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Is Prevention of Suicide Worth Less?

-A Comparison of the Value per Statistical Life

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Abstract

This paper compares the value per statistical life (VSL) in the context of suicide prevention to that of prevention of traffic fatalities. We conducted a contingent valuation survey with questions on willingness to pay (WTP) in both contexts by administering a web questionnaire to 1038 individuals aged 18 to 80. We conjectured that WTP for a given impact on the number of fatalities would be lower for suicide prevention because suicide, at least to some degree, is the result of individuals' own decisions. However, this hypothesis was not supported by the within- or between-sample estimates of VSL or by responses to direct questions. Hence, no support is provided for the use of a lower valuation of the impact of suicide prevention than for risk-reducing programs in other fields, such as traffic safety.

Key words: Value of statistical life, Willingness to pay, Mental health, Cost-benefit, Altruism

JEL code: D61, I18, J17

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1. Introduction

Each year, more than 0.8 million individuals worldwide commit suicide, and several more make suicide attempts (World Health Organization, 2014). In addition to being a source of tremendous grief among friends and relatives of the victim, suicides give rise to large costs for society (e.g., O'Dea and Tucker 2005, Kennelly 2007, Ryen 2015). The World Health Organization (WHO) member states have committed to working toward the goal of reducing the suicide rate by ten percent by 2020 (WHO 2013). However, prevention programs are costly, and tradeoffs must be made with alternative expenditure items, such as the reduction of traffic accidents. The aim of this study is to compare the value of suicide prevention to the value of preventing fatalities caused by other accidents, such as traffic accidents.

One of the core parameters in economic evaluations of programs that affect the risk of premature fatalities is the Value of a Statistical Life (VSL). The VSL is used in cost-benefit assessments of investments and programs within a wide range of policy areas, such as traffic, health, environment and social work.[1] Until recently, economic evaluations of suicide prevention programs have been uncommon and have been based on VSL levels derived in another policy context (i.e., Hegerl et al. 2009). However, because suicide, in some sense, is the result of an individual's own decision, it could be that society is unwilling to spend as many resources per life saved through suicide prevention programs as for programs that target premature non-voluntary fatalities. Therefore, one could argue that VSL for suicide should be lower than for other causes of premature death.

To our knowledge, this is the first study to compare WTP for the prevention of suicide and traffic fatalities based on data collected within the same survey. It is also the first study to estimate WTP for suicide prevention outside of Japan.

We conducted a contingent valuation study with a web questionnaire among a representative web panel of Swedish residents aged 18-80. A total of 1038 subjects were asked to state their willingness-to-pay (WTP) for interventions that were expected to save 100 (200) lives by preventing traffic fatalities or suicides, respectively. They were also asked whether they thought it was more important to reduce the number of deaths due to traffic accidents or due to suicides. Approximately 69 percent stated that these purposes are equally important, while 17 percent stated that suicide prevention is more important and 13 percent stated the opposite. No support was found for the hypothesis that the WTP for suicide prevention is lower than the WTP for risk-reducing programs related to traffic

[1] For reviews of previous studies, see de Blaeij et al. (2003), OECD (2012). A number of Swedish VSL studies are reviewed in Hultkrantz and Svensson (2012). More recent Swedish VSL studies are Olofsson et al. (2016; 2018a; 2018b; 2019).

safety. With regard to policy, this finding suggests that funds for the prevention of fatalities should be directed to the program with the lowest cost per saved life.

The paper is organized as follows. In section 2, we review relevant theory, previous literature and the Swedish policy context. Section 3 describes the study design, questionnaire, empirical strategy and the sample. The results are presented in section 4, and in section 5, the paper ends with a discussion and conclusion.

2. Background

2.1 Economic theory

In a society with purely self-interested individuals, the VSL is determined by the marginal rate of substitution between own wealth and own risk (Jones-Lee 1976). The same holds for the valuation of a private good that only has effects on individual risk. However, when the good being valued is public and the individual has preferences for the wellbeing of others, the VSL can also incorporate altruistic preferences. These preferences can further be divided into pure altruism and paternalistic altruism. In the case of pure altruism, the individual cares about the wellbeing of others and respects their preferences; that is, the utility of individual *i* depends on the *utility* of individual *j*. In the case of paternalistic altruism, the individual cares about the wellbeing of others but does not believe that these individuals are the best judges of their own utility; that is, the utility of individual *i* depends instead on some argument in the utility function of individual *j*. If individual *i,* for example, only cares about the safety of individual *j*, individual *i* is said to have safety-focused altruism (Jones- Lee 1991). The form of such possible altruistic preferences will affect the WTP for suicide prevention because a positive WTP means that the respondent is willing to pay to prevent another individual from taking a certain action.

In their seminal paper on the economics of suicide, Hamermesh and Soss (1974) argue that a utility-maximizing individual commits suicide if the present value of his expected lifetime utility becomes zero. A subject that has purely altruistic preferences can then be expected to have a zero WTP for preventing other individuals from committing suicide.[2] Similarly, if the subject respects the preferences of her future self, the WTP to reduce the own probability of committing suicide would also be zero. If, on the other hand, the subject does not view suicidal-prone individuals as rational decision makers, the WTP to prevent suicide could be positive, meaning that the subject has paternalistic altruistic preferences. Similarly, if the subject thinks that there is a possibility that her

[2] However, even in this case, people may have a positive WTP for the prevention of suicide considering the grief and other harm to the next of kin that suicide evokes.

future self is not the best judge of her own utility, then she might be willing to pay to reduce her own risk of committing suicide in the future (i.e., the subject has paternalistic altruistic preference toward herself).

We conjectured that WTP for a given impact on the number of fatalities is lower for suicide prevention if subjects have self-centered or purely altruistic preferences and see suicide as the outcome of a (in some sense) rational decision. Traffic accidents are, as a rule, involuntary (if not caused by a suicide attempt). In contrast, the decision to commit suicide can be seen as either a voluntary decision by a (in some sense) rational individual or as an irrational decision by an individual who is unable to decide what is best for herself. In the former case, subjects with self-centered or purely altruistic preferences have no reason to pay for suicide prevention. In the latter case, people may have paternalistic preferences that result in a positive WTP for suicide prevention that may be lower, equal to or higher than the WTP for the prevention of fatalities caused by traffic accidents.

2.2 Earlier literature

To our knowledge, the only previous literature on WTP for suicide prevention is a series of studies in Japan by Sueki (2015, 2016a, 2016b, 2017).[3] In the first two of these studies, the VSL for suicide prevention was estimated with two different samples (university students and Japanese taxpayers) and different methods (open-ended questions and double-bounded dichotomous choices). This resulted in VSL estimates of USD 0.2 million and USD 0.27 million. These findings were then compared to VSL estimates of approximately USD 2 million for traffic accidents found in other studies in Japan.

Sueki (2016b) further investigated how the WTP for suicide prevention is influenced by respondents' attitudes toward suicide. He found that respondents who think that suicide *can happen to anyone* and that *suicides can be prevented* have, on average, a higher WTP than respondents who state otherwise, while respondents who believe that committing suicide is *an individual right* have a lower average WTP. Furthermore, Sueki (2017) found that WTP can be changed by, for example, giving respondents a series of lectures about suicide before answering the questionnaire.

Our study differs from these previous studies in several important ways. First, Sueki (2015, 2016a) framed the good as a reduction of *the respondent's own* probability of dying from suicide.[4]

[3] The Sueki 2015 paper is only available in Japanese; therefore, all information regarding this study is gathered from the Sueki 2016a paper.
[4] However, it is stated that it is a public intervention.

> "By implementing the countermeasure, the death risk by suicide for 1 year can be decreased from 20/100,000 to 15/100,000, meaning that your death risk from suicide decreases by 25%. Imagine national and local governments were to launch the new countermeasure against suicide and collect specific contributions for it.
>
> Do you approve or disapprove of JPY XXX (500; 1,000; 2,000; 4,000; or 8,000) tax increase per year to implement the countermeasure against suicide?"

The task given to respondents in this way is a cognitively complex one because the respondent must think of herself as a current "planner" restricting herself as a future "doer". If the respondent views herself as a rational utility-maximizing person, the WTP to reduce her own risk of dying from suicide would be zero.

Furthermore, Sueki's (2015, 2016a) comparison was with VSL estimates in another context (i.e., traffic) from other studies, which means that the results may be confounded by differences in study design.

Previous research has shown that the VSL is dependent on context. For example, individuals are often willing to pay a higher premium to reduce the risk of dying from cancer than from other causes (Jones-Lee et al 1985, McDonald et al 2016, Viscusi et al. 2014, Olofsson et al 2016).[5] Johansson-Stenman and Martinsson (2008) found that respondents reveal a higher valuation of saving pedestrians than car drivers. Similarly, Carlsson et al. (2010a) found that the VSL for fire and drowning accidents seems to be lower than for traffic accidents. However, Carlsson et al. (2010b) found no difference with regard to the cause of an accident. These authors argue that this might be because in the first study (2010a), each respondent was asked to value a reduction in her own risk, while in the second study, she was asked to choose between different projects influencing the risk of others.

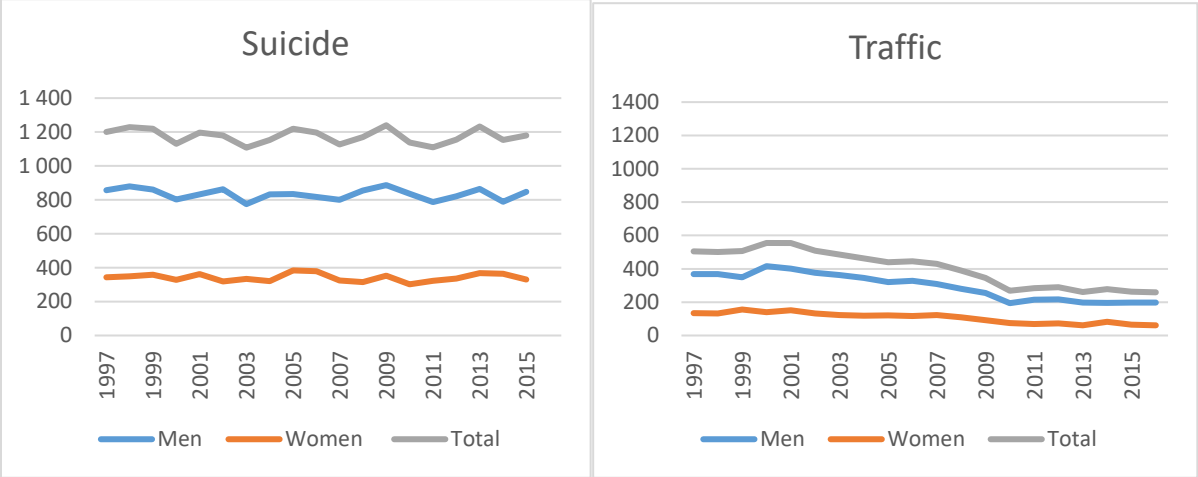
With regard to issues similar to the subject field of our study, studies show that individuals seem to be willing to pay less for different health care programs targeting mental health compared to both elderly care and cancer programs (O'Shea, Gannon, & Kennelly, 2008). Additionally, even though individuals view mental illness as more burdensome than general medical illness, their average WTP is lower for mental health illness (Smith et al. 2012).

[5] However, whether there should be a cancer premium remains an ongoing research question. For example, Hammit and Haninger 2010 do not find a statistically significant higher WTP for cancer compared to other contexts.

2.3 Swedish policy context

In 2008, the Swedish Parliament decided on a "vision zero" long-term target for suicides. This policy was inspired by a similar policy from 1997 targeting fatalities and severe injuries caused by traffic accidents. While the policy for traffic has been very successful and has resulted in a decrease in the number of traffic fatalities by close to 50 percent, the number of suicides has been more or less constant since the decision was made (Figure 1).

Figure 1. Number of deaths by suicide and traffic.



Source: The National Board of Health and Welfare, statistical database, Causes of Death 2018-04-23

In 2016, 1134 individuals committed suicide and 259 died in traffic. More men than women die both in traffic and from suicides. Both suicides and deaths due to traffic accidents are present in all age categories (table 1).

Table 1. Number of deaths 2016, by age, by suicide and traffic.

Age	Suicide		Traffic	
	(%)	n	(%)	n
0-29	17	195	22	56
30-49	29	334	20	52
50-69	33	378	30	78
70-	20	227	28	73
Total	100	1134	100	259

Source: The National Board of Health and Welfare, statistical database, Causes of Death 2018-04-23

Within traffic policy, there is a long tradition of conducting cost-benefit analysis, and the VSL has become a core parameter in this context. Hultkrantz and Svensson (2012) summarized twelve different studies, including 48 VSL estimates, conducted in Sweden between 1996 and 2010. Most of

these (39/48) were based on traffic safety, but this review also included studies from other policy contexts, such as health care, air travel, fire and drowning. The current recommendation by the Swedish Transport Administration is to use a VSL of 40.5 million SEK and is based on results from Olofsson et al. (2016).

3. Modelling approach

3.1 Study design

To estimate the VSL, we conducted a contingent valuation study. Because traffic is the policy area where most previous VSL studies have been performed, estimating the WTP for traffic safety and suicide prevention within the same study can provide important insight into how and why these values might diverge from each other. To further facilitate comparison, our study design and analysis of responses is similar in several respects to the methods used by Olofsson et al. (2016), which is the most recent Swedish study for the elicitation of VSL in a traffic-safety context.

The survey started with an introduction explaining the purpose and providing some practical information. This was followed by background questions on age, gender, marital status, country of birth, number of persons in the household (total and under 18), education, occupation, and life satisfaction. This section ended with a question regarding the respondent's opinion on the importance of interventions that could save lives with regard to traffic safety and suicide prevention. The survey consisted of two WTP sections, one about traffic and one about suicide. To check for scale sensitivity, both sections included two levels of absolute risk reduction (100 and 200 saved lives). After a short introduction to the WTP concept, both of these sections initially showed information on the number of people who die in traffic/by suicide each year by age and gender. Approximately 80 percent of the respondents were given the questions about traffic before the questions about suicide, while approximately 20 percent received these questions in the opposite order.

The respondents were asked whether they thought the government should spend money on an intervention that would save 100/200 lives within the specific policy context (Appendix A1). Because previous studies have shown that respondents have a difficult time understanding a reduction in small probabilities (Hammit and Graham 1999), the risk reduction was presented as the absolute number of lives saved. However, information was also provided about the risk reduction expressed as the change in probability for a random individual. The WTP questions followed a variation of the bidding game method that ended with an open-ended WTP question, similar to the method used in Olofsson et al. (2016). Each respondent was asked about a maximum of four different payment levels from a tree structure (Appendix A2). The respondent was subsequently shown the maximum bid for

which she answered yes and the minimum bid for which she answered no and was asked to state her maximum WTP within this range. To control for starting point bias, the respondents were divided into three groups starting at different values. The respondents were informed that the payments would be collected through a uniform tax, and they were shown both the total payment by all taxpayers and the cost per taxpayer.

Respondents were further asked to specify how certain they were that in reality they would vote yes to a proposal to run the intervention using a 0-10 Likert scale and whether they would be willing to donate the money they would receive for answering the survey to support interventions to improve traffic safety or to support mental health programs.

To ensure that the final answer was consistent with the individual's preferences, each respondent was shown a comparison of her stated WTP for saving 100 lives in both contexts and asked whether she wanted to change her answer. Feedback was given by a text stating, for instance, "*this indicates that you think it is worth more to save a life related to traffic than by suicide reduction*" and then asking whether this statement was correct. If the stated WTP for one area was larger than the WTP in another area, the respondent was asked why. Because this may have induced the respondents to state equal WTPs because they thought this was the right thing to do, both the responses to the first open-ended question and the (potentially changed) final answer were used in the analysis.

A final section of the survey consisted of questions regarding each respondent's own experience with traffic accidents and mental health problems. The respondents were also asked questions regarding their attitude toward mental health problems in general and suicide in particular. Finally, they were asked to evaluate their own quality of life on a Likert scale.

3.2 Pilot study

As a test, the survey was sent to 50 respondents in November 2017. In addition, we conducted a focus group study with five students. The pilot indicated that some respondents did not consider the opportunity cost of public funds. Therefore, in the final survey, a sentence was included describing what the same amount of money could buy in terms of numbers of preschool teachers, doctors, nurses, and police officers. Additionally, the outline was changed, starting with the total societal cost and showing the payment per individual in parentheses. Apart from this, only minor changes were made.

3.3 Empirical strategy

Because the WTP is censored from below at zero, when analyzing the determinants of WTP, a standard Tobit model was estimated.

$$y_i^* = x_i'\beta + \varepsilon_i$$
$$y_i = y_i^* \; if \; y_i^* > 0$$
$$y_i = 0 \; if \; y_i^* \leq 0,$$

where y_i is the stated WTP of individual *i* and ε_i is assumed to be NID(0,σ^2) and independent of x_i.

To analyze the size of the difference in WTP in the two contexts, a variable for this difference (i.e., $WTP_{suicide} - WTP_{traffic}$) was generated. This was analyzed using a standard OLS.

The same set of explanatory variables was used in all analyses. In the baseline specification, only age (and age squared), gender and education (any tertiary education or not) were included. The effect of income was analyzed separately because this variable contained many missing values. In a second step, variables capturing the respondent's experiences and attitudes were included. For suicide, a dummy variable indicated whether the individual knew someone who had tried to commit or had committed suicide. Additionally, a variable indicating whether the respondent had ever sought help for depression was included. Two other variables indicated whether the respondent thought that she had control over her probability of experiencing depression and whether, according to her opinion, it should be an individual's own decision to end her own life. Other included variables indicated whether the respondent knew anyone who had died from a traffic accident, whether she herself had ever been in a traffic accident, whether she thought that her risk of being in a traffic accident was higher or lower than that of the general population, and finally her concern, on a 1-10 scale, of her own risk of being involved in a traffic accident. Finally, a set of dummy variables was included, indicating how often the respondent travelled by car, as a driver and as a passenger.

3.4 The sample

In total, 3 908 individuals were invited to participate in the survey, all of whom were participants in the Norstat panel, a telephone-recruited web panel consisting of 67 000 individuals. Of these, 1 197 (31 percent) started the survey and 1 038 (27 percent) completed the full survey. All participants received a small reward (points that could be exchanged for money), which they could choose to donate to charity. The sample was drawn to be representative of the total population with regard to

age, gender and region (Table 2). In the sample, approximately 50 percent were married, 23 percent were born in a country other than Sweden, and 26 percent had at least one person under the age of 18 living in the household. The majority, 54 percent, had some form of tertiary education (at least some education from a university). With regard to employment, approximately 52 percent were employed and 32 were retired

Table 2, Descriptive statistics, full sample, n=1038

	Sample (%)
Gender	
Men	50.39
Women	49.42
Age (mean)	50.43
Marital status	
Not married	37.57
Married/partnership	50.96
Widow/widower	3.95
Divorced	7.51
Country of birth	
Sweden	75.82
Outside of Sweden	23.41
Highest level of education	
Primary education	8.09
Some secondary education	38.24
Some university or more	53.66
Employment status	
Employed or self-employed	56.64
Retired	31.50
Student	6.94
Searching for job	2.31
Other	2.60

4. Results

4.1 Attitude and preferences

Respondents' answers to the question of which policy area, traffic safety or suicide prevention, was most important are shown in Table 3. Most respondents stated that they perceived both areas as equally important. However, statistically significantly more respondents answered that suicide reduction was more important than reducing the number of deaths due to traffic accidents.

Table 3. What do you think is most important?

	Frequency	Percentage
To reduce the number deaths due to traffic accidents	140	13.5
To reduce the number of suicides	181	17.4
I think both policy areas are equally important	717	69.1
Total	1038	100

Regarding previous experience, 19 percent stated that they had been in a traffic accident that required them to go to a hospital and 14 percent knew someone who had died in a traffic accident. Nineteen percent stated that they were worried that they would be hurt in a traffic accident.[6]

With regard to suicide, 54 percent knew someone who had committed suicide or had tried to do so. Furthermore, 63 percent stated that they thought society should take vigorous action to reduce the number of suicides,[7] while 23 percent agreed with the statement that each individual should be allowed to decide whether they would like to end their life.[8]

Among those who stated a higher WTP for suicide prevention than traffic safety (n= 180), the main reason was "I think society does too little in this area" (n = 89), followed by "I think there are more possibilities to reduce the number of deaths within this area". Those who stated a higher WTP for traffic than suicide prevention (n=157) stated, "I think it is more important to prevent an involuntary death then a voluntary death" (n = 62) and "I think there are more possibilities to reduce the number of deaths within this area" (n= 58).

Each respondent received a small monetary reward for answering the survey. When asked whether they would be willing to donate this to support different types of interventions, approximately 54 percent indicated their willingness to do so.[9] Thirteen percent stated that they would be willing to donate the money to mental health programs, 5 percent stated that they would be willing to donate the money to traffic safety programs, 30 percent would be willing to donate to both types of programs, and 7 percent would donate to programs in other fields.

4.2 Willingness to pay

In the WTP section, for each scenario, the respondents were asked to make a maximum of four binary (accept or decline) choices for cost bids that were raised or decreased depending on the previous response. Finally, the respondent received an open-ended question asking about the

[6] Defined as answering higher than six on the question, *How worried are you that you will be hurt in a traffic accident?* (scale 0-10).
[7] Defined as answering higher than six on the statement, "*I think society should take vigorous actions to reduce the number of suicides*" (scale 0-10).
[8] Defined as answering higher than six on the statement, "*Each individual should get to decide if he/she would like to end his/her own life; this is no one else's business*" (scale 0-10).
[9] This was a hypothetical question, and no actual donation was made.

maximum WTP. In the following analysis, we used the answer from the open-ended question (table 4). When cleaning the data, we began by dropping five outliers who stated extreme values for WTP, probably due to errors.[10] This will, of course, have a large effect on the mean WTP.

Table 4, Willingness to pay

	WTP suicide prevention		**WTP traffic safety**	
	Mean (standard deviation)	Min;Max	Mean (standard deviation)	Min, Max
		Scenario 1: 100 lives		
Full sample (n=1019)	2 433 (31 385)	0;1 000 000	56 341 (1 574 219)	0;50 000 000
Without outliers (n=1014)	1 448 (2 555)	0;30 000	1 385 (2 485)	0;30 000
Without irrational (n =750)	1 475 (2 623)	0;30 000	1 340 (2 498)	0;30 000
Without uncertain responses (n = 675)	1 470 (2 652)	0;30 000	1 326 (2 488)	0;30 000
		Scenario 2: 200 lives		
Full sample (n=1019)	11 756 (313 227)	0;1 000 000	52909 (1566780)	0;50 000 000
Without outliers (n=1014)	1 939 (3 748)	0;40 000	1872 (3534)	0;40 000
Without irrational (n =750)	2 201 (3 995)	0;40 000	2119 (3861)	0;40 000
Without uncertain responses (n = 675)	2 168 (3 993)	0;40 000	2069 (3818)	0;40 000

From the descriptive statistics, we did not find support for the hypothesis that the WTP for suicide prevention is lower than the WTP to reduce the number of deaths within traffic. On the contrary, the results suggest a somewhat higher WTP for suicide prevention. However, using a Wilcoxon signed-rank test, we found that the difference was only statistically significant in the scenario with 100 lives after we dropped the irrational respondents, i.e., those who stated a higher WTP for the lower risk reduction. The distribution of the final WTP responses for both suicide and traffic is presented in Figure 3.[11]

[10] Of these five, one stated a WTP for saving 100/200 lives in traffic of 50 000 000; one stated a WTP for saving 100 lives in traffic of 5 000 000 while only stating a WTP to save 200 lives in the same context of 5 000; one stated a WTP of 1 000 000 in every scenario/context; one stated a WTP to save 200 lives within traffic of 110 000 while stating a WTP of only 2600 to save 100 lives; and the last respondent stated a WTP for saving 200 lives within traffic of 110 000 (only 2600 for 100 lives).

[11] Five outliers were excluded; 4 stated a WTP> 800000 and 1 stated a WTP>100 000.

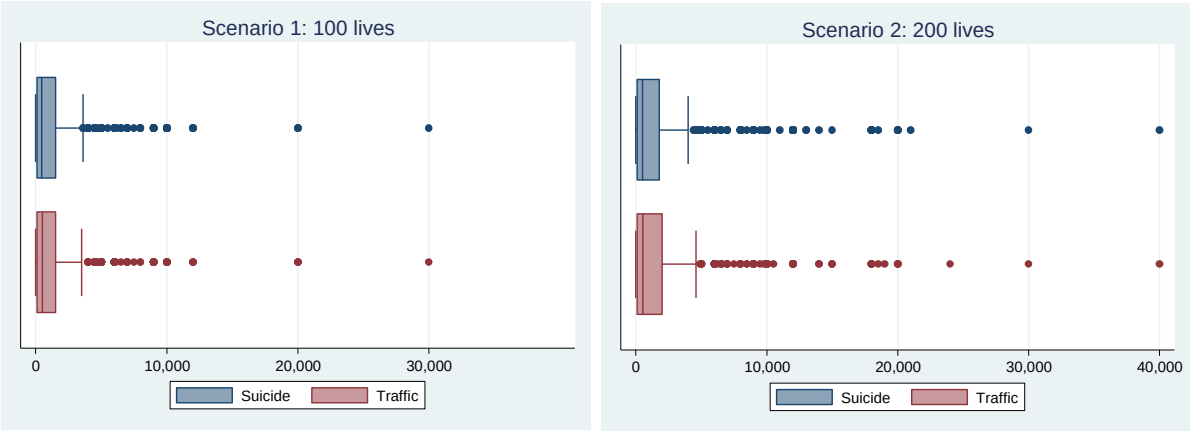


Figure 3. Willingness to pay to save 100 and 200 lives

Figure 4 shows the difference between the WTP to save 100 lives through a reduction in the number of suicides and the WTP to save 100 lives through a reduction in the number of deaths from traffic accidents.

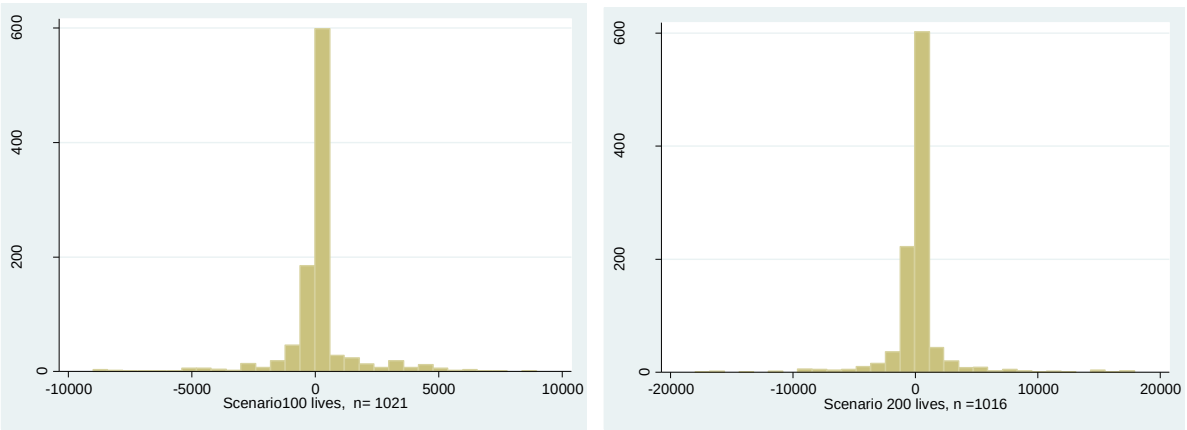


Figure 4. WTP suicide-WTP traffic

The null hypothesis that the WTP for suicide prevention is larger than or equal to the WTP for traffic safety could not be rejected in a t-test when using the full sample. As a robustness test, the test was re-run step by step for 100 and 200 lives including all respondents and then excluding outliers[12], respondents who stated a higher WTP to save 100 lives than to save 200 lives, and those who were uncertain[13] (Table 5).

[12] Same as note 8.

[13] Respondents were defined as uncertain if they answered <5 on the question regarding how certain they were that they actually would accept the proposed tax increase.

Table 5, test H_0 = mean (WTPs-WTPt) ≥ 0 (p-value in parenthesis)

	Scenario 1: 100 lives	Scenario 2: 200 lives
Full sample (n=1019)	Cannot reject H_0 (0.137)	Cannot reject H_0 (0.205)
Without outliers (n=1014)	Cannot reject H_0 (0.907)	Cannot reject H_0 (0.801)
Without irrational (n =750)	Cannot reject H_0 (0.996)	Cannot reject H_0 (0.821)
Without uncertain responses (n = 675)	Cannot reject H_0 (0.998)	Cannot reject H_0 (0.865)

In none of these specifications was support found for the hypothesis that the average WTP from suicide prevention is lower than the average WTP for saving a life in traffic. On the contrary, when using the lower risk reduction (100 lives) and after cleaning the data for outliers, using a two-tailed test, we found that the average WTP for suicide prevention is statistically significantly higher than the average WTP for preventing fatal traffic accidents (Appendix A3).

A further set of tests was conducted using the WTP values stated before the respondents were able to change their answers.[14] In these tests, no support was found for the hypothesis that the average WTP for suicide prevention is lower than the average WTP for saving a life within traffic. Furthermore, a test was conducted regarding the difference between the responses of those who started with different scenarios using only the first scenario, which showed no significance.

4.3 VSL

To make a possible comparison with other studies, the VSL was computed as in equation 1 based on the assumption that there are 8 000 000 taxpayers in Sweden[15].

$$VSL_s = \frac{WTP_s}{\Delta deaths_s} \times 8\,000\,000, \qquad \text{(eq. 1)}$$

where Δdeaths is 100 in s = 1 and 200 in s = 2.

To further facilitate comparison, the VSL was computed with results from our study that were cleaned of unrealistic answers following the same procedure for cleaning the data as in Olofsson et al. (2016). Responses from respondents who stated a higher WTP to save 100 lives than to save 200 lives (269 respondents) were dropped, while those who stated the same amount for both scenarios were retained. The data were also cleaned of responses from protesters and outliers[16]. Untrimmed

[14] Results available upon request.
[15] This assumption was also made in the questionnaire when showing the total cost for society.
[16] A outlier was defined as an individual stating a WTP > *1,5 x the interquartile distance (Q3-Q1)*

answers are provided in the appendix (A4). Descriptive statistics for the trimmed answers are presented in Table 5.

Table 5. Median, mean and standard deviation for VSL. Swedish Kronor (SEK).

	Suicide n = 745 , n = 738		Traffic n = 760, n =737	
	Median	Mean (standard deviation)	Median	Mean (standard deviation)
Δdeaths = 100	20 000 000	51 200 000 (67 300 000)	22 200 000	51 200 000 (64 200 000)
Δdeaths = 200	16 000 000	34 500 000 (43 800 000)	20 000 000	35 300 000 (41 100 000)

The estimated VSL reported in Table 5 is in line with the result by Olofsson et al. (2016) and can be compared to the latest recommendation by the Swedish Transport Administration, which is 40.5 million SEK. As expected, the VSL is lower when using the larger risk reduction.

4.4 Determinants of WTP

Women seem to have a higher WTP for suicide prevention than men, and respondents with higher education have a lower WTP for both scenarios (Table 6). Apart from this, the attitude toward mental health in general and suicide in particular seems to be important. Those who think that it is possible to control their own risk of experiencing depression have a lower WTP for suicide prevention. The same holds true for individuals who state that they think it should be up to an individual to end her own life. This finding is in line with Sueki (2016b), who showed that respondents' attitudes toward suicide are important for their WTP. In the case of traffic safety, most coefficients have the expected sign, but only a few are statistically significant.

Table 6. Determinants of WTP, Tobit regression.

	WTP suicide		WTP traffic		WTP suicide		WTP traffic	
Constant	319.39		332.32		591.71		284.20	
	(727.98)		(701.90)		(737.37)		(854.67)	
Age	43.21		42.02		43.52		44.19	
	(30.94)		(29.79)		(30.91)		(30.67)	
Age^2	-0.45		-0.38		-0.44		-0.40	
	(0.30)		(0.29)		(0.30)		(0.30)	
Women	566.21	***	127.51		526.75	***	119.93	
	(171.32)		(164.76)		(175.49)		(177.68)	
Higher education	-343.79	**	-290.06	*	-357.62	**	-291.68	*
	(171.73)		(165.11)		(171.92)		(168.01)	
Experience of suicide					95.81			
					(174.18)			
Depression					-5.81			
					(209.22)			
Control					-365.92	**		
					(179.48)			
Attitude – own choice					-400.59	**		
					(192.53)			
Traffic accident/death							200.39	
							(234.83)	
Experience own traffic							-46.83	
accident							(211.71)	
Worry traffic risk							16.87	
							(35.24)	
Subjective risk							-2.79	
							(47.39)	
n	1023		1023		1023		1023	
Censored observations	91		72		91		69	
Pseudo R^2	0.0010		0.0003		0.0015		0.0013	

Standard errors in parentheses. ***p<0.01, ** p < 0.05, * p<0.1

The second specification about WTP for traffic also includes dummy variables capturing how often the respondent travelled by car as a driver or as a passenger; none of these were statistically significant.

Controlling for the size of the first bid shows that individuals who started with the highest bid had, on average, a statistically significant higher WTP than respondents who started with the lowest bid.[17] Dropping irrational respondents makes the coefficient for age statistically significant in all specifications. Income is not statistically significant.

Analyzing the size of the difference ($wtp_{suicide}$-$wtpt_{traffic}$), the only statistically significant results are that the coefficient for women has a positive effect and the belief that individuals should have the right to decide when to end their own life has a negative effect.[18]

[17] Results avaible upon request.

[18] Results avaible upon request.

5. Discussion and conclusions

In this paper, we conducted a contingent valuation study to compare the WTP for suicide prevention with the WTP to save a life from a traffic accident. To our knowledge, this is the first paper to estimate these two values in the same survey and the first to estimate the WTP for suicide prevention outside of Japan. Our hypothesis was that the WTP for a given impact on the number of fatalities for suicide would be lower than the WTP to reduce the number of fatalities from traffic accidents because suicides are, to some degree, the result of individuals' own decisions. However, contrary to our hypothesis, we did not find that individuals have a lower WTP for a suicide prevention program compared to a traffic safety program with equal reduction of the number of fatalities.

One interpretation of our results is that the WTP responses reveal paternalistic altruism, i.e., individuals are willing to pay to change the behavior of others and/or their future selves. A reason for this could be that many individuals do not believe suicide to be a rational decision. This may be, for example, because many suicides are connected to mental illness and/or substance abuse, situations in which the individual is not viewed as a rational decision maker.

An aspect that could have an influence on the WTP is the fact that in Sweden, unlike the situation on the global scale, more people die by suicide than in traffic accidents. The respondents were informed about the number of deaths in the two cases, which may have influenced their answers.

We are aware that the contingent valuation method has several problems that could affect the validity of our results (Johnston et al. 2017). Although we attempted to control for some of these issues, they might bias the VSL estimates. However, our main goal was to study whether there is a difference in WTP for suicide prevention compared to traffic safety. Because both values were estimated in the same survey, this bias can be expected to go in the same direction. Additionally, we used a similar survey instrument and analyzed the results in a similar way as in the most recent traffic safety VSL study in Sweden.

Our results diverge from those of previous studies conducted in Japan by Sueki (2015, 2016a), which indicated that the VSL in the context of suicide prevention is lower than for traffic accidents. However, the possible confounding in a comparison of values from studies with different designs makes such a comparison difficult.

With regard to policy conclusions, our results do not find support for the hypothesis that the average WTP is lower for the prevention of suicide than for life-saving interventions in other policy areas, such as traffic. This implies that the same VSL should be used for evaluating suicide prevention

interventions and for risk-reducing programs in other policy areas. Funds for the prevention of fatalities should be directed to the area with the lowest cost per life saved.

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Appendix A1

Example from the questionnaire

There are different types of interventions that could be used to reduce the number of suicides. We will ask you to take a stand regarding several scenarios. We ask you to assume that if one person is hindered from committing suicide, this individual will not commit suicide at a later stage. If no intervention is made, approximately 1200 individuals are expected to commit suicide each year. Assume that an intervention exists that can reduce the number of suicides by 100 individuals.

This means that the risk that a random individual will commit suicide during the next year is reduced from 0.012% to 0.011%

Scenario 1 – suicide, WTP question 1 of 4

Assumed number of suicides next year without intervention	1 200
Expected reduction of number of suicides next year with intervention	100
Total cost each year	6 000 000 SEK
Total cost per taxpayer	750 SEK

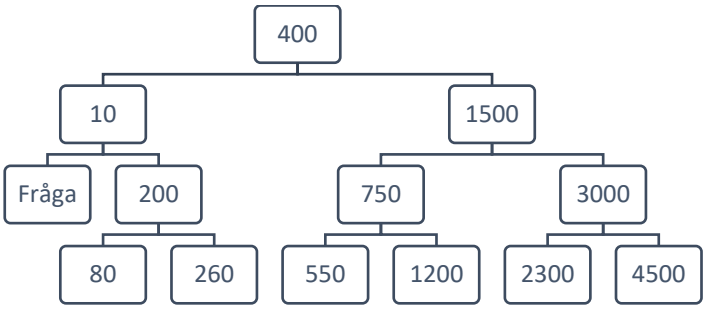
We ask you to consider the alternative use of taxes. The same amount, i.e., 6 000 000 (750kr/taxpayer), could instead be used to pay for 13 161 pre-school teachers, 11 780 schoolteachers in primary education, 15 435 nurses, 9 131 doctors or 15 206 police officers.

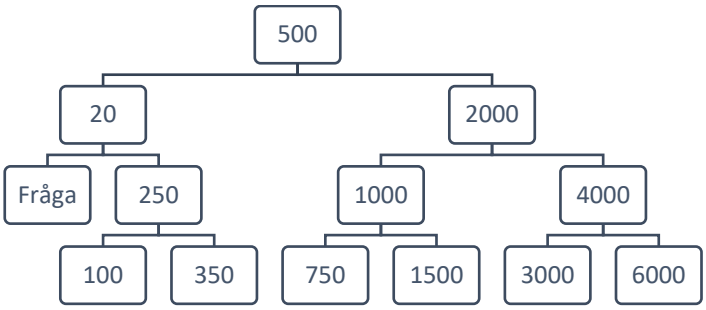
Do you think that the intervention should be done?

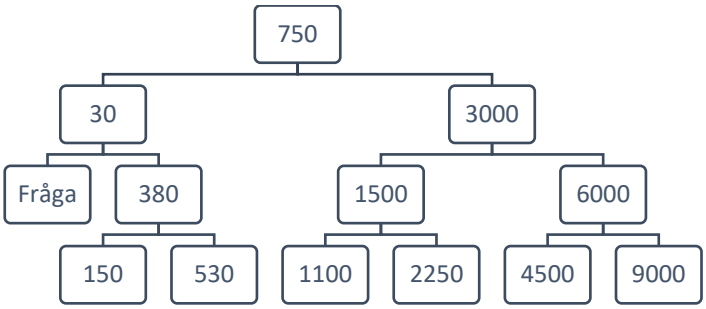
Yes No

Appendix A2, Structure of the cost bids

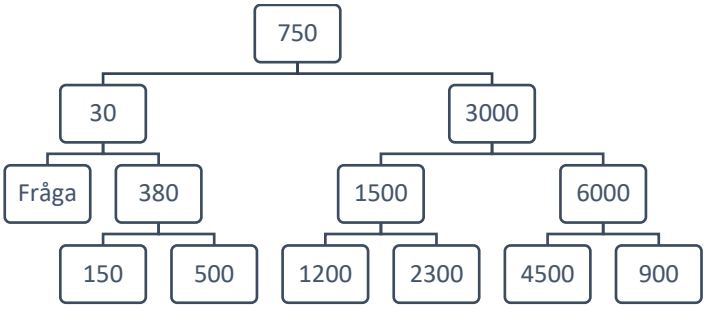
Scenario 1: 100 lives

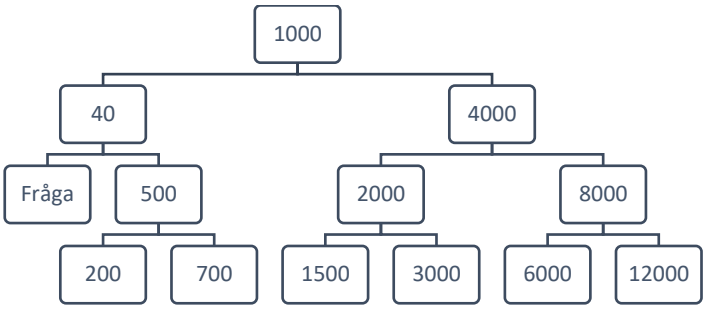


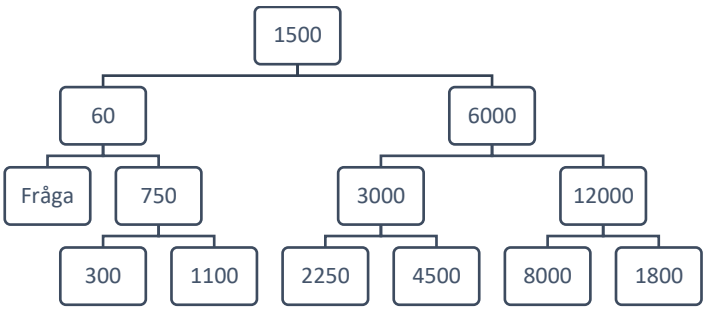




Scenario 2: 200 lives







Appendix A3

Two-tailed test

H_0 = mean (WTPs-WTPt) = 0

	Scenario 1: 100 lives		Scenario 2: 200 lives	
	Mean (Std dev)	T-test (p-value)	Mean (Std dev)	T-test (p-value)
Full sample (n=1019)	-53908 (1573969)	Cannot reject H_0 (0.275)	-41153 (1591995)	Cannot reject H_0 (0.4095)
Without outliers (n=1014)	63 (1528)	Cannot reject H_0 (0.1869)	67 (2526)	Cannot reject H_0 (0.3985)
Without irrational (n =750)	135 (1377)	Can reject H_0 (0.0076)	82 (2446)	Cannot reject H_0 (0.3591)
Without uncertain responses (n = 675)	144 (1313)	Can reject H_0 (0.0044)	99 (2331)	Cannot reject H_0 (0.2691)

Appendix A4, VSL uncleaned and cleaned answers

	Suicide		Traffic	
	Median	Mean (std)	Median	Mean (std)
		Specification 1: Full sample		
Δdeaths = 100	36 000 000	195 000 000	40 000 000	4 470 000 000
(n= 1029, n= 1027)		(2 500 000 000)		(125 000 000 000)
Δdeaths = 200	20 000 000	469 000 000	22 000 000	2 110 000 000
(n=1025, n=1025)		(12 500 000 000)		(62 500 000 000)
		Specification 2: Without outliers (WTP>90 000)		
Δdeaths = 100	35 800 000	117 000 000	40 000 000	112 000 000
(n=1028, n = 1024)		(205 000 000)		(199 000 000)
Δdeaths = 200	20 000 000	78 400 000	21 200 000	76 000 000
(n=1024, n=1021)		(150 000 000)		(144 000 000)
		Specification 3: Without irrational (WTP 100 lives < WTP 200 lives)		
Δdeaths = 100	32 000 000	118 000 000	32 000 000	104 000 000
(n=866, n= 854)		(212 000 000)		(193 000 000)
Δdeaths = 200	24 000 000	88 100 000	28 000 000	82 500 000
(n=862, n=848)		(160 000 000)		(150 000 000)
		Specification 4: Without protesters		
Δdeaths = 100	32 000 000	118 000 000	32 000 000	104 000 000
(n = 860, n=850)		(212 000 000)		(193 000 000)
Δdeaths = 200	24 000 000	88 300 000	30 000 000	82 800 000
(n = 860, n=845)		(161 000 000)		(150 000 000)
		Specification 5: Without outliers (WTP > 6 Q3-Q1))*		
Δdeaths = 100	32 000 000	98 400 000	32 000 000	88 400 000
(n= 844, n = 836)		(151 000 000)		(137 000 000)
Δdeaths = 200	20 000 000	70 600 000	25 600 000	67 600 000
(n = 839, n=827)		(111 000 000)		(105 000 000)
		Specification 6: Without outliers (WTP > 1,5 Q3-Q1))*		
Δdeaths = 100	20 000 000	51 200 000	22 200 000	51 200 000
(n= 747, n= 760)		(67 300 000)		(64 200 000)
Δdeaths = 200	16 000 000	34 500 000	20 000 000	35 300 000
(n= 738, n= 737)		(43 800 000)		(41 100 000)

Cleaning for VSL suicide, scenario 100 deaths: From specifications 1 to 2, we dropped 1 respondent who stated a WTP of 100 000 (=VSL 80 000 000 000). From specifications 2 to 3, we dropped 158 respondents, all of whom stated a higher WTP to save 200 lives than 100 lives. Respondents who stated the same amount for 100 and 200 lives were retained since this can be explained by budget constraints. From specification 6, observations were dropped; however, this did not influence the result. In the last steps trimming for outliers we followed Olofsson et al. (2016). This step was done to be able to compare our results with previous studies that have followed this approach.

In the scenario with 200 deaths, we found a large drop in the VSL from specifications 1 to 2. In this step, we dropped only one observation. However, this respondent stated a WTP of 10 000 000, which corresponds to a VSL of 40 0000 000 000.

For traffic, we also observed a large drop in the in VSL from specifications 1 to 2. In the scenario with 100 lives, we dropped three respondents in this step who stated WTP 1 000 000 000 (VSL= 80 000 000), 5 000 000 (VSL= 400 000 000) and 50 000 000 (VSL=4 000 000 000).