults, the amount of money available for safety investment is likely to be lower for households with children compared to those without children within each income bracket. Thus, the VOSL could be lower for both adults and children in households with young children, due to less disposable income available for improving safety.

3.3 A 2-WAY ANALYSIS OF VARIANCE (ANOVA)

The above discussion suggests that the difference in VOSL values could be due to the difference in income or due to existence of young children in the household or both. To check the interaction effects, we carried out a 2-way ANOVA analysis for unequal sample between income group effects and between household type effects, following the method described in Rao (1973).

The top panel of Table 4 summarises the sum of squares between income groups, household types, within cells and between cells. The sum of squares due to income ignoring household type is 1,628.06, whereas the sum of squares due to household type ignoring income is 588.26. The bottom panel of Table 4 gives the mean sum of squares for each source of variance.

The test statistic for household type is F (1,385) = $\frac{255.9}{59.68} = 4.29$, which is significant at the 5% level. This means that there is significant difference between WTP estimates for households with and without young children, when the effect of income is accounted for.

Table 4: 2-way ANOVA for WTP estimates

Source	**df**	**Total sum of square**	**df**	**Total sum of square**	**Source**
Between income (ignoring H/H type)	3	1,628.06	1	588.26	Between H/H type (ignoring income)
Between H/Htype	1	255.90	3	1,295.69	Between income
Interaction	3	32.36	3	32.26	Interaction
Between cells	7	1,916.21	7	1,916.21	Between cells
Within cells	379	22,560.73			
Total	386	24,476.94			
		Mean sum of square		**Mean sum of square**	
Between income		542.69		588.26	Between H/H type
Between H/H type		255.90		431.90	Between income
Interaction		10.75		10.75	Interaction
Between cells		273.74		273.74	Between cells
Within cells		59.68			
Total		63.58			

The test statistic for income groups is F (3,385) = $\frac{431.90}{59.68} = 7.24$, which is significant at the 5% level. Hence, the WTP values for different income groups are different.

The test statistic for interaction is F (3,385) = $\frac{10.75}{59.68} = 0.18$, which is not significant at the 5% level. Thus, there is no significant interaction effect between household type and income groups.

3.4 REGRESSION ANALYSIS

Regression analyses were conducted to find out the influence of age distribution within a household on its valuation of safety using a similar model structure as in Guria et al. (2003).

The four measures of MRS considered in this analysis are: M_{DA4}, M_{DB4}, M_{DA5} and M_{DB5}. The first two are the MRS estimates from the household relocation question based on Matching version and Standard Gamble version respectively. Similarly M_{DA5}

and M_{DB5} are the MRS estimates from the safety improvement question based on Matching version and Standard Gamble version respectively. The estimates M_{DA4} and M_{DB4} used in the analysis included responses from both 20% and 50% risk reductions.

The regression equation used is: $M_{DIj} = e^{(\alpha + \beta_g X_g + e)}$, where I = A (Matching) or B (Standard Gamble); j = 4 (Household relocation) or 5 (Safety programme); X_g = a vector of explanatory variables; α & β are parameters to be estimated and e is the error term.

Most of the X variables described in Table 5 are self-explanatory, thus no further explanation is necessary. After the dummy variables representing different age categories, we have occupation dummies (but non-significant occupation categories are not included in the table). Income is the mid-point of the income range of the respondent. VKT is the total vehicle kilometre driven by the household. Initial 20 and Initial 100 are dummy variables to represent the initial prompt values in the survey. The survey included three initial values. Each household started with one of three values $20, $100 and $400, randomly generated by the computer.

Table 5: Regression results

	ln (M_{DA4})		ln (M_{DB4})		ln (M_{DA5})		ln (M_{DB5})	
constant	3.152	***	2.745	***	2.876	***	1.220	**
proportion aged 0 - 14	0.731		0.043		-0.205		0.006	
proportion aged 15 - 24	1.250		-1.709	*	-0.055		1.188	*
proportion aged 25 - 34	0.961		0.161		-0.245		0.380	
proportion aged 45 - 54	0.615		0.391		-0.164		0.903	*
proportion aged 55 - 64	-0.522		-0.177		-0.731		0.630	
proportion aged 65 - 74	0.165		-0.896		0.284		0.366	
proportion aged 75 +	-0.434		-2.084	**	-0.164		0.283	
Occup1 (Managers)			0.746	*	0.872	*		
Occup2 (Professionals)			1.072	**				
Occup3 (Technicians)			-1.682	**				
Occup5 (Sales workers)	-0.990	*						
Income							2.43E-05	***
VKT							-9.26E-05	***
Adjusted HH inc/person	1.21E-05		2.88E-05	***	1.94E-05	***	9.63E-06	
initial 20	-0.846	**	-1.415	***	-0.861	***	-0.881	***
initial 100	-0.809	**	-0.641	**	-0.843	***	-0.447	*
screen P	-0.854	**	-0.122		-0.264		0.073	
percent	-0.138		0.097		-0.259		0.173	
Risk (P) / person	-0.126	***	-0.119	***				
Risk (Z) / person					-0.080	***	-0.077	***
Sample size	363		322		385		309	
Adjusted R2	0.139		0.278		0.174		0.225	

* denotes significant at 10%   ** denotes significant at 5%   *** denotes significant at 1%

As mentioned earlier, there were two variations of the household relocation question: (1) increase in risk at an alternative location and (2) reduction in risk at an alternative location. In some cases, (1) appeared first and in other cases (2) appeared first. Screen P is a dummy variable with 1 if (1) appeared first, 0 otherwise.

The total risk the household members faced is Z in 100,000. This risk is appropriate for using in the neighbourhood safety improvement question. For the housing relocation question, the total risk (denoted by P) is the total of risks of those who would move with the respondent. The risk per person is the average risk per person in the household or the average risk for those who would be moving with the respondent. The dummy variable 'percent' is included to control for effects, if any, of 20% and 50% risk changes. This dummy equals 1 if the change is 20%.

The results do not show any consistent effects of household age distribution in the estimates. Proportion of household members aged 0-14 is not significant in any of the models. This suggests that after accounting for other factors, the presence of children did not make a significant impact on the valuation of safety by a household.

4. VOSL AND MEASURES OF HEALTH STATUS

While the VOSL is commonly used in transport safety project evaluation as a measure of pain and suffering related to loss of life and loss of life quality, some other sectors (e.g., the health sector) use measures of health status.

The most commonly used measures of health status are the quality and disability adjusted life years (QALYs and DALYs). QALY and DALY are complementary concepts, but they are both measures of change in health states that combine mortality and quality of life from health interventions. QALY measures the years of healthy life lived. It places a weight on time in different health states, ranging from 0 for death and 1 for a year of perfect health. On the other hand, DALY measures the years of healthy life lost. DALY assigns a disability weighting, ranging from 0 for perfect health and 1 for death, to each state of health (Arnesen and Nord 1999). DALY is similar to QALY but with unequal age-weights incorporated (Hammitt 2002). However, the application of age-weights in the calculation of DALYs is not compulsory. For example, age weightings have not been adopted for the estimation of DALYs in the burden of disease and injury studies conducted in Australia and New Zealand (cited in MOH 2001).

The application of QALYs and DALYs in the health sector does not necessarily involve conversion of these measures into monetary values. For example, these measures can be used in conjunction with intervention costs to generate the average or the incremental programme cost per QALY saved (the cost-utility ratio CUR). The smaller the CUR, the more cost effective the intervention. However, such application does not provide any estimates of net benefit or benefit to cost ratio of a health intervention.

Because these measures can be used without being converted to monetary terms, very little is available in the literature on the monetary valuation of these measures, particularly with DALY. For the case of QALYs, researchers usually estimate the number of QALYs lost first. Then they estimate the value of a QALY based on the VOSL such that the discounted present value of QALY's lost in a fatality equalled the VOSL (e.g., Miller 2000 and O'Dea 2000). While this may appear to be a logical approach, there is one major drawback. If the value of a QALY were the same for all ages, this suggests the implicit VOSL for children would be significantly higher than that for older people. However, this is contrary to our VOS survey findings that age distribution has no significant effect on a household's willingness to pay for safety.

The VOSL will clearly vary with age if it is derived from human capital approach, which relates to an individual's contribution to society. Even in this case, the value of a QALY estimated from the VOSL based on the present value approach would not necessarily give the same implicit VOSL at each age or age group. The main reason for this is that the annual contribution to society by an individual does not remain constant over his/her lifetime.

Therefore, whether the VOSL is determined by the human capital or the WTP approaches, a uniform value per QALY for all ages does not conform to the VOSL. The VOSL and the implicit VOSL by age groups would be comparable only if the number of QALYs lost and the value of a QALY were separately determined or estimated for each age group. In fact, studies found that QALY scores or weights depend on age and income (e.g., Gerdtham & Johannesson, 1999 and Praag & Ferrer-i-Carbonell, Forthcoming).

Another point to note is that the WTP-based VOSL we have considered does not include the altruistic value of society. Where it is high, a high VOSL for children may be justified. If the altruistic value diminishes with age of the person, then the same value of QALY can be in conformation with the same or with slightly different value of VOSL based on individual's contribution.

5. DISCUSSION AND CONCLUSION

This paper investigates whether society is willing to pay more for children's safety, based on the Value of Safety survey conducted during 1997/98.

As expected, we found that the estimated VOSL increased with income and the difference was statistically significant. However, the average VOSL was found to be smaller for each household income group with children than for the same income group without children. This could mean either (1) the value people placed on children was lower or, (2) the value for children was either higher than or equal to those of adults in these households and the value placed on adults' risk reduction was relatively low. The first explanation is extremely unlikely in any society. The value could be lower for both adults and children in households with young children, due to less disposable income available for improving safety.

The ANOVA analysis suggests that the difference in VOSL between households with and without children is statistically significant. This is different from the findings of the regression analysis, which showed that after controlling for other factors the presence of children did not make any significant impact on the valuation of safety by a household.

Based on the above analyses, we cannot confirm conclusively that the VOSL for children would be higher than for adults, though such a possibility could not be ruled out. As can be seen from the discussion on the value of a QALY, such high values for children can be justified with additional altruistic value of society. That is, if the society at large is willing to pay substantially for the safety of children on top of the WTP amount of the household, then a high VOSL for children can be justified.

6. ACKNOWLEDGEMENT

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7. REFERENCES

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